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COST ANALYSIS OF SUWAMEDURA CHEST HOSPITAL,

SRI LANKA IN 2008



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การศึกษานี้มีวัตถุประสงค์ เพื่อวิเคราะห์ต้นทุนรวมและต้นทุนต่อหน่วยของการให้บริการผู้ป่วย ณ โรงพยาบาลซูวาแมดูรา ประเทศศรีลังกา ในปี พ.ศ.2551 และต้นทุนต่อหน่วยของการให้การรักษาคอนไจด์โรค โดยใช้รูปแบบการวิจัยเชิงพรรณนา ในมุมมองของผู้ให้บริการ ทำการรวบรวมทั้งแหล่งปฐมภูมิและทุติยภูมิ ระหว่างเดือนมกราคม ถึง เดือนธันวาคม ในปี พ.ศ.2551 การศึกษาต้นทุนมี 5 ขั้นตอน เริ่มด้วยการจำแนกศูนย์ต้นทุนทั้ง 15 ศูนย์ ออกเป็น 3 กลุ่ม ได้แก่ overhead intermediate และ final (patient care) cost centers จากนั้นจึงคำนวณต้นทุนรวมโดยตรงของแต่ละศูนย์ต้นทุน และต้นทุนรวมทั้งหมด (full cost) ซึ่งเกิดจากผลรวมของต้นทุนรวมโดยตรงและต้นทุนทางอ้อมที่กระจายมาจากศูนย์ต้นทุนต่างๆ มายัง final cost center ด้วยวิธี step-down เมื่อเอาต้นทุนรวมทั้งหมด หักด้วยผลผลิต(output) ทั้งหมด ก็จะได้ต้นทุนต่อหน่วย

ผลการศึกษาพบว่า ต้นทุนรวมเท่ากับ 12, 787,165 รูปี (ศรีลังกา) และต้นทุนต่อครั้งของการให้บริการผู้ป่วยเท่ากับ 252 รูปี ส่วนต้นทุนของการให้การรักษาคอนไจด์โรคในโครงการ Direct Observed Treatment Short Course (DOTS) เท่ากับ 4715 รูปี (41 ดอลลาร์สหรัฐ)

การที่ต้นทุนต่อหน่วยค่อนข้างสูง และสัดส่วนของต้นทุนค่าแรงสูงถึง 61% สะท้อนถึงประสิทธิภาพในการจัดสรรทรัพยากร ซึ่งสมควรที่ผู้บริหารจะนำมาปรับปรุงแก้ไขต่อไป

สาขาวิชา เศรษฐศาสตร์สาธารณสุขและภาวะจัดการบริหารสุขภาพ

ลายมือชื่อนิติ

ปีการศึกษา 2552.....

ลายมือชื่อ อ. ที่ปริกษานิพนธ์หลัก 

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This study analyses the cost (total cost and unit cost as well as unit costs of final cost centers) of the Suwamedura hospital in the year 2008. All the cost components are considered from provider perspective. This hospital started as a model chest clinic in Kurunegala municipal council area, North Western Province, Sri Lanka in 2001. After that it has developed as medium scale hospital with OPD facilities. This study is important for our health sector, because the Provincial government of North Western Province decided to start new chest clinics in six base hospitals in this province in 2011.

The total cost of the hospital is Rs 12,787,165.38(USD111,192.70) and the unit cost of the hospital Rs 237.82(USD2.07). The unit costs for out patient department are Rs 148.00(USD 1.29), for medical clinic Rs185.61(USD1.61), for chest clinic (non tuberculosis) Rs 371.72(USD3.23), for well baby clinic Rs 1,744.40(USD15.17), for tuberculosis unit Rs 3,970.82(USD34.53) and for dental clinic Rs 259.06(USD2.25). But unit cost of the DOTS program is Rs 4,715.74(USD41.00)

High unit cost and low performance indicators suggest low utilization in certain units in this hospital due to inefficiency in human and material resource allocation and the wastage of resources in the hospital. This study presents recommendations to the hospital administrators on improving these areas towards achieving quality and standard provision of health care.

Field of Study: Health Economics and Health Care Management

Academic Year: 2009

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LIST OF ABBREVIATIONS

CC	Capital Cost
CD	Central Dispensary
DH	District Hospital
DOTS	Direct observed treatment short course
ETU	Emergency Treatment Unit
ECG	Electrocardiography
FCC	Final Cost Centers
ICC	Intermediate Cost Center
IPD	Inpatient Department
LC	Labor Cost
MC	Material Cost
MLT	Medical Laboratory Technologist
MO	Medical Officer
MOIC	Medical Officer for In-charge
NPFTC	National Program for Tuberculosis control
NTB	Non tuberculosis
NWP	North Western Province
OCC	Overhead Cost Centers
OPD	Out-Patient Department
PDHS	Provincial Director for Health Service
PHC	Primary Health Care
PHI	Public Health Inspector
PHNS	Public Health Nursing Sister
PS	Patient Service
RDHS	Regional Director of health services
SL	Sri Lanka
TB	Tuberculosis
WB	Well Baby

CHAPTER I

INTRODUCTION

1.1 Rationale

As Sri Lanka we have finished thirty years terrible war season last year. This war condition has mainly affected to northern, eastern provinces as well as north western province. Especially northern part of Puttalan district in north western province directly suffered from this war. This war has created us more social and health problems. The conflict and associated trauma have created huge psychological problems, which are more common in displaced families. Repeated displacement and disruption of livelihoods have made people dependent on handouts. Women often had to take on extra responsibilities without adequate support, making them particularly vulnerable. (Monthly report, Provincial Health Forum, July, 2009)

If government and other inter national organizations like Red Cross had supplied drugs and food items for these people, some time terrorists tried to disturbed this processes. Therefore public health infrastructure and health care facilities, goods and services were not available in sufficient quantity or quality, leading to a severe shortage of safe drinking water and adequate sanitation, trained health staff and essential drugs. The quality of health services is far below the rest of the island. In other hand large number of war refugees has gathered in Puttalam district they need more health facilities. Therefore Sri Lankan government and provincial health department hope to promote health facilities in these areas. (War refugee's rehabilitation program, 2009) Therefore cost study works in health sector in this province are very important. It is one main reason; I selected this type of topic as my thesis work.

Also, according to Wayamba Health Summit (2005), some of small scale health institutes in rural areas in North Western Province showed high unit cost due to lower utilization rate, high wastage of drugs and consumables, problems in human resource allocation and reduce quality of service. Besides, general hospitals and base hospitals

also have shown high unit costs due to over utilization (over crowded) of OPD and IPD. Other reasons for high unit costs of these hospitals were usage of more sophisticated equipments and high labor costs for senior and qualified staff. (Somanathan, 1998). Other main factor of this high unit cost was hospital management problems. If hospital administrators of these hospitals should be qualified medical administrative officers, most of hospital heads were general medical officers. (Cadre summary report, NWP, 2008) This indicates that further research in this area is needed.

Beside Ministry of Health and Japan International Cooperation Agency (JICA) has started a health sector development project in Sri Lanka. Under this project they introduced a hospital cost accounting program in North Western Province with support of provincial ministry of health in north western province. From this program, they hope to improve the quality of hospitals and health care centers in rural areas in this region. . (Annual administrative report, Provincial Health Ministry (NWP), 2008) Therefore my research work may very useful for this project.

In the other hand, this study is not only a number measurement, this is very important to our health sector. Because Sri Lankan government hopes to introduce much health development projects and programs in near future. Especially under the new vision of our government, our country hopes to step down to the first world from the third world during next decade. Considering above factor, our government has introduced our health master plan (2007 - 2016) .The Health Master Plan in Sri Lanka indicates policies and strategies for the development of health care system during ten years (2007-2016). Ministry of health and nutrition has prepared by this document with support of provincial ministries of health and all other relevant stake holders. According to this plan, it mainly targeted to following factors,

- (a) Develop health financing, resource allocation and utilization of the health system.
- (b) Improve quality and quantity of human resource for health system.
- (c) Empower communities to maintain their health conditions well

(d) Ensure health system to reduce diseases, burdens and promote health.

(e) Strengthen management function and qualities of the health system.
(Health Master Plan in Sri Lanka 2007- 2016, Prepared by Ministry of health and nutrition)

These study works are paralleled with Sri Lankan health master plan. Because of this hospital is a medium scale hospital with OPD facilities (no IPD facilities), these results very useful for most of our health institutions to improve their quality according to our health master plan. This analyze is mainly based on following factors. They were number of patient's attendance, staff structure, total direct cost of the cost centers, total indirect cost of the cost centers, direct cost and indirect cost allocation (using step down technique), total cost of the final cost centers, unit cost of the final cost centers, cost profile of the hospital, unit cost of the DOTS program in the TB clinic

In the real world, these types of studies are very useful for the society. Policy makers and other related officers in health department, hospital administrators, insurance companies, private health sectors, foreign and local funding agencies, hospital management information systems (HMIS) can use these results for health sector development in Sri Lanka.

1.2 Basic information about hospital

Suwamedura hospital is the main chest treatment facilities provider with modern technology in north western province and it is located at Kurunegala Municipal council area. It has started as a first model provincial chest clinic in Sri Lanka, 2001, under the provincial council of north western province. If 2.1 million people are living in this province, only one teaching hospital belongs to this province and it is also situated in Kurunegala municipal council area. But supply of the public health services of the teaching hospital and other thirty regional level hospitals are inadequate in growing demand. Therefore provincial health ministry decided to introduce complete open patient department facilities to Suwamedura hospital. There

after, number of patient attendance increases year by year. In year 2001 annual patient visits were 8494, but in 2008 this figure has reached to 53,768, as shown in table 1.1 and now it is one of a main medical facility provider in this province. According to the capacity of this hospital, it can provide health facilities to more people in this area. High patient attendance may cause to increase efficiency of the hospital. Unit cost of the hospital also can be reduced. (Annual report, Suwamedura, 2008)

Table 1.1 Annual patients' attendance 2001-2008:

Year	2001	2002	2003	2004	2005	2006	2007	2008
No of patients	8,494	16,369	21,328	20,022	26,269	37,348	47,856	53,768

Source – Administrative report, Suwamedura, 2008

1.21 Main facilities available in Suwamedura hospital

Suwamedura hospital is provided both curative care and preventive care facilities to the population. Preventive care services are mainly conducted by health education unit, clinics and public health inspector (PHI) Health education programs, immunization programs and rehabilitation programs consist of preventive care services. But some times some health education programs have directly conducted by different units in the hospital with support of international organizations and local non government organizations in year 2008.

The diagnostic services and medical facilities available in the hospital were out patient department facilities, medical laboratory facilities, lung function test facilities, emergency treatment facilities, X ray facilities, dental treatment facilities, Electrocardiography (ECG) facilities and medical clinics facilities. People living in this area can get these facilities completely free of charge, because Sri Lanka has free health service system. (Administrative report, Suwamedura, 2008)

1.2.2 Main diseases list in this hospital

There were two main categories of diseases can identify in this hospital. They were respiratory diseases and common diseases. Pulmonary tuberculosis, extra pulmonary tuberculosis, bronchial asthma, allergic rhinitis, lung cancers, interstitial lung diseases, respiratory track infections were most common respiratory diseases in this hospital in year 2008.

Diarrhea, viral fever, malaria, dengue, H1N1, hypertension, diabetes, heart diseases, renal diseases and urinary track infections were the ten leading diseases reported in this hospital in year 2008. After registration process, these patients are sent to corresponding units considering their medical requirement and disease pattern. (Administrative report, Suwamedura, 2008)

1.3 Country Profile and Health Indicators: Sri Lanka

Sri Lanka is a republic island in the Indian Ocean and a member of the Commonwealth of Nations. Nearest country in Sri Lanka is India and It is separated from Sri Lanka by the Palk Strait and Gulf of Mannar. Sri Lanka has a pearl-shaped.

Sri Lanka has very beautiful coastal belt around the country. It's coastal area in West, South, and Southeast indented by lagoons and inlets. The more marvelous eastern coastal zone contains Trincomalee natural Harbor, beautiful Nilaweli beach.

Natural resources of Sri Lanka are gems, Limonite, Dolomite, Serpentine, Ilmenite etc. Sri Lankan economy is predominantly based on agricultural products, garments field. The chief export products are tea and rubber, followed by coconut products, clothing, graphite, mineral sands, precious and semiprecious stones. Main food products in the country are rice, vegetable and fish. The economic growth rate in the country is 6% - 7%. (http://en.wikipedia.org/wiki/Sri_Lanka, accessed on 10/01/2010)

The land area of the country is approximately 65,610 Square kilometers and the population of the country is 20,010,000. The greatest length from North region to

South region is about 440 km and the greatest width is about 220 km. (Annual report, Statistical department, Sri Lanka)

Sri Lanka is a democratic socialist republic. The executive president is the leader of the country and he elects the cabinet among members of parliament. The president of Sri Lanka and members of parliament are directly elected by citizens in the country. Sri Lanka is divided into nine provinces and twenty five districts for administration purposes. (Government press report, June 2009)

Sri Lanka is followed “High quality health at Low Cost” concept during last two decade. But today demand for health facilities are increase and demand pattern also changed due to the demographic change and epidemiological transition.

Health Economics and health care managements are grate challenges in the world especially in developing countries, such as countries in African and south Asian regions. Sri Lanka has reached a high level of health standard (table 1.2) amongst its population in comparison to the countries in the Asian region. There are many factors that directly and indirectly influenced this achievement. But three social development programs, namely free healthcare, free education system and food subsidies, implemented by consecutive governments of Sri Lanka during the last 60 years. It was the main reasons for this achievement.

These social development programs resulted in significant improvement in literacy rates, as well as the health status of the population. Expansion of health services led to lower death and birth rates. Life expectancy at birth has increased. All these factors gradually changed the social structure, expectations and aspirations of the society.

These improvements clearly show in the National Health Indicators in Sri Lanka. (Annual Health Bulletin, Sri Lanka, 2007)

Table1.2 Health Indicators of Sri Lanka

Indicator	Year	Value
Infant mortality rate	2006	11 per 1000 live births
Maternal mortality rate	2005	44.3 per 100,000 live births
Life expectancy at Birth	2006	Female - 76.4 Male - 71.7
Literacy rate	2001	90.7

Source – Annual Health Bulletin, 2007, Health Ministry, Sri Lanka, Available online at <http://www.health.gov.lk/> (accessed on 12/12/2009)

Administrative Report, 2007, Provincial Health Department (NWP), Available online at <http://www.healthdept.nw.gov.lk/> (accessed on 12/12/2009)

1.4 Research Questions & Objectives

This study work is mainly done according to following research questions and research objectives.

