JIA (Jurnal Ilmiah Akuntansi) • 8 (1), 147-166 • 2023

Determinants of Cost Recovery Rate of Inpatient Cases: Evidence from Indonesian Public Hospitals

Maqhfirah Rahayu, Heru Fahlevi*, Ratna Mulyany
Accounting Department, Faculty of Economics and Business, Syiah Kuala University, Jl. Teuku Nyak Arif, Kopelma Darussalam, 23111 Banda Aceh, Aceh, Indonesia
*hfahlevi@usk.ac.id

CITATION:
Rahayu, Maqhfirah, Fahlevi, Fahlevi, & Mulyany, Ratna (2023). Determinants of Cost Recovery Rate of Inpatient Cases: Evidence from Indonesian Public Hospitals. *JIA (Jurnal Ilmiah Akuntansi),* 8 (1), 147-166.

ARTICLE HISTORY:
Received:
February 23th, 2023
Revised:
August 24th, 2023
Accepted:
August 26th, 2023

DOI: 10.23887/jia.v8i1.59019

Abstract
This study aims examine the influence of patient profile, severity, length of stay (LOS), and bed treatment class for cost recocery rate (CRR) of inpatient cases in three Indonesian public hospitals located in Aceh Province, Indonesia. Data were collected from hospital insurance claim from 2018 to 2020. The number of patient dataset collected in this study is 23,125 cases from top ten most frequent cases. Using Multiple Linear Regression, this study found that patient gender, age, LOS length of stay, severity and bed treatment class have a positive significant effect on CRR the inpatient cases. In addition, this study also used questionnaires to elaborate the perspective of managers and doctors in the public hospitals on cost management system and procedures in their hospitals. The results suggested that the CRR determinants can be used to improve cost management in the Indonesian public hospitals through case evaluation and CRR prediction.
Keywords: cost recovery rate; inpatient cost; cost management; DRG; public hospital

INTRODUCTION

Universal health coverage (UHC) implementation in Indonesia has led to increasing government expenditure in healthcare sector. Since the last few years, the social security agency (or *Badan Penyelenggara Jaminan Sosial – Kesehatan*/ BPJS Kesehatan) that manages national health insurance (or *Jaminan Kesehatan Nasional*/ JKN) has reported a serial deficit as participant contributions lower than the hospital claims. In 2019, the deficit reached IDR 51 trillion (Liputan 6, 2022). To cover the deficit, the Government adopted a short-term policy in the form of an injection of funds originating from the state budget. For four years, BPJS Kesehatan has received an additional injection of IDR 15.9 trillion due to a

mismatch between participant contribution and occurred healthcare expenses (Annisa et al., 2020).

Along with the implementation of JKN, the Indonesian government has shifted provider payment system from a retrospective to a prospective method through the adoption of Indonesian Diagnostic Related Groups/INA-DRGs (Fahlevi, 2016). The aim is to improve the efficiency and quality of hospital sector particularly in public hospitals (Fahlevi et al., 2022). In 2014, BPJS Kesehatan introduced Indonesian Case Based Groups (INA-CBGs) to replace the Indonesian Diagnosis Groups (INA-DRGs). In principle, both provider payment systems are the same where hospitals are paid based on the patient's primary diagnosis and predetermined rates without considering patient hospitalization days (Aulia et al., 2016).

The adoption of the INA-CBGs payment method is both an opportunity and a challenge for every hospital in Indonesia (Cook & Averett, 2020). The financial risk due to the surge in medical costs for patients who used to be in insurance institutions has now shifted to hospitals because in the DRG payment system, the insurance uses has the same rates for each case of disease with the same main diagnosis regardless of the difference in the number of days of hospitalization and the actual costs incurred. discharged by hospital (Cook & Averett, 2020; Camilleri et al., 2018; di Giacomo, et al, 2017). Health services are financed from various sources, namely: the government, both central and local governments (provincial and district/city) with funds derived from taxes (general and sales), public health service revenues and other business income as well as social insurance (Cook & Averett, 2020).

The DRG-based payment system is very different from previously used payment methods such as fee for service (Perelman & Closon, 2007). In previous payment system, hospitals are relatively safe from the risk of spikes in patient costs because the insurance company will pay according to the actions taken. However, in the INA-CBGs system, payments are made based on fixed and predetermined. The rate is based on the average value for each treatment for each of the main diagnoses of patients being treated (Sutoto, 2014). Thus, the DRGs based system not only encourage hospitals to control costs, but also to enable hospitals to predict their patient cost treatments (Fahlevi et al., 2022). The latter is related with the production of patient data and claims as hospitals

are required to calculate each patient treatment cost as a basis of DRG rate calculation and update (Sutoto, 2014).

