Efficiency Policy in Hospitals with Envelopment Analysis Method

Lovita Diba Br Sinaga[1], Destanul Aulia[2], Siti Saidah Nasution[3]
[1,2,3] *University of Sumatera, Indonesia*
lovitadiba@gmail.com

Abstract

The aim of the study is efficiency policy analysis in hospitals with data envelopment analysis method with return to scale model. The time of the research is carried out in November 2020 until completion. The sample in this study was Hospital X. The data collection technique used in this study used secondary data is obtained from the literature study method, literature exploration, and hospital annual reports. This research uses data envelopment analysis method. The results show that the average efficiency score of Hospital X for the 2017-2019 period is 0.981966, where in 2017 it is 0.998424, in 2018 it is 0.990754, and in 2019 it is 0.956721. During the research period, namely 2017-2019, it can be interpreted that Hospital X has not been technically efficient because the efficiency value is below 1 or 100 percent. It is hoped that hospital leaders will be able to implement hospital input control programs such as total hospital assets, total staff, and make efficiency in the use of operational costs so that hospital outputs such as total patients, number of health checks, and operating income can be achieved maximally. Improving quality is important so that current hospital efficiency can be achieved. Furthermore, the data envelopment analysis method can be used as one of the considerations for establishing a hospital because it is able to calculate the relative efficiency of hospitals in a particular area. Then, it can promote plenary accreditation to ensure to the public that hospital standards have been properly met.

I. Introduction

In Indonesia, the government has developed a social health insurance system through a national health insurance program which was implemented starting January 1, 2014 in which the national health insurance applies the principles of cost control and quality control so that the community gets quality, adequate services at reasonable and controlled costs. According to Nurwahyuni and Setiawan (2020), The national health insurance program is organized by a Social Security Administering Body which brings significant changes, especially in the payment of health facilities, especially hospitals. One of these changes is the payment of claims, which has been using the fee for service mechanism to become a prospective payment system through Indonesia case base groups.

In the fee for service payment method, the number of claims billed depends on the services provided so that the hospital can determine what services are provided to the patient, while the prospective payment system payment method through the Indonesian case base groups uses a service package mechanism based on the grouping of the patient's diagnosis. This condition is a challenge for hospitals that cooperate with the Social

19579

Security Administration in managing hospital funds as effectively and efficiently as possible so that they are able to survive and thrive in the era of national health insurance.

In Indonesia, hospital growth is approximately 400 hospital units or an average growth of 4% throughout Indonesia with the following details, in 2015 as many as 2,488 hospitals, in 2016 as many as 2,601 hospitals, in 2017 as many as 2,776 hospitals, in 2018 as many as 2,813 hospitals, and in 2019 as many as 2,877 hospitals (Kementerian Kesehatan, 2020). The increase in the number of hospitals can provide benefits for increasing access to health services and increasing people's choices to obtain health services. In addition, an increase in the number of hospitals can become a burden on hospitals if it is not accompanied by efforts to make hospitals an efficient health service facility, especially in the era of national health insurance. Human Resources (HR) is the most important component in a company or organization to run the business it does. Organization must have a goal to be achieved by the organizational members (Niati et al., 2021). Development is a change towards improvement. Changes towards improvement require the mobilization of all human resources and reason to realize what is aspired (Shah et al, 2020). The development of human resources is a process of changing the human resources who belong to an organization, from one situation to another, which is better to prepare a future responsibility in achieving organizational goals (Werdhiastutie et al, 2020).

Hospital efficiency is the most important aspect that needs to be considered to realize a good and sustainable hospital performance. Law of the Republic of Indonesia Number 44 of 2009 concerning hospitals in article 33 states that every hospital must have an effective, efficient, and accountable organization.