1.4.1 Research Questions

1.4.1.1 Primary Research Question

What is the unit cost of the Suwamedura Chest Hospital , Sri Lanka in year 2008?

1.4.1.2 Secondary Research questions

- (1) What are the unit costs of patient care service centers?
- (2) What is the unit cost of the DOTS program in this hospital?

1.4.2 Research Objectives

1.4.2.1 General Objective

To calculate and analyze the total cost and unit cost of the patient care service in Suwamedura chest hospital in Sri Lanka in the year of 2008.

1.4.2.2 Specific Objectives

- (1) To calculate the unit cost of the DOTS program and unit costs of patient care service centers for 2008
- (2) To evaluate the cost profile of the hospital for year 2008

1.5 Scope of the study

The scope of the study is to provide analysis of the total cost profile of Suwamedura hospital in the year 2008. Under this study is to examine analysis of total costs as well as unit costs of each final (patient care) cost centers in term of provider perspective.

CHAPTER II

LITERATURE REVIEW

This chapter will concentrate on different types of cost analysis techniques, costing tools, cost classification systems and cost definitions as well as applied studies. Different types of cost studies in Sri Lanka and international level and their findings are also considered under this section.

2.1. Cost classification systems and cost definitions.

2.1.1 Cost center Identification

If the cost analysis does not involve patient charges or revenue, cost centers can be dividing in to following three categories. They are Patient care (final cost centers), Overhead cost centers and ancillary (intermediate) cost centers. But when the study is considered regarding the hospital revenue, it is necessary to divide cost centers in to revenue cost centers, non revenue cost centers and patient care cost centers as well. (Sheppard, Hodgkin & Anthony, 1998: JICA EBM costing team, 2007)

2.1.2 Full cost determination

There are four main types of cost allocation methods useful for calculate full cost of the cost centers.

1. Direct allocation method - In this case, each overhead costs has allocated directly to the final cost centers.
2. Step down allocation – The overhead departments have allocated in a step wise pattern to the all of overhead departments as well as to the final cost centers. In this case (a) should allocate cost from higher cost centers to lower cost centers (down ward) (b) Should not allocate cost lower cost centers to higher cost centers (upward)
3. Step down allocation with iterations – The overhead departments have allocated in a step wise pattern of all overhead departments and then to the final cost centers. This procedure should repeat two three times to eliminate remaining unallocated amounts.

4. Simultaneous allocation – This system is similar to 2nd and 3rd systems, but in this case it should solve a set of simultaneous linear equations to give the allocation.

(Sheppard, Hodgkin & Anthony, 1998: Edirisinghae, 2002: Drummond, Sculpher, Torrance, O'Brien, Stoddart, 2005 : JICA EBM costing team, 2007)

2.1.3 Unit Cost Analysis

In this studies describe, main five parts in unit cost calculations. They are cost center identification and grouping, direct cost determination, allocation criteria, full cost determination and unit cost calculation.

(Sheppard, Hodgkin & Anthony, 1998: JICA EBM costing team, 2007)

2.2 Cost: Cost objects have consumed some resources such as financial, physical, human and intangible. These resources can categories as direct resources and indirect resources. These categorizations depend on the type of our study. In other hand we can measure financial, physical and human cost easily, but measuring process of intangible cost is very complex. (Ministry of health Canada, 2007)

Every good or service has a specified value. The cost of goods or services is the value of the resources spent for the acquisition of those goods or services; it can be expressed as a monetary or non monetary value (Carrin and Evlo, 1995)

2.2.1 Economic Cost:

Economic cost or opportunity cost recognizes that, even if no money is spent, the cost of using resources that could have been productively used elsewhere. In the other hand economic cost includes accounting cost as well as opportunity cost. In the health sector, donations from foreign/ local donors and wages for volunteers are also include to economic cost. (Creese & Paker, 1994 :de silva et al., 2007)

2.2.2 Accounting Cost

Accounting cost is cost that is incurred to acquire resources. It is concern with measuring cost for financial planning, accessing and reporting purpose from a particular organizational perspective (Mogyorosy and Smith, 2005)

This can also be referred as the monetary values of actual expenditure for acquisition of goods and services. In the health field, accounting cost includes the cost only the health institution actually spends by them selves. (Creese & Paker, 1994 : Carrin and Elvo, 1995 : de silva et al., 2007)

2.2.3 Capital Cost

Capital costs are inputs that last for more than one year (Creese and Parker, 1994) those including the cost of depreciation of main equipments, machineries, buildings and other fixed assets. (Tisayaticom et al, 2007))

2.2.4 Direct cost and indirect cost

There are two types of costs can be identify in cost calculations in hospitals.

They are direct cost and indirect cost. Direct costs are directly link to the use of particular resources or cost objects. (Mogyorosy and Smith, 2005) Direct cost can be defined in relation to a given activity, a medical service or a department of hospital.(Carrin and Evlo, 1995)

2.2.5 Labor Cost

In the health sector, labor cost has defined as the salary and other fringe benefits of all the personnel in all the departments of the hospital. In estimating labor cost, the working hours personnel spend on different departments must be considered. For this full time equivalent could be used to reflect number of full time staff contribute to each department.(Tisayaticom et al, 2007)

2.2.6 Material Cost

In the health sector, material cost has defined as the cost of all the medical goods, suppliers and other related non medical suppliers incurred in the operation of activity or department. It consists of office supply, housekeeping, maintenance expenses, public utilities, gasoline, laboratory chemicals etc. (Tisayaticom et al, 2007)

2.3 Cost analysis techniques and costing tools

Evidence based management for the health system in Sri Lanka

Health transition process in Sri Lanka is increasing the demand for the health care financing but the budgetary situation in the country, will constrain the availability of funds. Managerial cost accounting can provide a valuable tool for better fund management. Cost efficiency is a one main tool for improving health financing. Especially pilot hospital cost accounting programs operating under this project in teaching hospital Kurunegala and base hospital Kuliyaipitiya are very important to students, study cost analysis and hospital cost management (chapter 2). Calculation and analyzed methods for establish cost centers, allocate direct and indirect costs to cost centers using step down method, total hospital cost structure and unit cost are very use full for this research work. (JICA EBM costing team, 2007)

2.4. Applied studies

2.4.1 Cost estimation of diabetic clinic attendance at the General Hospital, Kandy, Sri Lanka

Diabetes is one of major non communicable diseases in the world these days. The global diabetes epidemic has devastated human lives all aver the world. It effects to human, social and economic fields. The purpose of this study was to estimate the economic burden incurred upon the health care system and family by diabetic clinic patients at the General Hospital Kandy, Sri Lanka.

Main figures and important findings in these studies are as follows. The study sample is consisted of 406 patients with a mean age of 55 years. The estimated annual hospital cost for a diabetic clinic patient was Rs 8,015. Hospital direct variable cost (DVC) was Rs 6,244. Out of 78% of this was for pharmaceuticals. It was Rs 4,871. Direct hospital fixed cost for a patient was Rs. 1,070. This value was 14.33% of total hospital cost for a diabetic clinic patient. Staff salaries and fringe benefits of the diabetic clinic centre contributed about 95% of direct hospital fixed cost. Expenditure

for utilities contributed 94.4% of indirect variable cost (IVC). The estimated mean annual household cost of diabetic clinic patient was Rs 17,595

Total annual cost for attendance to diabetes clinic in General Hospital Kandy was around Rs 2,686,860.00. The household cost of diabetic clinic attendants at this Hospital was also considerably high. (Fernando, Dharmarathna, Agampodi, Lowa, 2009)

2.4.2 Cost Analysis of “Samadhigama” Health Care Unit in Sri Lanka.

This health care center is established in year 2007 at Hambantota district of Sri Lanka under support of a Taiwan non government association, and it is situated in Southern province. This study has aimed to analyze total cost, cost profile, unit cost of Central Dispensary “Samadigama” and also hoped to calculate unit costs of the final cost centers in provider’s perspective. This health center is an integration model of providing curative and preventive care services through one center at the primary level facility. The step-down technique is used to separate cost functions of each patient service department. The data in year 2008 are collected using both secondary and primary sources.

Under this study, unit costs were Rs.147.00 for OPD, Rs. 261.00 for medical clinic, Rs. 514.00 for antenatal clinic, Rs. 940.00 for well baby clinic, Rs. 561.00 for family planning clinic, Rs. 418.00 for dental clinic and Rs. 232.00 for ayurvedic clinic respectively..

They found out that, unit costs are relatively high due to lack of full-time staff and underutilization of services. But finally they believed, extending number of full-time staff and number of service hours the results show that the unit costs will be reduced by 35% of OPD, 75% of medical clinic and 9% of dental clinic as so on.(Bandara,2008)

2.4.3 Cost and unit cost of Gaafu Dhaalu regional hospital, Maldives, in the year 2007

This Gaafu Daafu regional hospital is in Maldives, south Asian region. This hospital has divided in to eighteen cost centers and these cost centers clustered in to four groups. They are called non revenue producing cost centers, revenue producing cost centers, patient service cost centers and non patient service cost centers and this study was a retrospective study conducted in provider's perspective. The data in year 2007 are collected using secondary and primary sources.

According to this study, total direct cost of the hospital in 2007 was Rf 18,596,888 and total operating cost was Rf 16,068,753. Unit costs of the cost centers were Rf 232 for out patient department, Rf 821 for observation room, Rf 178 for dressing room, Rf 514 for dental department, Rf 7,687 for male ward, Rf 4,097 for female ward, Rf 6,910 for surgical ward, Rf 2,312 for pediatric ward and Rf 10,598 for intensive care unit.

These study results showed the high unit costs and low hospital performance due to low utilization of health services in GDH regional hospital in this year and also mentioned about presence of inefficiency in resource allocation and wastage in this hospital. Finally these results recommended to policymakers and hospital administrators on improving these areas can achieve high quality and standard provision of health care. (shafeeq,2007)

2.4.4 Unit cost analysis of three Central Dispensaries in Gampaha, Sri Lanka, 1992

This study mainly based on calculation of unit cost in three central dispensaries in Gampaha district, Sri Lanka. Under this study they have considered, CD Halpe – Katana, CD Andiambalama and CD Dewalapola. CD - Halpe-Katana presents Rs. 35.00 for cost per patient visit with an average of 46 patients daily. The lowest unit cost is Rs. 23.00 which is reported on the average of 73 patients in the CD Andiambalama. On the other hand, CD Dewalapola shows Rs. 53.00 as average cost

with 29 average patient visits. These types of CDs can be identified as traditional or existing CDs in Sri Lanka. Such institutions provide only basic treatments and limited resources are available. (silva, attanayake, 1992)

2.4.5 Unit cost analysis of district hospital, Dompe in year 2000

District hospital means a medium scale hospital in Sri Lanka .According to the cost analysis of Edirisinghe (2000) in Dompe District Hospital, Gampaha, unit cost per day is Rs. 64.00 with an average of 450 patients daily. These types of hospitals are provided inpatient care and have a number of trained staff. Considering other clinics of this hospital, unit cost of medical clinic per patient is Rs. 74.00 per clinic day. An average of patients per clinic day is 215 and unit cost of dental clinic perpatient is Rs 454. An average patient per clinic day is 18.

(Edirishinghe, 2000)

2.4.6 Cost analysis of basic hospitals and complex hospitals

According to the studies of Somanathan (1998) and Somanathan (2000), classify hospitals as complex hospitals, intermediate hospitals and basic hospitals. Complex hospital includes teaching and other specialized hospitals in Sri Lanka. Unit cost of inpatient care facilities of complex hospital is high as these facilities have sophisticated equipments, senior and qualified staff. Hospitals with inpatient facilities (not have any facilities of intensive care, blood bank, etc) and only outpatient facilities are classified as basic and outpatient care. According to this study, unit cost of complex hospital was Rs 338.00 and unit cost of basic hospital was Rs 88.00.

(Somanathan, 2000)

CHAPTER III

METHODOLOGY

3.1 Research Design

This research study is a descriptive study focusing on provider perspective. Both primary and secondary data from January 2008 to December 2008 has collected retrospectively to analyze the total cost and unit cost of patient services at the Suwamedura chest hospital and DOTS program.

3.2 Conceptual frame work

Conceptual frame work of this research depends on the costing methodology of the study. This conceptual frame work mainly consists of five steps.(Figure 3.1)

According to figure 3.1, First step represents the analysis of hospital organization for identification of cost centers. In this part, three types of cost centers have identified. They are overhead cost centers, intermediate cost centers and final cost centers. Step two represents identification of cost sources. Third step describes allocation criteria. Fourth step consist of calculation of total cost (full cost) using direct cost and indirect cost. Fifth and final part describes the calculation of unit cost of the patient care services of the Suwamedura hospital.

Figure 3.2 describes the conceptual frame work of DOTS program in this hospital. There are four main steps include to this frame work. Step one is described the funding sources of DOTS program. Step two is represented allocation criteria of the program. Step three is total cost calculation of the program and final step is described unit cost calculation of the program. Five units were engaged to operate DOTS program in this hospital. They were TB unit, Pharmacy, X ray unit, laboratory and NPFTC. TB unit supplies medical treatment facilities, Pharmacy supplies TB drugs, X ray unit supplies X ray facilities, Laboratory supplies laboratory facilities and NPFTC

gives overall support including training and advocacy programs for the DOTS program.

