



CHAPTER V

DISCUSSION AND CONCLUSION

The results of the study are discussed in this chapter. This chapter consists of 5 parts; the first part is discussion and second is conclusion of the study, follow by suggestions for policy implication. Limitations of study will then be discussed and also recommendations for further study.

5.1 Discussion

Research questions were formulate in chapter one about what is the average charge per one relative weight of DRG in different groups of hospitals, what factors affect average charges and should these factor be taken into consideration in adjusting reimbursement rates. From this study, we found that there were differences in hospital charges among levels of public hospitals in Thailand. Regional hospitals with teaching status had the highest charge whereas community hospitals had the lowest charge. This study is base on assumption that every hospital, charge due to the National Standardizing Price of the Ministry of Public Health 1994. In reality the hospital pricing mechanism is influence by many factors especially administrative decision-making. The charge may be adjusted from the rate of National Standardizing Price due to changes in the economic aspect. The National Standard Price was not update since 1994, so some hospitals charge may reflect the changes in price of inputs especially after the economic crisis in year 1997 while some may still follow the National Standardizing Price.

In fiscal year 2001 from October 2000 - September 2001, Thailand has many health schemes such as Voluntary Health Card Scheme, Low-income Health Scheme, Social Security Scheme and Civil Servant Medical Benefit Scheme (CSMBS) and then Universal Coverage Health Insurance Scheme since April 1,

2001. The charge to the patient should be the same regarding the differences in each scheme, but in reality the hospital sometime cross-subsidized charges between different schemes due to low reimbursement rate in some scheme. Also in some scheme such as CSMBS, hospital charges are per item charge and are totally collect from the patient. In some other schemes, some charge data are “just record” data, which refers to the charge that get reimbursement from the Ministry of Public Health. There is no incentive for the hospitals to record the complete total charge they require for treating that in-patient case because the reimbursement rate are already determine prospectively.

From the reason above, hospitals that record the charge for in-patient services and submit to the Health Insurance Office are about 21.9% of the hospitals in the Office of Secretary, Ministry of Public Health. The results from Table 4.9 show the average charge per one relative weight of DRGs is 3,303.30 baht. The average charge differs in different levels of hospital. The hospital that charge per one relative weight of DRGs lowest was 241.27 baht which was a community hospital and the highest charge was 13,155.53 baht in the regional hospital with teaching status. However, the average charge of each level of hospitals are, Regional hospitals with teaching status charge the highest of 10,025.40 baht, regional hospitals without teaching status 8,082.52 baht, general hospitals 6,775.93 baht and community hospitals charge the lowest in the group of 2,553.02 baht.

In hospital charge function, determinants are categorized into input prices, outputs of hospital or productivity and management efficiency. In principle it is expected that increase in output volumes, input prices and x-efficiency will lead to higher level of charge of the hospital. From this study, by analyzing the determinant factors of average charge from the estimated result of the linear regression analysis model I in Table 4.20, levels of hospital and inverse of case flow rate are the only two factors that are significantly related to average charge per relative weight. From the hospital charge function, levels of hospital reflect the outputs of hospital and inverse of case flow rate reflects the output and

management efficiency. The estimated result of the linear regression analysis model II in Table 4.21 shows factors that are significantly related to average charge per 1 relative weight are physicians per bed, average relative weights, Gross Provincial Product, percentage of labor cost, inverse of case flow rate, percentage of referral rate and level 1. These variables are from all 3 categories in the component of the hospital cost function.

5.1.1 Explanatory variables in category output

Levels of hospital

In Thailand the public hospitals are categorized into general hospitals and regional hospitals by the capability of providing complex care, number of beds and populations of the province. Regional hospital usually expands from general hospital of the province when it meets the criteria set by the Ministry Of Public Health and Civil Service Commission. Community hospitals provides two types of cares, mainly 75% is prevention or primary care and 25% secondary care or in-patient care. While the task of general and regional hospitals are mainly providing secondary and tertiary care. If hospital's administrator tries to increase capacity of hospital, they are required to increase both the number of personnel and equipments to match with the increase in capacity so as to maintain the original quality level of health care. This will result in higher cost for provision of health care and management.

