CHAPTER 4

RESULTS AND DISCUSSION

This chapter provides the results as well as discussion part. The result follows the objectives of the study. Discussions include in each part to answer the objective and compare with other studies that have been done before.

4.1 Utilization pattern of Automatic Clinical Analyzer.

This part presents the factors influencing the utilization of Automatic Clinical Analyzer (ACA) from many perspectives such as physician, patients and others. Utilization rate of ACA was described as well.

4.1.1 Physician Factors.

In this study, 50 physician were interviewed during February 2000 to determine the factor influencing utilization of ACA from physician viewpoint. The results are as follows. From total number of respondents, 90% are general doctors, while the rest are many kind of specialization (see Table 4.1).

It was found that 62% of respondents did not know whether ACA was available in the referral laboratory (see Table 4.2). It was possible because they concerned with the result of the laboratory tests rather than the technology used. This finding was supported by the answer that 70% of respondents did not have partnership with the laboratories (see Table 4.3).

Table 4.1 Specialization of Respondents.

Type of physician	Number of respondents (n = 50)	Percentage
General practice	45	90 %
Specialist	5	10 %
Total	50	100 %

Table 4.2 Knowing about Automated Clinical Analyzer in Referral Laboratory.

Availability of ACA	Number of respondents (n = 50)	Percentage
Know	19	38 %
Did not know	31	62 %
Total	50	100 %

Table 4.3 Partnership with Referral Laboratory.

Partnership	Number of respondent (n = 50)	Percentage
Yes	15	30 %
No	35	70 %
Total	50	100 %

30 % of respondents had partnership with the laboratory. This partnership was unwritten agreement between laboratory and physician promising to pay the physician some amount of money, averagely 20% of total charge as financial incentives. Financial incentive might be one of strategy to market promotion. The incentive was sent to the physician at the end of the month in every month in money term. From 30 % of respondents, being partnership, about 66.7% of them know about the availability of ACA in the laboratory (see Table 4.4). It might be influence the physician to decide the partnership agreement.

The main reason to refer the patient to the laboratory is the result of the tests support the diagnosis (76% out of 50 respondents which is 94.7% are general practice), see Table 4.5. This reason was supported by the confirmation of the result to the precise diagnosis or appropriate use. It was found 64% of respondents answered that more than 80% the precise diagnosis was done after receive the result of the tests. The mean of appropriate use was 80% as well (see Table 4.6). Easy to access and provide fast result were other factors that influencing the physician to utilize ACA.

Meanwhile, only 30% of respondents answered that the financial incentive was the reason to refer patients (see Table 4.5). It was also found that the decision to refer to the laboratory was done by physician 76%. The patients often rely on physician to act as agents in order to get the medical care on their health status and prospective treatment. This phenomenon has been called supplier-induced demand. Even though 62% of respondents did not know the availability of ACA, they still requested the laboratory tests which they it is think necessary or as routine examination. According to the total number year of practice, the result showed that 54% of the physician with 5 - 10 years of experience refered the patient to the laboratory because of the result supporting the diagnosis, while 16% of them otherwise (see Table 4.7).

In addition, Figure 4.1 presents the number year of practice of respondents. It shows that the physicians with 4 to 10 years of experience tend to utilize the ACA rather than those with 4 years or more than 10 years of experience. It can interpret that the young practitioners often rely on the equipment for supporting diagnosis.

Table 4.4 Partnership with Referral Laboratory by Knowing about Automated Clinical Analyzer.

Partnership	Know	Don't know	Total
Yes	10 (66.7%)	5 (33.3%)	15 (100%)
No	9 (25.7%)	26 (74.3%)	35 (100%)

Table 4.5 Reason to Refer Patient to the Laboratory.

Reason*	Number of respondents	Percentage
1. The result of laboratory tests support the diagnosis (n=50)	38	76 %
2. Easy to access (n=50)	24	48 %
3. Provide fast result (n=50)	21	42 %
4. Financial incentive (n=50)	15	30 %
5. Patient's choice (n=50)	12	24 %
6. The results of tests were delivered immediately (n=50)	9	18 %

Note: * Respondents could answer more than one reason.

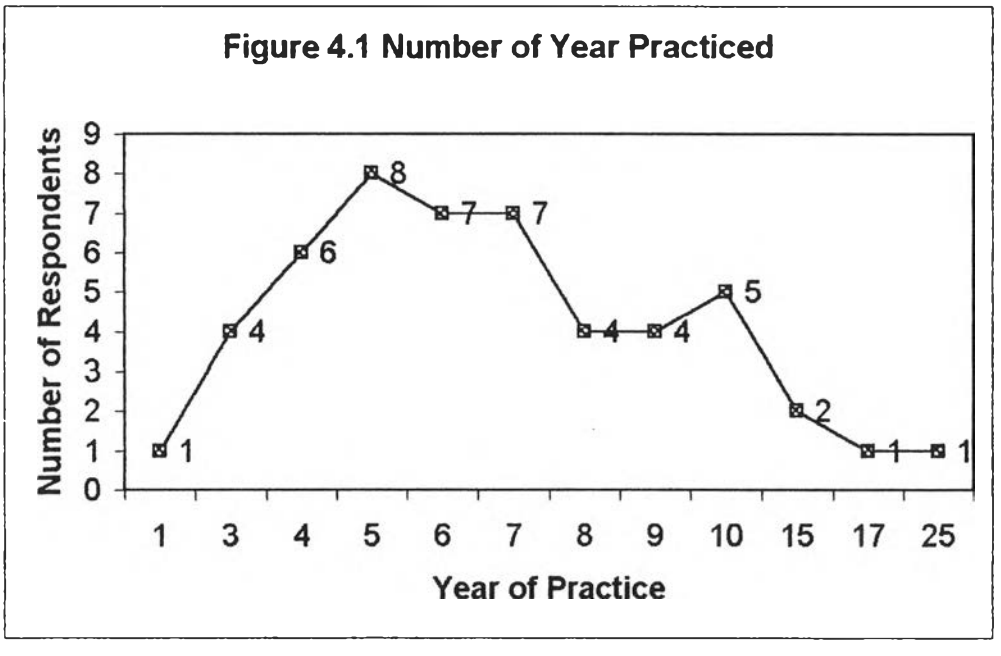
Table 4.6 Confirmation of the Result to the Precise Diagnosis.