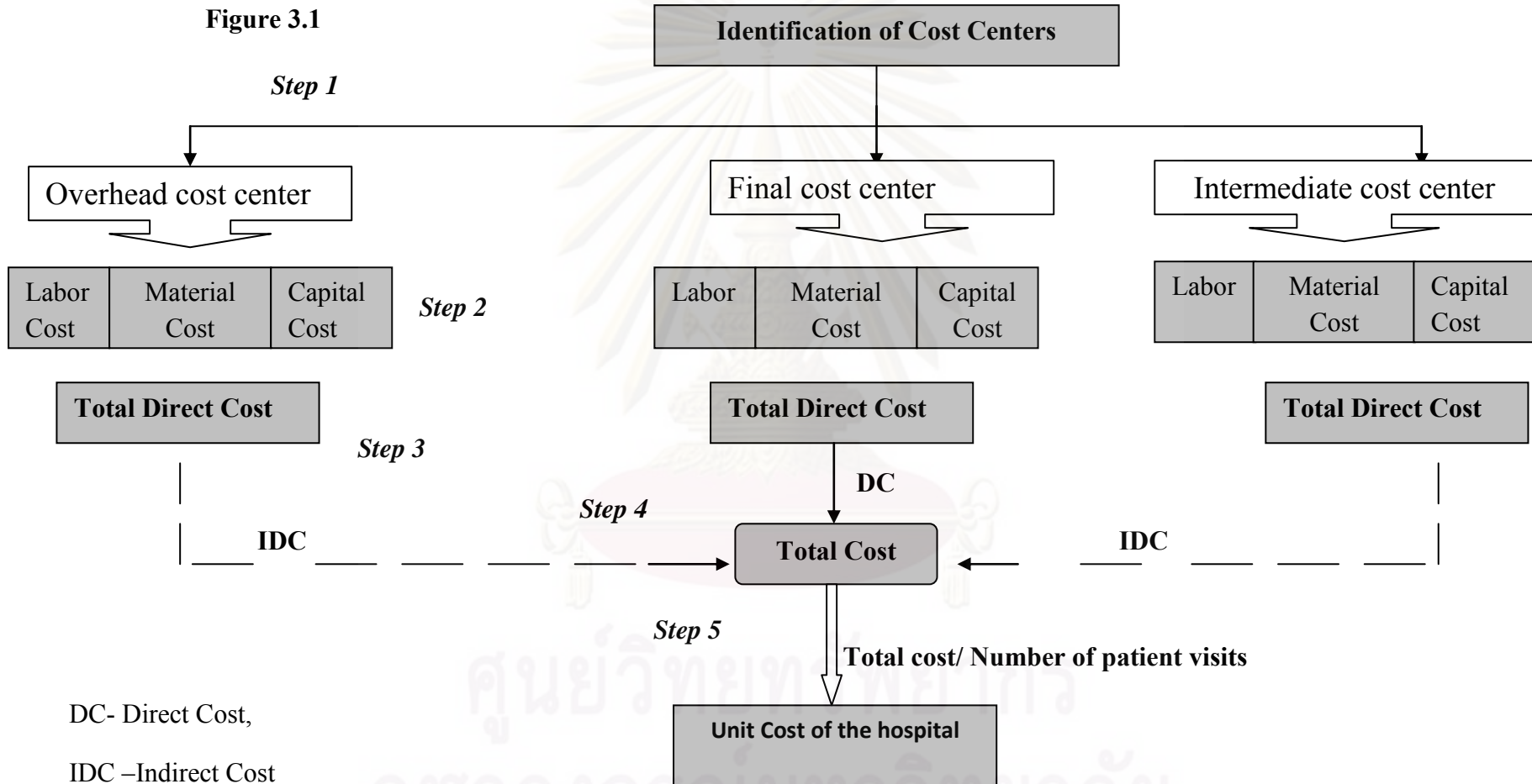
Figure 3.3 is demonstrated the organization structure of the “Suwamedura” hospital. There are two main parts include for this hospital, they are patient care section and administration section. Registration and administration unit, maintenance and cleaning unit and general stores unit belong to administration unit. Patient care section can divided in to two sub parts as curative care service and preventing care service. HE unit and PHI unit belong to preventing care service and OPD, medical clinic, chest clinic, WB clinic, dental clinic, FP clinic, TB clinic, medical lab, pharmacy and X ray clinic belongs to curative care services.



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Conceptual framework

Figure 3.1



Unit cost of the DOTS program

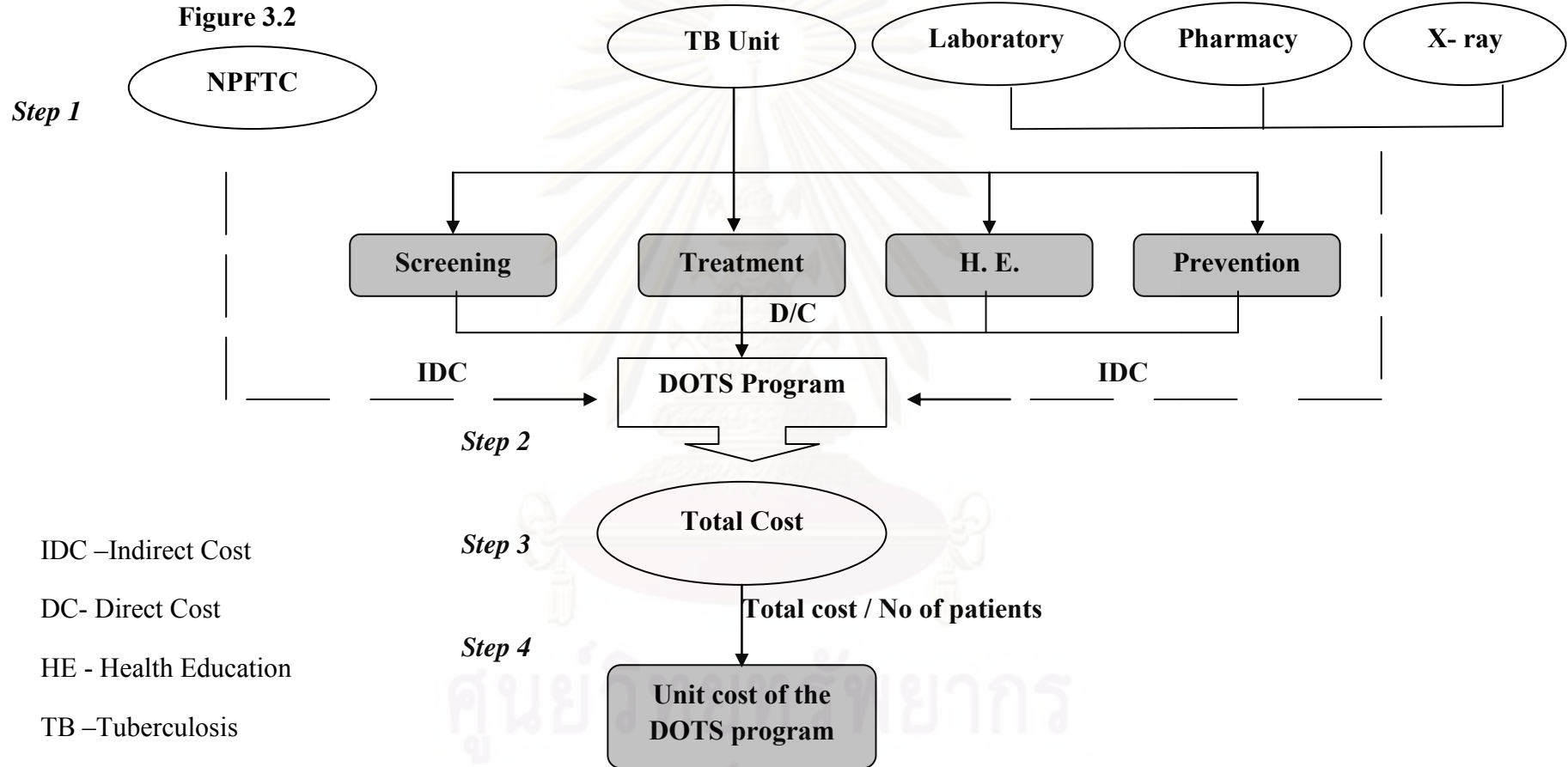
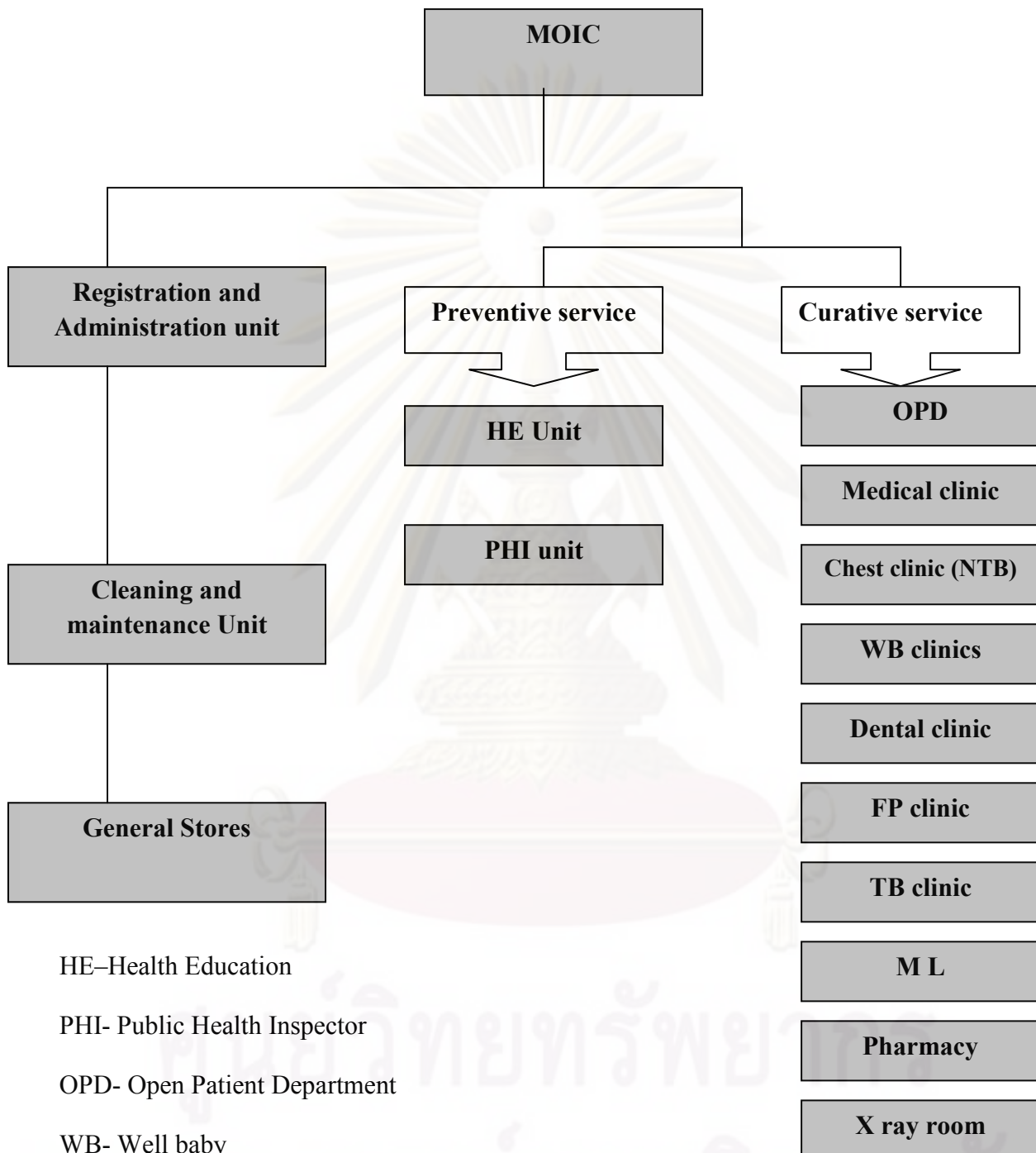


Figure 3.3 Organization structure Suwamedura chest hospital



HE-Health Education

PHI- Public Health Inspector

OPD- Open Patient Department

WB- Well baby

FP- Family Planning

ML- Medical Laboratory

TB -Tuberculosis

3.3 Main service description of cost centers

Registration and Administration unit

Hospital administration works and patient registration works are mainly done by this section. Computer room and driver's room also belong to this unit. MOIC, Nursing sister, two Program assistants and driver are attached to this unit. Every working day MOIC is worked in this unit until 11.30am and then he has worked in OPD. Driver and nursing sister are also shared their working time with other sections according to service requirements. Every patient should register in this unit first and after that they sent to OPD.

Cleaning and maintenance Unit

Hospital cleaning works, minor electrical, electronic and mechanical maintenance works of the hospital are done by this unit. One program assistant and two sanitary labors are worked in this unit. After complete their main duties in this section they are engaged to other sections.

General Stores

Additional medical equipments and other major equipments are stored in this unit. Store keeper's position has vacant. Therefore all stores activities are not functioned properly. But trained sanitary labor is covered store keepers some works with support of other officers during one year.

HE Unit

Overall health education programs in this hospital are covered by this unit. One medical officer, nursing sister, program assistant and sanitary labors are worked in this unit.

PHI unit

Health related field works are mainly arranged by this unit. Especially this unit is very important to preventing care programs. PHI is mainly covered this work and sanitary labors also gave their support to field works.

OPD

This is one of major unit in this hospital. After registration process, patients directly sent to OPD. In OPD, medical officers are done basic medical tests and if patients need further treatments then they send patients to relevant clinic center for further treatments. Medical officers, nursing officers and attendants are covered duties of this unit. This OPD service is functioned every day in the week except Sunday (Saturday is a half day)

Medical clinic

This unit is mainly reserved for common diseases.(page no 3). If patients need long term treatments, they should attend for the clinic services in every month. This clinic service is functioned every day in the week except Sunday (Saturday is a half day) Medical officers, nursing officers and attendants are covered duties of this unit same as OPD.

Chest clinic (NTB)

This unit is reserved for respiratory diseases (page no 3) except Tuberculosis patients. If patients need long term treatments, they should attend for the clinic services in every month as same as medical clinic. Scanning service and other important medical investigations for respiratory diseases patients are conducted by this unit. This clinic service is functioned every day in the week except Sunday (Saturday is a half day) Medical officers, nursing officers and attendants are covered duties of this unit.

WB clinics

This unit is mainly reserved for infants. If they have abnormal features, medical officers investigate them very carefully. According to these investigations they need further intensive treatments; they directly send infants to intensive baby care room or pediatric ward in teaching hospital Kurunegala. Weight measuring and exercise courses for infants are also done by this clinic. Especial education programs for mothers are also conducted by this unit. Medical officers, nursing sister, nursing officers and attendants are shared their service to this unit. This clinic service is functioned twice a month on Tuesday.

Dental clinic

This is another important clinic service in this hospital. Most of the dental treatment facilities are given by this clinic. Basic dental treatments are given in the morning session. If patients need advance treatments, they need to get an appointment and can get treatments in the afternoon. Dental surgeon and nursing officer are worked in this unit. This clinic service is functioned every day in the week except Sunday (Saturday is a half day)

FP clinic

This unit is given family planning materials, knowledge as well as basic treatments for family planning. Hospital administration is introduced successful sex education programs for teenagers and school students with support of family health bureau in year 2008. This clinic service is functioned every day in the week except Sunday (Saturday is a half day) Medical officers and nursing officers are covered duties of this unit.