From the study of Pracha Vasuprasat (1979) about Hospital cost function in Bangkok quotes about the capability in providing care

“ A hospital providing a relatively greater quantity of more complex care can be expected to have higher average cost per patient day than a hospital supplying relatively more patients day of care of a less complex type, even when the two hospitals are otherwise equal in all respects (including bed complement,

efficiency and occupancy ratios) ” (From Collins G.L. “ Cost analysis and Efficiency measures for Hospitals” Inquiry Vol.V June 1968 p.56)

In this study the levels of hospital that are significantly related to average charge are regional hospitals with teaching status, regional hospitals without teaching status and general hospitals. The coefficients of each level of hospital have positive relation with the average charge per relative weight of the hospital. For regional hospitals with teaching status the coefficient are 6414.507, regional hospitals without teaching status are 4485.558 and general hospitals are 3538.291 respectively. The reason that regional hospitals with and without teaching status have high average charge per relative weight is probably due to the fact that these hospitals serve within a wide range of services. The average relative weights of these hospitals are higher than of general and community hospitals, which states that these hospitals have more complexity treated cases and operations that need advance medical knowledge, techniques and more resources. Furthermore in hospitals with teaching status, these hospitals tend to use many sophisticated apparatuses such as ultrasound and CT scan and order more laboratory test, which is sometime not necessary for normal case but necessary for teaching purpose. Also these hospitals tend to have high acceptance of referral case that requires complex tertiary care due high capability of medical personnel of the hospital such as board certified physicians and high technology equipments. For general hospitals, capability in providing more complicate cases is higher than community hospitals in secondary and tertiary services. Overhead fixed cost and recurrent cost are higher due to more capitals and personnel.

Inverse of case flow rate

Case flow rate is the ratio of outputs or number of cases to number of beds. Number of beds is considered as a measure of scale of hospital and as a fixed variable. Fixed cost will spread over more to each case as the output increases.

Therefore, increases in output will lead to lower cost per case. Thus, if the ratio of case flow rate is low; it implies that hospital's capacity may not be fully utilized. This means that the hospital may capture more economies by increasing its capacity utilization.

From the long-run average cost curve, a firm is said to experience economies of scale when its curve is declining as output increases. Conversely, the firm experiences diseconomies of scale if and only if the long-run average cost curve is increasing as output increases. In this study, the community hospital operates at the highest case flow rate of 111.29 cases per bed per year in comparison to the other levels of hospital of 63.45-70.47 cases per bed per year. This study did not plot the cost curve of each hospital due to cross-sectional data, so we cannot conclude about the economy of scale. The results could explain that the community hospitals have high case flow rates and tend to charge lower than general and regional hospitals with lower case flow rates.

This study's results are similar to Gaynor and Anderson (1991) in some circumstances; they study about Hospital Cost and the Cost of Empty Hospital Beds and estimated the average cost function. They found that from the estimated average cost function, the inverse of occupancy rate as a proxy for fixed capacity cost is positively significant to the average cost of the hospital. However, the wage rate and case-mix index have a positive impact on cost as expected. While teaching hospitals are not significantly more costly, which is different from this study.

Administrative policy of the hospital has some influence about the cases in the hospital such as complexity of case treated and volume of outputs in the hospital. Since case flow rate is an indicator of capacity utilization of the hospital, it should have some relation with management efficiency also. Low case flow rate may indicate low efficiency in management of outputs, which may give some signal to hospitals to improve their efficiency.

Number of beds

This variable was excluded from the regression due to high correlation and multicollinearity between this variable and many other variables. The levels of hospital can be used to substitute this variable as a proxy of output or productivity. The higher number of beds, the larger the hospital leads to higher average charge.

Average relative weights of hospital

This variable was excluded from the regression due to high correlation and multicollinearity between other explanatory variables in the first model but is used as a representative of level of hospital in the second model. Average relative weights of hospital reflect the complexity of service provided in the hospital, which is different in each level of hospitals. Regional hospital has higher relative weights than general and community hospital respectively, which is similar to the relation of average charge to level of hospital and refer rate. Hospital with high complexity of care needs more resources in providing that type of care. Even though relative weights are expected to represent the average cost of that DRGs relative to average total cost of all DRGs but the relative weights of each DRGs needs to be revised continuously or recalibration frequently in order to reflect the actual cost of services.

Admission rate

This variable was excluded from the regression due to high correlation and multicollinearity between this variable and many other variables. Admission rate of hospital reflects the output of inpatient service relative to all the patients of the hospital. If a hospital has high admission rate, the resources will be allocated more to in-patient service leads to higher cost per output. From the result, the admission

rate is in positive direction ranging from 6.51 in community hospitals to 10.33 in regional hospitals with training center, which is similar in relation with levels and refer rate. From Table 4.11, the severity or complexity of cases are higher in the regional and general hospitals, which is the reason why these hospitals have admission tendency more than community hospitals and incur more initial fixed cost of admitting an in-patient.

