



CHAPTER 1

INTRODUCTION

1.1 Background

Some types of illness for example : cancer , kidney disease , severe trauma , aplastic anemia, and etc. can cause very high expenditure for treatment which the patients cannot afford by them self so facing this illness may lead to a large loan in order to support their health expenditures or else they have to sell their assets or even the producing factors of the family. Finally catastrophe occurs to them and their families. This kind of illness is called catastrophic illness.

Nowadays , about 30 % of Thai population have no health insurance. Even those who have health insurance coverage (for example : Civil servant medical scheme , Health card scheme , Social security scheme workers , Compensation scheme , and Low income people) can be influenced by catastrophic illness. Besides the point that incomplete health insurance coverage for catastrophic illness is not thorough , there is a problem of efficiency in funding for the cost of the catastrophic illness as well. There are important questions e.g. what is the appropriate reimbursement rate to the contractor provider of bone marrow transplantation In severe hematologic disorder , what is the appropriate method of paying to the provider so that the patients can get the most efficient health services. So it is important to know the real cost incurred by the provider of the treatment for catastrophic illness to determine the most appropriate policy for management of this illness. (Thailand Health Research Institute, 1998)

Hematologic disorders comprise one group of catastrophic illness , because of their treatment, bone marrow transplantation , which is technologically complicated procedure and needs intensive 24 hours care , so the cost overall is very high. Bone marrow transplantation (BMT) is used to treat a number of cancers , blood diseases , and immune disorders that were once considered incurable.

Since it was first used successfully in 1991, more than 7,500 people in the United States underwent the procedure, and BMT now saves thousand of lives each year. BMT has been recommended as the best treatment for such conditions at this time. There are two types of transplant : autologous and allogeneic. In an autologous transplant, the patient's own marrow, or blood stem cells, are used. An allogeneic transplant uses the marrow of another person, either a related or unrelated donor. Transplanted bone marrow effectively replaces marrow that has been destroyed by radiation. This same procedure was found to be effective in treating certain malignant and nonmalignant diseases that cause the marrow to produce either abnormal blood cells or very low numbers of normal cells. Drugs and radiation are used to destroy both abnormal and normal cells and BMT replaces the diseased or damaged marrow with healthy marrow. BMT is not a surgical procedure, but a painless infusion, similar to a blood transfusion, that is done in the hospital room. (The Children's Hospital of Philadelphia, 1994)

The Social Security scheme has been established in Thailand since 1990. There are many changes which have occurred in both insured persons and medical providers. Insured persons expect to get higher health care benefits from this scheme but the medical providers cannot provide services to the extent insured persons expected, because of the limited resources. (Intajak, 1996) The Social Security Office (SSO) approved in 1996 the bone marrow transplantation to be included in the criteria and rate of reimbursement in case of injury or illness that caused by the work conditions as the third proclamation. SSO will be responsible for the expenditure which is equal to Bt. 600,000 per case by payment to the hospitals which are the contracting providers until the process of bone marrow transplantation is finished completely. (The Social Security Office, 1996)

There were 11 cases of insured person who have been permitted to receive bone marrow transplantation according to the Third Proclamation of the Social Security Organization. Four of them were treated at Chulalongkorn Hospital , another 4 of them were treated at Ramathibodi Hospital , and the 3 at Siriraj Hospital. (The Social Security Office , 1997)

Chulalongkorn Hospital is a charity hospital with financial support from the government , the Thai Red Cross and a part of costs paid by cost recovery. Its aims are to provide medical treatment to the sick irrespective of race and nationality , to provide medical education and training , to provide nursing education and training , to be well-equipped and well-prepared in time of national emergency or disaster arising during peace or war time , and to initiate investigation and/or research procedures to uncover the cause of an epidemic wherever the latter arises. General information concerning Chulalongkorn Hospital in 1997 is described in Table 1.1

Chulalongkorn Hospital is one of the three main contractors in Thailand (besides Ramathibodi Hospital and Siriraj Hospital) of the Social Security Scheme where has a bone marrow transplantation facility, which is technologically complicated procedure and needs intensive 24 hours care. The bone marrow transplantation program was first established at Chulalongkorn Hospital in 1991 , the first successful bone marrow transplantation was performed in June 1991. Up till December 1997 , 80 patients had undergone bone marrow transplantation with a 5 year survival rate of 61% (Intragumtornchai ,1995) The procedure of bone marrow transplantation is briefly described in Table 1.2