TB clinic

This unit is also given critical service to the society. Tuberculosis patients are taken medical treatments from this unit. New, relapse, fail and drop out TB patients are attended to this clinics. Most of these patients are engaged with DOTS program. Medical officer, nursing officer and attendant are occupied in this clinic. This clinic service is functioned twice a week on Wednesday and Friday

Medical laboratory

This unit is given ancillary support for the patients. Blood test, stool test, sputum test and urine test are done by this laboratory. MLT , Microscopist and sanitary labor are attached to this unit. But medical officers, nursing officers, radiographer and attendants are also supported to the lab. Medical laboratory service is functioned every day in the week except Sunday (Saturday is a half day)

Pharmacy

This unit is also given ancillary support to the patient care service. Pharmacy is issued drugs for the patients according to prescriptions. This unit is also functioned every day in the week except Sunday (Saturday is a half day). Pharmacist, dispenser and sanitary labor are occupied in this unit.

X ray room

This is the most efficient unit in the hospital, because of maximum service out put given labor cost. (appendix B-11) Minimum persons are worked in this unit. Main character is a radiographer. This unit is taken X ray reports of the patients. X ray room is also functioned every day in the week except Sunday (Saturday is a half day).

3.4 Research Methodology:

The conceptual frame work has designed considering step down method. This frame work has consisted of five steps (Shepard, Hodgkin and Antony,1996)

1. Cost centre identification and grouping
2. Direct cost determination
3. Allocation criteria
4. Full cost determination
5. Unit cost calculation

3.4.1 Cost centers identification and grouping

Cost centers divided into main three parts.

- (1) Over head Cost Centers

These cost centers provided overhead support services to both patient care and intermediate (ancillary) cost centers. Costs of overhead cost centers are shared with the patient related cost centers. Register & administration, cleaning & maintenance, stores and health education units belong to over head cost centers

- (2) Ancillary/ intermediate Cost enters

These cost centers provided ancillary services to support patient care units but are organized as separate departments. These cost centers also called as transient cost centers. PHI unit, medical laboratory, Pharmacy and X ray unit belong to intermediate cost centers.

(3) Patient Care/ final cost centers

These cost centers were responsible for direct patient services. OPD, medical clinics, chest clinic, well baby clinic, TB clinic, dental clinic and FP clinic belong to patient care cost centers

Table 3.1 Cost center identification

Group	Code of cost center	Name of cost center
Overhead cost center	A 1	Registration and administration unit (R & A)
	A 2	Cleaning and maintenance unit (C & M)
	A 3	Stores unit
	A 4	Health Education unit (HE)
Intermediate (ancillary) cost centers	B 1	Public Health Inspector's Unit (PHI)
	B 2	Medical Laboratory (ML)
	B 3	Pharmacy
	B 4	X Ray Unit
Patient care (final) cost centers	C 1	Out Patient Department (OPD)
	C 2	Medical Clinic
	C 3	Chest Clinic- NTB
	C 4	Well Baby Clinic
	C 5	Tuberculosis Unit (TB)
	C 6	Dental Clinic
	C 7	Family Planning

3.4.2 Direct cost determination

There were three types of direct costs belong to this category. They were material cost, capital cost and labor cost.

3.4.2.1 Material cost- Material cost can be divided in to four categories.

1 Medical supplies -

Medical consumables, drugs, vaccines and low value medical equipments (value less than 100\$ / life time less than one year) considered as medical supplies. All the medical supplies to the hospital is supplied by regional drug stores, Kurunegala. These medical supply values are taken from institute wise drug issue detail form.

2 Office materials and general supplies -

Office materials (life year less than one year) such as stationery, furniture and general items belonged to this category. Costs of these materials are taken from log books, bills and invoices in the administration section.

3. Operational and maintenance cost (general utilities)

Operational and maintenance costs of vehicles, electricity, water, telephone costs belonged to this category. These cost information was directly obtained from bills, invoices and log books in administration department. Later these cost were calculated separately, according to cost centers.

4. Other costs

Expenses for material transport, staff traveling cost, expenses of staff improvement programs were belonged to these cost categories.

3.4.2.2 Capital cost –The cost of items, value more than \$ 100 and usage time period more than one year are belong to capital cost. This cost compromise land, buildings, major equipments, vehicles, vessels and machineries.

Land, two buildings, two vehicles, major equipments, machineries in the hospital is taken as the capital items. Major equipments and machineries could share cost center

wise using inventories and other related documents. Land and building values obtained with support of Civil engineer at the Wayamba engineering department, Kurunegala. Mitsubishi jeep and Mazda van also belonged to the hospital. This jeep mainly used by MOIC for the administration works of the hospital and van used to other official works of the cost centers.

3.4.2.3 Labor cost- All employees, attached to the hospital considered as labors in this case. Thirty four persons were worked in this hospital. Annual salary details of these persons were taken from the salary department in office of regional director of health services (RDHS), Kurunegala. After that their basic salaries and other allowances were calculated carefully. But the salaries and other allowances for the people, who worked for the shorter period less than one year, were calculated separately considering to the duration of their service.

Total labor cost mainly consisted of basic salary, professional allowances, living allowances, medical allowances, over time allowances and other special allowances.

In the other hand, the staff members who worked for more than one cost center, their full time equivalent salary were used to reflect their salary contribution from each cost center, considering their working time.

3.4.3 Allocation criteria

In this case, Hospital cost is separated as direct cost and indirect cost.

Indirect cost- *Cost which allocated from the other cost centers

*Cost which allocated to the other cost centers

3.4.4 Total cost determination

Then we calculated full cost using direct cost and indirect costs.

Total cost = Total Direct Cost (TDC) + Indirect Cost (IDC)

Total cost = TDC (Capital cost+ Labor cost+ Material cost)+ IDC(Capital cost+ Labor cost+ Material cost)

3.4.5 Calculating unit cost

After calculating total cost, we calculated the unit cost of the hospital using this total cost and number of patient visits.

Unit cost of the hospital = Total cost / Number of patients visits

Then We could calculate unit cost of each final cost centers.

Unit cost of cost center = Total cost of the cost center / Number of patient visits of cost centers

Eg- Unit cost of the DOTS program = Total cost of the DOTS program/ No of patient Visits of DOTS

3.5 Data collection and Source

Initially hospital authority was consulted regarding the availability and accessibility of cost information about in the hospital. Then an official permission granted from Provincial director of health services (NWP) and regional director of health services in Kurunegala.

The data collected using two types of sources.

3.5.1. Primary data

Primary data can be defined as the data which are collected specially for this thesis/project. The method of in-depth interview and self observation were used to collect the data, (time allocation of each health personnel, time used of medical and electrical equipments and materials etc..)

3.5.2. Secondary data

Secondary data can be defined as the data which are collected for some purpose other than the research situation. Patient's records, statistical records, inventory books, attendant sheets, salary slips, electric, telephone and water bills were used as secondary data in my work.

3.5.3. Method of Data Collection

Method of data collection is done by as follows in the table

Table 3.2 Data collection structure

Objective	Variable	Unit of analysis	Type of Data	Data Source
*Over head cost centers	1. Labor cost (1)No of staff	Rupees/Month	Primary & secondary data	*In-depth interview & observation method
*Ancillary cost centers	(2)Salary & fringe benefits			*Personal records (Diary)
*Patient Care cost centers				* Record form
	2. Material cost (1)Medical materials (2)Non-medical materials (3)Operational & maintenance	Rupees/Month	Primary & Secondary data	*In-depth interview & observation method * Records from Medical Supply Division, Bio-Medical Department , Purchasing section *Monthly Bills *Inventory lists
	3. Capital cost (1)Equipments (2)Building (3)Land	Rupees/Month, year	Primary & Secondary data	* Floor plan of the building * Inventory lists * MoH records
Unit of service	Final/patient service centers	Number of Patients visits/month	Secondary data	* Record form

3.5.4 Data collection tools:

During data collection, following data collection tools were used in the field. They were forms for salaries and other allowances, forms for water, electricity, telephone, e mail , internet etc, forms for medical equipments vehicles, photocopy machines, fax machines, computers with accessories, furniture, air conditions etc, forms for buildings, forms for traveling claims, form for drugs and other medical items

3.5.5 Data collection of DOTS program

During calculate labor cost, material cost and capital cost of cost centers in hospital, corresponding costs of labor, material and labor of DOTS program have also separated clearly. Most of these data were collected using administration report of Tuberculosis unit. Cost component of National Program for Tuberculosis Control (NPFTC) was taken directly from their head office. Using these cost figures full cost of DOTS program was calculated.

$$\begin{array}{l} \text{Total cost of TB unit} \\ \text{Relating to DOTS} \end{array} = \begin{array}{l} \text{Labor cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Capital cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Material cost} \\ \text{for DOTS} \end{array}$$

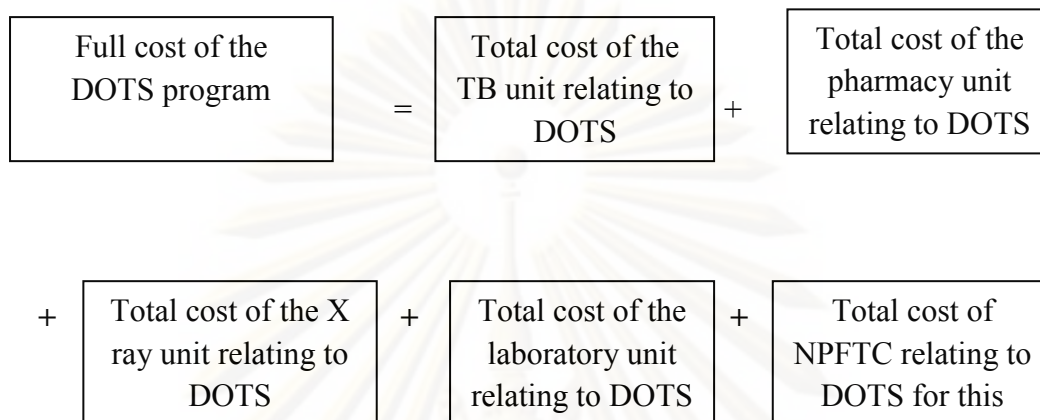
$$\begin{array}{l} \text{Total cost of Pharmacy unit} \\ \text{Relating to DOTS} \end{array} = \begin{array}{l} \text{Labor cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Capital cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Material cost} \\ \text{for DOTS} \end{array}$$

$$\begin{array}{l} \text{Total cost of X ray unit} \\ \text{Relating to DOTS} \end{array} = \begin{array}{l} \text{Labor cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Capital cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Material cost} \\ \text{for DOTS} \end{array}$$

$$\begin{array}{l} \text{Total cost of Laboratory unit} \\ \text{Relating to DOTS} \end{array} = \begin{array}{l} \text{Labor cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Capital cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Material cost} \\ \text{for DOTS} \end{array}$$

$$\begin{array}{l} \text{Total cost of NPFTC} \\ \text{relating to DOTS} \\ \text{for this hospital} \end{array} = \begin{array}{l} \text{Labor cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{capital cost} \\ \text{for DOTS} \end{array} + \begin{array}{l} \text{Material cost} \\ \text{for DOTS} \end{array}$$

Figure 3.4 Full cost calculation of DOTS program



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CHAPTER IV

RESULTS AND DISCUSSION

4.1 General Background

The total operating area of the Suwamedura hospital was divided into two buildings, the large building used mainly for patient care services and other main functions, small building used for medical laboratory. If this large building is a four-story building, only ground and first floor used for hospital works. Second and third floors used for Health museum, Provincial food lab, Analyst department lab and health library. These sections neglected, because these parts were not belonging to the hospital. Total floor area of the hospital is approximately 39,000 square feet (small building and ground and 1st floor of the main building). These buildings have constructed in 1993 and this hospital has started in 2001. This hospital belongs to Kurunegala municipal council area in Kurunegala district in North Western Province. Administration and registration unit, cleaning and maintenance section, Stores, health education unit, PHI office, pharmacy, X ray unit, OPD, medical clinic are in ground floor and chest clinic, WB clinic, TB clinic, dental clinic, WB clinic and family planning clinic are operating in first floor.

All the costs in this study were calculated in Sri Lankan Rupees (Rs). The exchange rate is 1 US dollar is equal to Rs115 and 1 Thai bath is equal to Rs3.30 as of 20/01/2010

The existing staff of the hospital, 7 MO including MOIC, 1 Dental surgeon, 1 nursing sister, 1 PHI- has joined health related field works, 7 Nursing officers -have covered both OPD and clinics, 2 program assistant in R/A section and 1 program assistant worked both health education unit and maintenance and cleaning unit, 1 pharmacist and 1 dispenser were in pharmacy, 1 MLT, 1 Microscopist and 1 sanitary labor were in medical lab, 1 Radiographer was in X-ray room, 1 trained sanitary labor has covered store keepers duties(store keeper position has vacant), 3 attendants and 3 sanitary labors have covered other overall sections of the hospital, 1 driver has also

worked in the hospital as shown in the table 4.1. All staff members have worked as full time basis and all are permanent staff.

Table 4.1 Existing Staff Structure of Suwamedura Hospital

	Staff Category	Type of service	Number of days /week
1	7 Medical Officer	Full time	6
2	1 Dental Surgeon	Full time	6
3	1 Nursing Sister	Full time	6
4	3 Program Assistants	Full time	6
5	1 Public Health Inspector	Full time	6
6	7 Nursing Officers	Full time	6
7	1 Pharmacist	Full time	6
8	1 MLT	Full time	6
9	1 Radiographer	Full time	6
10	1 Microscopist	Full time	6
11	2 Attendant	Full time	6
12	6 Sanitary labors	Full time	7
13	1 Dispensers	Full time	6
14	1 Driver	Full time	7

Source: Data collection for the study

4.2 Patients visits and basic cost calculations - 2008

Table 4.2 shows patients visits of the hospital in the year 2008. The OPD was taken the highest percentage of total patient visits which was 55.1%. Sri Lankan people use April and May for celebrate their New Year season and Wesak ceremony. Therefore highest patient's visits are reported in months June and July in the hospital. These amounts were 4,963 and 5,503. Average number of patient visits per month was 4,481 and per day were 187.

