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MEASURING HOSPITAL EFFICIENCY DURING COVID-19 PANDEMIC IN INDONESIA

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Abstract

By addressing indicators of inefficiency at the initial of the COVID-19 pandemic, hospitals can immediately respond through resources. This research aims at assessing the efficiency of both government and commercial hospitals in Indonesia during the pandemic. Accounting data was collected from documentation of financial statements. The data was analyzed by using the data envelopment analysis technique and Tobit regression. The research showed that over three years of the pandemic, the hospital's efficiency rate decreased successively by 100%, 86%, and 76%. However, the optimization of hospital efficiency can be significantly improved by revenue factors, specifically the quantifiable quantity of income generated. This highlighted the need to increase revenue to ensure the provision of high-quality services to the general population. It is hoped that this research will shed light on the challenges faced by hospitals during these difficult times and provide insights for future improvements.

INTRODUCTION

Hospital efficiency refers to the ability of a hospital to provide high-quality healthcare services to patients while making effective use of the resources at its disposal. The hospital's ability to provide quality health care to patients optimally using available resources is the concept of hospital efficiency. The aim at providing constructive feedback for the hospital, both in terms of income and service satisfaction for the community (Lindlbauer et al., 2016). One indicator of efficiency was assessing the ability of hospital management to produce service output which was reflected in operational income (Fazria & Dhamayanti, 2019; Kohl et al., 2019). With the number of hospitals year-on-year increased by an average of 4%, the level of hospital efficiency in Indonesia had reached 56% (Irwandy et al., 2020). The application of efficiency measures would lead to a variety of benefits, including financial gains and increased satisfaction in society (Lindlbauer et al., 2016). Nevertheless, the efficiency of the hospital remained a matter of concern due to several issues. These included technical inefficiencies as highlighted by Piubello Orsini et al. (2021), allocation inefficiencies as identified by Gong et al. (2023), insufficient healthcare access for individuals with low income as discussed by Niedar et al. (2022), and inadequate community response as noted by Khasanah et al. (2023). The aforementioned

challenges were further exacerbated amidst the ongoing COVID-19 pandemic, which had endured for a duration exceeding two years. The effects involved a decrease in outpatient and inpatient appointments unrelated to COVID-19, alterations to services, adjustments in infrastructure and facility utilisation, diminished service quality, increased workload for healthcare personnel, strategies for managing health services, and psychological consequences (Sarasnita et al., 2021). To improve resource allocation during the current global outbreak, it was imperative for policymakers to initially ascertain the underlying factors contributing to inefficiencies inside hospitals, with a specific focus on the financial aspect. This would enable the effective implementation of resource optimisation strategies (Anggraeni et al., 2023; Ravaghi et al., 2023).

The research conducted by Harmadi & Irwandy (2018) revealed that a significant proportion of government hospitals in Indonesia, including both central government-funded (BLU) and local government-funded (BLUD) hospitals, were found to be inefficient based on their financial statements from 2017. Specifically, out of the total 82 government hospitals examined, 54 hospitals, accounting for 65.9% of the sample, were classed as inefficient. The mean efficiency scores recorded were 78.9%. This inefficiency in hospitals can be caused by various factors, including excessive workforce, inappropriate hospital length of stays, inappropriate hospital sizes, inappropriate workforce composition, lack of workforce motivation, inefficient use of health system inputs, medical errors, and inappropriate level of strategies (Ravaghi et al., 2023). The issue was further intensified by the COVID-19 pandemic, leading to a reduction in hospital income and delays in claim payments. This disruption in cash flow ultimately resulted in a cessation of hospital operations and services (Ambarwati, 2021). Figure 1 illustrated a notable increase in income for private hospitals, juxtaposed with a decline in revenues for government hospitals during the COVID-19 outbreak. This meant that private hospitals possessed superior capabilities in cash flow management and resource optimisation in comparison to government hospitals. Consequently, it had became crucial for managers of government hospitals to formulate effective plans amidst the current pandemic.