Referral rate

From the results referral rate is not significantly related to average charge in the first model but is significant in second model, still the coefficient in both models are positive in relation with average charge. This variable represents the capability in complexity of services provided leading to higher cost per case of service. Therefore the hospital will charge higher to compensate with the cost. Referral rate is high in regional hospitals because these hospitals have high acceptance of referral case compare with the community hospitals that mostly refers out complex case that requires complex secondary and tertiary care.

Percent of Board Certified Physician

Almost all of the physicians in regional and general hospitals are Board Certified Physicians compare to community hospitals with about only 10% are Board Certified Physicians. This variable represents the capability in complexity of services provided leading to higher cost per case of service. This variable was exclude from the regression due to limitation in availability of data. Also it was found that this variable has high correlation and multicollinearity with many other variables. The other variable that can be use instead is referral rate because of the same positive direction in relationship.

5.1.2 Explanatory variables in category input price

Gross Provincial Product (GPP) and Consumer Price Index (CPI)

From the result of study coefficient value of Gross Provincial Product (GPP) is not significantly related to average charge per relative weight of DRGs in the first model but is significant in the second model. However, the positive coefficient does indicate an increasing trend of average charge. This factor refers to the income of the population, which reflects the development of province's economy and wealth of population. Which leads to more consumptions, higher cost of living and input prices. Consumer price index which is another proxy of input price in this study are classified by regions while Gross Provincial Product is classified by province, which reflects more in details. The variation between CPI among the regions are small, ranging from 131.4 in Bangkok metropolitans, 131.8 in the north, 135.1 in the south, 135.3 in the central and 135.4 in the northeast. Consumer Price Index does not have linear relationship with charge and has collinearity with other variables so it was exclude from both of the models. Therefore, in considering about the determinant factors of average charge, Gross Provincial Product should be a factor to be taken in mind more than Consumer Price Index due to more details in reflectivity of each province.

Proportion of Labor Cost/Total expenditure

From the principle that input prices should be positively related to cost of output, however in this study the percentage of labor cost relative to total expenditures has negative relationship to average charge. Larger hospitals are thought to have many high skilled-trained personnel with higher rank of salary leading to higher proportion of labor cost relative to total expenditures than small community hospital with fewer personnel. In this study the results is inversely,

community hospital tends to have higher percentage of labor cost and leads to higher negative relation to charge since community hospitals has the lowest average charge.

Community hospitals provides primary and prevention services care as main task of 75% while 25% goes to secondary care. The allocation of resources to primary care is then higher than secondary care. This may be the reason of why the percentage of labor cost relative to total expenditures is high in community hospitals. However, the average charge per relative weight is low because the labor cost is unresponsive relative to in-patient cost due to high proportion of services in prevention and promotion. This may explain the reason about the negative coefficient of labor cost in the regression analysis results.

5.1.3 Explanatory variables in category management efficiency

Inventory Turnover Ratio

This variable has positive coefficient but is insignificantly related to average charge. Community hospitals in this study has higher turnover rate than general and regional hospitals. From the principle mention in chapter III, the hospital with high inventory turnover rate has more revenues per bath of inventory, leads to better financial position of the hospital. The revenues of regional hospitals should be higher than general hospitals and community hospitals respectively due to higher charge and more patients. Eventhough regional and general of hospitals charge higher, inventory turnover rate is lower than in community hospitals, this may comes from the reason that the former has higher investment inventory. The charge per output should be higher in the group of high investment inventory. This variable is a proxy of management efficiency; hospital with high inventory turnover rate is in better financial position and has positive relationship to management efficiency. Hospitals with low inventory turnover rate should concern

more about efficiency of management. From the hospital cost function, management efficiency is hypothesized to have relation with cost function. If the hospital have efficiency in management and allocates the resource efficiently, the cost per output should not be high. In this study, turnover rate is the efficiency in turnover of inventory and revenue. The hospital with high rate is supposed to have good management efficiency. The reason this factor is insignificant may be due to hospitals in this study are all public hospitals and in common exposures with small variations between different levels of hospital. There are many other financial analysis factors in management efficiency category and these factors might be use instead for better explanation of the relation with charge.

