

CHAPTER 5

DISCUSSION OF THE RESULTS



In this chapter, data analysis and discussion of the results of the study are presented. These discussion are made on the basic of medical indications identified in the methodology. For instance, costing analysis, situation analysis and utilization of MRI technology.

5.1 Diffusion of MRI

MRI was introduced to the world market in 1978, and the first MRI scanner was introduced in Thailand in 1989 and installed in private sector in Bangkok with the lowest magnetic field strength.

During the early-1990s, 12 hospitals had purchased MRI. The use of MRI technology spread rapidly during the late 1995s so that by 1995-1997, 12 (4 medical school and 8 private hospitals) centers had installed.

As a result of table 5.2 shown the number of MRI install in Thailand. MRI installed in the public sector were in teaching hospital (88%) while the MRI's in private sectors were allocated to MRI diagnostic centers (42%), private hospitals not listed on the stock market (33%) and private hospitals listed on the stock market (25%).

MRIs installed in Bangkok seem to be over utilized while those installed in hospitals outside Bangkok are under utilized due to the lack of technical personnel which will result in additional costs. Another factor concern is the scarcity of qualified individuals to maintain the machine in good working conditions, to operate the machine and to interpret the results.

However, there are several factors influencing the MRI diffusion some concern are : once the market for MRI has been established, a competitiveness of hospital is judge by their technological superiority by clients who belief that the more sophisticated the equipment, the better health care. Smaller or lower capitalized hospitals will attempt to purchase MRI, with a lower magnetic field strength and cost.

Where as, physicians become entrepreneurs when they purchase expensive equipment from which they expect a profitable return on investment. On one hand, they are expected to act or the agent from their patient and undertake diagnostic and treatment intervention based on technology's.

On the other hand, they are an entrepreneur who wishes to return their investment in reasonably short period of time and may tempt to take advantage of situations where indications are not considerable the rationale use.

Table 5.1 Currently MRI diffusion in Thailand , classified by magnetic field strength.

MRI Machine	2.0 T	1.5 T	1.0 T	0.5 T	0.4 T	0.3 T	0.2 T	0.1 T
1.ELSCINT 2.G.E.	Bangkok Hospital	Chulalongkorn Hospital Army Hospital Ramathibodi Hospital Maharajnakorn Chiengmai Hospital Srinakarin Hospital Smitthivej Hospital ,Srinakarin		Bumrungraj Hospital Phyathai I Hospital Rachada X-ray computer Hospital of MRI Diagnostic Center				
3.HITACHI						Rajyindee Hospital , Had Yai	Siam Hospital Phayathai X- Ray Computer Center , Victory Monument	
4.PICKER 5.PHILIPS 6.SHIMADZU		Rajvithi Hospital Siriraj Hospital Vachira Hospital		Ran kam heang Hospital Chiengmai - Ram Hospital Por.Pheat Hospital X-ray Computer Center ,Asoke			Pitsanuvej Hospital,pitsanulok	
7.SIEMENS		Sonkha Nakarin Hospital Neuro Hospital						
8.TOSHIBA		Vichaiyuth Hospital		MRI Center , Prachacheon				U-Ruphong x- ray Computer

Table 5.2 Distribution of MRI classified by regional of Thailand.

Region	No.of MRI	Population*	Unit per mil. pop	Discrepancy index
Bangkok	18	4.6	1: 1.20	2.70
Central	3	10.3	1: 0.29	0.65
North	2	11.9	1: 0.16	0.35
South	2	7.8	1: 0.25	0.55
North-East	2	20.8	1: 0.09	0.20
The whole country	27	60.0	1: 0.45	1.00

Note: * million population

Source: 1.Nation Statistics Office

2.Radiation Protection Department

Table 5.3 MRI distribution classified by owner in Thailand

Ownership	Bangkok	%	Other Provincial	%	Total
Public Hospital	6	-	3	33	9
-Teaching Hosp.	5		3		
-MOPH Hosp	1		0		
Private Hospital	13	-	5	67	18
-Private Hosp	7		3		
-Diagnostic center	6		2		
Total	19	70	8	30	27

Source: Radiation Protection department
Division of medical science

5.2 Utilization of MRI

As the result, I found that the main factors was influence the MRI utilization is financial incentives, and competition. Utilization of MRI was strongly influenced by the policies that provided financial incentives for entrepreneurs.