Confirmation	Number of respondent (n = 50)
0 – 50 %	3 (6%)
51 % - 79 %	15 (30 %)
80 % - 100%	32 (64 %)
Total	50 (100 %)

Mean = 80 %

Table 4.7 Reason for Ordering Laboratory Tests to Supports the Diagnosis by Number of Year Practiced.

Number of year practiced	Result of test support the diagnosis (n = 50)		Total
	Yes	No	
Less than 5 years	10 (20%)	1 (2%)	11 (22%)
5 to 10 years	27 (54%)	8 (16%)	35 (70%)
More than 10 years	1 (2%)	3 (6%)	4 (8%)
Total	38 (76%)	12 (24%)	50 (100%)



4.1.2 Patient Factors

392 patients in public hospital and 69 patients from clinical laboratory who visited the laboratory unit were interviewed during February 2000 to determine the factors from patients' viewpoint.

It was found that outpatients (OPD) of public hospital contribute the highest portion (64,5%) of the users, while in clinical laboratory the largest users were emergency patients (79.7%) (see Table 4.8). It was indicated that in the day time the OPD patients utilizes more public hospital services. The emergency cases refer to clinical laboratory, especially when they need service in the evening or night. The opening hours of clinical laboratory is 10 hours per day, six days per week, while laboratory unit in public hospital open in day time only or 6 hours per day, six day per week.

The pattern of age and sex, both in public hospital and clinical laboratory, showed the similar trend (see Table 4.9). The older groups utilize more than the young one. It was indicate that the elderly has more demand for health services because of the lower health status. Also found that female at age between 36 to 55 years more utilize the services. However, according to age and sex pattern, we can not simply say that this factor determines the utilization of ACA. It is necessary to know the tests requested for each patient.

Education seems to affect the need of health care. The awareness of illness and recognizing the early symptom of illness make the high educated people more likely to seek health care services. The high educated persons prefer to use the private sector (see Table 4.10).

The result of study by Birch et al (1993), using statistical analysis found that females are significantly more likely to have used a family physician than males and there is a general association of increasing probability of use with increasing age group. On the contrary, neither household income nor education was found to be significantly associated with the quantity of use of family physician.

Table 4.8 Type of Respondents in Public Hospital and Clinical Laboratory.

Type of patient	Public hospital (n=392)	Clinical laboratory (n= 69)
Inpatient (IPD)	113 (28.8%)	-
Outpatient (OPD)	253 (64.5%)	14 (20.3%)
Emergency	26 (6.6%)	55 (79.7%)
Total	392 (100%)	69 (100%)

Table 4.9 Age and Sex Distribution in Public Hospital and Clinical Laboratory.

Age (years)	Public hospital (n=392)			Clinical laboratory (n=69)		
	Male	Female	Total	Male	Female	Total
< 15	12 (3.1%)	9 (2.3%)	21 (5.4%)	-	1(1.4%)	1 (1.4%)
16 – 25	16 (4.1%)	16 (4.1%)	32 (8.2%)	2 (2.9 %)	2 (2.9%)	4 (5.8%)
26 – 35	19 (4.8%)	34 (8.7%)	53(13.5%)	8(11.6%)	5 (7.2%)	13(18.8%)
36 – 45	28 (7.1%)	43(11.0%)	71(18.1%)	4(5.8%)	8(11.6%)	12(17.4%)
46 – 55	38 (9.7%)	51(13.0%)	89(22.7%)	9(13.0%)	8(11.6%)	17(24.6%)
> 56	64(16.3%)	62(15.8%)	126(32.1%)	15(21.7%)	7(10.2%)	22(31.9%)
Total	177 (45.2%)	215 (54.8%)	392 (100%)	38 (55.1%)	31 (44.9%)	69 (100%)

Table 4.10 Education of Respondents in Public Hospital and Clinical Laboratory.

Education	Public hospital (n=392)	Clinical laboratory (n=69)
No education	69 (17.6%)	1 (1.4%)
Elementary school	85 (21.7%)	7 (10.1%)
Junior high school	52 (13.3%)	13 (18.8%)
Senior high school	126 (32.1%)	34 (49.3%)
University	60 (15.3%)	14 (20.3%)
Total	392 (100%)	69 (100%)

Regarding to occupation, government employee more utilize the public hospital, while self-employee prefers use the clinical laboratory (see Table 4.11). Education and occupation can be proxy of income, thus from the result it was indicate that the higher income more utilize the service and moreover they prefered to use the private sector.

