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# Hospital Performance Efficiency And Bed Use Using Pabon Lasso Graphics In Nusa Tenggara Province Hospital West Before And During The Covid-19 Pandemic

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ABSTRACT
Evaluating the performance of hospitals and the bed use using the efficiency indicators of hospitals can help and properly improve an accurate understanding of the set plans. This study aimed to identify factors and compare the performance efficiency towards the use of beds at West Nusa Tenggara Provincial Public Hospital, by employing the Pabon Lasso model before and during the Covid-19 pandemic in West Nusa Tenggara. This study is categorized as descriptive study using the qualitative approach in which the data were collected retrospectively from 2018 to 2022. There were three main indicators, namely bed occupancy rate, bed turnover rate, and the average length of stay. The excel software and Pabon Lasso model were used for data analysis. This research concludes that hospital performance and use of hospital beds were inefficient when the Covid-19 pandemic broke out compared to before the pandemic. Every effort should be made to identify and correct the factors contributing to poor efficiency conditions during the year. This analysis can be a guide for planning to increase hospital efficiency and disaster preparedness in the event of a third wave of Covid-19 or other possible pandemics.



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## INTRODUCTION

A hospital is a health service institution that provides comprehensive individual health services that provide inpatient, outpatient, and emergency services. Hospitals are the most important and valuable component of the health system, and play a role in the health service system that is required to increase productivity in serving patients and try to maximize the use of existing resources. This contributes up to two-thirds of health expenditure (1). As a result, hospitals greatly affect the overall quality of health services. Hospital beds are currently unused due to lack of proper planning. Even in many cases, even though the demand for these resources is very high and very much needed, hospitals often waste them due to poor management and lack of proper use (2). Of course, hospitals, like other organizations, need to carry out continuous and regular monitoring and evaluation. Given the main responsibilities of these centers, namely education, treatment, research and participation in public health, this issue becomes even more important. Because by analyzing the results of continuous monitoring and evaluation, it is possible to compare hospital performance with a

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predetermined plan and then assess and determine its effectiveness and efficiency (3). Performance evaluation is an effective method used by hospital management to evaluate and monitor activities in the hospital (4). Evaluation used as a process to assess the efficiency of a predetermined plan requires the use of certain tools and models. Various models have been introduced to evaluate the performance of health services, each of which has its own characteristics.

The model commonly used in accordance with the need for the principle of efficiency in optimal use of resources is performance evaluation using hospital efficiency indicators (5). The main concern of policy makers and health system management around the world is to improve hospital efficiency and performance. To achieve this increase in efficiency, they try to implement several changes in the health sector (6,7). Hospital performance can be evaluated using several approaches. The Pabon Lasso model has proven to be one of the most useful tools for comparing the performance of different hospitals or different wards within the same hospital. This model is a graphical method that utilizes three indices (bed turnover, bed occupancy ratio and average duration of hospitalization) simultaneously to assess the relative performance of a hospital (7-10), without relating relatively to several variables of human resources such as the number of doctors, paramedics, non-paramedics or other variables and technology, namely medical equipment and so on.

The Pabon Lasso model can be applied to identify underperforming hospitals or wards and can develop appropriate strategies to improve inefficiencies (11,12). These steps can also help in diverting limited resources to more cost-effective interventions in outpatient services or primary health care. Although the bed utilization ratio of a hospital is one indicator of efficiency, a Bed Occupancy Rate value of >60% is not necessarily efficient, because hospital efficiency is also greatly influenced by service input and management input.

WHO officially stated on March 11, 2020 that the status of Covid-19 was a pandemic. Indonesia first announced a case of Covid-19 on March 2, 2020, 4 months after the first case in China was announced. Coronavirus disease 2019 or commonly called Covid-19 is an infectious disease caused by the corona virus or Severe Acute Respiratory Syndrome Coronavirus 2 (SARs-CoV-2). In November 2020 in West Nusa Tenggara, the number of confirmed Covid-19 cases was recorded at 4,242, with the number of deaths due to Covid-19 at 230 deaths, and the highest number of Covid-19 cases occurred in the city of Mataram at 1,285 cases.