However, literature reported incapability and failure of cost containment in hospitals. For instance, Fahlevi (2016) uncovered lack of cost information utilization in Indonesian public hospitals after DRGs adoption. His study found that patient costs maintained by the Indonesian hospitals were mostly used for reimbursement/ claim administrative procedures rather that management patient costs. Meanwhile, Jovanović et al. (2019) uncovered how Croatian and Slovenian hospitals in their study are still using aggregate cost information to evaluate hospital costs.

There has been a growing literature on patient cost and its recovery prediction using big data analytics approach or more traditional techniques (Wang et al., 2018). Some determinants of patient costs and its profitability have been found, but the results are mixed. For instances, patient characteristics, namely age and gender shape patient cost pattern and behavior. Handayani et al. (2019) found that elderly patients absorbed significantly more resources than relatively young patients. Similarly, Kulkarni et al (2021) discovered that age difference led to divergent cost of treatment in New York hospital. Meanwhile, Mardiah & Rivany (2017) found that severity level of patient contributes to differences of CRR in a referral hospital located in Palembang, Indonesia. Specifically, they found that less severe cases were more cost recovered than more severe cases.

Recently, Fahlevi et al. (2020) examined potential determinants of CRR of Ischemic Stroke cases in an Indonesian public hospital. They found that severity level and length of stay have influence on CRR of cases, while patient gender and age have no effect on caseCRR. More recently, Fahlevi et al. (2022) found that patient profiles, severity, length of stay, patient class, treatment types and reimbursement fees have impact on case CRR. Moreover, Wu et al. (2011) discovered that severity level of patient with diabetes has a positive correlation with health care costs. These contractive results indicate the need of further studies. While prior studies used mostly quantitive study, qualitative study or mixed method-based study is required not only to re-examine the relationship between the variables, but also to gain more understand how the tested variable interacted and correlated. Improved understanding on the variable relationship will lead to better and

accurate predictions of health care costs (Kulkarni et al., 2021).

More accurate patient costs' predictions benefit both hospital management and insurance company. Having predicted patient costs enables hospital management to anticipate high-cost patients and mitigate financial risk occurred. Meanwhile, insurance companies can predict patient cost claims for better financial management system. Thus, this study aims to examine the determinants of CRR of inpatient cases in three Indonesian public hospitals. Tested determinants are patient profile, severity, length of stay, and bed class.

This study is beneficial to help Indonesian hospitals to evaluate and predict patient costs and their reimbursement. After DRGs payment system adoption, Indonesian hospitals are encouraged to implement cost control to cope with the increase in patient care costs (Fahlevi, 2016). Traditionally, hospital management compares total expenses and total income to assess case profitability and efficiency (Aurelia & Pujiyanti, 2017; Pettersen & Solstad, 2014). However, such traditional method is no longer suitable in today prospective payment system. More micro and case-by-case controls are imperative (Fahlevi et al., 2020). This can be done by using the DRGs rate as a comparison. This control is known as case-mix accounting and has been applied in many hospitals, especially in developed countries (Lehtonen, 2007).

Unlike previous studies, this study focusses more on public hospitals which have different size and owners. Public hospitals play crucial roles in Indonesian health care system. Most of referall hospitals are public hospitals, and thus, their financial sustainability is important to ensure health care delivery continuity. Besides, private hospitals located mostly in cities. Thus, public hospital is primary hospital in every Indonesian district. Moreover, tested determinants are not only patient characteristics, but also diagnoses related variables, and type of DRG tariff. Thus, it provides more comprehensive findings. Moreover, this study adopts mixed method that started from quantitative and followed by qualitative research. The purposes are to understand the interaction of determinants as well as challenges and problems of controlling patients' costs.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Hospital Fee Payment System, Cost Recovery Rate, and Cost Management Strategies

Along with the implementation of JKN, the Indonesian government has changed the method of hospital payment from a retrospective to a prospective method through the adoption of Indonesian Diagnostic Related Groups (INA-DRGs). The aim is to improve the efficiency and quality of hospital services in Indonesia. In 2014, *BPJS Kesehatan* introduced Indonesian Case Based Groups (INA-CBGs) which replaced the Indonesian Diagnosis Groups (INA-DRGs). Operationally, the two systems are the same in that the hospital is paid based on the patient's primary diagnosis and does not depend on how long the hospital stays, the type of action taken, and the costs incurred by the hospital.(Aulia et al., 2016).