Physician per bed

This variable has positive coefficient and insignificantly related to average charge in the first model but significant in the second model. The percentage of physicians per bed could be identified into 2 groups of hospital, regional hospitals about 14% and general/community hospitals about 9%. Percentage of physicians per bed is expected to represent the management efficiency of the physicians relative to outputs of the hospital. Hospital with high percentage of physicians should have higher productivity, in this study refers to regional hospitals. In this study the variations between hospitals in percentage of physicians per bed is not high but variations of outputs per physician is high. Regional hospitals have lower outputs per physician than general hospitals and community hospitals. Therefore productivity of community hospitals is higher than larger hospitals, which the results of this study are inversely of hypothesis of percentage of physicians per bed mentioned in chapter III. However we should not focus only on quantity of outputs because there is quality or complexity difference of cases between hospitals, larger hospitals has more complex cases. Improvement in management efficiency of every level of hospitals should be focus on also. Physicians have higher incentives

than other medical personnel in the hospital; if the hospital has many physicians they may incur higher labor cost which also can reflect the input price also.

The reason that the first estimated model has few significant factors is may be due to common exposures of the hospitals. All the hospitals in this study are public hospitals in Thailand, which is a small country and variations between some factors are not high. After excluding the factor levels of hospital in the second model, factors that were insignificant in the first model appear to be significant. The reason might be from that levels of hospital in the first model could explain most of the variations in the characteristic factors of the hospitals. When levels of hospital are removed, other variables that represent characteristics and levels of hospital then become significant. Nevertheless the adjusted R-square of the first model is higher, which indicates that explanatory variables in the first model could explain or predict the relation with average charge better than second model. However, the results of second model should not be looked over also because the regression analysis has two objectives, one is predicting relation between dependent and explanatory variables that was mentioned earlier and the other is to find the determinants. The second model shows seven significant factors that could be used as determinants of average charge per relative weight of the hospital.

From the assumption that hospital charges reflect cost and in considering the factors related to average charge, if these factors were used to adjust the reimbursement rate of the hospital by using the estimated average charge of each hospital as the reimbursement rate. The result in chapter IV shows that regional hospitals with and without teaching status will all gain revenues from both of the estimated models. For general hospitals, model one estimated higher revenue gain while model two some hospitals will incur loss of revenues. However for community hospitals, most of the hospitals incur loss of revenues and only few hospitals gain revenues. The decision making about the reimbursement rate should be equal or not and if not what factors should be taken into consideration should be carefully explored.

In concluding from the regression analysis result and the discussion above, hospital charges in this study depend mainly on the level of organization. However from this study the charge are somewhat may be related to the behavioral of the organization, which is different in each level. Some possible explanations about why small hospitals charge patients at lower prices than large hospitals may be as follow. Firstly, the former may have lower complexity of cases and cost of care. Secondly, pricing policies between different hospitals may be different depends on administrator. Larger hospitals tend to set their price higher for prestige reason whereas smaller hospitals tend to keep the price low to gain acceptance from people or consumers satisfaction. Which of these explanations are acceptable or are there any other more explanations, requires further studies.

5.2 Conclusion

The objectives of this study are to determine average charge per relative weight of DRGs and the factors that are related to charge of in-patient services in different levels of hospital in Thailand which is assume to reflect the cost of providing services. The scope of the study is limited to public hospitals in Office of Permanent Secretary, Ministry of Public Health. Data from 178 public hospitals of different levels in fiscal year 2001 were used. The levels of hospital under consideration are 4 regional hospitals with teaching status, 5 regional hospitals without teaching status, 18 general hospitals and 151 community hospitals. Data were collected from the hospital reports of in-patient records and hospital monthly and annually statistics. This study use average charge per relative weight as dependent variable. The explanatory variables are seven output measurement variables, three input price variables and two management efficiency variables. Findings are that the overall average charge per one relative weight of DRGs is 3,303.30 bahts. Regional hospitals with teaching status charges highest of 10,025.40 bahts, then regional hospitals without teaching status follow by general

hospitals and community hospitals charge the lowest in the group of 2,553.02 baths. From the first model, there are two factors from output category that have significantly positive relationship with average charge per relative weight. The first factor is levels of hospital, which are regional hospitals with teaching status, regional hospitals without teaching status and general hospitals are all significantly related at 99% confidence level. The second factor is inverse of case flow rate which is proxy of fixed capacity of hospital also has positive relationship which average charge at 95% confidence level. The adjusted R-square of the regression was 0.583, which indicates that 58.3% of average charge per relative weight can be explained by the explanatory variables in the regression. The second model employs average relative weights and referral rate to represent levels of hospital. Results shows additional variables that are significantly related to average charge per relative weight at 95% confidence level are average relative weight, referral rate, percentage of physicians per bed, percentage of labor cost, gross provincial product per capita, teaching status and inverse of case flow rate. However, the first model could explain relation of determinants to average charge better than the second model because of the adjusted R-square of the latter was 0.445 and results indicate that levels of hospital are very significant. In concluding, the factors that are determinants of average charge per relative weight of DRGs in each hospital are characteristics of hospital of outputs, input prices and management efficiency.