Table 4.2 Number of patient visits

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
OPD	2,428	3,208	2,328	2,580	2,460	2,672	3,240	2,388	1,968	2,180	2,060	2,120	29,632
Dental	360	496	328	408	380	324	468	460	288	260	388	372	4,532
Medical Clinic	300	348	324	316	304	348	360	336	352	328	348	336	4,000
Family Planning	636	792	812	592	520	1,048	828	1,160	720	540	500	540	8,688
Chest Clinic	462	448	470	444	448	479	508	515	491	489	498	508	5,760
TB	36	36	28	32	38	23	40	31	39	42	32	39	416
WB	48	54	41	65	61	69	58	67	71	63	74	69	740
Total	4,270	5,382	4,331	4,437	4,211	4,963	5,502	4,957	3,929	3,902	3,900	3,984	53,768

Source: Annual Administration Report, Suwamedura Hospital, 2008

4.2.1 Total Direct Cost Calculation

The total direct cost of Suwamedura hospital in 2008 was Rs.12,787,165.38. Total direct cost for labor cost which was Rs. 7,782,057.24 and this is the highest one. Capital cost was Rs. 2,773,826.70 .Material costs was Rs 2,231,281.44. (Refer to figure 4.1)

Figure 4.1 Total Direct cost by cost Classifications - 2008

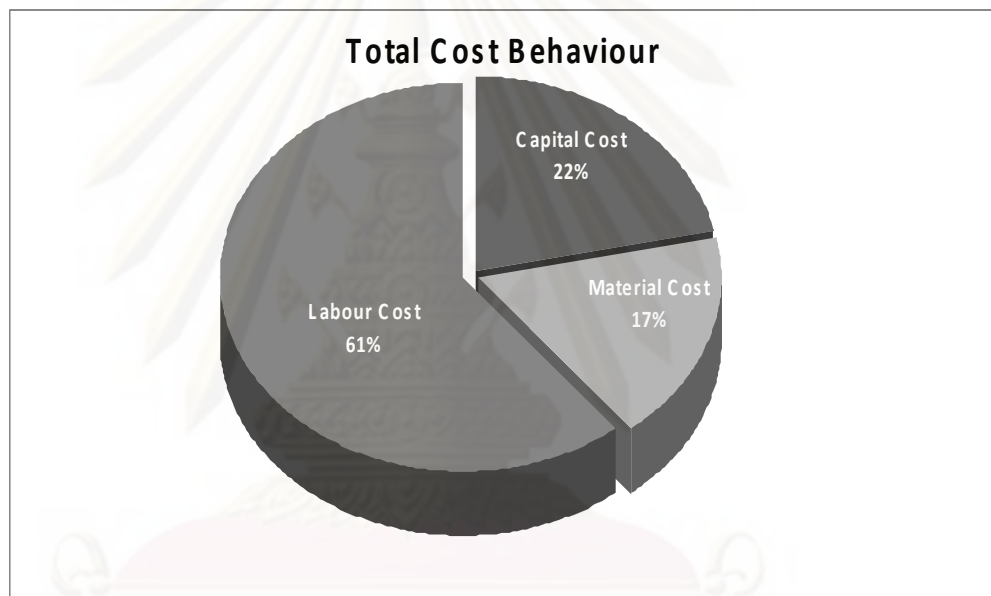


Table 4.3 shows the largest value of total direct cost was incurred by the R / A unit. This value stands Rs. 2,034,337.60. Capital cost and labor cost in this unit is showed higher values. R/A unit maintained a vehicle (Jeep) for its administration works by MOIC and used more office equipments than other units. In other hand number of staff members in this section was also high. MOIC, nursing sister, two program assistants and driver are attached to this unit. Therefore its capital cost and labor cost are showed a higher value (Appendix B -15).

The next highest total direct cost was represented by the pharmacy which is Rs 1,439,485.00. The value of material cost in this unit is higher than other units. Because this unit used more Chemical, Drugs & Medical supplies in this year than (Appendix B -15).

The third highest total direct cost was represented by the chest clinic which is Rs 1,345,822.64. The value of capital cost in chest clinic shows higher value than other units. Because area of the chest clinic is quite larger than other units and value of major medical equipments used in chest clinic is higher than other units.(Appendix B-3)

This table shows the lowest total direct cost was incurred by stores. This value was Rs 264,133.20. Stores works was not functioned properly during this year because of absent of qualified store keeper. Sanitary labor has covered these duties. (Appendix B-3)

The X ray unit also shows low total direct cost. The main reason of this low cost is low labor cost.(Appendix B-3) Efficiency of radiographer was very high. He is covered all major duties in X ray unit himself. According to the attendance register his work attendance rate was 100% and he covered his most duties during his work hours. He also not reported to over time works. (Over time papers, 2008 not shown but available upon request)

Table 4.4 Total Direct Cost by Cost Center Categories – 2008 (Rupees)

	Capital Cost	%	Material Cost	%	Labor Cost	%	Total	%
Overhead Cost Centers (A 1 – A 4)	1,169,266.56	42.15	41,043.60	1.84	2,612,470.44	33.57	3,822,780.60	29.90
Intermediate Cost Centers (B 1 – B 4)	339,908.80	12.25	783,566.36	35.12	2,080,733.80	26.74	3,204,208.96	25.06
Final Cost Centers (C 1 – C 7)	1,264,651.34	45.59	1,406,671.48	63.04	3,088,853.00	39.69	5,760,175.82	45.01
Total	2,773,826.70	100	2,231,281.44	100	7,782,057.24	100	12,787,165.38	100

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Table 4.4 presents the total direct cost by cost center categories. The final cost centers (C 1 – C 7) are the most important cost category of total expenditure components at the center. This category has consumed the largest portion of total direct cost which is 45.1%. It is equivalent to Rs. 5,760,175.82. The overhead cost centers have used the next higher total costs which were Rs. 3,822,780.60 (29.9%). Moreover, intermediate cost centers have bearded the lowest costs of total direct costs which was 25.06% of total direct costs. The amount was 3,204,208.96

4.2.2 Total Indirect Cost

Total indirect costs are obtained using step-down technique. Total direct costs and total indirect costs of overhead cost centers and intermediate cost centers were allocated down to the final cost centers (absorbing cost centers) following the allocation criteria (table 4.5). Table 4.6 illustrates allocation of the direct and indirect cost from up to down, using Step down technique. (Data from Appendix B-15.) The overhead cost centers are allocated in a step wise fashion to all of the remaining overhead cost centers and to the final (patient care) cost centers. (Drummond, Sculpher, Toorrance, O'Brien & Stoddart, 2005)

When apply step down technique, it has some principles to follow.

1. Costs should allocate higher cost centers to lower cost centers
2. Cost should not allocate from downward to upward
3. At the end, highest cost center become zero

Table 4.5 Direct Costs and Indirect Costs allocation using Step down Technique

	Department	Total Direct Cost	A1- R/A	A2- C/M	A3- Stores	A4 - H/E	B1- PHI	B2- Med. Lab	B3 – Pha	B4 – X Ray	Full Cost
A 01	R / A Unit	2,034,337.6	0.00								
A 02	C / M Unit	811,410.96	40,686.76	0.00							
A 03	.Stores	264,133.2	40,686.76	17,041.96	0.00						
A 04	H/ E Unit	712,898.84	61,030.12	17,041.96	6,437.24	0.00					
B 01	PHI Unit	419,371.96	101,716.88	8,520.96	6,437.24	0.00	0.00				
B 02	Med. Laboratory	1,027,846.4	101,716.88	8,520.96	6,437.24	0.00	10,720.96	0.00			
B 03	Pharmacy	1,439,485	40,686.76	17,041.96	32,186.2	39,870.4	10,720.96	23,104.84	0.00		
B 04	X Ray Unit	317,505.6	20,343.36	17,041.96	12,874.48	39,870.4	10,720.96	46,209.68	0.00	0.00	
C 01	OPD	996,166.84	960,207.36	452,463.88	172,518	44,854.2	52,532.6	113,213.76	1,282,476.88	311,259.52	4,385,693.04
C 02	Medical Clinic	365,800.52	97,648.2	46,013.28	15,449.36	44,854.2	5,253.28	11,321.36	128,247.68	27,874.00	742,461.88
C 03	Chest Clinic (NTB)	525,865.88	81,373.52	38,344.4	12,874.48	179,416.84	35,604.80	314,225.96	110,200.00	23,228.32	1,321,134.20
C 04	WB Clinic	623,096	32,549.4	15,337.76	7,724.68	179,416.84	64,325.64	138,629.08	0.00	13,937.00	1,075,016.40
C 05	TB Unit	1,064,491.16	130,197.6	61,351.04	23,174.04	179,416.84	15,200.20	471,338.92	203,507.00	41,811.00	2,190,487.80
C 06	Dental Clinic	1,345,822.64	146,472.32	69,019.92	25,748.96	44,854.2	8,255.12	17,790.72	192,371.52	46,456.64.00	1,896,792.04
C 07	Family Planning	838,932.72	179,021.72	84,357.68	0.00	44,854.2	9,005.60	19,408.08	0.00	0.00	1,175,580.00
	Total	12,787,165.32	2,034,337.64	852,097.72	321,861.92	797,408.12	222,340.12	1,155,242.40	1,916,803.08	464,566.48	12,787,165.36

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Table 4.6 Total Indirect Cost (Sri Lankan Rupees)

Code	Cost Center	Indirect Cost of OCC*	Indirect Cost of ICC*	Total Indirect Cost	%
C 1	OPD	1,630,043.44	1,759,482.76	3,389,526.20	48.24
C 2	Medical Clinic	203,965.04	172,696.32	376,661.36	5.36
C 3	Chest Clinic	312,009.24	483,259.08	795,268.32	11.32
C 4	WB Clinic	235,028.68	216,891.72	451,920.40	6.43
C 5	TB Unit	394,139.52	731,857.12	1,125,996.64	16.02
C 6	Dental Clinic	286,095.40	264,874.00	550,969.40	7.84
C 7	Family Planning	308,233.60	28,413.68	336,647.28	4.79
	Total	3,369,514.92	3,657,474.68	7,026,989.60	100

*- Overhead Cost Centers (OCC) and Intermediate Cost Centers (ICC)

Table 4.6 shows the highest portion of total indirect cost stands at 48.24% for OPD. It consists Rs. 1,630,043.44 from overhead cost centers and Rs. 1,759,482.76 from intermediate cost centers. Because different types of patients are visited to OPD and they need to get different types of supports from every overhead cost centers (OCC) and intermediate cost centers (ICC). Therefore every OCC and ICC are shared their cost with OPD.

Family planning unit is taken the lowest value of indirect cost. Because special group of patients are come to get treatments from family planning unit. They are not needed to deal with some overhead cost centers (OCC) and intermediate cost centers (ICC). Therefore X ray unit, pharmacy and stores are not shared their cost with family planning unit. It is contained Rs. 308,233.60 from overhead cost centers and Rs. 28,413.68 from intermediate cost centers.(Table 4.6)

4.2.3 Total Cost (Full Cost)

The total costs of final cost centers are provided in the table 4.7 below. A proportion of 23.36% of total direct costs is utilized by the chest clinic, which is the highest portion (Table 4.3). On the other hand, FP clinic is the second large direct cost. It is 18.48% of total direct cost. OPD incurs 17.29% of total direct cost, which is the third large cost. Nevertheless, the largest amount of total indirect cost is incurred by the OPD that is 48.24% of total indirect cost (Table 4.5). Thus, 34.3% of total cost is bearded by the OPD and on the other hand, chest clinic expends 16.74% of total cost. Both departments stand first and second places of total cost profile respectively. The third large total cost, which is 12.92%, is obtained by the TB clinic.

Medical clinic is taken the lowest total cost. Patients with general diseases are come to the medical clinic. Most of the general disease patients in this hospital are considered as miner cases. Because both Suwamedura and teaching hospital are situated in Kurunegala municipal council area, Patients with major general diseases are attended to the teaching hospital Kurunegala. Therefore total cost of medical clinic shows a lower value.

Table 4.7 Total Cost of Final Cost Centers

Cost Center	Total Direct Cost	%	Total Indirect Cost	%	Total Cost	%
OPD	996,166.84	22.71	3,389,526.20	77.29	4,385,693.04	100
Medical Clinic	365,800.52	49.30	376,661.36	56.70	742,461.88	100
Chest Clinic	1,345,822.64	62.85	795,268.32	37.15	2,141,090.96	100
WB Clinic	838,932.72	64.99	451,920.40	35.01	1,290,853.12	100
TB Unit	525,865.88	32.02	1,125,996.64	67.98	1,651,862.52	100
Dental Clinic	623,096	53.07	550,969.40	46.93	1,174,065.40	100
Family Planning	1,064,491.16	75.97	336,647.28	24.03	1,401,138.44	100
Total	5,760,175.76	45.05	7,026,989.60	54.95	12,787,165.32	100

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Table 4.8 Cost Profile of Suwamedura Hospital

Cost Category	Cost (Rs.)	%
Capital Cost	2,773,826.70	21.69
Material Cost	2,231,281.44	17.45
Labor Cost	7,782,057.24	60.86
Total Cost	12,787,165.38	100%

In considering cost profile in Suwamedura hospital as a whole, the highest costs borne by labor cost. It is Rs. 7,782,057.24. It is equivalent to 60.86% of total cost. Normally labor cost of the health sector in Sri Lanka is higher than material cost and capital cost. Health workers are earned more money using over time works and other fringe benefits, because health service is an essential service.

Secondly, Rs. 2,773,826.70 is spent for the capital cost. It is reported 21.69% as a percentage of total cost. Material cost is Rs. 2,231,281.44 and represent 17.45%.

4.3 Unit Cost

Unit cost of the Suwamedura hospital can be define as ratio of total cost of the hospital and number of patient's visit to the hosp ital in year 2008.

$$\begin{aligned} \text{Unit cost of the Suwamedura hospital in 2008 in Rupees} &= 12,787,165.38 / 53,768 \\ &= \text{Rs } 237.82 \end{aligned}$$

$$\text{Unit cost of the Suwamedura hospital in 2008 in USD} = \$ 2.07$$

Table 4.9 Unit Costs of Final Cost Centers

Department	Total cost	No of patients visits	Unit Cost (Rs.)	Unit Cost (\$)
OPD	4,385,693.04	29,632	148.00	1.29
Medical Clinic	742,461.88	4,000	185.61	1.61
Chest Clinic (NTB)	2,141,090.96	5760	371.72	3.23
WB Clinic	1,290,853.12	740	1,744.40	15.17
TB Unit	1,651,862.52	416	3,970.82	34.53
Dental Clinic	1,174,065.40	4,532	259.06	2.25
Family Planning	1,401,138.44	8,688	161.27	1.40
Total	12,787,165.38	53,768	237.82	2.07

According to table 4.9, reported unit cost of OPD is Rs. 148.00. That is the lowest cost per patient visit at the Suwamedura hospital. The highest unit cost per patient visit is presented by TB clinic that is Rs. 3,970.82. It is because, providing high expensive drugs, and high labor cost. In other hand special programs for TB patients are also conducted in year 2008. WB clinic and chest clinic also have high unit costs per patient visit.