Access to health care generates additional costs to the price of seeking care. There may be travel cost or time cost and loss of income due to absence from work. Table 4.12 presented the residence of respondents, it was reveal that most of the patient were domicile inside the city. However, the patients from outside the city also have to be concerned, according to result, that 33.9% of them utilize the public hospital and 17.4% visit clinical laboratory. Inequity exists in terms of access to care. Because they have to add the cost to travel cost and time cost or income loss due to seeking care. A study by Dor et al (1987) found that demand fell when time taken to reach the facility increased.

Table 4.13 presented the source of finance of respondents, it showed that out-of-pocket was to be the main source of finance of patient in both facilities. All the patients who have public insurance use public hospital because this insurance only provides health care financing in the public sector. Sometimes they have to pay out-of-pocket when the fees were too much, while the insurance provide only a certain fund to finance the services.

Patient who paid by Social Safety Net could be categorized in free of charge also, but the charge will be reimbursed by the organization that responsible for managing the Social Safety Net Financing. Meanwhile, the patient who was categorized in free of charge financing was not pay at all and no reimbursement for them. The patients have to show the poverty card, which is can get from the local authority of the place, where the patiens domicile.

Table 4.11 Occupation of Respondents in Public Hospital and Clinical Laboratory.

Occupation	Public hospital (n=392)	Clinical laboratory (n=69)
Government employee	71 (18.2%)	2 (2.9%)
Private employee	52 (13.3%)	6 (8.7%)
Self employee	42 (10.7%)	37 (53.6%)
Farmer / fisher	3 (0.8%)	-
Labor	28 (7.1%)	-
Retired	42 (10.7%)	-
Other (no occupation)*	154 (39.3%)	24 (34.8%)
Total	392 (100%)	69 (100%)

* Includes housewives and children also.

Table 4.12 Residence of Respondents in Public Hospital and Clinical Laboratory.

Residence	Public hospital (n=392)	Clinical laboratory (n=69)
Inside the city	259 (66.1%)	57 (82.6%)
Outside the city	133 (33.9%)	12 (17.4%)
Total	392 (100%)	69 (100%)

Table 4.13 Source of Finance of Respondents in Public Hospital and Clinical Laboratory.

Source of finance	Public hospital (n=392)	Clinical laboratory (n=69)
Out-of-pocket	175 (44.6%)	67 (97.1%)
Public insurance	169 (43.1%)	-
Private insurance	5 (1.3%)	2 (2.9%)
Social security scheme	11 (2.8%)	-
Social safety net	31 (7.9%)	-
Free of charge	1 (0.3%)	-
Total	392 (100%)	69 (100%)

According to the occupation of the patients who paid out of pocket, the result showed that 43.4% in public hospital and 34.8% in clinical laboratory were the patients who did not have occupation, including housewives and children (see Table 4.14). Inequity occurs because they have to pay out pocket without exemption of the charge. It is necessary to provide the exemption charge for those who pay out of pocket to reduce the equity problem.

Table 4.14 Out of Pocket Financing by Occupation of Respondents in Public Hospital and Clinical Laboratory.

	Out of Pocket Financing	
Occupation	Public Hospital (n =175)	Clinical laboratory (n = 67)
Government employee	2 (1.2%)	2 (2.9%)
Private employee	32 (18.5%)	6 (8.9%)
Self employee	36 (20.8%)	35 (52.2%)
Farmer / fisher	3 (1.7%)	-
Labor	18 (10.4%)	-
Retired	7 (4.0%)	-
Other (no occupation)*	75 (43.4%)	24 (34.8%)
Total	173 (100%)	67 (100%)

4.1.3 Other factors

Because of the limitation of time and data available, this study did not show the variable of other factors that affecting utilization. However, some literature review was discussed below.

In the middle of 1997, Indonesia had suffered from economic crisis. The crisis threatened future income capacity through damaging the health and education of Indonesians.

The crisis affected the poor, primarily through the redution of employment and the increase in price of necessary commodities and services. The health sector has been severely impacted by the sharp depreciation of rupiah, which has raised prices of drugs, vaccine and other medical equipment. Small-scale surveys indicate that drug prices have doubled or tripled since the crisis started (World Bank, 1999). The impact results in declining the utilization of health services. Declines in accessibility and increased cost prevent the poor from seeking health care services.

Falling private consumption expenditure, particularly among the rising numbers of employment, means that many households have less ability to pay for the out-of-pocket cost of medical care, whether provided by the private sector or by public facilities. This factor lead to significant changes in medical care utilization patterns. There was an evidence that patients in the private sector are switching back to the subsidized public sector, while some potential users, especially among the poor, switching to lower quality providers (World Bank, 1999).

From the study of Impact on monetary crisis of health services in hospital and public health center in East Java by Poerwani et.al. (1998), she found that the low-income group reduced the utilization of medical services in hospital, meanwhile number of visit in public health center did not show the increasing trend. It was probably because most of the poor turning to the traditional medicine. It was also found that hospital readjusts the charge by increasing the charge for in-patient department.