Table 1.1 General Information of Chulalongkorn Hospital

Items	Number
1.Out patients	91,371 cases
2.In patients	4,025 cases
3.Discharged patients	3,912 cases
-Dead	146 cases
-Discharge with approval	3,766 cases
4.Number of out patient per day	2,947 cases/day
5.Number of In patient per day	130 cases/day
6.Number of out patients per one doctor	121 cases/month
7.Number of in patients per one doctor	42 cases/month
8.Occupancy bed rate	70.61 %
9.Number of patients per one bed	2.73 cases/bed/day
10.Dead rate	37.32 : 1,000 / month
12.Number of beds	1,433 beds
13.Number of doctors	753 persons
-Medical teacher	420 persons
-General practice	333 persons
14.Number of nurses	1,273 persons
15.Number of technical nurses	635 persons

Source : Information and Statistic Department of Chulalongkorn Hospital , 1997

The 80 transplanted patients in 1991 to 1997 can be divided by year as follows : only 3 cases in 1991 , 6 cases in 1992 , 2 cases in 1993 , 12 cases in 1994 , 9 cases in 1995 , 18 cases in 1996 , and 30 cases in 1997. The number of cases in each type of transplantation and their type of payment is shown in Table 1.3

The transplanted patients can be divided by age-group into 4 categories : 5 cases in 0 - 14 years old group , 34 cases in 15 - 29 years old group, 31 cases in 30 - 44 years old , and 10 cases in 45 - 59 years old. There was no case in the age -group > 60 . The number of cases divided by sex is shown in Table 1.4

Table 1.3 The Number of Transplanted Patients In Each Type of Transplantation and Type of Payment.

Types of Disease	Transplant		Status		Type of payment					Total
	BMT	PBSTC	Alive	Dead*	Free	Cash	Health benefit*	SSC	Co - payment	
1.AA	15	-	11	4	8	4	1	2	-	15
2.ML	8	3	3	8	4	6	1	-	-	11
3.AML	9	9	15	3	7	3	6	-	-	18
4.NHL	1	20	16	5	1	4	12	-	4	21
5.ANLL	2	10	12	-	4	5	3	-	-	12
6.MM	-	1	1	-	-	-	1	-	-	1
7.ALL	1	1	2	-	-	1	1	-	-	2
Total	36	44	60	20	24	23	27	2	4	80

Source : Bone Marrow Transplantation Unit , Chulalongkorn Hospital , 1997

Notes : Dead* = dead within 6 months after transplantation

Health benefit* = Civil servant medical scheme and State enterprise

AA = Aplastic anemia

CML = Chronic myeloid leukemia

AML = Acute myeloid leukemia

NHL = Non-Hodgkin lymphoma

ANLL = Acute non-lymphoblastic leukemia

MM = Multiple myeloma

ALL = Acute lymphoblastic leukemia

Table 1.4 The Number of Transplanted Patients by Disease and Sex.

Sex	Categories of Disease														total
	AA		CML		AML		NHL		ANLL		MM		ALL		
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	
M	10	-	6	2	3	3	1	11	-	6	-	1	-	1	44
F	5	-	3	-	6	6	-	10	2	3	-	-	1	-	36

Source : Bone Marrow Transplantation Unit , Chulalongkorn Hospital , 1997.

1.2 Rationale

Because bone marrow transplantation is a technical procedure that requires extensive hospitalization, BMT is very expensive. Advances in treatment methods, including the use of peripheral blood stem cells (PBSTC), have reduced the time many patients must spend in the hospital by speeding recovery; this shorter recovery time has brought about a reduction in cost. Still, transplantation costs are expensive. Costs are incurred not only in the hospital but outside as well. Patients and their families may need to stay near the hospital for several months so that the patient can receive follow up care. This can involve a considerable amount of money, particularly if accommodations are far from home. After the patient returns home, other expenses may arise. No patient is able to function independently immediately after discharge from the hospital and convalescence at home takes a significant amount of time. Family members may need to call on home helpers or visiting nurses to assist them with the care of the patient. Only in some cases do insurers cover a portion of these costs so most of the patients get into financial trouble. There has been much debate about the cost of bone marrow transplantation even in the more affluent societies where most of the operations have been done. Their discussions and arguments are always focused within the national health expenditures and what societies can afford to provide in terms of medical care of its citizens (Panananunt, 1995)

Among the 80 patients given bone marrow transplants at Chulalongkorn Hospital during 1991 to 1997, only some were paid by the third party or government insurance. That means the hospital had to incur most of the cost for the operations. In Chulalongkorn Hospital, although the financial support come from the government and donation, it is still very necessary to understand the cost and practice cost containment as the cost for the operation is very high and there is an increasing trend to provide this kind of medical service in the future.