4.4 Direct Observe Treatment Short Course (DOTS Program)

DOTS program is a special treatment system for TB patients in the world. Most of the developing countries are followed this program with support of World Health Organization (WHO). National Program for Tuberculosis Control (NPFTC) is conducted this program in Sri Lanka, coordinating regional chest hospitals.

Suwamedura hospital is also operating this program successfully. According to this program, Identified TB patients are joined with this program and select a suitable observer near of patient's residence. This observer should be a health worker, government officer or other responsible person and both patient and observer should agree with this program.

Chest hospital is given drug course to the patient free of charge. In first two months, patient should take his medical tablets in front of observer daily and he also should mark his format given by hospital. After two month patient should follow next drug course another four months. During this season patient and observer meet once a week and patient show his format to the observer.

During this program health officers check the health condition of the patient time to time. After finish his drug course, If health authority satisfy with his health condition patient can stop drug course. Hospital also gives some awareness programs for TB patients, community leaders, health staff and public society under this program also.

4.4.1 Common drug list, use in DOTS program and its price values

In Tuberculosis preventing treatments, Physicians are used special drug list. Under DOTS program, TB patients are received these drugs course from the hospital. Patient should use these drugs under supervision of his supervisor.

Table 4.10 Common drug list for TB patient

Drug name	Price (Rs)
Isoniazid	0.28
Rifampicin	2.52
Pyrazinamide	2.06
Ethambutol	3.42
Stretomycine	13.40

Source- Provincial drug stores, Kurunegala, 2008

4.4.2 Cost allocation of DOTS program in Suwamedura hospital, 2008

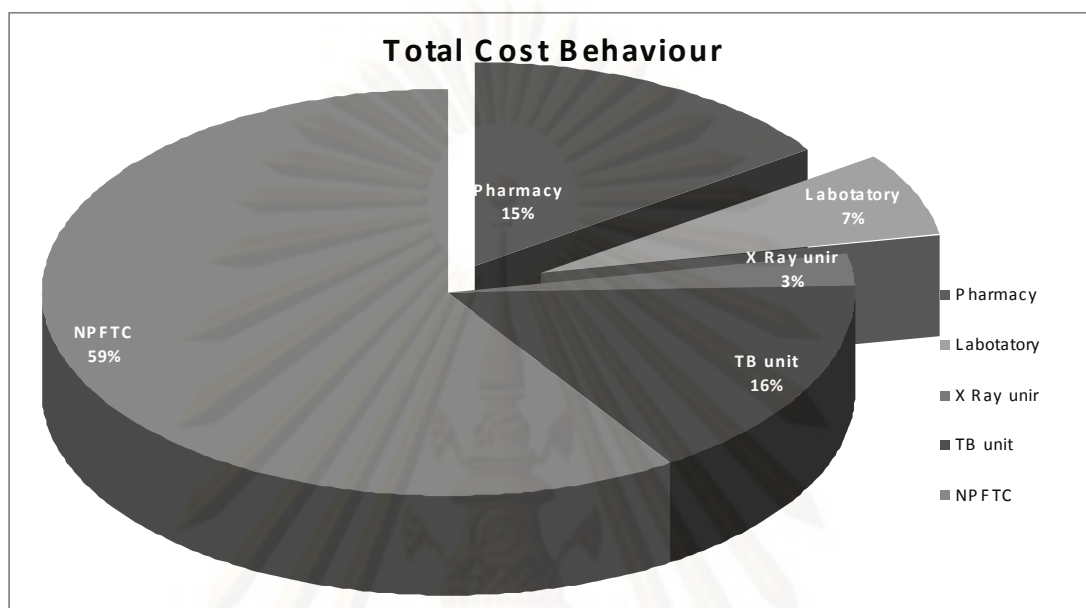
Table 4.11 Cost component of DOTS program

	Pharmacy Unit	Laboratory Unit	X ray Unit	TB Unit	NPFTC	Total
Capital	3,050.00	5,200.00	15,800.00	40,000.00	87,750.00	151,800.00
Labor	37,600.00	60,750.00	18,740.00	155,000.00	45,875.00	317,965.00
Material	184,106.00	31,650.00	4,200.00	45,000.00	736,590.00	1,001,546.00
Total	224,756.00	97,600.00	38,740.00	240,000.00	870,215.00	1,471,311.00

According to the cost allocation, NPFTC has contributed the highest amount; it is Rs 870,215.00 and Its percentage is 59%. NPFTC is the main national TB preventing organization. It is coordinate with other provincial level chest hospitals and organize respiratory diseases programs like DOTS. Lowest contribution was Rs 38,740.00 and it has given by X- Ray unit. Its percentage is 3%. The total cost of the DOTS program is 1,271,311.00. Percentage values of the cost components have shown in the below graph.(Appendix B-16, B-17, B-18, B -19)

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Figure 4.2 Percentages of Cost Components of DOTS program



4.4.3 Calculating unit cost of DOTS program in Suwamedura hospital, 2008

In January 2008, three hundred and eighty five (385) patients were registered in DOTS program. But 10% of patients have dropped due to various reasons. About 90% of TB patients completed DOTS program successfully. According to this case 347 patients ate completed DOTS program. Among these persons, 312 TB patients are completely cured and this amount as a percentage of total registered persons is 81% (Administrative report, Suwamedura hospital, 2008)

$$\text{Unit cost of the DOTS program (Relative to registered patients)} = \frac{\text{Total cost of DOTS program in the hospital}}{\text{No of TB patients registered}}$$

$$\text{Unit cost of DOTS program (Relative to patient completed course)} = \frac{\text{Total cost of DOTS program in the hospital}}{\text{No of TB patients DOTS completed}}$$

Unit cost of DOTS program = $\frac{\text{Total cost of DOTS program in the hospital}}{\text{No of patients cured}}$
 (Relative to patient cured)

Unit cost of the DOTS program = $\frac{\text{Rs } 1,471,311.00}{385} = \text{Rs } 3,821.59 = \$ 33.23$
 (Relative to registered patients)

Unit cost of DOTS program = $\frac{\text{Rs } 1,471,311.00}{347} = \text{Rs } 4,240.08 = \$ 36.87$
 (Relative to patient completed course)

Unit cost of the DOTS program = $\frac{\text{Rs } 1,471,311.00}{312} = \text{Rs } 4,715.74 = \$ 41.00$
 (Relative to patients cured)

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CHAPTER V

DISCUSION, CONCLUSION & RECOMMANDATION

5.1 Discussion

5.1.1 Expenditure of the hospital

Major cost components in Suwamedura hospital are discussed under this part.

5.1.1.1 Labor cost

According to the results, approximately 60.9% of total cost of the hospital is spent to the labor cost. Most of the health institutions in Sri Lanka show high labor cost than other cost functions. Because basic salary scale of health staff in Sri Lanka is higher than other sectors. Therefore their overtime and most of other fringe benefits are also relatively higher than other employees.

Most of the medical staff of this hospital is qualified. For examples, Medical officers, Nursing sister, PHI, Nursing officers, MLT, Microscopist, Pharmacist, Dispenser and Radiographer are graduate or well trained qualified officers. Even program assistants are graduate officers. In other hand most of their duties are very critical to the hospital. Therefore majority of these officers are done overtime duties and additional field works. Especially officers involved in provision of public health services in out side the hospital such as health education programs, National immunization programs and Family planning programs are earned more income other than basic salaries. This was the main reason for high labor cost in this hospital.

Problems in human resource allocation to clinics and other sections are given significant contribution to high labor cost. For examples, R/A unit and medical laboratory are indicated high labor cost due to unnecessary human resource allocation.

(Appendix B-11)

Especially we can notice, highest portion of labor cost has allocated to medical officers and Nursing sister's salaries and fringe benefits. Seven graduate medical officers (MO) are working in this hospital. If two or three registered medical officers (RMO) or assistant medical officers (AMO) used for this hospital, labor cost could reduce significantly. Because graduate medical officer received higher salary compare to AMO and RMO. Minimum basic salary of graduate medical officer is Rs 22,570.00 and minimum basic salary of AMO is 15,780.00.(Physician's salary circular 2006/1) The difference between graduate medical officer and RMO is 6,790.00. Annual advantage of using one RMO instead of one graduate medical officer is Rs 81,480.00. If hospital uses three ROMs instead of graduate medical officers, annual advantage is Rs 244,440.00.(Hospital can't replace more than three RMOs, because hospital also needs to consider quality of health service).

In other hand, labor cost in R/A unit and laboratory is relatively higher than other cost centers. (Appendix B-11)

5.1.1.2 Capital Cost

Approximately 21.7% of total hospital cost is spent to capital cost. Depreciation values of land, building, vehicle, medical/laboratory equipments and office equipments are consisted to labor cost. This hospital is used many sophisticated medical equipments, vehicles, office equipments and building facilities than other regional level hospitals.

The total capital depreciation cost of the hospital was Rs 2,773,826.70. A 40.1% of this amount is spent for land and building. In other hand 32.5% is spent for vehicles and 27.4% is spent for equipments. Some of items are claimed more contribution of this capital depreciation. For example, Depreciation value of Mitsubishi jeep was Rs 700,000.00 and depreciation value of digital scanner machine in chest clinic was 112,500.00. (Appendix B-4, Appendix B-7). This vehicle is mainly used by MOIC for hospital administration works.

In other hand, floor area of the hospital is too large for the present operation. The used floor area of the hospital was 39,000 feet. The similar level of service could be provided with much smaller floor area than this area. In addition, large floor area was use for limited time period in some clinics and computer room. For example 500 square feet area use only 24 days per year for well baby clinic. (Annex B)

Major material cost component of cost centers are chemical, drugs, utility and medical supplies except well baby care clinics. Well baby clinic in this hospital has started in year 2007. New materials, medical equipments and human resources were received to well baby clinic in year 2008. Therefore capital, labor and material costs are relatively higher than most of other cost centers. Utility cost like electricity, fuel, water and telephone costs in Sri Lanka are higher than most of other countries in Asia. In other hand, Building cost and major medical equipments take higher percentage of capital expenditure. Especially this hospital use modern medical equipments comparing to other regional hospitals in Sri Lanka. So electricity consumption in this institute is comparably higher than most of other similar hospitals

5.1.1.3 Material cost

Approximately 17.4% of total hospital cost is spent to material cost for the year 2008. The value of the material cost was Rs 2,231,281.44. Drug, utilities, stationery and other equipments (not belong to capital items) are comprised to material goods. The pharmacy is claimed the highest value of the material cost and it is Rs 755,840.60. Pharmacy has spent Rs 747,840.60 for drugs in year 2008.

Next consecutive highest values are reported by Family planning unit and Well baby clinic. Because family planning unit are supplied family planning equipments such as condoms, oral pills etc to people free of charge. Both family planning unit and well baby unit have conducted series of health education programs for the society in year 2008.

Utility costs consist of fuel, electricity, telephone and water. Utility consumptions in order by departments are R/A, OPD and dental units. R/A unit claim the highest

figure because it has used more fuels for the Mitsubishi jeep. OPD is reported the highest number of patients visit in 2008 and dental unit is used the high electricity consumption for operate dental chair and other electrical equipments.

5.1.1.4 Unit Cost

Table 5.1 Selected Unit cost values of health institutions

Study area	Name of the Study	Average Patient per day/per Clinic Day	Cost * Rs.
OPD	de Silva and Attanayake (1992)		
	CD - Halpe-Katana	46	38.00
	CD- Dewalapola	29	53.00
	CD- Andiambalama	73	23.00
	Somanathan et al (2000) Complex		338.00
	Somanathan et al (1998) Basic		88.00
	Edirisinghe (2002) District Hospital Dompe	450	64.00
	Bandara (2009)CD - Samadhigama	77	147.00
	Shafeeq (2007) RH - Moldives	-	2,076.26
	Suwamedura Hospital	103	148.00
Medical Clinic	Edirisinghe (2002) District Hospital Dompe	215	74.00
	Bandara (2009)CD-Samadigama	16	261.00
	Suwamedura Hospital	14	185.61
Dental Clinic	Edirisinghe (2002) District Hospital Dompe	18	454.00
	Bandara (2009) CD-Samadigama	20	415.00
	Suwamedura Hospital	16	259.06
Chest Clinic	Perera(2007)-Welisara Chest hospital	67	418.40
	Suwamedura Hospital	20	371.72
TB clinic	Perera(2007)-Welisara Chest hospital	16	4,015.25
	Suwamedura Hospital	5	3,970.82

Unit cost figures of the final cost centers in the Suwamedura hospital can compare with other cost studies. According to study of de Silva and Attanayake(1992), unit cost of the OPD unit was Rs 38, 53, and 73 respectively in Halpe-Katana, Dewalapola and Andiambalama central dispensaries. According to this study, unit cost value has varied with the average patients per day. Central dispensary is the smallest health center unit in Sri Lanka and most of these CDs are situated in rural areas. CDs provides only basic treatments and most of the physicians in these hospitals are RMOs or AMOs. These institutes have very limited resources compare to the Suwamedura. However unit cost of the OPD in Suwamedura is higher than these CDs.

But Samadhigama CD is a well equipped model institute. It has better resources than other CDs. Unit cost of OPD in this CD is Rs 147.00 and it is very similar to unit cost of Suwamedura.

According to study of Edirisinghe(2002), It was based on district hospital Dompe. District hospital is considered as a medium scale hospital in Sri Lanka and also has inpatient facilities. Most of health staff in this hospital is qualified and trained. Utilization of most of the units are higher than medium scale institutes. Under this study, unit cost of OPD is Rs 64.00, with 450 average patients per day, unit cost of medical clinic is Rs 74.00, with 215 average patients per day and unit cost of dental clinic is Rs 454.00, with 18 average patients per day. An average of patients per clinic day in OPD and Medical clinic in District hospital Dompe is higher than Suwamedura and unit cost of this district hospital is very low compare to the Suwamedura. But unit cost of the dental clinic of Suwamedura is quite lower than DH Dompe and CD Samadhigama.