So that this payment system is known as the package system (Sutoto, 2014). The use of the INA-CBGs payment method is both an opportunity and a challenge for every hospital in Indonesia (Mardiah & Rivany, 2017). The financial risk due to the surge in medical costs for patients who used to be in insurance institutions has now shifted to hospitals because in the DRG payment system, insurance (BPJS) pay the same rates for each case of disease with the same main diagnosis regardless of the difference in the number of days of hospitalization and the actual costs incurred (Cook & Averett, 2020).

With this payment method, hospitals are relatively safe from the risk of spikes in patient costs because BPJS will pay according to the actions taken. However, in the package system (DRGs), patients' cost payments made based on rates determined by the ministry of health. The rate is based on the average value for each treatment for each of the main diagnoses of patients being treated (Dumaris, 2015).

The DRG-based payment system is very different from previously used payment methods such as fee for service and capitation. In both payment methods, hospitals are relatively safe from the risk of spikes in patient costs because BPJS will pay according to the actions taken. However, in the INA-CBGs system, payments will be made based on rates determined by the ministry of health. The rate is based on the average value for each treatment for each of the main diagnoses of patients being treated (Dumaris, 2015). To determine the rates for INA-CBGs, the

Ministry of Health's tariff team collected data from sample hospitals in Indonesia. The data collected starts from the size of the hospital, the type of hospital to the operational costs. Because the payment is per package, the hospital no longer needs to detail the costs it has incurred during patient care (Sari, 2014). As hospitals bear financial risk in DRGs payment system, hospital management need to maintain patient costs. Failed to do that, hospital may end with financial deficit. In other words, hospitals are required to calculate and evaluate cost recovery of each treated patient/ cases.

Cost recovery rate (CRR) is one of the indicators of financial performance that compare between revenue and cost of a service. In hospital context, CRR refer to the ability of patient costs' claim/DRG rate to fully compensate actual patient cost. The importance of the CRR as an efficiency determination tool that aims to determine the extent to which hospital revenues can cover hospital costs (Mardiah & Rivany, 2017). Through CRR the hospital can cover and describe how the relationship between the results achieved by a business carried out with the resources used to produce a product or output. Calculation of CRR by comparing the cost of treatment with hospital rate/claim (Mardiah, 2016).

If CRR of case is of less than 100%, meaning that the treatment is not fully covered by DRG fees. CRR equal to 100% states that the share is equal between treatment costs and revenues. Finally, if CRR is more than 100% stating that the reimbursement fees collected from insurance company is bigger than actual patient costs. . In DRG payment system, CRR should be evaluated for each case. CRR also reflects profitability of case/ treatment. Hospitals should offer higher CRR cases than low CRR cases. Moreover, managers should evaluate cases with low CRR through collaboraten with doctors (Lehtonen, 2007).

Cost control in hospitals can be done in various ways and strategies (Maghfira, Fahlevi, & Basri, 2018; Rauliajtys-Grzybek, Baran, & Macuda, 2017). Hospital costs can be reduced using macro approach and micro approach. The macro approach focuses on hospital aggregate costs or expenses such as equipment costs, number of beds and optimal number of hospital staff. In contrast, the micro approach aims to evaluate and reduce costs per unit or per patient treated in a hospital. An example is cost control that takes into account the case-mix or the cost mix for each patient.

The use of the DRGs-based hospital payment method affects the cost control method in the hospital. The DRGs system not only provides motivation to control individual patient costs, but also provides the tools (data) needed in the cost control procedure. Each department in the hospital can be held responsible for the production and efficient provision of intermediate services such as lab testing, pharmacy and nursing services (Lehtonen, 2007). Likewise, doctors can be held accountable for their decisions on the combination of services and materials used in the treatment of patients (Lehtonen, 2007). Such capabilities and procedures are known as the case-mix approach.

It is argued that in DRG based payment system, hospital needs to radically change how they control costs. Hospitals are recommended to adopt a more patient level cost evaluation or casemix accounting, rather than aggregate and cumulative cost accounting and management (Fahlevi et al., 2022). Thus, CRR can be used as an indicator to evaluate each case in hospital.