1.3 Research Questions

In this study, the questions which have to be answered are : what is the total provider cost of bone marrow transplantation since the day of admission to the day of discharge and follow up for 6 months and its influencing possible factors, how should we calculate the unit cost (cost per case treated), cost per intermediate effective treatment and cost per effective treatment, in terms of five year survival rate of bone marrow transplantation and what are the components of the total costs and what is their proportion, and how the patients pay for the operations.

1.4 Objectives

1.To measure the total provider cost in bone marrow transplantation and explore its influencing possible factors.

2.To assess the unit cost (cost per case treated), cost per patient with intermediate effectiveness, and cost per patient with full effectiveness of bone marrow transplantation.

3.To determine the effectiveness in terms of five year survival rate of bone marrow transplantation patients.

4.To describe the cost components of bone marrow transplantation in terms of capital cost and recurrent cost (labor cost and material cost)

5. To assess the sources of finance the patients who received bone marrow transplantation and describe the difference of cost in each category of data.

1.5 Scope of the Study

In this study, only the internal costs incurred by Chulalongkorn Hospital directly to provide the service of bone marrow transplantation were included, so the provider direct costs for transplant procedure from the day of admission to day of

discharge and follow up 6 months are focused, namely those costs that are accumulated from the day of admission to the day of discharge and follow up 6 months later will be determined. Those will cover the costs in two areas where the patients stay i.e., operating room and intensive care unit (ICU) of the hematologic ward.