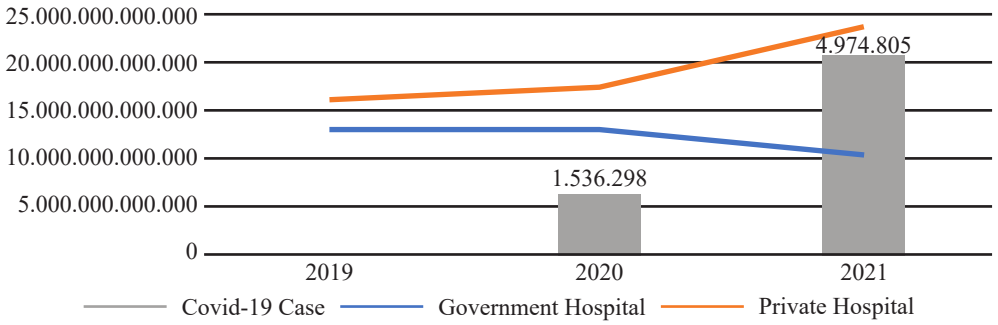

Figure 1. Hospital Revenue and COVID-19 Cases between Government and Private Hospitals 2019-2021.

The Resource Dependence Theory (RDT) posited that organisations relied on external entities for essential resources necessary for their functioning (Craighead et al., 2020; Kulkarni et al., 2023; Lu & Herremans, 2019). In the healthcare industry, hospitals depended significantly on a variety of resources, including financial, human, technological, and infrastructural, to facilitate effective and high-quality provision of services (Dagenais et al., 2023; Maphumulo & Bhengu, 2019; Yip et al., 2019). During the pandemic, hospitals encountered substantial operational and budgetary challenges, therefore the prudent management and use of resources were directly correlated with hospital efficiency (Lupu & Tiganasu, 2022; Piubello Orsini et al., 2021; Wójtowicz et al., 2022). According to the findings of Harmadi & Irwandy (2018), a significant proportion of governmental hospitals in Indonesia, up to 65.9%, exhibited inefficiencies. These inefficiencies were mostly attributed to their heavy dependence on government funding. The hospitals experienced increased vulnerability as a result of the escalating financial restrictions brought forth by the pandemic (Ahrens & Ferry, 2020; Bali et al., 2022; Kruse et al., 2018). On the contrary, private hospitals demonstrated resilience due to their increased resource diversification and superior cash flow management (Kruse & Jeurissen, 2020). The utilization of the Resource Dependence Theory offered a valuable framework for comprehending these differences. By analysing how hospitals were classified and organisationally structured, navigated their external environment, handled dependencies, and devised strategies to acquire crucial resources, particularly in times of crisis, RDT could provide valuable insights. This theory emphasised the importance of employing adaptive tactics in the acquisition and management of resources to maintain long-term efficiency, particularly during periods of instability (Tortorella et al., 2023).

The research conducted by Srimayarti et al. (2021) examined the levels of hospital efficiency in Indonesia through the application of Barber Johnson's four-indicator technique. This approach encompassed the assessment of Bed Occupancy Rate (BOR), Length Of Stay (LOS), Bed Turnover (BTO), and Turnover Interval (TOI). Several additional investigations employed the Barber-Johnson methodology. It explored the efficacy of

healthcare services in various hospitals. These included studies conducted at Muhammadiyah Nanggulan Hospital (Pradnyantara, 2022), Baubau City Hospital (Nur Rahmi et al., 2022), Bali Royal Hospital (Wirajaya, 2023), Anna Medika Madura Hospital (Ferdianto & Rizaldy, 2023), and Gunung Jati Cirebon Hospital (Khasanah et al., 2023). The aforementioned research offered significant contributions to our understanding of the efficiency of healthcare services in hospitals that implemented the Barber-Johnson strategy. Nevertheless, it was imperative to acknowledge the potential limitations inherent in these investigations, including the presence of biases or confounding variables. The assessment of the efficiency of hospital healthcare services during the COVID-19 pandemic presented difficulties when employing the Barber-Johnson approach, primarily due to challenges in obtaining reliable data on hospitalized patients and the fluctuating availability of beds (Pecoraro et al., 2021).

A research gap existed in prior studies regarding the limited application of the Barber-Johnson method to effectively handle the unique challenges posed by the pandemic. The utilization of data envelopment analysis (DEA) and Tobit regression was employed by researchers to assess the levels of efficiency in hospitals, building upon the previous studies conducted by Mbau et al. (2023) and Nurcahyo et al. (2020).