The increasing charge was itemized into private services, class I, class II and class III by up to 66.7%, 50%, 66.6% and 17.64% respectively.

4.1.4 Utilization Rate

Utilization rate was defined as utilization of ACA, which is the total number of tests per year, on the basis of full capacity. According to that definition, the utilization rate could be computed by dividing total number of tests per year over full capacity per year. Assume that the operating machine per day was 10 hours, based on the maximum operating hour in clinical laboratory.

$$\text{Utilization rate} = \frac{\text{Total number of tests}}{\text{Full capacity per year}} * 100\%$$

Total number of tests in public hospital = 98,012 tests

Total number of tests in clinical laboratory = 60,157 tests

Full capacity per year = total operating hours per year * full capacity of tests per hour

Total operating hours per year = maximum operating hour * opening day in one year

Maximum operating hours was 10 hours

Thus, total operating hours = 10 * 6 * 52 = 3,120 hours

Given full capacity of tests per hour = 180 tests

Then full capacity per year = 3,120 * 180 = 561,600 tests

Thus,

$$\text{Utilization rate in public hospital} = \frac{98{,}012}{561{,}600} * 100\% = 17.5\ \%$$

$$\text{Utilization rate in clinical laboratory} = \frac{60{,}157}{561{,}600} * 100\% = 10.7\ \%$$

The utilization rate above revealed the utilization rate during October 1998 to September 1999, during those period of study in public hospital and clinical laboratory were 17.5% and 10.7% respectively. However it is required to know the utilization befor and after economic crisis. In terms of under-utilization, it can be said that utilization of ACA was inefficient, both in public hospital and clinical laboratory. This result indicated inefficiency in utilization of ACA. The utilization rate in clinical laboratory was low, because in this study did not calculate all of the tests (due to data limitation). In order to optimize the revenue, clinical laboratory try to extend the operating hours of ACA (10 hours) per day, while in public hospital operate the machine only during the office hour. Moreover the low utilization rate due to total number of tests did not include all the tests. The tests include in calculation were blood glucose, total cholesterol, trigliceride, HDL, blood urea nitrogen, uric acid, total bilirubin, SGOT/SGPT, total protein albumin and alkali phosphatase. Meanwhile, more tests are available to be processed using ACA. If all the tests had been included in the calculation, then the utilization rate will be higher.

The study by PPEKI (1991) revealed that the utilization rate was range between 3.6 % to 100 % with average 46.4 %. The possible reason is because the two studies were not in the same areas and period of time. Moreover, the full capacity was not the same. The low full capacity per year may cause the utilization rate higher.

A study by Wouters (1993) found that 73% of the non hospital private facility were technically inefficient, compared to 32% of those in the public sector. Possible reasons for inefficiency are over staffing and under-utilization. These results indicate that for IPD services, facilities are operating under capacity; high fixed costs are distributed over relatively few admissions. Lack of complementary inputs is likely to explain for low utilization levels.

4.2 Economic and Financial Analysis

4.2.1 Cost

All of the cost were obtained from provider point of view, while the cost from patient perspective could not obtained because the limitation of time during data collection. The cost component consists of capital costs, materials costs and labor costs. In public hospital, it was found that the highest portion of cost was the capital cost, followed by material cost and labor cost. The percentage of cost shared by capital cost, material cost and labor cost were 48.3%, 44.4% and 7.3% respectively (see Table 4.15). The highest part of capital cost was the cost of Automated Clinical Analyzer (53.7%) followed by building, and office inventory cost (see Table 4.16 and Table 4.17).

All of the lifetime of capital assets were obtained from expert opinion of each institution, except the life time of ACA. The lifetime of ACA was obtained from expert opinion of clinical laboratory. With the assumption that the lifetime of ACA depended on the maximum operating hour, i.e. 10 hours per day, six day per week, then we can calculate the total operating hours of ACA for 5 years to get the life time of ACA in public hospital.

Total operating hours = maximum operating hours * day * week * life time
Total operating hours in clinical laboratory = 10 * 6 * 52 * 5 = 15,600 hours
Since the total operating hours should be the same, then
Total operating hours in public hospital = 15,600 hours
While, operating hour of ACA in public hospital was 6 hours.
Thus the lifetime of ACA in public hospital = 15,600 / (6 * 6 * 52) = 8 years

In clinical laboratory, the capital cost was the highest component of total cost, followed by material cost and labor cost (see Table 4.15). The cost of ACA was determined as the largest portion (92.9%) of capital cost, even higher than portion of material cost and labor cost (see Table 4.16 and Table 4.18). This is because they have three machine use all machine to provide the laboratory services. Meanwhile, the building cost shared the lowest portion because the clinical laboratory use the rent building so it has not to pay a larger amount of initial cost.

Table 4.15 Cost Sharing of Total Cost in Public Hospital and Clinical Laboratory, 1999.

Cost item	Public hospital (Rp.)	Percentage	Clinical laboratory (Rp.)	Percentage
Capital cost	346,782,575	48.3%	450,134,518	53.5 %
Material cost	319,409,085	44.4%	266,808,642	31.7 %
Labor cost	52,310,400	7.3%	124,200,000	14.8 %
Total cost	718,502,060	100%	841,143,161	100 %

Table 4.16 Cost Sharing of Capital Cost in Public Hospital and Clinical Laboratory, 1999.