According to Somanathan et al(2000) and Somanathan et al(1998) studies, Complex is consider as complex hospitals (teaching hospitals and other specialized hospitals) and these institutes have modern medical equipments and specialized medical staff. But basic is consider as hospital with inpatient facilities (without specialized facilities)

Under this study unit cost of Complex is Rs 338.00. But unit cost of basic is Rs 88.00. Therefore unit cost values are depend on the facilities in the in the institutes.

According to Perera (2007), unit cost of the chest clinic in Welisara hospital was Rs 418.40 and unit cost of the TB clinic was Rs 4015.25. Welisara chest hospital is the main chest hospital in Sri Lanka. It has sophisticated equipments, senior and qualified staff. Therefore unit costs of Chest clinic and TB clinic are higher than unit costs of Suwamedura hospital. (Table 5.1)

Considering above facts, all of these health institutions are not similar in terms of functions, staff structure, medical equipments and other facilities. Therefore it's unit costs values show different variations.

How ever according to the cost figures of Suwamedura hospital, unit cost of chest clinic and TB clinic are higher than other final cost centers except WB clinic. The reason of this case, drugs, medical equipments and labor costs in chest related diseases are higher than comparing to other diseases.

. Material costs and some expenditure of some training programs are not clear in official documents in the hospital It is problem for material cost calculations.

5.1.1.5 DOTS program

Unit cost values of DOTS program in different countries show different values. These values mainly depend on number of patients attached to DOTS program and implementation process of the program.

According to unit cost of DOTS in this hospital is \$ 43.0, training programs claim high percentage of the total value. If this hospital has a health education unit, these training programs have directly conducted by TB unit. In other hand 10% of participants had dropped, during the program. Coordinators of this program of the hospital try to reduce this amount. How ever approximately 80% of persons attached to the DOTS program have completely cured end of the course (Hospital administration report, 2008)

5.2 Conclusion

This cost analysis attempted to find out the

- (a) Total cost and unit cost of the Suwamedura hospital and
- (b) Unit costs of the cost centers
- (c) Unit cost of the DOTS program in the hospital

The study was able to analyze cost profile of the hospital for the year 2008.

5.2.1 Findings

5.2.1.1 Unit cost calculation of the hospital

Under this study, Suwamedura hospital was divided into fifteen (15) cost centers. These cost centers were categorized under three main groups named as overhead cost centers, intermediate cost centers (ancillary) and patient care (final) cost centers. After that labor cost, capital cost, material cost and total cost were calculated for every cost center separately. Then using these values, total cost of the patient care cost centers (final cost centers) was calculated. This value was Rs 12,787,165.32. Three main types of cost components were included to this figure and they were labor cost, material cost and capital cost. Values of labor, capital and material cost were Rs 7,782,057.24, Rs 2,773,826.70 and Rs 2,231,281.44 respectively.

Unit cost of the Suwamedura cost center was calculated using ratio of total cost of the final cost centers and number of patients visits to the hospital. This unit cost value was Rs 237.82. Finally unit costs of the final cost centers were calculated. Unit cost values of OPD, Medical clinic, Chest clinic, WB clinic, TB clinic, Dental clinic and Family planning clinic were Rs 148, Rs 185.61, Rs 371.72, Rs 1744.40, Rs 3970.82, Rs 259.06 and Rs 161.27 respectively.

5.2.1.2 Unit cost calculation of DOTS program

There were four sections were contributed to DOTS program, named TB unit, pharmacy, X ray unit, laboratory and NPFTC. First labor cost, material cost and capital cost of each section were calculated separately and then total costs of the each section were calculated. Total cost of pharmacy, laboratory, TB unit, X ray unit and NPFTC were Rs 224,756.00, Rs 97,600.00, Rs 240,000.00, Rs 38,740.00 and Rs 870,215.00 respectively. Sum of these five figures is created total cost of the DOTS program and this figure was Rs 1,471,311.00. Finally unit cost of the DOTS program is taken using ratio of total cost of the DOTS program and number of registered, DOTS completed as well as cured patients. These values are Rs 3,821.59 (\$33.23), Rs 4240.08 (\$ 36.87) and Rs 4,715.74 (\$ 41.00) respectively.

5.3 Policy recommendations

Using this study, hospital management, policy makers, and officers in health ministry, private hospitals, donor agencies, insurance companies and other civil society members can get idea about hospital function.

(1) High fuel efficiency, low cost and suitable vehicles use for health institutions instead of luxury or high value vehicles. This is very useful for reduce both capital cost and material cost.

(2) Qualified medical administrative officer elected as MOIC, It is very useful for reduce wastage, proper human resource allocation and maximize utilization. (Studying these data sheets, qualified officer can identify weak places, because in some cost centers cost functions take higher values with out reasons- (Appendix B- 15)

(3) The floor area of Suwamedura hospital required to be reduced in order to cut down the unnecessary cost born by capital cost.

(4) Proper evaluation system need for increase efficiency of health staff

Unnecessary overtime and other allowances control system.(Labor cost in some unit costs are very high relatively service out put (Appendix B-11, salary slips and over time sheets)

(5) Costing information of this research work contributes to the Health Information System (HIS).

5.4 Limitations and assumptions-

There are no separate electricity, water, telephone (utility) bills and charging systems for different cost centers. Therefore utility cost should divide in to different cost centers considering operating space, no of people work, capacity of machines used.

In this case I have assumed, utility cost has a positive relationship with increase of operating space, no of people work and capacity of machines. In special places I also considered the usage of electrical appliances.

If some of cost information of medical and other instruments are not available, the cost of the same type of equipments in another hospital are use for calculations but it may have minor differences to the cost. Under this condition we should assume that the costs of the same type of the equipments are approximately equal.

Since this study is conduct under the limited time frame, some data and information are not available as per need. (Especially secondary data). In these cases, I cross checked these data with primary data.

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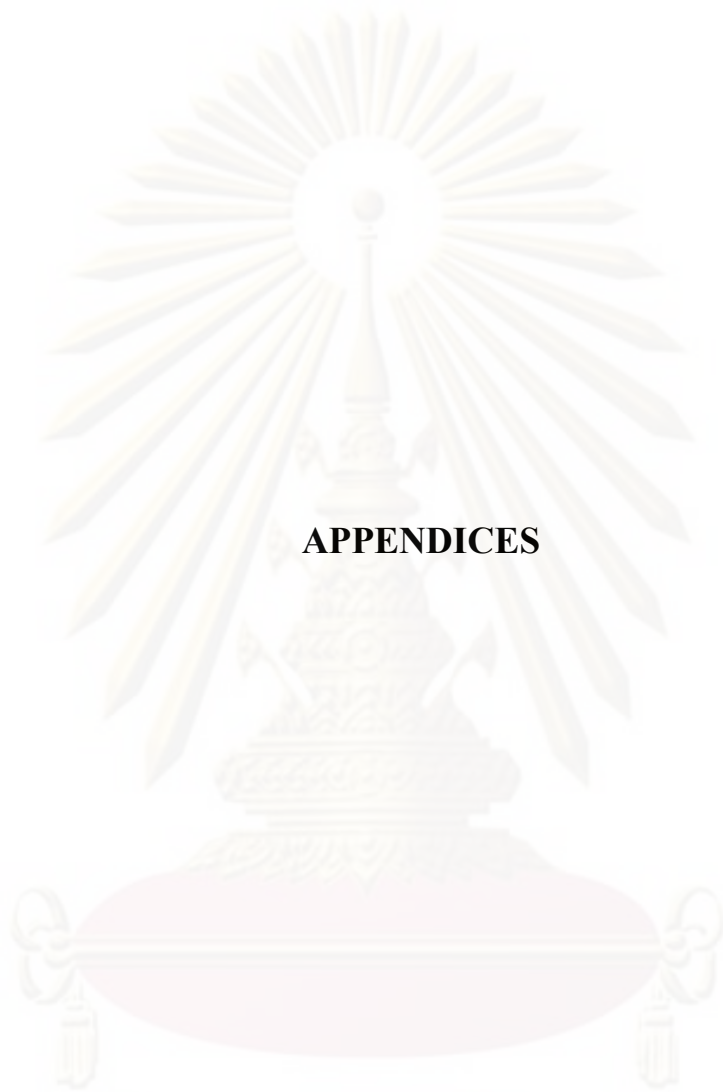
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APPENDICES

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Appendix B -1

According to Sri Lankan government rules the land is given for 99 years lease in order to work out opportunity cost of the land. But current value of a perch of land is around Rs. 118,000.00. Usually cost of land is available as cost per perch. A perch is equal to 272.25 square feet. Therefore,

Formula 1

$\frac{118,000.00}{272.25 \text{ Sq.ft.}} = \text{Rs. } 433.42 = \text{Unit cost/ square foot}$
$\frac{433.62}{99 \text{ years} \times 365} = \text{Rs. } 0.012 = \text{Opportunity cost/square foot/day}$
$0.012 \times \text{No of square feet per dept.} \times \text{No of days used per year} = \text{Cost of land/ dept/year}$

Opportunity cost was assumed for the land (Shepherd et al., 1998). The valuation of the land was obtained from the opinions of the residents and a land value of this area.

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Appendix B -2

1 Building:

The building of this hospital has constructed in year 1993. The actual cost per square foot was obtained from a civil engineer at the Wayamba engineering department, Kurunegala. Cost of building per square foot is Rs. 3500.00 including bathroom fittings, wiring etc. Linear depreciation and a life span of 30 years are assumed with regard to the building (Sheppard et al, 1998). Cost of building per day is calculated using the formula in below, for each department separately.

Formula 2

Step 1

$$\frac{4,200.00 \times \# \text{ of sq.foot}}{10950^*} = \text{Cost of building of the department / day}$$

Step 2

$$\text{Cost of building of the department / day} \times \# \text{ of days used/year} = \text{Cost of building /year/ dept}$$

*- Number of days for 30 years = 365 x 30 = 10950

Table 1.1 shows the depreciated cost of both land and building for each department per year. Costs of building and land of administration department is also included computer room, drivers room and walking areas (Jayatissa, 1995).

Appendix B-3. Depreciatory costs of land and building per year 2008 (Sri Lankan Rupees)

Department	No of Square feet	Time used (days)	Cost of Land (Rs.)	Cost of Building (Rs.)	Total (Rs.)
R / A Unit	1500	288	5,184.00	165,698.63	170,882.63
Computer Room*	300	48	172.80	5,523.29	5,696.09
Drivers Room*	450	365	1971.00	63,000.00	64,971.00
C / M Unit	155	365	678.90	21,700.00	22,378.90
.Stores	620	288	2,142.72	68,488.77	70,631.49
H/ E Unit	970	48	558.72	17,858.63	18,417.35
PHI Unit	560	288	1935.36	61,860.82	63,796.18
Med. Laboratory	500	288	1728.00	55,232.88	56,960.88
Pharmacy	400	288	1,382.40	44,186.30	45,568.70
X Ray Unit	190	288	656.64	20,988.49	21,645.13
OPD	1600	288	5,529.60	176,745.21	182,274.81
Medical Clinic	310	288	1,071.36	34,244.38	35,315.74
Chest Clinic	2,500	288	8,640.00	276,164.38	284,804.38
WB Clinic	500	24	144.00	4602.74	4,746.74
TB Unit	500	96	576.00	18,410.96	18,986.96
Dental Clinic	200	288	691.20	22,093.15	22,784.35
Family Planning	200	288	691.20	22,093.15	22,784.35
Total	11,455	-	33,753.90	1,078,891.78	1,112,645.68

Source- Field data collection

Depreciatory Costs of vehicles (Sri Lankan Rupees)

Two vehicles have used in this hospital. They were Mitsubishi Jeep, the official vehicle for MOIC. He used this vehicle for hospital administration works. Mazda van has used to other official works. In year 2008, R/A, X- Ray, OPD, Medical, HE, Chest and WB have used this vehicle for their official works

Appendix B4 Vehicles details

Item Description	Qty	Life Span	Unit Price Rs.	R/A	X ray	OPD	Medical	H/E	Chest	WB
Mitsubishi full option Jeep	1	05	3,500,000.00	700,000.00						
Mazda Van	1	05	1,000,000.00	28,571.43	28,571.43	28,571.43	28,571.43	28,571.43	28,571.43	28,571.43
Total	2			728,571.43	28,571.43	28,571.43	28,571.43	28,571.43	28,571.43	28,571.43

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Appendix B -5

Depreciatory Costs of Medical Equipments (Sri Lankan Rupees)

Medical Equipments

All kinds of medical equipments that last more than one year or unit price is more than \$ 100 are included to this category. The straight line depreciation method is assumed. As all these equipments are donated, the replacement costs are adopted (Creese & Parker, 1994). The price lists in 2008 for the surgical equipments are given by the Medical Supply Division and Bio-Medical Engineering department of PDHS office



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Appendix B6 Depreciation cost of medical equipments (Sri Lanka Rupees)

Item Description	Qty	Life Span	Unit Price Rs.	Lab	X ray Room	OPD	Medical Clinic	Chest Clinic	WB Clinic	TB Clinic	Dental	F.P.
Distillation Plant	1	15	55,500.00	3,700.00								
Centrifuge	1	10	33,600.00	3,360.00								
Spectra Photo Meter	1	10	47,800.00	4,780.00								
Microscope	1	10	44,000.00	4,400.00								
Boiler	1	15	9,600.00	640.00								
Incubator	1	10	18,540.00	1,854.00								
X Ray machine	1	10	546,807.70		54,680.77							
Eliminator	1	10	65,500.00		6,550.00							
X Ray cleaning machine	1	10	84,000.00		8,400.00							
Manual Processing Unit	1	10	72,500.00		7,250.00							
Exhaust Fans	2	5	5,000.00		2,000.00							
ECG Machine	1	10	245,000.00			6,125.00	6,125.00	6,125.00		6,125.00		
Sterilizer	2	10	360,000.00			24,000.00	24,000.00	12,000.00	12,000.00			
Nebulizers	4	10	10,000.00			1,000.00		1,000.00	1,000.00	1,000.00		
BP Apparatus	5	10	12,000.00			1,200.00	1,200.00	1,200.00	1,200.00	1,200.00		
Suction Apparatus	4	10	150,000.00			1,500.00	1,500.00	1,500.00		1,500.00		
Oxygen Cylinder	5	15	6,000.00			400.00	400.00	400.00	400.00	400.00		
Pulse Oxymeter	4	15	20,000.00				1,333.33	1,333.33	1,333.33	1,333.33		
Sphygmomanometer	2	10	7,500.00				750.00	750.00				

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Appendix B-7 Depreciation cost of medical equipments (Sri Lanka Rupees)