DEA was widely used by accounting scholars to determine the organization's technical efficiency. Kohl et al. (2019) analyzed 262 scientific articles and found that DEA was a practical and implementable approach for hospital leaders and managers when making strategic decisions. Similarly, Piubello Orsini et al. (2021) explained that using the DEA model, hospital performance can be measured by estimating the capacity for optimization of inputs and outputs while also identifying key sources of inefficiency. Efficiency analysis using the DEA technique evaluated hospital efficiency by comparing input variables with outputs. In 1984, Banker, Charnes, and Cooper (BCC) modified the DEA method to include a more flexible model with a Variable Return Scale (VRS) (Lindlbauer, Schrey and Winter, 2016). The DEA VRS method offered more precise results in measuring relative efficiency as it considered wider aspects. However, its weakness lay in the susceptibility of the analysis outcomes to the precision of input and output data. Therefore, to attain the most robust conclusions, it was advisable to use the DEA VRS approach in conjunction with other methods (Miranda et al., 2014; Wu, 2023a). Further analysis of DEA VRS could involve longitudinal analysis, such as Tobit regression or truncated regression, to identify the factors that impacted hospital performance (Deng et al., 2020; Widyastuti and Nurwahyuni, 2021).

This research analyzed the efficiency of both government and private hospitals to identify areas of inefficiency and develop strategies to improve future performance, including in the face of a pandemic or other crisis. The aim at providing a better understanding of hospital efficiency, which can serve as a foundation for more effective strategic planning and faster responses to future challenges. This, in turn, would enable healthcare providers to offer better services to the public. This study proposes the use of resource dependency theory to understand how hospitals manage their dependency on external resources, particularly during crises such as a pandemic. Additionally, the application of data envelopment analysis (DEA) techniques contributed significantly to developing a more comprehensive efficiency evaluation method. Overall, this research enhanced the comprehension of hospital efficiency in Indonesia and offered practical guidance for stakeholders to improve their performance and responsiveness in delivering quality healthcare services to the community.

Given the dynamic nature of healthcare service demands during the pandemic, it is critical to explore alternative or supplementary indicators to accurately evaluate hospital efficiency during times of crisis. Moreover, there is a scarcity of research analyzing the monetary influence on hospital efficiency in Indonesia. Therefore, the research attempted to address the existing research gap by proposing novel indicators derived from accounting data to assess the efficiency of hospitals in Indonesia amidst the COVID-19 crisis. The primary aim of this research is to gauge and explicate the operational efficiency of government and private healthcare facilities in Indonesia during the current pandemic. To achieve the research purpose, the research utilized a quantitative multi-method approach to analyse the data from the hospitals' financial statements. It is hoped that the research has the potential to serve as a valuable point of reference for hospitals in Indonesia that are tasked with managing input and output characteristics in the context of an infectious disease pandemic. Finally can provide insights for future improvements.

METHODS

This research employed a quantitative-descriptive method. This method might assess hospital management effectiveness in Indonesia using financial report documents from 2019 to 2021. The population consisted of private hospitals that had gone public and government hospitals. Purposive sampling was used to determine samples using two major criteria. First, the sample of private hospitals was chosen based on the fact that they had gone public and published their financial reports to the Indonesian Stock Exchange (IDX) in 2019 and 2021. Second, for government hospitals, samples were selected from hospital data on Java Island, and this selection was customized to the condition of the data of the private hospitals that had been public. Third, for government hospitals, samples were selected from hospital data on Java Island. This selection was customized

to the condition of the data of the private hospitals that had been public in this research on Java Island. The sample size was 14 hospitals, 7 of which were government-owned and 7 owned by private companies. This sample size was based on the overall availability of data obtained during the research. Secondary data had been collected online from the Indonesian Ministry of Health and the Indonesia Stock Exchange (IDX) in the form of 42 hospital financial reports for three periods.