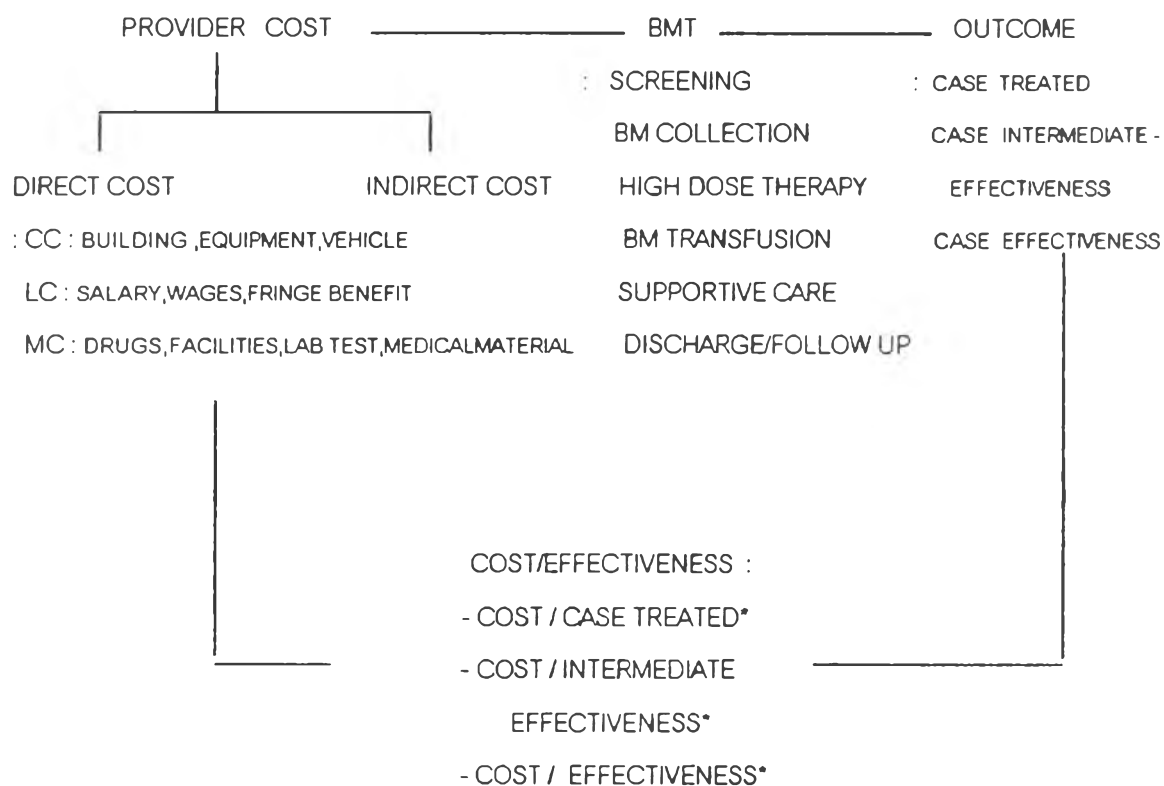
1.6 Conceptual Framework

The focus of this study is to examine the direct costs incurred to the provider, or from the perspective of the provider, which provides the health care services and special activities of bone marrow transplantation to the hematologic disorder patients. Costs were examined since the day of admission to the day of discharge and follow up for 6 months (Figure 1.2). We do not include costs that incurred before admission, costs of care and costs of screening because these costs are not available in the medical records. The external costs are not included in this study. We emphasized different levels of outcomes, there were 3 levels:

- First level : case treated or the total number of transplanted patients.
- Second level : case intermediate effectiveness of BMT or the number of transplanted patients who survived more than 6 months after transplantation but less than 5 years.
- Third level : case full effectiveness of BMT or the number of transplanted patients who can survive more than 5 years after transplantation.

We will examine cost per outcome in each level of outcome so that we can see how much of cost the provider has to incur more to get the higher level of outcome.

Figure 1.1 Conceptual Framework for the Bone Marrow Transplantation :

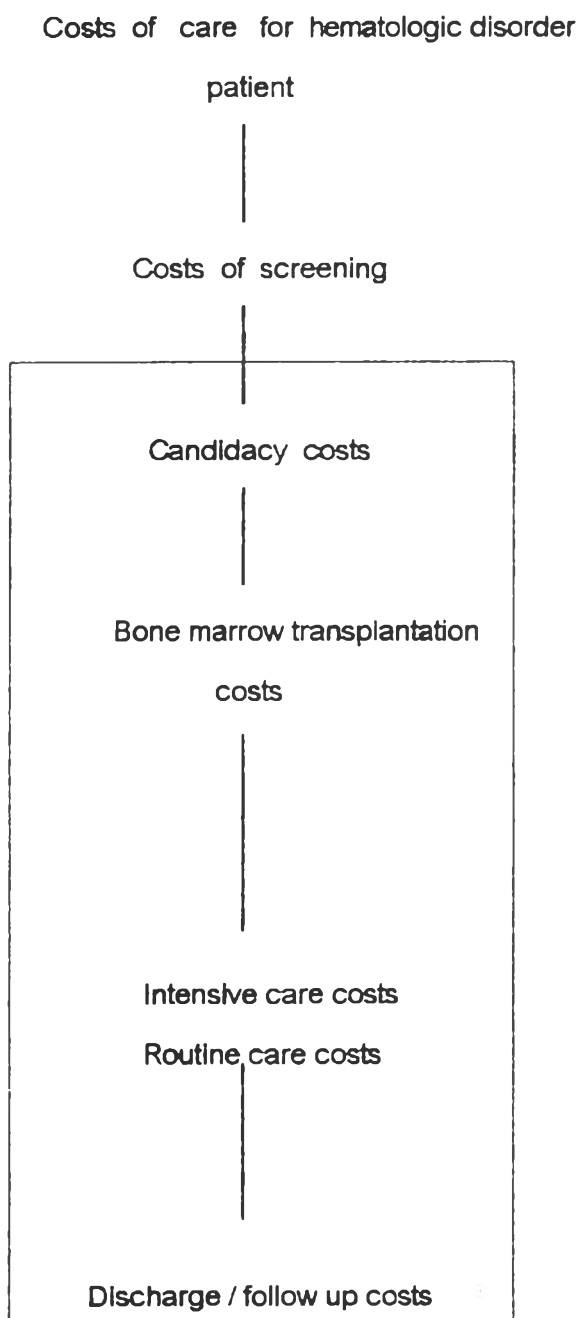


Note : CASE TREATED* = number of all transplanted patients

INTERMEDIATE EFFECTIVENESS* = number of transplanted patients who survived after discharge more than 6 months but less than 5 years

EFFECTIVENESS* = number of transplanted patients who survive after discharge more than 5 years (Five year survival)

Figure 1.2 Costing Framework for Bone Marrow Transplantation Procedures :



Note : This study will focus only the costs in highlighted frame.