Cost items	Public hospital		Clinical laboratory	
	Annual price (Rp)	Percentage	Annual price (Rp)	Percentage
Building	87,260,719	25.5 %	8,416,714	1.9 %
ACA	186,171,953	53.7 %	418,165,012	92.9 %
Office inventory	73,349,904	21.1 %	23,552,792	5.2 %
Total	346,782,575	100 %	450,134,518	100 %

Table 4.17 Capital Cost in Public Hospital, 1999

Items/input	Quantity	price per unit (Rp.)	Total price (Rp.)	Year of purchase	Life time	Interest rate (%)	Value at 1999	Annuali zation Factor	Annual cost (Rp.)
Building	1	193,385,610	193,385,610	1992	30	15.77	539,009,461	6.177	87,260,718
ACA	1	698,566,957	698,566,957	1998	8	15.77	808,730,966	4.344	186,171,953
Air Conditioner	3	4,500,000	13,500,000	1992	5	15.77	37,627,555	3.274	11,492,839
Furniture	1	22,140,000	22,140,000	1995	5	15.77	39,770,564	3.274	12,147,393
Computer	9	15,620,000	140,580,000	1998	5	15.77	162,749,466	3.274	49,709,672
Total									346,782,575

Table 4.18 Capital Cost in Clinical Laboratory, 1999

Items/input	Quantity	Price per unit (Rp.)	Total price (Rp.)	Year of purchase	Life time	Interest rate (%)	Value at 1999	Annuali zation Factor	Annual cost (Rp.)
Building	1	25,000,000	25,000,000	1994	30	15.77	51,990,043	6.177	8,416,714
ACA	3	254,051,041	762,153,125	1995	5	15.77	1,369,072,250	3.274	418,165,012
Air Conditioner	2	3,000,000	6,000,000	1995	5	15.77	10,777,931	3.274	3,291,976
Furniture	1	8,500,000	8,500,000	1995	5	15.77	15,268,735	3.274	4,663,633
Computer	3	2,250,000	6,750,000	1995	5	15.77	12,125,172	3.274	3,703,473
Car	1	32,000,000	32,000,000	1995	10	15.77	57,482,296	4.833	11,893,710
Total									450,134,518

This result was totally different with the similar study in Chulalongkorn hospital by Chotiwan et al (1996). They found that material cost was the biggest component of total cost followed by labor cost (31.43%) and capital cost (24.40%). This may be because the cost classification of these two studies were not the same as well as the period of data collected. Moreover, they obtained high material cost, because of their study determining all the cost of laboratory tests, which means a lot of reagent costs included, while in this study, only certain laboratory tests cost were calculated.

The result of the study of unit cost of diagnostic imaging test at OPD department at Chulalongkorn hospital by Dhanamun et al (1996) showed that the maximum component of total cost was the capital cost (40.13%), followed by labor cost (31.08%) and material cost (28.79%). This is possible because of the high cost of medical instrument such as X-ray machines.

Table 4.19 and Table 4.20 show the components of material cost in public hospital and clinical laboratory. The data was the real cost in both facilities at current year. It revealed the operational cost during one year. The reagent cost was the biggest portion of total material cost.

Labor cost in public hospital was consists of basic salary, fringe benefit and incentive, while in clinical laboratory only basic salary. Table 4.21 and Table 4.22 show the component of personnel and their salary. The salary in clinical laboratory was high because they used the market price to pay their personnel, while at public hospital refered to the government regulation.

Table 4.19 Material Cost in Public Hospital, 1999

Input	Quantity	Price per unit (Rp.)	Total price (Rp.)
Stationary	4	2,025,000	8,100,000
Water			17,489,150
Electricity			14,901,120
Maintain(building)			600,000
Multiclean	77	438,496	33,676,458
Aquadem	19	250,000	4,800,000
Hitergent	19	392,510	7,536,185
Cfas	8	873,666	6,989,324
PNU	5	2,339,451	11,229,364
PPU	5	2,339,451	11,229,364
PNL	3	525,621	1,681,988
Lamp hitachi	3	2,046,000	6,547,200
Cuvet hitachi	38	772,497	29,663,885
Spuit 25cc	4,800	1,225	5,880,000
Spuit 5cc	3,200	1,537	4,917,440
Spuit 10cc	3,200	1,975	6,320,960
Cotton	13	32,500	416,000
Alcohol 70%	14	12,800	184,320
Sample cup	3,360	891	2,993,760
Reagent:			
Blood glucose	33,013	758	25,023,854
Cholesterol	6,492	1,264	8,203,291
Trigliceride	4,865	1,681	8,178,552
HDL	1,788	726	1,297,194
BUN Creatinine	15,208	2,160	32,844,718
Uric Acid	7,628	984	7,502,901
Total Bilirubin	4,713	794	3,740,708
SGOT+SGPT	14,220	2,251	32,012,064
Total protein+alb	6,814	3,259	22,204,782
Alkali phosphatase	3,271	992	3,244,505
Total material cost			319,409,085