The financial incentives at the hospital or center, like specific payment systems to the doctor (doctor free) or the department using the MRI technology but also financial benefits for the investor (owner). The competitive between hospitals in affecting the MRI procedure.

Utilization may also have been stimulated by competition, as some hospitals may have viewed MRI as a technology that would symbolize the sophisticated care available and thus attract patients for other services.

Furthermore, many physicians prefer to practice in the MRI facility, patient volume depends on recruitment of physicians. The number use of MRI procedures has been highly influenced by this approach.

MRI scans performed on hospitalized patients, can categorized into In-patient and Out-patient.

Out-patient use of MRI was also encouraged by the fact that MRI almost certainly was the object of competition among medical specialists (e.g. radiologists, neurologists, orthopedists) to be come leading order the case.

It is evident that Chulalongkorn hospital, the porportion of Out-patients using MRI is nearly 50% , compared to that for In-patients. Chulalongkorn hospital was started evening clinic (1995's) which stimulating additional ordering of actual clinical demand for the services. When comparison the number of patient in office hour and the total number of extra clinic. The proportion of increasing rate almost the fifty percentage.

Average number of examination per day in Chulalongkorn Hospital and Eastern Seaboard Hospital were 10 , 5 respectively. The examination role was mainly brain tumor 54% , spine diseases 46%. For the use rate of In- Patient and Out-Patient have shown in next page.

Table 5.4 Number of ordering case classified by services section in Chulalongkorn Hospital.

Month	1993		1994		1995			1996			1997			
	Office Hour		Office Hour		Office	Hour	Extra clinic	Office	Hour	Extra clinic	Office	Hour	Extra clinic	
	OP	IP	OP	IP	OP	IP		OP	IP		OP	IP	OP	IP
Jan	-	-	54	36	51	36	51	64	29	26	86	31	37	10
Feb	-	-	64	18	40	45	48	65	35	42	74	24	39	7
Mar	49	46	77	44	62	29	20	55	31	47	71	34	35	6
Apr	37	30	62	28	53	24	40	45	33	43	54	32	40	8
May	46	50	64	29	59	36	44	63	32	35	59	27	37	6
Jun	51	35	62	48	57	39	41	55	30	47	61	26	53	8
Jul	49	41	49	46	49	28	40	56	43	53	84	26	53	6
Aug	44	44	63	59	61	35	34	70	37	56	78	31	54	3
Sep	35	28	62	39	41	46	30	65	31	49	86	38	51	10
Oct	48	40	64	39	59	34	24	76	29	50	76	29	45	16
Nov	35	19	63	49	65	35	52	46	13	26	46	13	46	6
Dec	50	46	73	38	60	39	23	63	33	47	63	33	44	8
Total	444	379	757	473	657	426	447	723	376	521	838	344	534	94

Source: Dept. of Radiology

Table 5.5 Number of ordering cases ,classified by different application and service time in Chulalongkorn Hospital.

Month	Office Hour					Extra Clinic				
	Brain	Spine	Body	Extremity	Total	Brain	Spine	Body	Extremity	Total
Jan	43	53	10	10	117	17	24	3	3	47
Feb	42	39	10	7	98	17	24	4	1	46
Mar	46	42	7	10	105	20	16	2	3	41
Apr	25	34	14	13	86	14	30	2	2	48
May	47	24	10	5	86	13	25	4	1	43
Jun	40	35	4	8	87	17	37	4	3	61
Jul	46	52	4	8	110	23	28	3	5	59
Aug	56	40	6	7	109	13	40	2	2	57
Sep	60	40	15	9	124	15	37	4	5	61
Oct	50	37	9	9	105	23	29	3	-	61
Nov	21	23	5	10	59	23	26	3	-	52
Dec	45	32	11	8	96	16	31	2	3	52
Total	521	451	105	104	1,182	217	347	36	28	628

Source: Dept. of Radiology

Table 5.6 The number of ordering cases classified by different application in 1997 in Chulalongkorn Hospital