The investigation's primary dependent variable was efficiency, while the independent variables were comprised of five input variables and three output variables. The input variables, along with their data sources, included fixed assets (FA), which referred to property, plant, and equipment as stated in the BLU Balance Sheet or the Private Hospital Report on Financial Position; inventories (INV), detailed in the BLU Balance Sheet or the Private Hospital Report on Financial Position; intangible assets (ITA), which encompassed patents, goodwill, trademarks, and other intangible assets as recorded in the BLU Balance Sheet or the Private Hospital Report on Financial Position; salary expenses (SEP), representing wages expenses as reported in the BLU Operating Report or the Private Hospital Income Statement; and operating expenses (OPE), the cost of goods sold as indicated in the BLU Operating Report or the Private Hospital Income Statement. On the output side, the variables and their sources included revenues (REV), represented by total sales as reported in the BLU Operational Report or the Private Hospital Income Statement; receivables (ARS), which were accounts receivable as listed in the BLU Balance Sheet or the Private Hospital Report on Financial Position; and operating cash (OCS), denoting net cash as outlined in the BLU Balance Sheet or the Private Hospital Report on Financial Position.

In this research, the efficiency measurement was undertaken using the Data Envelopment Analysis-Variable Return to Scale (DEA-VRS) technique, a non-parametric approach that incorporated the principle of variable returns to scale. This principle acknowledged that the ratios of input-to-output additions vary, allowing for the exploration of non-linear relationships between input and output variables within the realm of hospital management. Specifically, it posited that an increase in inputs does not uniformly result in equivalent increases in outputs. This delineation of input and output variables provided a structured framework for analyzing hospital management efficiency through the lens of the DEA-VRS method. The mathematical model in the DEA-VRS calculation was output-oriented (Widyastuti & Nurwahyuni, 2021).

$$E_b = \frac{\sum_{r=1}^{R} u_{rb} y_{rb}}{\sum_{i=1}^{N} v_{ib} x_{ib}} \quad \text{.....(1)}$$

With the constraint function:

$$0 \leq = \frac{\sum_{r=1}^{R} u_{rb} y_{rb}}{\sum_{i=1}^{N} v_{ib} x_{ib}} \leq 1; n = 1, 2, 3 \ldots N \quad \text{.....(2)}$$

And

$$u_{rb} v_{ib} \leq 0 \text{ ; for every } r \text{ , } i \text{ (} r = 123 \ldots . r \text{ dan } i = 123 \ldots i) \quad \text{.....(3)}$$

DEA VRS could provide more accurate results in measuring the relative efficiency of a unit because it considered broader aspects, but DEA BCC also had a weakness, namely that the results of the analysis were affected by the accuracy of the input and output data, so the DEA BCC method needed to be compared with other methods (Miranda et al., 2014; Wu, Sun and Liang, 2021). In measuring hospital efficiency, the DEA method was often followed by further analysis in the form of longitudinal analysis, either tobit regression or truncated regression, to determine the factors that affected healthcare performance (Deng et al., 2020; Widyastuti & Nurwahyuni, 2021).

Additionally, we performed further analysis utilizing Tobit regression to determine the input and output variables that had the greatest impact on hospital efficiency. We chose to use Tobit regression due to the use of censored data, where the dependent variable, or hospital efficiency level, ranges from 0 to 1. The following was the Tobit regression equation utilized in this research:

$$EF = \beta_1 + \beta_2 * FA + \beta_3 * I + \beta_4 * IA + \beta_5 * SE + \beta_6 * OE + \beta_7 * IN + \beta_8 * R + \beta_9 * OC + \varepsilon \quad \text{.....(4)}$$

Software to calculate DEA used the DEAP program version 2.1 (Tim Coelli Inc.), while Tobit regression analysis used the Stata 16 program. (Stata Corporation LLC, College Station, TX, USA) The interpretation of efficiency was when scores of 1 indicated efficiency and <1 indicated inefficiency.

RESULTS

Analyzing hospital efficiency levels was a crucial aspect of healthcare management, as it could identify early on any inefficient resources that could be optimized to promote hospital efficiency. This research counted the number of hospitals that had managed their finances to achieve a Technical Efficiency score.

Table 1. Hospital Characteristics

No	Hospitals	Ownership	Bed Numbers	Provinces
1	RSP 1	Public	109	West Java
2	RSP 2	Public	732	Jakarta
3	RSP 3	Public	331	Jakarta
4	RSP 4	Public	273	Jakarta
5	RSP 5	Public	1108	Middle Java
6	RSP 6	Public	486	West Java
7	RSP 7	Public	347	Jakarta
8	RSS 1	Private	6063	Jakarta
9	RSS 2	Private	791	West Java
10	RSS 3	Private	1454	West Java
11	RSS 4	Private	581	Jakarta
12	RSS 5	Private	3320	East Java
13	RSS 6	Private	1600	Jakarta
14	RSS 7	Private	3693	Jakarta

Table 1 presented that hospitals in this research were distributed into three provinces namely Jakarta, Middle Java, and East Java. The largest beds number was in private hospitals, while the fewest were in government hospitals.