Hyphoteses Development: CRR Determinants in hospitals

Patient Profiles (Age and Gender) and CRR

There has been a growing literature on the association between patient profiles and patient costs. Age and gender of patients are associated with different risks and complications that affect patient treatments (Fahlevi et al., 2022). For instance, the older patients are, more medical procedures, surgeries, and interventions for age-related health issues are required. These procedures can be more complex and costly than those needed by younger patients. Meanwhile, male may have more complications as their inhealty life styles, for instance smoking rates is higher in men than women. Prior studies support these arguments. Angstman et al., (2016) discovered that eldery patients required more hospital resources than younger patients for the depression cases. Chaikledkaew et al., (2008) found that patient age as one of determinants of health care cost and hospitalization probability. Similar results also found by Ariwardani et al., (2019, in Indonesian cases) and Aljunid and Jadoo (2018, in Malaysian University Hospital). Thus, the formulation model of CRR for the first hyphotesis is:

H_1: Patient profiles (age and gender) have influence on CRR.

Severity and CRR

DRG rates are different among severity level of patients. Patients with higher severity are paid higher than patients with lower severity. In INA-CBGs, severity level is classified into three groups, namely, mild, medium and severed. The reason could be that severed patients demands more intensive treatment, resources and complicated medical protocols (Wu et al., 2020). In turn, the treatment cost of the patient with the severed or critical condition is more likely higher. Prior study has confirmed this argument. For examples, Godard et al. (2002) documented that severity of disease has positive relationship with total costs of asthma inpatient medication. Similarly, Fahlevi et al., (2022) found that severity has positive effect on CRR of top ten inpatient cases in an Indonesian public hospital. Thus, the formulation model of CRR for the second hyphotesis is:

H_2: Severity has influence on CRR.

Length of Stay (LOS) and CRR

Generally, a longer hospital stay tends to lead to higher healthcare expenses as patients consumes more hospital resources. For instance, long LOS indicates that patients need more diagnostic tests and observations that lead increasing test and room costs. Using spinal fusion surgery in Taiwan, Kuo et al. (2018) found that LOS is a determinant of the medical costs. Similarly, Rahayuningrum et al. (2016) revealed that LOS has positive influence on inpatient costs of the studied Indonesian hospitals. Fahlevi et al., (2022) also documented similar results. Thus, the third hyphotesis is formulated as follows:

H_3: LOS has influence on CRR.

Treatment Class and CRR

In Indonesia, patients are classified into three class, namely class 1 (executive), class 2 (standard) and class 3 (low-income patients). The classification determines room of the patients, while the treatment and medication remain the same. For instance, class 1 patient will be treated in a single bed room, while class 3 patient will stay in three bed rooms. Thus, the DRG rates are different across the Treatment class and the CRR may be different. Thus, the fourth hyphotesis is formulated as follows:

H_4: Treatment class has influence on CRR

METHOD

This study was conducted in three biggest public hospitals in Aceh

Table 1. Top ten inpatient accumulative cases between 2018 and 2022

Codes	Disease Name	Number of cases
K30	Dyspepsia	4,182
A09	Diarrhea and gastroenteritis caused by infectious diseases	3,719
J18	Bronchopneumonia, unspecified	3,474
E11	Non-insulin-dependent diabetes mellitus with coma	2,957
I63	Cerebral infarction due to precerebral artery thrombosis	2,712
B34	Adenovirus infection	2,647
Z51	radiotherapy session	2,244
N13	Hydronephrosis with ureteropelvic junction obstruction	1,954
A01	Typhoid fever	1,504
I64	Stroke	1,293
	Total cases	26,686