	B	IAC	SP	CS	LS	LSS	TL	TS	LI	PE	AB	BR	C	NE	AR	EL	SH	L	K	FE
Jan	45	-	2	17	3	18	6	5	1	-	8	-	1	2	-	-	-	-	-	3
Feb	42	-	1	20	1	13	2	1	6	1	1	-	2	3	-	-	1	-	2	-
Mar	44	2	4	12	-	22	4	-	2	-	4	-	-	4	1	-	1	-	-	-
Apr	22	2	1	10	-	16	3	2	3	1	4	1	1	7	-	1	-	-	1	-
May	45	1	1	3	3	10	2	1	1	2	7	1	1	1	1	-	2	1	-	-
Jun	39	1	-	7	-	23	5	-	-	-	4	-	-	3	-	-	1	-	-	-
Jul	45	1	-	25	-	21	6	-	-	-	1	-	-	2	-	-	1	-	2	2
Aug	52	3	-	13	1	15	7	4	1	1	3	-	-	-	-	1	-	-	1	2
Sep	60	-	-	12	1	17	7	3	2	-	10	-	2	1	-	-	-	-	3	-
Oct	46	4	3	8	2	21	1	2	-	2	2	-	1	4	-	-	1	-	1	-
Nov	20	1	1	9	-	11	-	-	-	2	2	-	1	5	-	-	-	1	3	1
Dec	42	4	-	10	2	13	4	3	1	3	4	-	2	3	-	-	-	2	-	1

Source: Dept. of Radiology

5.2.1 Utilization of MRI in Chulalongkorn and Eastern Seaboard Hospital

The use rate of Chulalongkorn and Eastern Seaboard Hospital presented in table 5.7. I concluded that the utilization ratio are;

In Chulalongkorn Hospital:

Utilization rate of In-Patient is 1 : 100 IP cases

Utilization rate of Out-Patient is 1.1 : 1,000 OP visit

And Eastern Seaboard Hospital:

Utilization rate of In-Patient is 1.62 : 100 IP cases

Utilization rate of Out-Patient is 2.3 : 100 OP visit

From the actual report of both hospital, The most of case ordering were Out- patient in order to marketing strategy. While private sector tried to decrease the price as low as possible. In case of Eastern Seaboard Hospital, they charged as equal public price.

Table 5.7 Utilization ratio of MRI in Chulalongkorn Hospital and Eastern Seaboard Hospital: 1997

	Chulalongkorn Hospital	Eastern Seaboard Hospital
Number of order		
In-Patient	518	211
Out-Patient	1,372	845
Total	1,890	1,056
Number of case		
In-Patient	48,199	12,775
Out-Patient	1,181,895	36,500
Total	1,230,094	49,275
Utilization Rate		
IP case	0.010	0.016
OP visit	0.0011	0.023

Note: Utilization rate = case ordering / No. of OP or IP case

5.2.2 Factors influence with MRI utilization

There are three major factors which influence the utilization indicator. The first is age- sex distribution, and geographic location. The demographic effects are the utilization , as this is likely to affect the patient. Which have age and sex be significant as shown in the table 5.7 mostly is over 45 years old and particularly female patient.

The demographic transition : It appears that health status of countries at different levels of development seem to go through three stages of health development. The low income countries have the characteristics of high morbidity and high premature mortality, mainly from infectious diseases.

The middle income countries have much lower mortality from infectious diseases but still a high morbidity from a similar pattern of diseases. With the decline in infectious diseases there is generally a decline in fertility. The high income countries have much lower mortality from infectious diseases.

One effect of the utilization is geographic (residence of patient). The movement of population, particularly towards the rural areas can lead to the crowded in the cities. It seem to contradict the more utilized in cities. From the table 5.9 shown the residence of patient classified by region of Thailand. It shown that 69 % of patient came from outside Bangkok, which patients was take time to travel and opportunity cost.

Several factors were considered by utilization. The important factor are method of payment, which were two ways. One is by short term credit, the other is no payment. But its covered by health insurance or third- party payment.

Table 5.8 and 5.10 are a representative of payment method and related to monthly income of the patient' s occupation. The number of scanned patient of self- paid (out-of-pocket) was 45 % as government insurance scheme. In order to a low income, who ordered the MRI scan are not able to pay by them-self. It due to cost recovery of the hospital.

Moreover, when considering the service behavior. Mostly patients in evening clinic are more able to pay than unemployment. It seem to be inequity in access to care.