Secondary data from financial reports of both government-owned and commercial hospitals was subjected to data envelopment analysis (DEA) techniques for the period spanning 2019 to 2021. The analysis aims at enhancing output variable efficiency without increasing or decreasing the input variables. The collected data and conclusions offer valuable insight to the hospital for improved management and efficiency of resources from the financial dimension (financial statements).

Table 2. The calculation of Technical Efficiency in DEA hospitals during the period 2019-2021 in Indonesia

Type of Hospitals	Periods		
	2019	2020	2021
RSP 1	1	1	1
RSP 2	1	1	1
RSP 3	1	0,811	0,862
RSP 4	1	1	1
RSP 5	1	1	1
RSP 6	1	0,545	0,73
RSP 7	1	1	0,892
RSS 1	1	1	1
RSS 2	1	1	1
RSS 3	1	1	1
RSS 4	1	1	1
RSS 5	1	1	1
RSS 6	1	1	1
RSS 7	1	1	1
Efficiency percentage (%)	100	86	78

Note: RSP: Government Hospital; RSS: Private Hospital;

Table 2 illustrated that hospital management in Indonesia was optimal in 2019, with an efficiency level of 100%. However, in 2020, the COVID-19 outbreak resulted 14% decrease in hospital efficiency, particularly in government hospitals RSP3 and RSP6. In 2021, hospital inefficiency continued to increase, affecting three government hospitals; RSP3, RSP6, and RSP7.

Table 3. Hospital Inefficiency Based on Actual Value, Target Output, and Radial Movement

Output Variables	Efficiency	Actual Value	Target Output	Radial Movement
Period 2020				
RSP 3	0,811			
Revenue		585.332	738.846	136.784
Account Receivable		81.210	377.065	18.978
Cash		326.654	402.988	76.334
RSP 6	0,545			
Revenue		77.479	142.207	64.728
Account Receivable		11.105	48.996	9.277
Cash		918	44.922	767
Period 2021				
RSP 3	0,862			
Revenue		782.091	907.337	125.246
Account Receivable		103.696	120.302	16.606
Cash		309.525	555.819	49.568
RSP 6	0,73			
Revenue		162.513	222.567	60.054
Account Receivable		23.846	54.259	8.812
Cash		1.530	256.474	565
RSP 7	0,892			
Revenue		654.717	734.170	79.453
Account Receivable		35.455	101.650	4.303
Cash		67.501	319.569	8.192

Note : RSP: Government-owned hospitals; in thousands (000),

Table 3 above presented that an efficiency score below 1 indicated the hospital's inefficiency in managing its financial system. This inefficiency arose because the output target value exceeds the actual value. As a result, the hospital must enhance its revenue variables from $60,054,000 to $136,784,000, accounts receivable from $4,303,000 to $18,978,000, and operating cash from $565,000 to $76,334,000 to achieve efficiency.

Table 4. Results of the Tobit Regression Analysis

Variables	Coef	t	p-value
Fixed Asset	-7.00e-08	-2.56	0.015*
Inventory	-5.92e-06	-2.08	0.045*
Intangible Asset	-5.42e-06	-1.70	0.097**
Salary Expense	-4.07e-07	-0.50	0.622
Operating Expense	-1.19e-06	-1.27	0.213
Revenue	1.54e-06	1.86	0.071**
Account Receivable	1.15e-06	1.06	0.298
Operating Cash	8.37e-08	0.12	0.902
_cons	1.164.927	10.43	0.000

p-value 0,05*; 0,1**

Table 4 illustrated that hospital efficiency had a significant and negative relationship with the variables of fixed assets and inventory (p-value <0.05) and intangible assets (p-value 0.1), which meant that the greater the variables of fixed assets, inventory, and intangible assets, the more inefficient they would be. On the other hand, the revenue variable showed a positive correlation, which meant that the higher the revenue variable, the more efficient the hospital would be (Senjiati & Yadiati, 2021). Revenue was the main financial resource that hospitals used to invest in medical equipment, human resources, and facilities needed to deliver health services. Adequate revenue can help hospitals have access to better resources, allowing them to invest in more advanced medical technology, improve staff competencies, and improve the hospital's infrastructure.