1.6.1 Cost Classification

1.6.1.1 Classification of Cost by Inputs

This type of classification of costs is widely applicable and useful so this scheme is used in this study. It groups inputs into categories whose components have similar characteristics and distinguishes two important categories of resources - those that are used up in the course of a year and are usually purchased regularly (i.e., recurrent costs) and those that last longer than one year, such as building, vehicles, and equipment (i.e., capital costs).

Capital costs

- Vehicles : Bicycles, motorcycles, 4-wheel drive vehicles, trucks
- Equipment : Refrigerators, sterilizers, manufacturing machinery, scales, other equipment with unit cost (price) of \$100 or more
- Building - Space : Health centers, hospitals, training school, administrative office, storage facilities
- Training - Non-Recurrent : Training activities for health personnel that occur only once or rarely
- Social Mobilization - Non-Recurrent : Social mobilization activities that occur only once or rarely.

Recurrent costs

- Personnel (all types) : Supervisor, health workers, administrators, technicians, consultants, casual labor
- Supplies : Drugs, vaccines, syringes, small equipment (unit cost of under \$100)
- Vehicles - Operation & maintenance : Petrol, diesel, lubricants, tires, spare parts, registration, and insurance.

- Building - Operation & maintenance : electricity, water, heating, fuel, telephone, telex , insurance , cleaning , painting , repair of electricity , plumbing , roofing , and heating.
- Training - recurrent (e.g. short , in - service courses)
- Social Mobilization - operation costs.
- Other operating costs not included in above

Resources still have other characteristics that is helpful in describing and assessing the costs of any program. They are secondary to the input scheme which is, they are usually less important and are briefly described below. (Creese and Parker, 1994)

1.6.1.2 Classification of Costs by Function/Activity

This classification involves the kind of activity or function for which the resources are used. In most cases , identifying the different functional components is straightforward. It may be easy to miss some functions that are handled separately from the rest of the program , either institutionally or financially. Looking at the whole health sector and not just at single program ,the functional breakdown may be in terms of preventive or curative program or by type of Institution - hospital , health center, or staff training institution.

1.6.1.3 Classification of Costs by Level

Another way of dividing up resources is according to the levels at which they are used. For most health program there is an obvious hierarchy of operations. In a national program , for example , some resources are used at the central or national level while others are used at the provincial , regional , or district level. And some are further decentralized to health facilities or to the community , village , or household level.

1.6.1.4 Classification of Costs by Source

The source of the resources is another very important characteristic. Contributors may include the Ministry of Health, other national government department, local government bodies, international donors, bilateral donors, independent non-government charitable or private organizations, community groups, and individuals.

1.6.1.5 Classification of Costs by Currency

Closely associated with the source of the resources is the type of currency required to purchase those resources. Bilateral and international donors, for example often supply goods and services needing to be purchased in foreign currency. Donors contributions are a way of easing foreign exchange shortages. However, donors may not be able to continue to support and it is useful to know foreign currency burden that would then fall on the government.

1.6.2 Allocated Share Inputs

Shared resources is simply that the same types of inputs are used for different programs or activities. It is usually necessary to take into account shared costs by finding a reasonably accurate way of dividing the costs of these shared resources among their various uses. This process is called "Cost Allocation" Its importance and difficulty of accomplishment will vary among program and levels of service. (Creese and Parker , 1994)

1.6.3 Measuring Economic Costs

1.6.3.1 Donated Goods and Services

The types of goods and services commonly donated to health program by individuals and communities include labor, construction materials, and food. Private and public enterprises frequently provide resources, such as free TV or radio time, newspaper space, and transport services. The easiest way to value donated goods and services is to look at the prices they are being sold for in the market.

1.6.3.2 Other Inputs

The concept of opportunity or economic cost has applications beyond valuing unpaid-for resources. It cannot be assumed that the price paid for the resources used in program always reflects the true value of those resources to society. Economists use the term "shadow prices" to refer to prices that have been adjusted for various reasons, including donations, to yield economic costs. Shadow pricing might be in order in other situations where an input price is incorrect, for example, where a resources used in a program has been subsidized so that it appears to be worth less than it really is. Costing is never complete or perfect when there are prices that have been distorted through taxes, subsidies, or other factors. Where a distortion appears to have an appreciable effect on total costs - personnel provide major possible examples of that - an adjustment often should be attempted and the results presented with and without it. Inputs that require foreign exchange pose other complications for true costs. Important supplies, such as certain drugs, and equipment are among the resources that often require foreign exchange rate for imports. To value them in economic cost terms necessitates use of an exchange rate, which expresses the value of foreign currency in terms of domestic currency.