People infected with SARS-CoV2 will generally suffer from mild to moderate respiratory problems and can recover without special treatment. Meanwhile, the elderly and people who have risk factors for health problems such as cardiovascular disease, diabetes mellitus, chronic respiratory disease, and cancer will experience more severe respiratory problems (13,14). Acute respiratory syndrome due to Corona Virus-2 (SARS-Cov-2) was declared a pandemic because it continues to spread rapidly, resulting in more

Starting from March 10, 2020, the Indonesian government has designated 132 hospitals as referral hospitals for Covid-19 by issuing the Decree of the Minister of Health Number 169 of 2020 concerning the Determination of Referral Hospitals for Handling Certain

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Emerging Infectious Diseases. The government is providing a larger capacity in case of an increase in cases of emerging infectious diseases, namely Covid-19 (13). In a pandemic situation, health facilities in hospitals such as ICUs, doctors, nurses, resources and others are under great pressure, therefore the efficiency of the health care system is in the spotlight, pandemic control is carried out with accurate management of human resources, equipment, materials, and information (16). The Covid-19 pandemic in 2020 should be used as a study related to preparedness in dealing with new emerging diseases, especially when designing a health system to deal with public health emergencies. Around 70% of current infectious diseases that infect humans are caused by zoonosis, namely types of diseases that can be transmitted from animals to humans or vice versa. Indonesia is a densely populated area with a large geography, causing the opening of domestic and international transportation that can cause the entry of new disease agents (13).

Hospital efficiency in developing countries has been discussed in a number of studies. For example, a study conducted by Achoki et al., investigated the scale and technical efficiency of maternal and child health service provision in Zambia. After examining environmental factors that could not be handled by health system decision makers, they used Data Envelopment Analysis (DEA) to assess the performance of subnational units in Zambia. They found that the average increase in child survival was 61.5% associated with the technical efficiency of hospitals in Tehran, Iran (17). Kakemam et al., used Data Envelopment Analysis (DEA) and the Tobit model. They found that there was a correlation between technical efficiency and the efficiency of 17 hospitals and social security. Public hospitals performed better than private hospitals (18).

Many studies have highlighted variations in hospital efficiency across countries using econometric models (19-21). However, the use of econometric models including Data Envelopment Analysis and stochastic frontier analysis is very technical and may be difficult for healthcare providers to use in measuring efficiency. In addition, these models do not use routine data such as Bed Occupancy Rate, Average Length of Stay, and bed turnover in measuring efficiency. The use of Pabon Lasso graphical analysis to measure hospital efficiency as an alternative to econometric methods to measure hospital efficiency is simpler. Pabon Lasso analysis is a simple and less complicated ratio analysis (22). The performance of hospitals and health centers in Indonesia has also been measured using the Pabon Lasso model in the healthcare environment (23), and in other countries (24-31). This study also considers it important to evaluate hospital performance amidst the global emergency due to the corona virus. Therefore, this study aims to meet this need. The findings of this study will be useful for policy makers and hospital administrators in using simple efficiency assessment tools to measure hospital performance. The ease of assessing the efficiency of bed use by utilizing three indicators (Bed Occupancy Rate, Average Length of Stay, and Bed Turnover Rate) simultaneously to assess the relative performance of the hospital and presented visually is the reason for using the Pabon Lasso Chart. Calculation of bed use efficiency is needed to assess the efficiency and performance of hospital bed management in recent years, so that it can provide a reference point for future analysis. The purpose of this study was to Analyze

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the efficiency of hospital performance and bed use using the Pabon Lasso chart at the NTB Provincial Hospital before and during the Covid-19 pandemic.

## METHOD

The research method used in this research is descriptive with a qualitative approach, and data collection was obtained retrospectively, namely collecting past data that existed before the research was carried out. calculate data collected in 2018-2022 using Excel to calculate predictions for the number of days of treatment, bed use and average hospitalization for 2018-2022. Then analyze the results to calculate predictions of performance efficiency and bed use for 2018-2022 based on the Pabon Lasso method using Statistical Product and Service Solution 23 (SPSS) software.

This research uses primary data and secondary data, where primary data was obtained through unstructured interviews with sources at the NTB Provincial Regional Hospital and secondary data was obtained from information or recapitulation data of the daily inpatient census of all wards at the NTB Provincial Regional Hospital by reading, quoting and compiling based on the data. data found. Research informants include key, main and additional informants.