DISCUSSION

Measuring hospital efficiency was an important aspect of improving health services and resource management. Actual value reflected the hospital's actual performance in producing health services with existing inputs. However, to achieve an optimal level of performance, the hospital should refer to the target output that reflects the best standard in resource utilization. Radial movement becomes an important concept here, describing the hospital's efforts to reduce inefficiencies and approach the desired output target. This could involve improvements in resource utilization, improved operational processes, and better management strategies. Thus, it is recommended that inefficient hospitals continue to pursue positive radial movement to achieve higher levels of efficiency in their healthcare services.

Hospital inefficiencies in 2020 and 2021 occurred in various hospitals across different countries, such as those in Fujian Province, China (Sun et al., 2023), Kosovo (Karma & Gashi, 2022), and Egypt (Habib & Mourad, 2022). The COVID-19 pandemic also contributed to hospital inefficiency during this period. Several factors might contribute to inefficiencies in hospitals during the pandemic, such as an abrupt and significant surge in COVID-19 cases, which could overburden hospitals and impede their ability to deliver effective care.

An interesting finding of this research was that the financial management of private hospitals was better than that of government hospitals in the face of The COVID-19 pandemic. Government hospitals had undergone inefficiencies in the early of the pandemic. This also happened in several countries such as Fujian Province, China (Sun et al., 2023), Kosovo (Karma & Gashi, 2022), and Egypt (Habib & Mourad, 2022). This aligned with Taiwan's hospital effectiveness, where private hospitals typically demonstrated good operational performance (Lin et al., 2022). Sielskas (2021) highlighted that private hospitals in Poland were comparatively more efficient than government-owned hospitals. this was due to the owners of private hospitals were relatively more capable of facing financial difficulties in diverse settings, including obstacles instances as rising wages or energy costs.

On the other hand, it was also observed that government hospitals' efficiency levels exhibited swift recuperation during a pandemic. Measuring hospital efficiency was an important aspect of improving health services and resource management. Actual value reflected the hospital's actual performance in producing health services with existing inputs. However, to achieve an optimal level of performance, the hospital should refer to the target output that reflected the best standard in resource utilization. The radial movement became an important concept here, describing the hospital's efforts to reduce inefficiencies and approach the desired output target. This could involve improvements in resource utilization, improved operational processes, and better management strategies. Thus, it was recommended that inefficient hospitals continue to pursue positive radial movement to achieve higher levels of efficiency in their healthcare services.

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On the other hand, it was also observed that government hospital's efficiency levels exhibit shifted recuperation during a pandemic. They benefited from a more stable budget and resource support from the Universal Health Coverage (UHC) scheme (Ambarwati, 2021), allowing them to respond faster to pandemic crises. Therefore, they can enhance their financial system (monetary). Despite this, several hospitals were encountering delays

in receiving claim funds, hence being able to slow down recovery efforts for the resources (Ambarwati, 2021; Arfiani et al., 2020). As for China, Yin et al. (2023) revealed that government-owned hospitals demonstrated higher efficiency compared to their private counterparts. This can be attributed to the Chinese government's prompt response to high-quality government-owned hospitals by providing the public health protection network in the initial stages of the pandemic overall.

Several factors might contribute to inefficiencies in hospitals during the pandemic. One of the significant issues that hospitals encountered during the pandemic was the sudden change in surge and priority regarding COVID-19 patient care (Arsenault et al., 2022; Jung et al., 2023; Miftahussurur et al., 2022; Sarasnita, 2021) so that overburdened hospitals and impeded their ability to deliver effective care. Likewise, a considerable number of elective procedures were postponed or annulled, resulting in notable financial setbacks. Finally, many hospitals had undergone a decrease in revenue from routine operations caused by the emphasis on COVID-19 patients. Besides, postponed payments from patients or third-party payers, such as insurance or BPJS, resulted in reduced cash flow and diminished effectiveness. These outflows can decrease hospital profits and impact net income. This had been revealed by Habib & Mourad (2022) that operational expenses positively influenced operational efficiency scores (Safitry et al., 2021).