5.3 Policy Implication

Conceptually, DRGs prices have been set to cover the efficient cost of rendering care; practically, however, the prices are set at the estimated average hospital cost of providing that care. Given that production cost vary across hospitals; the policy maker must decide which costs to adjust for in setting payment for individual hospital. In the United States of America, the secretary and congress design a system with few adjustments; the basic structure of this system

has remained essentially unchanged since it was initially implemented in 1983. In Thailand the system of reimbursement was already mentioned in chapter I, but there is only one model of reimbursement rate which is

$$\text{Reimbursement of DRGs} = \text{RW} \times \text{base rate}$$

However the problems that arose in determining the appropriate reimbursement for one relative weight is what is the appropriate rate. If the payment is based on statistical estimate of the average charge for 1 RW of this study which is assume to reflect the cost of providing care, from model I levels of hospital and inverse of case flow rate will be the only two factors to be taken into consideration in adjusting the reimbursement rate or seven factors in model II. Hence any factors that might be use to adjusted the reimbursement rate must be carefully studied in details about the pros and cons that will affect each and every level of hospitals. The issue of equity and efficiency among hospitals are important points that should not be looked over also. Adjusting payment by either way is better than no adjustment or not will have to study more in details. This study suggests a guideline for health planner and administrator to take in mind some factors that have affect on average charges of hospital.

The charge of each hospital in this study is assume to use the National Standardizing Price 1994 but in reality some hospitals do not use due to current economic situation has change since then and also inflations. This price list should be revised every 2-3 years to be update but it will be very costly to do so because unit cost data of every medical diagnosis and treatment must be determine, which is very complicate to do it often. Since the reimbursement for in-patient services of almost every health scheme is base on DRGs, the average cost for each DRGs and each relative weight, which categorized patient's diagnosis into groups, should be revise frequently. Given that the objective of DRGs is to group disease with similar clinical characteristics and levels of resource consumption. The relative weights for each DRGs is already adjusted to the complexity of case treated but also should be adjusted periodically to update for the change in cost of providing care. The

average cost per each DRGs should reflect the real cost occur with the same standard of treatment in every levels of hospital. Adjusting the cost per relative weight should be one of the appropriate ways in the payment system. Therefore adjustment of the reimbursement rate by adding some adjusted factor to the model may be taken into consideration also and then the hospital will then receive the reimbursement that reflects the input price.

5.4 Limitation of the study

1. The data used in study may contain some errors of various sources. From medical record reviews in a previous study on DRGs found that the rate of medical coding errors varied from 20 to 46 percent (Pannarunothai, 1998). There should be systematic medical record reviews within patient ward by medical audit team to recheck the validity of data. In this study, due to incomplete data set a number samples were excluded resulting from incomplete charge data and due to ungroupable DRGs. In some hospitals the samples set are small, which may not be good representatives of the hospital as a whole.

2. In some hospital the charge did not cover all cost occur in the hospital. Also some items of charge are not reported so there may be some missed data records.

3. Non-standardized charge of the hospital is another limitation, since the National Standardizing Price 1994 has not been update. The pricing mechanism has high influence from the administrative decision-making. Further study should be taken to determine whether all the hospitals have the same standard in pricing or not. In view of the fact that Thailand has many health schemes, which mostly are prospective reimbursement, so the hospitals have no incentive to report the charge.

4. This study assumption is charge per output reflects the cost per output. The complete in-patient unit cost analysis of every levels of hospital could not be obtain due to limited time frame of the study. Calculations of relative weights of

DRGs are base on average charge, average cost and cost-charge conversion ratio so the charge and cost should have the same positive direction of relationship. In this study the results from charge of the hospital should be able to reflect the cost of providing care.

5.5 Suggestions for further study

From the limitation of this study, the suggestion for further research is to obtain the actual hospital costs to accomplish a better DRG payment system that reflects the real input price of providing in-patient services. Analysis should take into account budgets constraint by using simultaneous equation technique. The factors that are related to average charge or average cost should be study more in details and develop a composite index to establish a model in adjustment of reimbursement rate of DRGs.