Table 4.20 Material Cost in Clinical Laboratory, 1999

Input	Quantity	price per unit (Rp.)	Total price (Rp.)
Stationary	1.00	9,000,000	9,000,000
Water			15,606,000
Electricity			24,835,200
Telephone			33,000,000
Fuel			3,120,000
Maintain (Analyzer)			1,300,000
Maintain (building)			3,000,000
Maintain (car)			3,000,000
Maintain (AC)			2,000,000
Maintain (computer)			1,000,000
Multiclean	48.00	438,495	21,047,786
Aquadem	12.00	250,000	3,000,000
Hitergent	12.00	392,509	4,710,116
Cfas	5.00	873,665	4,368,327
PNU	3.00	2,339,451	7,018,352
PPU	3.00	2,339,451	7,018,352
PNL	2.00	525,621	1,051,242
Lamp hitachi	2.00	2,046,000	4,092,000
Cuvet hitachi	24.00	772,497	18,539,928
Spuit 25cc	3,000.00	1,225	3,675,000
Spuit 5cc	2,000.00	1,537	3,073,400
Spuit 10cc	2,000.00	1,975	3,950,600
Cotton	8.00	32,500	260,000
Alcohol 70%	9.00	12,800	115,200
Sample cup	2,100.00	891	1,871,100
Reagents :			
Blood glucose	9,986.00	758	7,569,388
Cholesterol	6,295.00	1,264	7,954,362
Trigliceride	6,183.00	1,681	10,394,241
HDL	5,319.00	725	3,858,934
BUN creatinine	8,612.00	2,159	18,599,336
Uric acid	5,345.00	987	5,257,342
Total bili + direct bili	5,066.00	794	4,020,884
SGOT + SGPT	9,246.00	2,251	20,814,595
Total protein + alb	2,036.00	3,259	6,634,713
Alkaliphosphatase	2,069.00	992	2,052,241
Total material cost			266,808,643

Table 4.21 Labor Cost in Public Hospital, 1999

	Basic salary per month (Rp.)	Salary per year (Rp.)	Fringe benefit per month (Rp.)	Fringe benefit per year (Rp.)	Incentives per month (Rp.)	Incentives per year (Rp.)	Total salary per year (Rp.)
Clinical Pathologist	438,900	5,266,800	125,000	1,500,000	43,000	516,000	7,282,800
Clinical Pathologist	460,800	5,529,600	125,000	1,500,000	43,000	516,000	7,545,600
Clinical Pathologist	364,600	4,375,200			43,000	516,000	4,891,200
Analyst	337,100	4,045,200	75,000	900,000	43,000	516,000	5,461,200
Analyst	337,100	4,045,200	75,000	900,000	43,000	516,000	5,461,200
Analyst	215,000	2,580,000	50,000	600,000	43,000	516,000	3,696,000
Analyst	128,500	1,542,000	25,000	300,000	43,000	516,000	2,358,000
Technician	239,300	2,871,600			48,500	582,000	3,453,600
Administration	327,200	3,926,400			48,500	582,000	4,508,400
Administration	327,200	3,926,400			48,500	582,000	4,508,400
Cleaning	219,000	2,628,000			43,000	516,000	3,144,000
Total		40,736,400		5,700,000		5,874,000	52,310,400

Table 4.22 Labor Cost in Clinical Laboratory, 1999

	Basic Salary per month (Rp.)	Total salary per year (Rp.)
Clinical Pathologist	3,000,000	36,000,000
Clinical Pathologist	3,000,000	36,000,000
Analyst	1,000,000	12,000,000
Analyst	1,000,000	12,000,000
Analyst	1,000,000	12,000,000
Technician	550,000	6,600,000
Administration	550,000	6,600,000
Cleaning	250,000	3,000,000
Total		124,200,000

Average Cost

Average cost is the cost per unit of output. The average cost was calculated by dividing the costs, i.e. fixed cost, variable cost and total cost, with total number of test. So there were three kinds of average costs, i.e. Average Fixed Cost (AFC), Average Variable Cost (AVC) and Average Total Cost (ATC). Basiccaly, ATC tells us the per unit cost of production. By comparing the average total cost to the price of the product, we can determine whether production is profitable (Pindyck and Rubinfeld, 1998).

In this study, fixed cost includes capital cost and labor cost, while variable cost includes material cost. In public hospital, it was found that the average fixed cost (AFC), average variable cost (AVC) and average total cost (ATC) of laboratory test were Rp.4,071, Rp.3,259 and Rp.7,330 respectively. Those average costs were lower than average charge (see Table 4.23). The average charge is the actual charge on average.

In clinical laboratory, it was found that average charge much higher than average total cost. The AFC, AVC and ATC were Rp.9,547, Rp.4,435 and Rp.13,982 respectively. As a private firm which tries to maximize profit, it was not surprised.

Theoretically, AFC does not influenced by the number of output, so the AFC will be higher with low output and become lower with high output. The AVC is the function of output, the change in output will affect the change in variable cost, so the AVC will not vary in the same services produce

This result is similar to the result of unit cost of laboratory tests by Chotiwan et al (1996). They found that most of the charges for laboratory tests were higher than unit costs. A study by PPEKI (1991) also indicated that the average charge was higher than average cost.