5.2.2.1 Demographic factors:

Table 5.8 Age- Sex distribution

Age	Male	Female	Total
less 15	2	3	(5%)
15 - 24	4	5	(9%)
25 - 34	1	8	(9%)
35 - 44	6	17	(23%)
45 over	24	30	(54%)
Total	37 (37%)	67 (67%)	100

Table 5.9 Patient's payment mechanism

Payment Status	Number of patient
Out of Pocket	45
Civil Servant	7
Health Insurance	25
Private Insurance	18
Research	5
Total	100

Table 5.10 Patient's Residence

Region	Number of patient
Bangkok	31
Central	14
East	14
West	6
North	5
South	15
North-East	15
Total	100

Table 5.11 Patient' s Occupation

Occupation	Number of patient
Factory/ Company worker	26
Laborer	30
Skilled worker/ Seller	13
Civil Servant	5
Unemployment	26
Total	100

5.3 Financial aspects of MRI utilization

This part are economic appraisal, a single cost analysis of MRI compared the revenue of MRI. Since it considers only costs which are mostly have to be imported from up-country compared with its country of origin (USA, Japan and German) to are local currency, brought also limitation in the implementation of performing the high technology due to the price which MRI is needed for a diagnostic procedure, cost of operation and maintenance.

5.3.1 Revenue estimation

The revenue producing of MRI are defined as the outcome of MRI productivity that are generated to the hospital. This study divided it into two types of the hospital; Chulalongkorn and Eastern Seaboard Hospital.

Chulalongkorn Hospital: these revenue are responsible for the number of patient and treatment charge.

Assume that:

$$TR_1 = TF_1 * NP_1$$

where;

TR_1 = Total Revenue as a public hospital,
Chulalongkorn Hospital

TF_1 = Treatment Fee

NP_1 = Number of patient in each year

In case of Chulalongkorn Hospital, the number of work hour were calculated in 21 week day. Exempt the first operated of year were calculated in 210 days. Because the MRI operated only 10 month in these year.

Eastern Seaboard Hospital: these revenue are responsible for the number of patient and treatment charge.

Assume that:

$$TR_2 = TF_2 * NP_2$$

where;

TR_2 = Total Revenue as a private hospital,
Eastern Seaboard Hospital

TF_2 = Treatment Fee

NP_2 = Number of patient in each year

Treatment fee is the amount to charge the patient in order to use MRI services. 8,000 Baht is the price of both public and private hospitals. But in case of Eastern Seaboard Hospital, the treatment charge will varying as different examination.

5.3.2 Cost estimation

Cost of MRI procedure are classified by investment and operating are calculated separately for each hospital. The purchasing price was use for the cost calculation instead of using shadow price which is not feasible due to limitation of resources.

Since the aim is to determine the cost-recovery of MRI, any cost for building, training for personnel, and opportunity cost of the patient will be excluded in the calculation. Therefore, total costs of MRI procedure are divided into two parts :

1) Capital costs are the costs to purchase the major capital assets required by the program, generally equipment, building and land. The price of each items was determined according to the market price and the total costs of each as following item:

Characteristic of cost of MRI:

- Equipment : MRI machine
- Buildings space : MRI unit, sitting
- Training : long term training activity for health personnel that operate the MRI machine.

2)Recurrent costs are the cost that are incurred within one year. These include items such as:

- Personnel : Physician, nurse, technician, administrator, clerk etc.
- Supplies, films, and contrast material.
- Machine operation and maintenance: Electricity, water, heating, cleaning .
- Other operating costs: Helium, Cryogen, Water shieller.

Recurrent cost structure in Chulalongkorn Hospital and Eastern Seaboard Hospital has been assume that:

$$RC = OC + MC$$

Where;

RC	=	Recurrent cost
OC	=	Operational running cost
MC	=	Service maintenance cost

Table 5.12 Cost estimates of MRI in Chulalongkorn Hospital

Items :	Salary(B.)	Number of workers
Operational running structure:		
Radiologist	10,600 / mo.	11
Radiographer	6,360 / mo.	1
Nurse	6,360 / mo.	1
Technologist	5,740 / mo.	3
Clerk	5,740 / mo.	1
Official	4,100 / mo.	1
Service maintenance	3,500,000 / yr.	