One method for assessing hospital efficiency is the Baber Johnson chart, where there are 4 indicators, bed occupancy rate, average length of stay, bed turn over, and turn over interval. Based on the health profile of North Sumatra Province, the average rate of utilization of public hospital beds, especially in Medan City for the 2015-2017 period is still below the ideal standard of 60%-85% where in 2015 it was 35.20%, in 2016 it was 36.94%, in 2017 it was 36.23% (Dinas Kesehatan Provinsi Sumatera Utara, 2017). This condition shows that the efficiency of the average use of public hospital beds in Medan City is still a problem. Furthermore, based on the average BOR of Hospital X, it was found that in 2017 it was 59%, in 2018 it was 50%, and in 2019 it was 57%. Therefore, Hospital X efficiency research needs to be done.

The level of efficiency depicted in the Barber Johnson chart still does not describe the overall efficiency of the hospital. The Barber Johnson chart is only oriented to inpatient output indicators such as the number of days hospitalized, the number of beds used and the number of patients discharged, both alive and dead (Chalidyanto, 2013). If we look at the efficiency level of the hospital, it is reflected in the hospital's ability to manage its resources. Where efficiency is a comparison or ratio of output to input or optimal use of input to produce maximum output.

According to Cheng et al. (2015), the approach that is often used to measure efficiency in hospitals is the frontier analysis approach where one of the methods in it is the data envelopment analysis method. The purpose of measuring data envelopment analysis is to find out the possibilities of using resources that can be done to produce optimal output. The frontier formed by the data envelopment analysis will also produce benchmarks for other companies to correct deficiencies, in order to achieve a standard-practice frontier. Efficiency measurement using data envelopment analysis method where a decision making unit is said to be efficient if it has an efficiency value of 1 or 100% while the decision making unit is said to be inefficient if it has an efficiency value of less than 1 or 100%.

If we look at the efficiency level of the hospital, it is reflected in the ability of the hospital in managing its resources where efficiency is the ratio between output and input. In general, a hospital can be said to be efficient if it uses a number of inputs that are less than the number of inputs for other hospitals, but can produce the same amount of output. Or in other words, a hospital is said to be efficient if the hospital uses the same number of inputs as other hospitals, but can produce a larger hospital output.

The aim of the study is efficiency policy analysis in hospitals with data envelopment analysis method with return to scale model.

II. Research Method

This research is quantitative research using data envelopment analysis method. Data envelopment analysis is an analytical method specifically designed to measure the relative efficiency of each research sample unit (Asyraini et al., 2022; Pandia et al., 2018; Pandiangan, 2015). In its development, data envelopment analysis is an analytical tool used to measure the relative efficiency of one of them in research in the health sector (Octiva, 2018; Pandiangan, 2022).

The location of the research is carried out in Hospital X. The time of the research is carried out in November 2020 until completion.

The population is a collection of data that has the same characteristics and is the object of inference (Octiva et al., 2018; Pandiangan, 2018). The population in this study is Hospital X with a unit of analysis of 36 decision making units. The research sample was taken using the total sampling method, namely taking the entire study population (Pandiangan et al., 2021; Pandiangan et al., 2022). The sample in this study was Hospital X. The sample in this study was 1 hospital with an analysis unit of 36 decision making units. This study also looks at the minimum number of samples required by using the data envelopment analysis method. According to Ramanathan (2003) that the number of sample decision making units in the data envelopment analysis method should be 2-3 times the number of indicators used. The indicators used in the study (input and output) are 6 indicators, so the minimum number of decision making unit samples that must be fulfilled is 12-18 decision making units. In this study, taking indicator data for 36 months (3 years) so that with a sample of 1 hospital, the number of decision making units analyzed using the data envelopment analysis method was 36 decision making units (1 hospital x 36 months) so that meet the adequacy of the sample in the data envelopment analysis method.

Data collection method is the method used to collect research data (Octiva et al., 2021; Pandiangan et al., 2018; Tobing et al., 2018). The data collection technique used in this study used secondary data is obtained from the literature study method, literature exploration, and hospital annual reports.