1.6.3.3 Capital Inputs

For recurrent costs, resources purchased and resources used in a given year are likely to be very similar. Differences will only exist if the program has not stabilized or is not in equilibrium, and stocks are being heavily built up or run down. However, capital items are by their nature bought in one year and used for several more. A way is needed to spread out the costs over the study period. There, one approach is shown, which is valid for most purposes: simply to divide the total capital cost over the number of years of the item's expected life, a kind of depreciation. Estimates of costs of capital inputs can provide useful information, especially from the perspective of national allocation of scarce resources, so a reasonable way to make them is worth consideration.

1.7 Terms and Operational Definitions

1. Cost: The value of a resource used to produce something which is conceptually defined as the value that could be gained by using resources in a different way. Cost in this study refers to the economic cost including all the resources input for the specific activities of bone marrow transplantation.

2. Bone marrow transplantation: A surgical procedure to transplant healthy bone marrow to a patient with deficient bone marrow function, usually due to chemical treatment (chemotherapy) or radiation treatment for cancer. The healthy bone marrow may be taken from the patient prior to chemotherapy or radiation treatment (autograft) or it may be taken from a donor (homograft). Donated bone marrow must match the patient's tissue type. It can be taken from a living relative (usually a brother or a sister: allogeneic), or from an unrelated donor. Donors are matched through special blood tests called HLA tissue typing.

3. Allogeneic transplantation: A procedure in which a patient receives bone marrow from another person other than an identical twin.

4. Autologous transplantation : A procedure in which bone marrow or peripheral stem cells are removed from a patient , stored as the patient receives high dose chemotherapy , and refused into the same patient.

5. Catastrophic Illness : It is one of the hazards that causes productivity loss and requires very high expenditure for its treatment until the catastrophe occurred to the patients and their families. For example : Trauma , Spiral cord injury , Cancer , Aplastic anemia , etc.

6. Effectiveness : is the number of patients who received bone marrow transplantation were discharged from the hospital and can survive without any complication at least 5 years (five year survival rate)

7. Intermediate effectiveness : is the number of patients who received bone marrow transplantation were discharged from the hospital and survived more than 6 months but less than 5 years.

8. Unit cost / Average cost : is the total provider cost divided by the number of total transplanted patients during 1991 – 1997.

1.8 Possible Benefits

Cost information in this study will be useful to estimate resource requirements for the delivery of the services and can be used to determine the reasonable rate of charging the patients who have ability to pay. The hospital administrators will know about the trend of cost for BMT in Chulalongkorn Hospital so that they can probe whether the resources of this program are being used more efficiently. Further more , this study will be proposed to the policy makers in order to negotiate with the Social Security Office to include the bone marrow transplantation into the criteria of reimbursement to the main contractor providers and this study can be used as a guide in decision making about health care services and financing in high cost care.

1.9 Limitations of the Study

Because this is a retrospective study, there are a lot of limitations which may lessen the value of this study. Firstly, there are no real unit costs available for some of the hospital services such as the laboratory costs, radiology, etc., so it would be difficult to get the real economic costs of those items. Some of the estimations could only be based on the hospital charges which would be a little bit higher or lower than the economic costs. Secondly, as the data was collected from the patients' charts, so there were some costs that could not be collected because they were not written in the charts for example number of donors, in this study we assume that there was only one donor for one patient, which made the appearance of costs lower than the real cost.

For the facility costs like electricity and water supply, because there is no meter to measure the quantity used specific for the hematologic ward so we have to estimate these costs by using unit used per one person as the allocation criteria. Moreover, because this study is limited to examination of the hospital costs from the day of admission to the day of discharge and follow up at 6 months so the costs before admission and after follow up for 6 months were not included and the study does not address the indirect cost or social costs of the bone marrow transplantation.

Next is the issue of general ability of data aside, the data itself may be incomplete or inaccurate to begin with, for example, the exactly number of supplies which is difficult to record. Finally, this study seem to be the high cost synario and high outcome synario as well because Bone marrow transplantation Unit is the new program at Chulalongkorn Hospital with research budget every year for running this program, if it was in normal situation, costs and outcomes may decrease so we

have to compare the decreasing amount in outcomes and costs. If outcomes decrease in larger amount than costs, this would effect the cost effectiveness ratio to become higher.

To a certain extent , these limitations on data may be overcome by the use of Sensitivity Analysis by varying the magnitude of the various variables like length of stay , drug cost increasing, and number of donors.