## RESULTS AND DISCCUSION

The data presented in this research will be described descriptively obtained from the results of interviews and grouping the data into auxiliary tables to make calculations and analysis easier. The results of all calculations in data presentation will be presented in the form of tables and graphs. The number of informants in this study was 5 informants who were considered able to provide accurate information. The informant data in this research are:

**Table 1:** Informant Data

| Informant | Initials | Gender | Age | Education |
|---|---|---|---|---|
| Head of Medical Records | PK1 | Woman | 48 years old | SKM |
| Head of inpatient unit | PU1 | Woman | 44 years old | Nurse |
| Officer | PU2 | Woman | 43 years old | Nurse |
| Officer | PT1 | Man | 39 years old | S2 |
| Officer | PT2 | Woman | 29 years | S1 |

### Hospital Performance Efficiency and Bed Use in Inpatient Units in NTB Provincial Regional Hospitals

Records of occupied beds, number of inpatients and inpatient days at the West Nusa Tenggara Regional General Hospital, between 2018 and 2022 (5 year period), are shown in table 2, average ready-to-use beds for NTB Provincial Regional Hospital per year is 457 beds. The average annual number of inpatients is 17,380 patients. In 2022 it will have the highest number of inpatients of 21,480 during that period. Meanwhile, the average daily hospitalization from 2018 to 2022 is 91,259 per year, the highest is the number of hospitalization days in 2022, namely 105,419.

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**Table 2:** Recapitulation of Inpatient Census 2018-2022

| Data | 2018 | 2019 | 2020 | 2021 | 2022 | Average |
|---|---|---|---|---|---|---|
| Σ care day | 90702 | 99423 | 73814 | 86935 | 105419 | 91258.6 |
| Σ T four beds ready to use | 362 | 375 | 439 | 679 | 432 | 457.4 |
| Number of patients discharged (H+M) | 15992 | 18723 | 14048 | 16659 | 21480 | 17380.4 |

Source: NTB Provincial Hospital Medical Records Installation (reprocessed)

**Table 3:** Hospital indicators for 2018 – 2022 according to the *Pabon Lasso method*

| Data | 2018 | 2019 | 2020 | 2021 | 2022 | Average | Max | Min |
|---|---|---|---|---|---|---|---|---|
| B ed O ccupancy Rate (%) | 68.6 | 72.6 | 46 .0 | 35.0 | 66.8 | 57.8 | 72.6 | 35.1 |
| Bed Turnover Rate ( times ) | 44, 2 | 49.9 | 32 | 24.5 | 49.7 | 40.0 | 49.9 | 24.5 |
| A verage Length of S tay (days) | 5,6 | 5.3 | 5.2 | 5.2 | 4.9 | 5.2 | 5.7 | 4.9 |

Source: NTB Provincial Hospital Medical Records Installation (reprocessed)

Table 3 shows that the average bed occupancy rate (BOR) at the NTB Provincial Regional Hospital during that period was 57.8%, and the value ranged between 35% and 72.6% between that period. The average bed turnover rate ( BTR ) is 40 patients per bed in a year, and the lowest BTR is around 24 patients per bed in a year in 2021. The highest value of around 49 patients per bed in a year was recorded in in 2019. The average length of stay ( ALS ) for patients treated in this study was as high as 5.7 days and the smallest average ALS is 4.9 days in 2022.

The bed occupancy rate ( BOR) is a basic indicator in assessing the performance of health facilities, with a value of 80-90% as The indicator of high efficiency is the occupancy rate (32.33), but hospitals in Indonesia have not yet achieved this target, in Indonesian hospitals the highest bed occupancy rate is 60% (23). Likewise, in line with the results of previous research conducted by Henri (28) who found that the average bed occupancy rate in teaching hospitals in Southeast Nigeria was 42.14 percent.