	Qty	Life Span	Unit Price Rs.	Lab	X ray Room	OPD	Medical Clinic	Chest Clinic	WB Clinic	TB Clinic	Dental	F.P.
Examination Beds	4	15	20,000.00			1,333.00	1,333.00	1,333.00	1,333.00			
Glucometers	2	10	6,000.00			600.00	600.00					
Stethoscopes	5	10	14,000.00			1,400.00	1,400.00	1,400.00	1,400.00	1,400.00		
Glucometers - small	2	10	5,000.00			250.00	250.00	500.00				
Examination Spot Lamp	5	5	20,000.00			4,000.00	4,000.00	4,000.00	4,000.00	4,000.00		
Trolley	2	10	10,000.00			285.71	285.71	285.71	285.71	285.71	285.71	285.71
Wheel Chair	3	10	6,000.00			257.14	257.14	257.14	257.14	257.14	257.14	257.14
Thermometers	3	10	1000.00			100.00	100.00	100.00				
Scissors	3	5	4,000.00			800.00	800.00	800.00			680.00	
Health Scalar	4	10	25,741.50			2,574.15	2,574.15	2,574.15	2,574.15			
Electronic Scalar	1	10	200,000.00						20,000.00			
Digital Scanner	1	10	1,125,000.00					112,500.00				
Portable mini Scanner	1	10	761,512.00						76,151.20			
Laryngoscopes	1	10	96,602.00							9660.21		
Dental Chair & unit	1	15	210,000.00								14,000.00	
Dental tool kit	1	15	45,000.00								3,000.00	
Excavator D E	1	10	21,751.50								2,175.15	



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Appendix B-8 Depreciatory Costs of office furniture (Sri Lankan Rupees)

Item Description	Qty	Life Span	Unit Price	Admin. Office	Cleaning unit	Store room	Health Education	Pharmacy	PHI	Lab
Computer/ computer table/chair	1	5	75,000.00	15,000.00						
Photocopy machine	1	10	145,000.00	7,250.00			7,250.00			
Laser Printer	1	10	55,000.00	5,500.00						
Steel cupboards	6	15	8,000.00	1,066.66		533.33		533.33	533.33	533.33
Telephone (Intercom)	6	7	1,200.00	342.86		171.43	171.43	171.43	171.43	
Executive table/chair	1	10	14,000.00	1,400.00						
Filling Cabinets	5	10	15,000.00	1,500.00		1,500.00	1,500.00		1,500.00	1,500.00
Writing table/ chair	10	10	15,000.00	3,000.00		1,500.00	3,000.00	1,500.00	3,000.00	3,000.00
Notice Boards (large)	2	10	3500.00	350.00						
Plastic Chairs	70	10	500.00	1,000.00	250.00	250.00	1,000.00		1,000.00	
Wooden Chairs	3	10	800.00	240.00						
Book Racks	2	10	10,000.00	1,000.00			1,000.00			
Wall clocks	1	10	6,213.00	621.33						
Wooden Rack	1	10	2513.50			251.35				
Cassette Radio	1	5	218.95				43.79			
Refrigerator	2	10	21,925.40					2,192.54		2,192.54
Wooden wall racks	1	10	10,000.00					1,000.00		
Color TV	1	5	14,285.00						2857.00	
Wooden Table	1	10	4,000.00		400.00					
Tool kit	1	5	10,267.00		2053.40					

Appendix B-9 Depreciatory Costs of office furniture (Sri Lankan Rupees)

Item Description	Qty	Life Span	Unit Price	X Ray Room	OPD	Medical Clinic	Chest clinic	W B Clinic	Dental Clinic	TB Clinic	FP clinic
Laptop computer	2	5	59,303.45				11,860.69				11,860.69
Multimedia Projector	1	5	10,990.80								1,099.08
Steel cupboards	9	15	8,000.00	1,066.67	1,066.67	533.33	533.33	533.33	533.33	533.33	
Filling Cabinets	7	10	15,000.00	1,500.00	4,500.00	1,500.00	1,500.00	1,500.00			
Color TV	4	7	65,000.00		9,285.71		9,285.71	9,285.71			9,285.71
Photocopy machine	1	10	145,000.00				14,500.00				
Notice Boards (large)	1	10	3,500.00		350.00						
Water Filter	4	8	15,000.00		1,875.00		1,875.00	1,875.00			1,875.00
Wall clock	2	5	4,000.00		800.00		800.00				
Writing Tables/ chair	12	10	15,000.00	1,500.00	4,500.00	1,500.00	3,000.00	3,000.00		3,000.00	1,500.00
Book Rack	2	10	9,300.00		930.00					930.00	
Plastic Chairs	130	10	500.00		1,500.00	500.00	1,500.00	1,000.00	500.00	500.00	1,000.00
Book Rack (Large)	1	10	15,195.00			1519.58					
Conference table and chairs -	1	15	65,000.00				4,333.33				

Appendix B -10**Labour Cost**

In-depth interview and observation method were applied to collect data of time spends of the personnel (Shepard et al, 1998: Kasturiratne, 2003: Bandara,2009). The formula in the below is used to calculate the cost of time spend by a single staff on a single department. Labor costs include midpoint of the new salary scale, allowances/fringe benefits etc.

Formul 3

$$\frac{\text{Salary per month}}{\text{No of working hour per month}} = \text{Cost per hour}$$

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Appendix B- 11 Labor cost

Category	R/A	C/M	Stores	H/E	PHI	Med. Lab	Pha	X Ray
Medical Officer	270,084.00			360,000.00		102,844.00		
Dental Surgeon								
Nursing Sister	300,014.00			100,000.00				
Program Assistant	399,400.00	131,040.00		164,186.84				
PHI					240,000.00			
Nursing Officers						32,000.00		
Pharmacist							200,000.00	
MLT						200,000.00		
Radiographer						20,000.00		150,442.00
Microscopist						200,000.00		
Attendant						168,000.00		
Sanitary labors		648,000.00	188,331.20		100,277.00	182,063.00	142,000.00	
Dispensers							190,000.00	
Driver	25,700.00			25,714.00		25,714.00		25,714.00
Total	995,198.40	779,040.00	188,331.20	649,900.84	340,277.00	931,621.60	632,678.40	176,156.80

Appendix B- 12 Labor cost

Category	OPD	Medical Clinic	Chest Clinic	WB Clinic	TB Unit	Dental Clinic	Family Planning
Medical Officer	270,000.00	135,000.00	514,286.00	45,000.00	180,000.00		258,000.00
Dental Surgeon						298,000.00	
Nursing Sister				50,000.00			
Program Assistant							
PHI							
Nursing Officers	300,000.00	75,000.00	216,244.00	74,286.00	200,000.00	109,831.32	149,831.32
Pharmacist							
MLT							
Radiographer							
Microscopist							
Attendant	41,330.80	1,313.80		28,589.76	39,239.00		
Sanitary labors							
Dispensers							
Driver	25,714.00	25,714.00	25,714.00	25,714.00			
Total	637,044.80	237,028.80	756,288.00	223,589.76	419,239.00	407,831.32	407,831.32

Appendix B -13

Material Cost

This included medical materials, non- medical materials and operation & maintenance. Medical goods included drugs, vaccines and other consumables. Non-medical goods were stationery, furniture etc.(life year less than one year). According to the assumed usage pattern, non-medical goods were distributed.

In terms of Operation and maintenance cost for **building**, de Silva et al. (1997) calculate the running cost for specific appliances such as lights, machines according to their voltage taking consultation from an Electrical Superintendent of Ceylon Electricity Board, Kurunegala.



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Appendix B-14 Material Cost

Cost Center	Utilities	General & Office supply	Chemical, Drugs & Medical supply	Maintenance & House keeping	Others	Total
R/A Unit	19,600.00	4,247.20		2,800.00	4,100.00	30,747.20
C / M Unit	2,800.00	830.00		2,500.00	1,158.00	7,288.00
.Stores	650.00	75.00		105.00	134.40	964.40
H/ E Unit	425.00	1,450.00		125.00	44.00	2,044.00
PHI Unit	925.00	4,100.00		400.00	811.96	6,236.96
Med. Laboratory	1,150.00	1,200.00	10,200.00	604.00	150.00	13,304.00
Pharmacy	1,200.00	1,800.00	747,840.60	1,200.00	3,800.00	755,840.60
X Ray Unit	1,500.00	300.00	6,049.80	210.00	125.00	8,184.80
OPD	4,800.00	1,300.00	28,663.04	1,100.00	2,100.00	37,963.04
Medical Clinic	750.00	225.00	8,248.00	1,200.36	2,000.00	12,423.36
Chest Clinic (NTB)	1,250.00	2,300.00	70,212.44	1,950.00	3,200.00	78,912.44
WB Clinic	650.00	4,200.00	18,200.00	1,450.00	418,396.28	442,896.28
TB Unit	575.00	2,200.00	46,890.20	850.00	6,200.00	56,715.20
Dental Clinic	4,100.00	1,300.00	160,249.00	3,100.00	2,300.00	171,049.00
Family Planning	2,100.00	7,300.00	575,876.00	1,600.00	19,836.16	606,712.16
Total	42,475.00	32,827.20	1,672,429.08	19,194.36	464,355.80	2,231,281.44

ศูนย์วิทยุทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix B-15 Cost summary Report

Cost Center	Utilities	General & Office supply	Chemical, Drugs & Med. supply	Maintenance & House keeping	Others	Capital	Labor	Total
R/A Unit	19,600.00	4,247.20		2,800.00	4,100.00	1,008,392.00	995,198.40	2,034,337.60
C / M Unit	2,800.00	830.00		2,500.00	1,158.00	25,082.96	779,040.00	811,410.96
Stores	650.00	75.00		105.00	134.40	74,837.60	188,331.20	264,133.20
H/ E Unit	425.00	1,450.00		125.00	44.00	60,954.00	649,900.84	712,898.84
PHI Unit	925.00	4,100.00		400.00	811.96	72,858.00	340,277.00	419,371.96
Med. Laboratory	1,150.00	1,200.00	10,200.00	604.00	150.00	82,920.80	931,621.60	1,027,846.40
Pharmacy	1,200.00	1,800.00	747,840.60	1,200.00	3,800.00	50,966.00	632,678.40	1,439,485.00
X Ray Unit	1,500.00	300.00	6,049.80	210.00	125.00	133,164.00	176,156.80	317,505.60
OPD	4,800.00	1,300.00	28,663.04	1,100.00	2,100.00	321,159.00	637,044.80	996,166.84
Medical Clinic	750.00	225.00	8,248.00	1,200.36	2,000.00	116,348.40	237,028.80	365,800.56
Chest Clinic (NTB)	1,250.00	2,300.00	70,212.44	1,950.00	3,200.00	510,622.20	756,288.00	1,345,822.64
WB Clinic	650.00	4,200.00	18,200.00	1,450.00	418,396.28	172,446.70	223,589.76	838,932.74
TB Unit	575.00	2,200.00	46,890.20	850.00	6,200.00	49,911.68	419,239.00	525,865.88
Dental Clinic	4,100.00	1,300.00	160,249.00	3,100.00	2,300.00	44,215.68	407,831.32	623,096.00
Family Planning	2,100.00	7,300.00	575,876.00	1,600.00	19,836.16	49,947.68	407,831.32	1,064,491.16
Total	42,475.00	32,827.20	1,672,429.08	19,194.36	464,355.80	2,773,826.70	7,782,057.24	12,787,165.38

จุฬาลงกรณ์มหาวิทยาลัย

Appendix B- 16 Cost summary report of DOTS program in Suwamedura hospital- 2008

No	Cost Item	Number of Unit	cost/ month	cost/ year	Remark
I	CAPITAL				
	Land and Building	2	2,966.66	35,600.00	TB unit and Provincial training center buildings used.
	Vehicles	1	5,466.66	65,600.00	Rented from RDHS office
	Cold Chain	1	200.00	2,400.00	
	X Ray Machine	1	1,316.66	15,800.00	
	Laboratory equipments	1	416.66	5,000.00	
	Laptop	1	100.00	1,200.00	
	Printer, fax, phone..	1	83.33	1,000.00	
	Other		2,083.33	25,000.00	
	Sub-total		12,633.30	151,600.00	

Appendix B -17 Cost summary report of DOTS program in Suwamedura hospital- 2008

No	COST ITEM	Number of Unit	Total/ month	Total/ year	Remark
II	MATERIAL				
1	Health Promotion & Education				
	Promotion material	5000	5,000.00	60,000	
	Food and soft drinks	1,000	20,833.33	250,000.00	20 programs conducted
	Other		19,333.33	232,000.00	
2	Screening				
	Smear test (reagents)	633	2,633.33	31,600.00	The costs is the cost of the reagents for smear test, including HIV patient
	X ray test (film, etc)	552	4,370.00	52,440.00	
3	Immunization				
	Vaccine	50	1,791.66	21,500.00	
	Disposal material	50	1,020.83	12,250.00	

จุฬาลงกรณ์มหาวิทยาลัย

Appendix B – 18 Cost summary report of DOTS program in Suwamedura hospital- 2008

No	COST ITEM	Number of Unit	Total/ month	Total/ year	Remark
4	Drug Package				
	Category 1	360	24,984.00	299,808.00	Category 1 is for new cases with positive smear test
	Category 2	15	1,187.50	14,250.00	Category 2 is for relapse, fail and drop out cases
	With complication	14	1,670.66	20,048.00	TB cases with complications (Drug category)
5	Office supply		633.33	7,600.00	
	Sub-total		83,458.00	1,001,496.00	

Appendix B 19 Cost summary report of DOTS program in Suwamedura hospital- 2008

No	COST ITEM	Number of Unit	Total/ month	Total/ year	Remark
III	LABOUR COST				
1	Salary & fringe benefits				
	Medical officers	2	4591.66	55,100.00	
	Nursing officers	3	2972.91	35,675.00	
	Attendants	2	4,058.33	48,700.00	
	MLT	1	2,066.66	24,800.00	
	Microscopist	1	3,025.00	36,300.00	
	Radiographer	1	1,561.66	18,740.00	
	Pharmacist	1	1,191.66	14,300.00	
	Dispenser	1	1,525.00	18,300.00	
	Sanitary labors	3	2,141.66	25,700.00	
2	Training cost				
	Resource persons	32	2,133.33	25,600.00	
	Other		1,250.00	15,000.00	
	Sub-total		26,517.87	318,215.00	
	TOTAL		122,609.25	1,471,311.00	

Source- Administration report, TB unit, Suwamedura & NPFTC, Sri Lanka

BIOGRAPHY

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