Table 4.23 Average Cost and Average Charge in Public Hospital and Clinical Laboratory in East Java, 1999

Facility	Total cost (Rp)	Total number of tests	Average cost (Rp.)			Average charge (Rp)
			AFC	AVC	ATC	
Public hospital	718,502,060	98,012	4,071 (55%)	3,259 (45%)	7,330 (100%)	9,220
Clinical laboratory	814,143,161	60,157	7,483 (68%)	6,500 (32%)	13,983 (100%)	17,250

AFC = average fixed cost
AVC = average variable cost
ATC = average total cost

Short-run cost curves

The position of the short-run cost curve depends on technology used, the severity of cases treated, the quality of care provided, the patient case-mix, and the amount of fixed inputs (Jacobs, 1991, Parkin, 1995). Any change in these variables, will change the position of the cost curve either upward or downward depend on whether the cost increases or decreases.

An increase in quality of care or more severity level of diseases will raise the cost of production by increasing the variable resources required per unit of output. Therefore, the cost curve will shift upward, both the marginal cost (MC) and average total cost (ATC). The adoption of a technology that uses more resources per test will have a similar effect. This technology has been associated with a large capital investment as well as a large variable expenditure for services of highly trained personnel when utilizing this equipment. The short-run variable cost represented by facility recurrent expenditures did not include in-kind gifts and donations, thus underestimate the costs.

The effect of introducing new medical technology will shift both the fixed and variable components of ATC upward. So the ATC for all level of medical services will increase. However, new laboratory equipment has allowed many tasks to be automated. This leads to falling average cost over broad ranges of output levels because of the low variable costs associated with the use of this equipment. The concept of economic of scope was playing the role in this case. It means that producing many kind of tests in the same production unit will cost less than producing in separate production unit.

An increase in any of the input prices will increase costs. As production level increase, total variable expenditures will also increase. Improvements in quality usually cost more. The study by Wouter (1993) found that the number of visits and wages increase the total cost, but quality appears to reduce the cost.

4.2.2 Revenue

Total revenue was obtained from total number of each test multiply by the charge of each test. It is assume that the revenue was fully collected and no exemption of the charges. It was found the total revenue of ACA in public hospital and clinical laboratory were Rp. 883,012,800 and Rp. 1,219,805,000 respectively. It was exceed the total cost, i.e. Rp. 718,502,060 in public hospital and Rp. 841,143,161 in clinical laboratory, which means that they have profit for year 1999 from the services provided (see Table 4.24 and Table 4.25).

4.2.3 Cost Recovery

The cost recovery ratio was defined as the ratio of cost that can recover from the total revenue over the total cost. The results of calculation of cost recovery ratio are as follows:

$$\text{Cost Recovery ratio} = \frac{\text{Total revenue}}{\text{Total cost}}$$

$$\text{Cost recovery ratio in public hospital} = \frac{\text{Rp. 883,012,800}}{\text{Rp. 718,502,060}} = 1.22$$

$$\text{Cost recovery ratio in clinical laboratory} = \frac{\text{Rp. 1,219,805,000}}{\text{Rp. 841,143,161}} = 1.45$$

The cost recovery ratio in public hospital and clinical laboratory were 1.22 and 1.45 respectively. It means that they earn profit and cover the total cost in this year. Although the utilization rate of full capacity per year in public hospital and clinical laboratory were 17.5% and 10.7% respectively, they can recover the cost. The profit achieved in public hospital and clinical laboratory were 22% and 45% respectively. This is due to some of the material and labor cost received subsidy and the charge of the services above the average unit cost. However, it does not mean that they have profit for the long run.

Table 4.24 Total Revenue in Public Hospital, October 1998 - September 1999

Type of test	Number of tests	Charge per test (Rp)	Revenue (Rp.)
Blood glucose	33,013	6,100	201,379,300
Cholesterol	6,492	7,800	50,637,600
Trigliceride	4,865	7,800	37,947,000
HDL	1,788	7,800	13,946,400
BUN creatinine	15,208	12,200	185,537,600
Uric acid	7,628	7,800	59,498,400
Total bili + direct bilirubin	4,713	12,200	57,498,600
SGOT + SGPT	14,220	12,200	173,484,000
Total protein + albumin	6,814	12,200	83,130,800
Alkaliphosphatase	3,271	6,100	19,953,100
Total	98,012		883,012,800

Note: Average charge is Rp. 9,220

Exchange rate Rp. 7,500 per US$ in 1999

Table 4.25 Total Revenue in Clinical Laboratory, October 1998 - September 1999

Type of test	Number of tests	Charge per test (Rp.)	Revenue (Rp.)
Blood glucose	9,986	25,000	249,650,000
Cholesterol	6,295	12,000	75,540,000
Trigliceride	6,183	14,500	89,653,500
HDL	5,319	13,000	69,147,000
BUN creatinine	8,612	27,000	232,524,000
Uric acid	5,345	13,000	69,485,000
Total bili + direct bilirubin	5,066	21,000	106,386,000
SGOT + SGPT	9,246	25,000	231,150,000
Total protein + albumin	2,036	29,500	60,062,000
Alkaliphosphatase	2,069	17,500	36,207,500
Total	60,157		1,219,805,000

Note: Average charge is Rp. 17,250

Exchange rate Rp. 7,500 per US$ in 1999

This study only calculated the economic cost and financial cost for one year, meanwhile the calculation of loss and profit should be calculated start at the point when the services was provided. The finding from study by PPEKI (1991) revealed that cost recovery ratio ranged between 0.35 to 2.36 with an average of 1.40.