**Comparison of Hospital Performance Efficiency and Bed Use in Inpatient Units in NTB Provincial Regional Hospitals**

Pabon Lasso has developed a model or graph that uses three ratio indicators (BOR, BTR and ALS) to assess the relative performance of hospitals. Bed Occupancy Rate (BOR) line on the horizontal axis, Bed Turnover Rate (BTR) on the vertical axis and use the average value of these two ratios to divide the graph into four quadrants. The Pabon Lasso model allows researchers to simultaneously evaluate hospital efficiency using three indicators (10).

The zone of the NTB Provincial Regional Hospital from 2018 to 2022 can be seen in Figure 1 and Figure 2. The quadrants in the Pabon Lasso graph describe the level and type of efficiency of the hospital. In 2018 and 2019 the NTB Provincial Regional Hospital was in quadrant 3 ( High B ed O ccupancy Rate and High T urnover Rate ) , indicating an appropriate efficiency level or performance . High BOR and BTR imply efficiency or the hospital's ability to utilize available resources efficiently.

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During the Covid-19 pandemic in 2020 and 2021, the Regional General Hospital of West Nusa Tenggara Province was in quadrant I ( low B ed O ccupancy Rate and B ed T urnover Rate is low ) the average percentage value of BOR and BTR is 57.8% and 40 times per year, with details in 2020 BOR 46.0% and BTR 32 times per year, in 2021 BOR 35% and BTR 24.5 times per year . And then in 2022 the NTB Provincial Regional Hospital will again be in quadrant 3 with BOR and BTR indicator values of 66.8% and 49.7 times per year.\

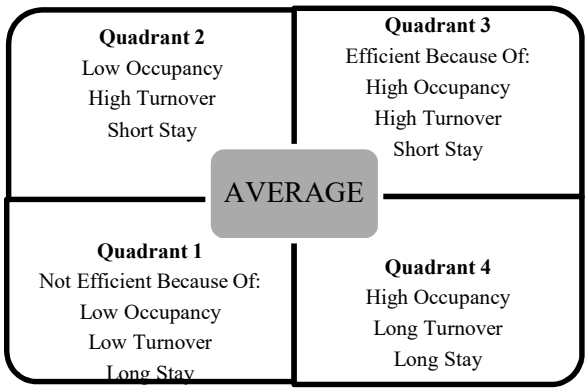


**Figure 1:** Pabon Lasso graph

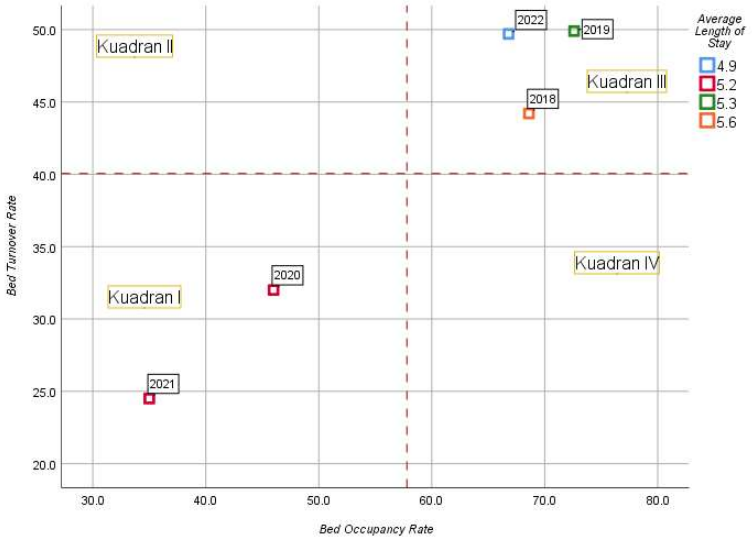


**Figure 2**: Performance of NTB Provincial Regional Hospital in 2018-2022 using the Pabon Lasso graph .

**Identification of causal factors that influence hospital performance efficiency and bed use in inpatient units at NTB Provincial Regional Hospital**

Based on the identification of factors that influence the efficiency of hospital performance and the use of beds in the Inpatient Unit at West Nusa Tenggara Provincial Regional Hospital using the Pabon Lasso model, researchers can identify that in 2018 and

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2019 there was a high utilization rate in quadrant 3 , which indicates efficiency or in that year the hospital's ability to utilize available resources efficiently. Then, in 2020 and 2021 during the Covid-19 pandemic, as can be seen in table 3, there was a decrease in the values of the BOR and BTO indicators, indicating inefficiency or inefficiency in the use of resources, relatively excess bed supplies, less need for inpatient care. , as well as low utilization or demand that year.