This research uses data envelopment analysis method, which is a data management in the form of input and output, it is used to measure the relative efficiency level (Wagner dan Shimshak, 2007). Relative efficiency is the relative efficiency among the observed units, in its evaluation a unit is said to be relatively efficient if the unit is efficient compared to other units. Measurement of relative efficiency can be used with a non-parametric engineering approach. The non-pamaterial approach is assumed that there is no relationship between input and output functionally. The data from the input and output variables are then entered into the formulation of data envelopment analysis to obtain efficiency values. Data envelopment analysis has been recognized as a tool that can represent performance evaluation by using a linear programming-based technique to measure the efficiency of organizational units called decision making units.

III. Result and Discussion

3.1 Quantity of Input and Output from Hospital X

Table 1. Quantity of Input and Output from Hospital **X**

Indicator	Number of Patients	Number of Health Checkups	Operating Income	Total Assets	Operating Costs	Total Staff
2019						
Average	10,470	11,641	5,833,333,333	46,500,000,000	4,333,333,333	434
Maximum	14,819	16,187	11,200,000,000	42,000,000,000	9,100,000,000	443
Minimum	7,787	8,522	3,300,000,000	48,000,000,000	2,800,000,000	416
2018						
Average	10,736	10,761	5,750,000,000	37,666,666,667	4,166,666,667	413
Maximum	15,912	16,123	11,100,000,000	42,000,000,000	9,100,000,000	416
Minimum	8,391	7,012	3,000,000,000	28,000,000,000	2,100,000,000	411
2017						
Average	14,754	16,147	5,833,333,333	26,500,000,000	4,250,000,000	409
Maximum	21,965	21,965	11,000,000,000	28,000,000,000	9,100,000,000	405
Minimum	9,994	10,942	3,000,000,000	25,000,000,000	2,200,000,000	407

The results of the study during the 2017-2019 period show that the average total assets, total staff have increased but the number of patients has decreased. Meanwhile, the average operating income, operational costs, and the number of inspections fluctuated.

3.2 Efficiency Level of Hospital X

By using the input and output variables, then the efficiency score is calculated using the input-oriented data envelopment analysis method using return to scale model.

Table 2. Efficiency Calculation Results from Hospital X

DMU	2017	2018	2019
DMU 1	1.000000	0.986727	0.973558
DMU 2	1.000000	1.000000	0.953143
DMU 3	1.000000	0.991349	0.952941
DMU 4	1.000000	0.985937	1.000000
DMU 5	1.000000	0.988673	0.947546
DMU 6	1.000000	1.000000	0.925046
DMU 7	0.989917	0.992260	0.926553
DMU 8	0.991955	0.992285	0.924889
DMU 9	1.000000	0.977300	0.926796
DMU 10	0.999211	0.986778	0.950183
DMU 11	1.000000	0.992830	1.000000
DMU 12	1.000000	0.994910	1.000000
Mean	0.998424	0.990754	0.956721

This research uses data envelopment analysis method. The results show that the average efficiency score of Hospital X for the 2017-2019 period is 0.981966, where in 2017 it is 0.998424, in 2018 it is 0.990754, and in 2019 it is 0.956721. During the research period, namely 2017-2019, it can be interpreted that Hospital X has not been technically efficient because the efficiency value is below 1 or 100 percent of 0.981966. This indicates that the inefficiency is caused by the hospital still carrying out wasteful actions in the use of its inputs. However, it is hoped that policies taken by reducing hospital inputs are appropriate without ignoring the quality of service.

IV. Conclusion

This research uses data envelopment analysis method. The results show that the average efficiency score of Hospital X for the 2017-2019 period is 0.981966, where in 2017 it is 0.998424, in 2018 it is 0.990754, and in 2019 it is 0.956721. During the research period, namely 2017-2019, it can be interpreted that Hospital X has not been technically efficient because the efficiency value is below 1 or 100 percent.

Suggestions in this research are:

1. Hospital

   It is hoped that hospital leaders will be able to implement hospital input control programs such as total hospital assets, total staff, and make efficiency in the use of operational costs so that hospital outputs such as total patients, number of health checks, and operating income can be achieved maximally. Improving quality is important so that current hospital efficiency can be achieved. Furthermore, the data envelopment analysis method can be used as one of the considerations for establishing a hospital because it is able to calculate the relative efficiency of hospitals in a particular area. Then, it can promote plenary accreditation to ensure to the public that hospital standards have been properly met.