Hospitals should have a financial strategy in place to manage the inefficiencies caused by changes in operational expenses during a pandemic. Hospitals necessitated the development of adaptable and robust financial solutions to effectively navigate these shocks (Kruse & Jeurissen, 2020). One strategy for improving hospital efficiency was to streamline resources (Piubello Orsini et al., 2021). This effort could be engaging in partnerships with other organisations, investigating innovative sources of revenue, and cooperating with governmental entities to potentially obtain financial incentives were all strategic actions aimed at acquiring and maximising the flow of resources (Rybnicek et al., 2020). Furthermore, hospitals analysed the constraints of their available resources, and then prioritise efficient allocation to achieve maximum effectiveness (Wu, 2023a).

Hospital administration should adopt and expand the use of telemedicine and remote patient monitoring technologies (Arsenault et al., 2022; Tortorella et al., 2023; Wu, 2023b). The pandemic had demonstrated the potential of telemedicine as a primary care medium for non-emergency consultations, challenging the traditional perception of it as a supplementary method of care (Bokolo, 2021; Mahmoud et al., 2022; Phillips et al., 2023). Hospitals could provide uninterrupted provision of healthcare services for patients who were unable to attend physical visits by making investments in resilient telehealth systems (Ward et al., 2022). This strategic move also enabled hospitals to broaden their sources of revenue (Qi & Han, 2020). Moreover, the implementation of a hybrid care model had the potential to mitigate the burden on healthcare facilities by decreasing the number of patients seeking in-person care, so enabling hospitals to optimise resource allocation (Zawada et al., 2023). Another technique within this framework was the home health model, which entailed providing medical care to patients in their residences for non-hospitalization-requiring conditions (Russell et al., 2023). This not only generated a source of income but also guarantees that hospital beds are allocated to individuals with the greatest need. These programmes necessitated early expenditures in technology and training; yet, they have the potential to function as enduring care models, regardless of the presence of a pandemic.

The pursuit of a financial strategy in place to manage the inefficiencies through internal optimisations and external partnerships was a fundamental principle of the Resource Dependence Theory (Ozturk, 2021). The Resource Dependence Theory asserted that organisations were intricately intertwined with their external environments and depended on these external resources to effectively accomplish their organisational goals (Kulkarni et al., 2023; Ozturk, 2021). Organisations endeavoured to mitigate environmental uncertainties and sustain their operations through proficient management and control of vital resources (Amanda Pinta et al., 2022; Liddle et al., 2022). By employing the Resource Dependence Theory framework, the research findings revealed a discernible pattern of reliance on external resources and the subsequent impact on performance and efficiency measures, namely a discrepancy in hospital finance systems occurred when the desired output exceeds the actual value. The reliance of hospitals on financial resources, as seen by revenue numbers, accounts receivable, and operational cash, highlighted their susceptibility to external financial pressures and necessitated their ability to adjust to a dynamic environment to achieve maximum efficiency.

These results highlighted such significant importance of revenue as a fundamental financial asset for hospitals (Pascualote et al., 2023). Within the context of healthcare, revenue served as more than a mere financial statistic, but rather as a facilitator. Sufficient revenue facilitated the allocation of funds towards investments in medical technology, talent enhancement, and infrastructural improvements, all of which played a crucial role in the provision of healthcare services of superior quality (Farouq Ishak, 2021; Habib & Mourad, 2022; Qi & Han, 2020).

The Resource Dependence Theory framework not only brought attention to the vulnerabilities that arose from external dependencies, but it also provided insights into the strategic responses of organisations to these weaknesses (Kruse & Jeurissen, 2020; Ozturk, 2021; Yeager et al., 2014). The present research provided clarification on this particular facet as it delved into the consequences arising from the decline in hospital revenues as a result of the COVID-19 pandemic. Hospitals encountered a situation of limited resources as a result of decreased revenues from regular procedures and increased expenses associated with the pandemic. This situation required the implementation of adaptive tactics, which aligned with the Resource Dependence Theory's focus on strategic reactions to external resource constraints. According to the Resource Dependence Theory, organisations operating in such a context would aim to reduce their dependents or build fresh interdependencies to gain access to essential resources (Kim et al., 2020; Spieske et al., 2020).