Source: Dept. of radiology

Table 5.13 Cost estimates of MRI in Eastern Seaboard Hospital

Items :	Salary(B.)	Number of workers
Operational running structure		
Radiologist	10 % of DF	3
Technologist	15,000 + on-call / mo.	5
Nurse	15,000 / mo.	1
Assistant Nurse	10,000 / mo.	6
Clerk	7,500 / mo.	3
Supplies;		
Film	50/ film / patient	
Contrast media (cost to patient)		
Service maintenance	3,000,000 / yr.	

Source: Diagnostic center, Chonburi

3) Depreciation

The loss in value of MRI, due to wear and tear obsolescence, or other reasons. Depreciation is usually computed on an annual basis as initial cost per year of useful life. It would be inappropriate, for example, to charge the full cost of a new MRI to the project in the year it was purchased. The equipment has a useful life year of 10 years or so. Therefore, its cost should be spread out over that 10-years period. That is called “depreciation”. Each year the value of MRI declines (depreciates) by a certain amount until at the end of 10 years its value is zero (Reynolds, 1992).

4) Discounting

Discounting is appropriate to perform when cost are to be incurred in the future. The process of discounting involved deflating future Baht by an appropriate factor. Mathematically, it can be computed a return on investment. To perform discounting, it is necessary to weight future Baht by the discount rate in order to net present values. The rate of interest obtained from the bank if the money was put into the bank instead of buying the MRI. This study used the World Bank discount rate = 10 %.

5) Annual cost of capital cost

The annualization factor depends on the discount rate and years of useful life. As all capital items can be used for long period (useful life), its initial cost must be spread to every year as well. The cost incurred for each year were calculated the annual cost of capital items as following :

- Estimate the useful life of MRI by consulting with expert or technician.
- Suppose that an item of MRI equipment was purchased from the beginning of the program with initial cost and its useful life is 10 years.

Thus the annual cost of MRI in *Chulalongkorn Hospital* will be :

Useful life at 10 yr., At 10% discount rate	=	6.145
Capital cost of MRI	=	70 mB.
Depreciate cost	=	11.796 mB.

Annual capital cost of MRI in Eastern Seaboard Hospital as below:

Annualization factor of capital cost with 10 % discount rate	
Useful life at 10 years , annualization from table	= 6.145
Capital cost of MRI	= 60 mB.
Depreciate cost of MRI	= 9.764 mB.

6) Steps of cost recovery analysis

$$\boxed{\text{Revenue / yr} = \text{Cost / yr}} \quad (1)$$

When $TC = \text{Recurrent Cost} + \text{Depreciate cost}$
and $TR = \text{Treatment cost} * \text{number of patient per yr}$

$$\begin{aligned} \text{Rev / case} * \text{case / yr} &= FC / \text{yr} + VC / \text{yr} \\ &= FC / \text{yr} + VC / \text{case} * \text{case / yr} \end{aligned}$$

$$\text{case / yr} * [\text{rev / case} - VC / \text{case}] = FC / \text{yr}$$

$$\text{No. of case / yr} = \boxed{\frac{FC / \text{yr}}{[\text{rev / case} - VC]}} \quad (2)$$

$$\text{No. of case / month} = (2) / 12$$

$$\begin{aligned} \text{No. of case / day} &= (2) / 21 \quad (\text{public service}) \\ &= (2) / 30 \quad (\text{private service}) \end{aligned}$$

5.3.3 Financial sustainability

The MRI services providing sustainable service can produce the efficiency of services. In this context, it can be defined that MRI used as an efficiency. To be able to offer the less “profitable”, in which revenue from MRI services are equal or higher than the expenditure for MRI service. Obviously, this is the end of the result of this study.

The cost recovery of MRI in Chulalongkorn Hospital was lose the beginning until now. When considering the cost recovery by using total recovery compared to running cost without depreciation cost, they were profits in every year of operation (see table 5.14). While the revenue from MRI in Chulalongkorn Hospital are more than total cost of MRI service.