In table 4 it can be seen that there was an increase in beds from 375 beds in 2019 to 439 beds in 2020, while the number of patient visits decreased compared to 2019, resulting in low bed utilization with a relatively excess supply of beds. The addition of beds was quite significant from 2018, this was due to the Covid-19 pandemic where the West Nusa Tenggara Provincial Regional Hospital was designated as a Referral Hospital for the Management of Certain Emerging Infectious Diseases through the Decree of the Minister of Health of the Republic of Indonesia (34).

**Table 4.4** Total number of patients treated in 2018-2022 at NTB Provincial Regional Hospital

| | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|
| Number of patients treated | 18,414 | 20,220 | 16,243 | 21,966 | 25,686 |
| Number of beds | 362 | 375 | 439 | 679 | 432 |

Source: Medical Records Installation at NTB Provincial Regional Hospital

The significant decrease in the number of inpatient visits in the first year of the Covid-19 pandemic can be attributed to people's fear of infection. As a measure to evaluate the use of hospital beds, the BOR indicator represents the efficiency of using hospital beds. This research shows that BOR had a significant decreasing trend in the first year of the Covid-19 pandemic compared to before the pandemic. The Ministry of Health of the Republic of Indonesia classifies hospital efficiency in several indicators, one of which is BOR. The ideal BOR parameter value according to the Ministry of Health of the Republic of Indonesia is between 60-85% (35). The average BOR in the pre-pandemic period was around 70%, while the corresponding figure was around 49.2% during the Covid-19 pandemic. This shows the lack of resource utilization at the West Nusa Tenggara Province Regional General Hospital during the Covid-19 pandemic compared to the period before the Covid-19 pandemic.

Many countries have reported a general decline in hospital admissions during the pandemic (36-39), and this study also shows that the NTB Provincial Regional Hospital has also experienced this. One of the main reasons for the decline in hospitalization rates is non-Covid diseases (36,37,40). Research in Croatia showed a decrease in inpatient activity and non-elective inpatient admissions in Croatia for conditions not related to the COVID-19 pandemic, but which can lead to serious health problems if left untreated (40). The decrease in the number of patients being treated in hospital can also be attributed to factors such as people's fear of seeking hospital treatment, and the implementation of screening for patients being treated in accordance with the recommendations of the Collegium of Specialist Doctors regarding patient care protocols during the Covid-19 pandemic.

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While there appears to be no single reason for the general decline in inpatient activity at NTB Provincial Regional Hospitals, some possible contributing factors are disruptions in the hospital system due to reorganization to address pandemic requirements; reluctance of people with health care needs to seek hospital care because they perceive a threat of becoming infected with COVID-19 in a hospital setting; hospital staff shortages due to infections and illnesses among the health workforce; reprioritization of elective procedures by hospitals; and decreased rates of non-emergency inpatient referrals due to reduced outpatient hours.

However, there is evidence from international sources to support the argument that patient reluctance to attend hospital may be a major contributing factor. For example, Deerberg-Wittram and Knothe say that patient avoidance of care in situations such as the Covid-19 pandemic is an example of Dread Risk , which is a behavioral response in which a rare and unexpected event, such as a pandemic, can trigger an irrational risk-averse response such as avoiding hospitals due to the perceived risk of infection, while ignoring the risk that such behavior could result in more serious consequences for the person's health (41). Reichardta et al (42) provided further evidence of this behavior by reporting that German states experiencing an increase in the incidence of Covid-19 experienced a greater reduction in the number of hospitalized patients.

Then in 2022 the BOR and BTO indicator values will rise again and are located in quadrant 3, which shows relatively good quantitative performance, a low proportion of unused beds, efficient use of resources, and has reached an appropriate level of efficiency. Likewise, previous research shows that around 20 to 45 percent of health facilities are in high-performing quadrant 3 (7,10,25,43).