2. Further Research

   This study can be developed using a parametric approach such as stochastic frontier analysis. In addition, it is recommended that efficiency measurements use a longer research period in order to better describe the state of the hospital.

References

Asyraini, Siti, Fristy, Poppy, Octiva, Cut Susan, Nasution, M. Hafiz Akbar, & Nursidin, M. (2022). Peningkatan Kesadaran Protokol Kesehatan di Masa Pandemi Bagi Warga di Desa Selamat Kecamatan Biru-biru. Jurnal Pengabdian Kontribusi (Japsi), 2(1), 33-36.

Chalidyanto, D. (2013). Faktor yang Berhubungan dengan Efisiensi Rumah Sakit Umum Pemerintah di Indonesia. https://www.onesearch.id/Record/IOS7064.01454.

Cheng, Z., Tao, H., Cai, M., Lin, H., Lin, X., Shu, Q., & Zhang, R. N. (2015). Technical Efficiency and Productivity of Chinese County Hospitals: An Exploratory Study in Henan Province, China. BMJ Open, 5(9), 1–10. https://doi.org/10.1136/bmjopen-2014-007267.

Dinas Kesehatan Provinsi Sumatera Utara. (2017). Profil Kesehatan Provinsi Sumatera Utara Tahun 2017.

Kementerian Kesehatan. (2020). Profil Kesehatan Indonesia 2019. https://pusdatin.kemkes.go.id/resources/download/pusdatin/profil-kesehatan-indonesia/Profil-Kesehatan-indonesia-2019.pdf.

Niati, D. R., Siregar, Z. M. E., & Prayoga, Y. (2021). The Effect of Training on Work Performance and Career Development: The Role of Motivation as Intervening Variable. Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 4(2), 2385–2393. https://doi.org/10.33258/birci.v4i2.1940

Nurwahyuni, A., & Setiawan, E. (2020). Kinerja Rumah Sakit Swasta Dengan Pembayaran INA-CBGS di Era Jaminan Kesehatan Sosial: Casemix, Casemix Index, Hospital Base Rate. Accessed from https://journal.fkm.ui.ac.id/jurnal-eki/article/view/3822/952.

Octiva, C. S., Irvan, Sarah, M., Trisakti, B., & Daimon, H. (2018). Production of Biogas from Co-digestion of Empty Fruit Bunches (EFB) with Palm Oil Mill Effluent (POME): Effect of Mixing Ratio. Rasayan J. Chem., 11(2), 791-797.

Octiva, Cut Susan, Indriyani, & Santoso, Ari Beni. (2021). Effect of Stirring Co-digestion of Palm Oil and Fruith for Biogas Production to Increase Economy Benefit. Budapest International Research and Critics Institute-Journal, 4(4), 14152-14160. DOI: https://doi.org/10.33258/birci.v4i4.3521.

Octiva, Cut Susan. (2018). Pengaruh Pengadukan pada Campuran Limbah Cair Pabrik Kelapa Sawit dan Tandan Kosong Kelapa Sawit terhadap Produksi Biogas. Tesis. Medan: Fakultas Teknik, Program Studi Teknik Kimia, Universitas Sumatera Utara. https://repositori.usu.ac.id/bitstream/handle/123456789/12180/157022002.pdf?sequence=1&isAllowed=y.

Pandia, S., Tanata, S., Rachel, M., Octiva, C., & Sialagan, N. (2018). Effect of Fermentation Time of Mixture of Solid and Liquid Wastes from Tapioca Industry to Percentage Reduction of TSS (Total Suspended Solids). IOP Conference Series: Materials Science and Engineering, 309, 012086. DOI: 10.1088/1757-899X/309/1/012086.