For example financial sustainability by using cost recovery analysis in Chulalongkorn Hospital, (1997) as follows:

Total revenue	=	15,120,000
Total cost	=	17,245,140
Running cost	=	5,448,560

$$\begin{aligned} \text{a) Cost recovery of (TR : TC)} &= 15,120,000 / 17,245,140 \\ &= 0.87 \end{aligned}$$

Therefore, total revenue < 87 % of total cost

$$\begin{aligned} \text{b) Cost recovery of (TR : RC)} &= 15,120,000 / 5,448,560 \\ &= 2.77 \end{aligned}$$

Therefore, total revenue > operating cost without depreciation cost

However, this study tried to put the various treatment charge from 8,000 - 10,000 Baht. I founded that the break- even point is B.9,125 / case. Once they charge at this point, after several years of loses will scanty profits.

The accumulated TR - [RC+MC] were presented the payback period of MRIs without discount rate is approximately next 10 year. It mean that, in case of Chulalongkorn hospital will get the payback period within 10 years.

For the balance sheet in the table 5.15, and 5.17 showed the balance of payments and receipts of MRI services in Eastern Seaboard Hospital. At the first year of MRI operated were less loss than second year due to the first year is free warranty.

When considering cost recovery by using recovery compared to running cost without depreciation cost, they were more profits. Due to the total revenue from MRI service in Eastern Seaboard Hospital are more than the cost of MRI service.

For example financial sustainability by using cost recovery analysis in Eastern Seaboard Hospital. (1997) as follows:

Total revenue	=	8,448,000
Total cost	=	14,323,030
Running cost	=	4,559,030
a) Cost recovery of (TR : TC)	=	8,448,000 / 14,323,030
	=	0.58
Therefore, total revenue	<	58 % of total cost
b) Cost recovery of (TR : RC)	=	8,448,000 / 4,559,030
	=	1.85

Therefore, total revenue > operating cost without depreciation cost

In conclusion, it means that the revenue can cover the operating cost in case of Eastern Seaboard Hospital. However, when calculated the break-even point by put the various treatment charge from 8,000- 14,000 Baht. Note that this estimate is based on 1,056 cases per year in order to less demand in this area. The break-even point of MRI in Eastern Seaboard Hospital is 13,563 Baht / case.

When the accumulated TR - RC is 34 million Baht, the pay back period is the next 10 year. It mean that, in case of Eastern Seaboard Hospital will get pay back period is shorter return on investment in order to the low magnetic field strength but high capital cost.

Table 5.14 Cash flow analysis of MRI application in Chulalongkorn Hospital

	1993	1994	1995	1996	1997
Revenue from MRI service					
Total of number of patient / Year	823	1,229	1,370	1,620	1,890
Treatment Fee (TF)	8,000	8,000	8,000	8,000	8,000
Total Revenue (TR)	6,584,000	9,832,000	10,960,000	12,960,000	15,120,000
Expenditure for MRI service					
Operational Running Costs (RC)	1,948,560	1,948,560	1,948,560	1,948,560	1,948,560
Radiographer	76,320	76,320	76,320	76,320	76,320
Nurse	76,320	76,320	76,320	76,320	76,320
Technologist	206,640	206,640	206,640	206,640	206,640
Radiologist	1,399,200	1,399,200	1,399,200	1,399,200	1,399,200
Clerk	68,880	68,880	68,880	68,880	68,880
Official	49,200	49,200	49,200	49,200	49,200
Contrast Media Cost	-	-	-	-	-
Electricity (air-con etc.)	60,000	60,000	60,000	60,000	60,000
Sundries(syringes/needle/cath)	12,000	12,000	12,000	12,000	12,000
Service Maintenance-MRI cost (MC)	0	3,500,000	3,500,000	3,500,000	3,500,000
Depreciation cost (DC)	11,796,580	11,796,580	11,796,580	11,796,580	11,796,580
Total Cost (TC)	13,745,140	17,245,140	17,245,140	17,245,140	17,245,140
Balance of Revenue and Cost					
TR - TC	-7,161,140	-7,413,140	-6,285,140	-4,265,140	-2,125,140
TR - [RC+MC]	4,635,440	4,383,440	5,511,440	7,511,440	9,671,440
Accumulated [TR - (RC+MC)]	4,635,440	9,018,880	14,530,320	22,041,760	31,713,200
Discounted [TR - (RC+MC)]	4,171,896	3,945,096	4,960,296	6,760,296	8,704,296
Accumulate discounted [TR -(RC+MC)]	4,171,896	8,116,992	13,077,288	19,837,584	28,541,880