If the policy maker attempt to recover the cost, they have to consider the effect of charge on the demand for services. If demand falls, this may lead to an increase in average cost. Even they recover only a small portion of total cost, the charges might affect to the demand for the services.

If we concern with the long-run sustainability of the program, the total cost of paying for all of its input, even those temporarily provided by donors or paid for at less than market rates, must be estimated. Economic cost should be considered to supplement financial cost analysis as additional information for decision making.

The cost recovery can also compute from other aspect, such as from operating cost instead of total cost. However, the high investment cost of capital cost should not be ignored when the sustainability of the program was taken into consideration.

The result reflects that efficiency conflict with equity. In term of cost recover, this machine was efficient, but when we assessed the factor influencing utilization of this machine, inequity occured, either access or source of finance of patients.

The result of cost recovery ratio above can attracting more investor to invest more machine because of the utilization of this machine revealed efficiency in term of cost recovery. However, the ineffeciency in term of utilization rate and inequity in access and source of finance of patients, must to become consideration before implementing the program.

4.2.4 Sensitivity Analysis

Sensitivity analysis was done based on the uncertain variables to ascertain the effects of using different number of unit measurement of variables. Since the two facilities have different mission, then we calculate diferrent sensitivity analysis for each.

1) In public hospital

The aim was calculate the appropriate number of test and appropriate charge.

(1) Aprropriate number of tests was calculated based on break event point.

$$TR = TC$$

Charge per test * Number of tests = TFC + TVC

Charge per test * Number of tests = TFC + (AVC per test * Number of tests)

$$\text{Number of tests} = \frac{TFC}{\text{Charge per test - AVC}}$$

Given:

Total fixed cost = 399,092,975

Charge per test = 9,220

Average Variable Cost = 3,259

Thus,

$$\text{Number of test} = \frac{399{,}092{,}975}{9{,}220 - 3{,}329} = 66{,}950$$

It was found that appropriate number of tests at BEP was 32% below the actual the number of tests (98,012 tests). For public sector, it was no significant implication of break-even point because either they have profit or loss, the services still have to be provided to the society. Since the aim is not for profit, the charge should be reduced to increase the demand only if necessary. In this case, it is possible to increase the number of tests requested.

(2) The second sensitivity analysis tries to determine how much the charge can be reduced. Given the actual number of tests, the appropriate charge was obtain from total cost divided by number of tests.

$$\text{Charge} = \frac{\text{Total cost}}{\text{Number of tests}}$$

$$= \frac{718{,}502{,}060}{98{,}012} = 7{,}331$$

The appropriate charge at BEP was 20% lower than average actua charge (Rp.9,220). The facility should reduce the price at that point. This appropriate charge can also apply to provide the exemption charge for those who pay out of pocket or who cannot pay the services.

2) In clinical laboratory

Since the aim of private sector was to earn profit, thus the sensitivity analysis in clinical laboratory was done, based on the average profit of the firm, that is 20 % of the total cost. Given the actual number of tests. What should is the charge?

Assume:

Cost recovery ratio = 1.20

And given:

Total cost (actual) = 841,143,161

Total revenue (20% than total cost) = 1,009,371,793

Number of tests (actual) = 60,157

Thus,

$$\text{Charge} = \frac{\text{Total revenue}}{\text{Number of tests}}$$

$$= \frac{1{,}009{,}371{,}793}{60{,}157} = 16{,}779$$

The result shows that the charge was 3% lower then actual average charge (Rp. 17,250). The manager should readjust the charge by reducing 3% of actual charge. The decision to reducing the charge will create more demand for the tests with assumption the physician request the appropriate laboratory tests that should be done, based on the diagnosis.

3) Opportunity cost of personnel cost in public hospital

Concern with the long-run sustainability of services provided the total cost of all input must be estimated. In this study, the labor cost in public hospital receives subsidy from the government so the labor cost is financial cost, while concern with economic cost or opportunity cost then labor cost must be the same as the cost in the private sector or market price. By applied opportunity cost of personnel, if they worked in private sector, the result of estimating opportunity cost showed that cost recovery ratio was 1.04 (see Table 4.26 and Table 4.27). It means that the cost are still recover when opportunity costs of personnel is taken into account. Application of this opportunity cost can reduce the burden of government by cut some subsidy for the salary of personnel with assumption the management of the program should be implemented the same as private sector.

Table 4.26 Labor Cost in Public Hospital Using Market Price, 1996

	Salary per month (Rp)	Total salary per year (Rp)
Clinical pathologist	3,000,000	36,000,000
Clinical pathologist	3,000,000	36,000,000
Clinical pathologist	3,000,000	36,000,000
Analyst	1,000,000	12,000,000
Analyst	1,000,000	12,000,000
Analyst	1,000,000	12,000,000
Analyst	1,000,000	12,000,000
Technician	550,000	6,600,000
Administration	550,000	6,600,000
Administration	550,000	6,600,000
Cleaning	250,000	3,000,000
Total	14,900,000	178,800,000

Table 4.30 The Cost Adjusted for Market Value in Public Hospital, 1999

Cost item	Market Value
Capital cost (Rp.)	346,782,575
Material cost (Rp.)	319,409,085
Labor cost (Rp.)	178,800,000
Total cost (Rp.)	844,991,660
Total revenue (Rp.)	883,012,800
Cost recovery ratio	1.04