Pandiangan, Saut Maruli Tua, Oktafiani, Fida, Panjaitan, Santi Rohdearni, Shifa, Mutiara, & Jefri, Riny. (2022). Analysis of Public Ownership and Management Ownership on the Implementation of the Triple Bottom Line in the Plantation Sector Listed on the Indonesia Stock Exchange. Budapest International Research and Critics Institute-Journal, 5(1), 3489-3497. DOI: https://doi.org/10.33258/birci.v5i1.4016.

Pandiangan, Saut Maruli Tua, Resmawa, Ira Ningrum, Simanjuntak, Owen De Pinto, Sitompul, Pretty Naomi, & Jefri, Riny. (2021). Effect of E-Satisfaction on Repurchase Intention in Shopee User Students. Budapest International Research and Critics Institute-Journal, 4(4), 7785-7791. DOI: https://doi.org/10.33258/birci.v4i4.2697.

Pandiangan, Saut Maruli Tua, Rujiman, Rahmanta, Tanjung, Indra I., Darus, Muhammad Dhio, & Ismawan, Agus. (2018). An Analysis on the Factors which Influence Offering the Elderly as Workers in Medan. IOSR Journal of Humanities and Social Science (IOSR-JHSS), 23(10), 76-79. DOI: 10.9790/0837-2310087679. http://www.iosrjournals.org/iosr-jhss/papers/Vol.%2023%20Issue10/Version-8/K2310087679.pdf.

Pandiangan, Saut Maruli Tua. (2015). Analisis Lama Mencari Kerja Bagi Tenaga Kerja Terdidik di Kota Medan. Skripsi. Medan: Fakultas Ekonomi dan Bisnis, Program Studi Ekonomi Pembangunan, Universitas Sumatera Utara. https://www.academia.edu/52494724/Analisis_Lama_Mencari_Kerja_Bagi_Tenaga_Kerja_Terdidik_di_Kota_Medan.

Pandiangan, Saut Maruli Tua. (2018). Analisis Faktor-faktor yang Mempengaruhi Penawaran Tenaga Kerja Lanjut Usia di Kota Medan. Tesis. Medan: Fakultas

Ekonomi dan Bisnis, Program Studi Ilmu Ekonomi, Universitas Sumatera Utara. http://repositori.usu.ac.id/bitstream/handle/123456789/10033/167018013.pdf?sequence=1&isAllowed=y.

Pandiangan, Saut Maruli Tua. (2022). Effect of Packaging Design on Repurchase Intention to the Politeknik IT&B Medan Using E-Commerce Applications. Journal of Production, Operations Management and Economics (JPOME), 2(1), 15–21. http://journal.hmjournals.com/index.php/JPOME/article/view/442.

Ramanathan, R. (2003). An Introduction to Data Envelopment Analysis. https://us.sagepub.com/en-us/nam/an-introduction-to-data-envelopment-analysis/book226087.

Shah, M. M., et al. (2020). The Development Impact of PT. Medco E & P Malaka on Economic Aspects in East Aceh Regency. Budapest International Research and Critics Institute-Journal (BIRCI-Journal) Volume 3, No 1, Page: 276-286.

Tobing, Murniati, Afifuddin, Sya'ad, Rahmanta, Huber, Sandra Rouli, Pandiangan, Saut Maruli Tua, & Muda, Iskandar. (2018). An Analysis on the Factors Which Influence the Earnings of Micro and Small Business: Case at Blacksmith Metal Industry. Academic Journal of Economic Studies, 5(1), 17-23. https://www.ceeol.com/search/article-detail?id=754945.

Wagner, J. M., & Shimshak, D. G. (2007). Stepwise Selection of Variables in Data Envelopment Analysis: Procedures and Managerial Perspectives. European Journal of Operational Research, 180(1), 57–67. https://doi.org/10.1016/j.ejor.2006.02.048.

Werdhiastutie, A. et al. (2020). Achievement Motivation as Antecedents of Quality Improvement of Organizational Human Resources. Budapest International Research and Critics Institute-Journal (BIRCI-Journal) Volume 3, No 2, Page: 747-752.