## CONCLUSION

Hospital performance efficiency and bed utilization before and during the Covid-19 pandemic fluctuated, in a pandemic situation hospital management has a critical level. This can be clearly seen from the significant addition of hospital beds that are not comparable to the number of inpatient visits that year, thus affecting hospital performance and efficiency. Hospital performance and bed utilization before the pandemic from the three assessment indicators on the Pabon Lasso graph, the Bed Occupancy Rate (BOR) and Bed Turnover Rate (BTR) indicator values decreased substantially after the outbreak of Covid-19 compared to before the pandemic, and are in quadrant 1, indicating inefficiency or inefficiency in the use of resources, relatively excess bed supply, less need for hospitalization, and low utilization or demand that year. There are factors that hinder efficiency and hinder the optimization of hospital performance and bed utilization, some contributing factors are a decrease in the number of patients treated; disruption in the hospital system due to reorganization to address pandemic requirements; reluctance of people with health care needs to seek hospital care because they feel there is a threat of being infected with Covid-19 in the hospital environment; Covid-19 is one of the most serious pandemics in the last 100 years, its rapid global spread has put hospitals and local communities in Indonesia and around the world in

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dire straits. One of the main challenges is to quickly and efficiently assign and reallocate appropriate resources, such as medical professionals, hospital beds and equipment to cope with the overload. For this reason, analyzing the efficiency of its structural management before the emergency outbreak provides an important reference point to further explore how emergency management has been carried out. In addition, on this basis, learning that outlines structural bottlenecks or facilitators can provide indications on how best to achieve hospital disaster preparedness in the event of a second wave of Covid-19 or another possible pandemic. Every effort should be made to identify and correct factors that contribute to poor efficiency. During a pandemic or other periods of disaster, the paradigm of hospital management needs to be changed so that it is necessary to balance the relationship between hospitals and regions and determine the right allocation of inpatient resources. Hospitals located in quadrant three must follow up on strategies to ensure continuity in providing efficient services or performance with an optimal number of beds used. Of course, in accordance with the increase in efficiency and the direction of the graph, in all four quadrants the shift towards the third quadrant indicates success in the plan to improve hospital efficiency and performance. There are clearly differences in the performance of the hospitals studied during the period. However, a better understanding of these differences must be based on objective evidence.

## REFERENCE

Kementerian Kesehatan RI. (2020). "Peraturan Menteri Kesehatan Nomor 3 tahun 2020 tentang Klasifikasi dan Perizinan Rumah Sakit". Kementrian Kesehatan, 5, 178.

Damayanti, M., Jati, S.P., Arso, S.P. (2017). "Analisis Permintaan Masyarakat Terhadap Pelayanan Rawat Jalan Rumah Sakit Umum Daerah Dr. R. Soetijono Blora". Jurnal Kesehatan Masyarakat (e-Journal), vol 5 (1), 85-94.

Asefzade S. (2003). "Health Economics Principles". Ghazvin: Hadise emrouz Publications.

Asefzadeh S. (2007). "Hospital's Management and Research". Ghazvin: Hadise emrouz Publications.

Bahadori M, Hamouzadeh P, Hakimzadeh M, Nejati M. (2011). "Combining multiple indicators to assess hospital performance in Iran using the Pabon Lasso Model". Australasian Medical Journal AMJ, vol 4, no. 4, 175-9.

Roberts M, Hsiao W, Berman P, Reich M. (2008). "Getting health reform right: a guide to improving performance and equity". Oxford university press: London.

Asbu E, Walker O, Kirigia J, Zawaira F, Magombo F and Zimpita P (2012). Assessing the efficiency of hospitals in Malawi: An application of the Pabón Lasso technique. Afr Health Monitor, 14:25-33.

Kalhor R, Salehi A, Keshavarz A, Bastani P and Orojloo P. (2014). "Assessing Hospital Performance in Iran Using the Pabon Lasso Model". Asia Pac J Health Manag, 9(2):77-82.

Forootan S, Arab M, Hoseini M, Khosravi B. (2015). "Determining the efficiency of social security hospitals of Tehran based on Pabon Lasso Model". J Health Adm, 18(59):7-18.

Pabón L. (1986). "Evaluating hospital performance through simultaneous application of several indicators". Bulletin of the Pan American Health Organization (PAHO), 20(4):341-57.