Table 5.15 Cash flow analysis of MRI application in Eastern Seaboard Hospital

	1996	1997
Revenue from MRI service		
Total of number of patient / Year	906	1,056
Treatment Fee (TF)	8,000	8,000
Total Revenue (TR)	7,248,000	8,448,000
Expenditure for MRI service		
Operational Running Costs (RC)	1,417,300	1,559,030
Radiographer	844,800	929,280
Nurse	180,000	198,000
Technologist	180,000	198,000
Film/patient	132,500	145,750
Contrast Media Cost	-	-
Electricity (air-con etc.)	60,000	66,000
Sundries(syringes/needle/catheter)	20,000	22,000
Depreciation cost (DC)	9,764,000	9,764,000
Service Maintenance-MRI cost (MC)	0	3,000,000
Total Cost (TC)	11,181,300	14,323,030
Balance of Revenue and Cost		
TR - TC	-3,933,300	-5,875,030
TR - [RC+MC]	5,830,700	3,888,970
Accumulated [TR -(RC+MC)]	5,830,700	9,719,670
Discounted [TR - (RC+MC)]	5,247,630	3,500,073
Accumulate discounted [TR - (RC+MC)]	5,247,630	8,747,703

Table 5.16 Break- even analysis of MRI application in Chulalongkorn Hospital: 1997

	Various Treatment Fee		
Revenue from MRI service	(1)	(2)	(3)
No. of Working Day = 21/mo	252	252	252
Total of number of patient / Year	1,890	1,890	1,890
Treatment Fee (TF)	8,000	9,124	10,000
Total Revenue (TR)	15,120,000	17,245,140	18,900,000
Expenditure for MRI service			
Operational Running Costs (RC)	1,948,560	1,948,560	1,948,560
Radiographer	76,320	76,320	76,320
Nurse	76,320	76,320	76,320
Technologist	206,640	206,640	206,640
Radiologist	1,399,200	1,399,200	1,399,200
Clerk	68,880	68,880	68,880
Official	49,200	49,200	49,200
Contrast Media Cost	-	-	-
Electricity (air-con etc.)	60,000	60,000	60,000
Sundries(syringes/needle/catheter)	12,000	12,000	12,000
Depreciation cost (DC)	11,796,580	11,796,580	11,796,580
Service Maintenance-MRI cost (MC)	3,500,000	3,500,000	3,500,000
Total Cost (TC)	17,245,140	17,245,140	17,245,140
Balance of Revenue and Cost			
TR - TC	-2,125,140	0	1,654,860
TR - [RC+MC]	9,671,440	11,796,580	13,451,440
Accumulated [TR - (RC+MC)]	9,671,440	21,468,020	34,919,460
Discounted [TR - (RC+MC)]	8,704,296	10,616,922	12,106,296
Accumulate discounted [TR - (RC+MC)]	8,704,296	19,321,218	31,427,514

Table 5.17 Break- even analysis of MRI application in Eastern Seaboard Hospital: 1997

	Various Treatment Fee		
	(1)	(2)	(3)
Revenue from MRI service			
No. of Working Day = 30/mo	360	360	360
Total of number of patient / Year	1,056	1,056	1,056
Treatment Fee (TF)	8,000	13,563	14,000
Total Revenue (TR)	8,448,000	14,323,030	14,784,000
Expenditure for MRI service			
Operational Running Costs (RC)			
Radiographer	844,800	929,280	1022208
Nurse	180,000	198,000	217800
Technologist	180,000	198,000	217800
Film/patient	132,500	145,750	160325
Contrast Media Cost	-	-	-
Electricity (air-con etc.)	60,000	66,000	72600
Sundries(syringes/needle/catheter)	20,000	22,000	24200
Depreciation cost (DC)	9764000	9764000	9764000
Service Maintenance-MRI cost (MC)	3,000,000	3,000,000	3,000,000
Total Cost (TC)	14,181,300	14,323,030	14,478,933
Balance of Revenue and Cost			
TR - TC	-5,733,300	0	305,067
TR - [RC+MC]	4,030,700	9,764,000	10,069,067
Accumulated [TR - (RC+MC)]	4,030,700	13,794,700	23,863,767
Discounted [TR - (RC+MC)]	3,627,630	8,787,600	9,062,160
Accumulate discounted [TR - (RC+MC)]	3,627,630	12,415,230	21,477,390