This research described that the COVID-19 pandemic had brought attention to the weaknesses inherent in the conventional financial structures of hospitals, wherein a substantial amount of revenue relied on lucrative elective medical interventions. To mitigate the impact of unforeseen disruptions in the future, hospital administration must prioritise the establishment of financial resilience (Ahrens & Ferry, 2020). This entailed maintaining a diverse revenue portfolio (Kruse & Jeurissen, 2020). In addition to provide direct care services, hospitals had the potential to forge collaborations with technology businesses to cultivate healthcare applications, and capitalise on their specialised knowledge in patient care (Piubello Orsini et al., 2021; Wu, 2023b). Another potential revenue stream can be generated through the provision of advisory services, healthcare training modules, and workshops. Moreover, engaging in public-private partnerships might create prospects for securing grants and accessing funding resources (Asandului, 2023). On the spending side, conducting a comprehensive audit of existing expenses can unveil possible opportunities for cost reduction (Jing et al., 2020). By implementing cost-control measures, renegotiating vendor contracts, and optimising personnel management through cross-training, it was possible to ensure the efficient operation of the hospital, even when facing resource limits. Ultimately, the establishment and preservation of a reserve or emergency fund, despite its inherent difficulties, can prove to be an essential safeguard during periods of economic decline, thereby preventing any disruptions to vital business functions arising from cash flow constraints (Ahrens & Ferry, 2020).

During times of crisis, the interdependence between a hospital and its surrounding community assumed utmost significance. The establishment of trust and rapport between a hospital and its community can be utilised as a strategic approach to address certain issues presented by the epidemic (Basabih et al., 2022). The act of actively involving oneself with community leaders and local organisations could effectively enhance communication channels, so guaranteeing that the general public was adequately informed regarding hospital operations, capacity, and safety standards. This approach could be beneficial in effectively regulating the influx of patients and establishing suitable expectations (Ilyas et al., 2020). Furthermore, community participation had the potential to facilitate opportunities for local cooperation. For example, partnerships with nearby enterprises had the potential to result in sponsorships or contributions of vital resources. Community-led fundraising initiatives had the potential to offer crucial financial assistance in times of adversity (Ilyas et al., 2020). In addition, establishing collaborations with nearby educational institutions could effectively assist the implementation of internships or volunteer programmes, so effectively addressing the issue of workforce shortages. In reciprocation, hospitals could provide community health check-up camps, instructional webinars, and workshops. These symbiotic partnerships served to enhance the hospital's connections with the community and foster a supporting environment characterised by the reciprocal exchange of resources, information, and support for mutual advantage (Hosen et al., 2022; Mustapha et al., 2021).

CONCLUSIONS

It can be concluded that in the research in 2019, all hospitals, including private and government entities, obtained an efficient score. However, after the outbreak of the pandemic in Indonesia in 2020, only 86 per cent of the hospitals obtained an efficient score, which further decreased to 78 per cent in 2021. The findings provided valuable insights for hospital stakeholders to promptly enhance the hospital management system from planning to supervision and evaluation, with an emphasis on revenue-oriented output variables. However, it was important to note that the relationship between input and output variables for hospital efficiency was very complex, and the results of this analysis represented only certain aspects of this relationship. Additionally, other factors, including management, utilization of resources, quality of service, and contextual elements, also influenced hospital efficiency.

Government hospitals had undergone inefficiency in finance during the COVID-19 pandemic. Therefore, hospital administrator should improve the quality of their services by optimizing resources and leveraging information technology, ultimately providing faster and more satisfactory service to their users. The improvement of service quality would certainly have an impact on the recovery of resources, such as revenue, accounts receivable, and cash, that could enhance the overall efficiency of government hospitals. In addition, the government could encourage hospitals to implement a unique approach to manage output variables during a global pandemic to maintain hospital efficiency.

This research had limitations due to insufficient hospital samples that could represent Indonesian hospitals, and inadequate input and output variables obtained from financial statements that can be analyzed utilizing DEA. This was due to the number of hospitals in Indonesia amounting to 3,027 units overall, and the efficiency score accuracy was affected by a large number of inputs and outputs such as variables related to Hospital Capacity, Market concentration, Structure, Characteristics, and Costs.

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