Jakab M, Harding A, Preker A, Hawkins L. (2000). "Organizational reform and management of public providers: focus on hospitals: appendix 3: critical skills: monitoring and evaluating hospital performance". Washington D. C, World Bank.

Peyravi H, Neyati J, Afshar M, Emami H, Pazargadi M. (2000). "The role of operational criteria in determination of objectives and decision-making strategies in Universities of Medical Sciences and Health Services". Pejouhandeh Quaterly Research Journal, vol 19:241-254.

Kementerian Kesehatan RI. (2020a). "Pedoman Pencegahan dan Pengendalian Corona Virus deases (Covid-19)". Kementrian Kesehatan, 5, 178.

World Health Organization. (2020). "Coronavirus Disease (COVID 19) Pandemic".https://www.who.int/indonesia/news/novel-coronavirus/qa/qa-for-public

Nepomuceno T.C.C, Silva W.M.N, Nepomuceno K.T.C, Barros I.K.F. (2020). "Research Article A DEA-Based Complexity of Needs Approach for Hospital Beds Evacuation during the Covid-19 Outbreak". Hindawi Mathematical Problems in Engineering, Vol. 2020 Article ID 8857553

Breitenbach, Martinus C; Ngobeni V; Aye G.C; (2020). "Global healthcare Resource efficiency in the Management of Covid-19 Death and Infection Prevalence Rates". Munich Personal RePEc Archive, Paper No.104814.

Achoki, T; Hovels, A; Masiye, F; Lesego, A; Leufkens, H; Kinfu, Y. (2017). "Technical and scale efficiency in the delivery of child health services in Zambia: results from data envelopment analysis". BMJ Open (1): 1-11.

Kakemam, E; Forushani, A.R; Dargahi, H. (2016). "Technical efficiency of hospitals in Tehran, Iran". Iran Journal Public Health, vol 45 (4): 494-502.

Elayyat, A.H; Sadek, A. (2016). "Hospital utilization pattern in a hapatogastroenterology departement of a research institute hospital, from 2004 to 2013. Journal Egypt Public Health Assoc, vol 91: 59-64.

Moradi, G; Piroozi, B; Safari, H; Nasab, N.E; Yari, A. (2017). "Asessment of the efficiency of hospital before and after the implementation of health sector evolution plan in Iran based on Pabon Lasso model'. Iran Journal Public Health, vol 46 (3): 389-395.

Rezaei, Satar; Hajizadeh, Mohammad; Bazyar, Mohammad; Karyani, A.K; Jahani, Behrooz; Matin, B. K. (2017). "The Impact of Health Sector Evolution Plan on the Performance of Hospitals in Iran Evidence from the Pabon Lasso model". International Journal of Health Governance, Vol. 23(2):111-119.

Shaqura, Iyad.I; Gholami, M; Sari, A.A. (2021). "Asessment of public hospitals performance in Gaza governorates using the Pabon Lasso". The International Journal of Health Planning and Management, vol 36 (4): 1223-1235.

Hafidz, F. (2018). "Assessing Health Facility Performance in Indonesia using the Pabon Lasso Model and Unit Cost Analysis of Health Service. International Journal of Health Planning

and Management, vol 33 (2), 1-16.

Marnani, AB, Sadeghifar J, Pourmohammadi K, Mostafaie D, Abolhalaj M, Bastani P. (2012). "Performance assessment indicators: how DEA and Pabon lasso describe Iranian hospitals' performance". Health Med, vol 6(7):791–6.

Mehrtak M, Yusefzadeh H, Jaafaripooyan E. (2014). "Pabon Lasso and data envelopment analysis: a complementary approach to hospital performance measurement". Global Journal Health Science, vol 6, no. 4, 107-10.

Ajlouni, M; Zyoud, A; Jaber, B; Shaheen, H; Al-Natour, M; Anshasi, R.J. (2013). "The relative efficiency of Jordanian public hospitals using data envelopment analysis and Pabon Lasso diagram". Global Journal Business Research, vol 7(2):59–72

Pecoraro, F; Clemente, F; Luzi, D. (2020). "The efficiency in the ordinary hospital bed management in Italy: An in-depth analysis of intensive care unit in the areas affected by COVID-19 before the outbreak". PLOS ONE, vol 15(9),1-15.

Aloh, H.E., Onwujekwe, O.E., Aloh, O.G., Nweke, C.J. (2020). "Is bed turnover rate a good metric for hospital scale efciency? A measure of resource utilization rate for hospitals in Southeast Nigeria". Cost Effectiveness and Resource Allocation, vol 18 (21), 1-8.

Dehnavi, H., Rezaee, M., Khosravi, M.F., Manshadi, M.G., Saeidpour, J. (2018). "Evaluation of inpatient surgical ward's performance at the hospitals affiliated with Tehran University of Medical Science in 2018". Evidence Based Health Policy, Management and Economics, vol 5 (4), 222-33.

Vukey, Enoch Yao; Ntow-Kummi, Gloria; Abuosi, Aaron Asibi. (2023). "Assessing the Efficiency of Regional Hospitals in Ghana: Implications for Optimal Resource Allocation for Referral Hospitals". Scientific African, Elsevier, e01847.

Pandey, Sujita dan Daley, Angela. (2022). "Assessing the Performance of a Private Hospital in Nepal: Evidence from Pabon Lasso and Regression Models". Journal of Health Management, vol. 24(3) 423–432.

Chisholm, D; and Evans, D.B. (2010). "Improving Health System Efficiency as a Means of Moving Towards Universal Coverage". Geneva, Switzerland.

Chatterjee, S; Levin, C; Laxminarayan, R. (2013). "Unit Cost of Medical Service at Different Hospital in India. Plos One, vol 8 (7):e69728

Kementrian Kesehatan Republik Indonesia. (2020b), "Pedoman Teknis Bangunan dan Prasarana Ruang Isolasi Penyakit Infeksi Emerging (PIE)". Direktorat Jendral Pelayanan Kesehatan.

Depkes RI. (2005). "Buku Petunjuk Pengisian, Pengolahan dan Penyajian Data Rumah Sakit. Jakarta: Depkes RI.

Oseran, A.S; et al. (2020). " Changes in hospital admissions for urgent condicition during COVID-19 pandemic". Am J Manag Care, vol. 26 (8): 327-8

Birkmeyer, J.D; Barnato, A; Birkmeyer, N; Bessler, R; Skinner, J. (2020). "The impact of the Covid-19 pandemic on hospital admissions in the United States: study examines trends in US hospital admissions during the Covid-19 pandemic". Health Aff, vol.39(11):2010-7.

Kuhlen, R; Schmithausen, D; Winklmair, C; Schick, J; Scriba P. (2020). "The effects of the COVID-19 pandemic and lockdown on routine hospital care for other illnesses". Dtsch Arztebl Int., vol.117:488–9.

Butt, A.A; Kartha, A.B; Masoodi, N.A; Azad, A.M; Asaad, N.A; Alhomsi, M.U; et al. (2020). "Hospital admission rates, length of stay, and in-hospital mortality for common acute care conditions in COVID-19 vs. pre-COVID-19 era". Public Health. 189:6–11. doi: 10.1016/j.puhe.2020.09.010

Kalanj, K; Marshall, R; Karol, K; Tiljak, M.K; Orešković, S. (2021). "The Impact of Covid-19 on Hospital Admissions in Croatia". Front Public Health, vol. 9:720948.

Deerberg-Wittram, J; Knothe C. (2020). "Do not stay at home: we are ready for you". NEJM Catalyst.

Reichardta P, Bollmann A, Hohenstein S, Glass B, Untcha M, Reichardt A, et al. (2021). "Decreased incidence of oncology admissions in 75 Helios hospitals in Germany during the COVID-19 pandemic". Oncol Res Treat. Vol. 44:71–4.

Rahmani, H. F. (2018). Pengaruh Penerapan Enterprise Resource Planning (ERP) Terhadap Kinerja Perusahaan. Jurnal Indonesia Membangun, 17(3), 1-18.

Mohammadkarim, B; Jamil, S; Pejman, H; Seyyed, M.H; Mostafa, N. (2011). "Combining Multiple Indicators to Assess Hospital Performance in Iran using the Pabon Lasso Model. The Australian Medical Journal, vol 4 (4):175.