Source: Department of patient cost claim, 2021

Table 2. Definition and measurement of tested variables

No.	Variables	Definitions and measurements
1	CRR	A variable used to evaluate the ability of DRG rates paid by BPJS to fully cover patient treatment costs claimed by the hospitals. A value of 100 CRR indicates that the DRG payment received by the hospitals is higher that total the patient treatment cost.
2	Severity	Level of sickness severity of each patient range from light (1), medium (2) and severed (3)
3	Length of Stay (LOS)	Duration of patients treated in the hospital (days). 1 = short stay (1-5 days), 2 = 6 – 10 days, 3 = more than 10 days
4	Age	Patient age (years) that classified into three groups, namely 1= toddlers (< 5 years old), 2 = children (5 – 10 years old), 3 = adolescents (10 to 20 years old), 4 = adults (20- to 50-year-old), and 5 = elderly (> 50-year-old)
5	Gender	1 = male, 2 = female
6	Treatment class	Bed classification. Class 1 = executive, class 2 = standard, class 3 = low-income patients

province, Indonesia. These hospitals are Diamond Hospital, Premier Hospital and Queen Hospital (not real names). Data of patients, costs/ claims and payment rates were collected from 2018 to 2020 from the top ten most frequently inpatient cases in the hospitals. Table 1 shows the dataset.

Using multiple regression method, this study examines the contribution of patient characteristics and other diagnoses related variables. Table 2 describes the

operationalization of variables tested in this study.

Apart from statistical analysis, this study also uses online questionnaires to assess the perspective of management and doctors from the studied hospitals regarding DRGs and cost controlling in their hospital. The questionnaires were distributed during June 2022. 100 responses were obtained in this study. The result of questionaries was descriptively analyzed to gain a more detail information on the current perspective and practices in the public hospitals.

RESULTS AND DISCUSSION

The description of the data provides an overview or description of the characteristics of the variable data used in the study. The data description function is to determine the minimum value, maximum value, average value, standard deviation (level of deviation of data spread from each variable), and the amount of data analyzed. The table shows the descriptive statistical values of each variable.

Based on the Table 3, theminimum CRR value is 30 and the maximum is 998 with an average value of 124. It means that some cases have very low CRR that caused deficits, while the others have extremely high CRR (998 means that the rate almost 10 times higher than the patient cost claim). Moreover, the standard deviation is 80, lower than the average. This might indicate a high variation of CRR among the cases. In addition, such high variation also indicates that the managements are facing challenges in evaluating and controlling patient costs.

In terms of patient classification, a balanced proportion between male and female is noticed. However, almost half of the patients are elderlies. Moreover, most of the patients are coming from class III (low-income patients). It accounts for 86% of total patients. The reason could be that the studied public hospitals are the primary reference hospitals in the region. In terms of severity, 70% of patients experienced mild severity. This is associated with short LOS, namely 69% of the patients only spent less than 6 days in the hospitals. Therefore, the statistical data shows that most of the patients are from low-income people with relatively light and mild severity and stayed in the hospitals less than 5 days.

Hypothesis Testing Results

The multiple regression analysis is used to determine whether there is an influence between the

Table 3. Results of Descriptive Statistics

Variable	Minimum	Maximum	Average	Standard Deviation
CRR	30	998	124	80
Gender	Male = 51%, Female = 49%			
Age	1 (toddlers < 5 years old)) = 5% 2 (children 5 – 10 years old = 6% 3 (adolescents 10 o-20 years old) = 8% 4 (adults 20 - 50-year-old) = 34% 5 elderlies > 50-year-old) = 47%			
Treatment class	Class 1 (Executive) = 9%, Class 2 (Standard) = 5% Class 3 (low-income patients) = 86%			
Severity	Light (1) = 70%, medium (2) = 23%, severed (3) = 7%			
Length of stay (LOS)	1 (1-5 days) = 69% 2 (6 – 10 days) = 16% 3 (more than 10 days) = 15%			

Table 4. Multiple Linear Regression Analysis Results

No	Variable	Coefficient Value	t value	Value of Sig.	F/Sig value.	R/R^2/Adjusted R^2
1.	Gender	0.019	7,686	0.000	11,315.492/ 0.000	0.860/ 0.740/ 0.740
2.	Age	0.038	28,800	0.000		
3.	Treatment class	0.131	64,181	0.000		
4.	Severity	0.129	52,655	0.000		
5.	Length of stay (LOS)	0.100	41,891	0.000		
6.	Constant	-0.071	-12.868	0.000		

independent variables on the dependent variable. The multiple linear analysis is used to obtain regression coefficients that determine whether the hypothesis proposed would be supported or not supported. The results of the regression analysis can be seen in Table 4. Prior to the multiple regression test, pre regression tests have been conducted. The data were normally distributed and no sign of multicollinearity and heteroscedicity.

Patient Profiles and CRR

Table 4 shows that both gender and age have significant and positive influence on CRR. As the value is positive, cases of female patient tend to have slightly higher CRR than cases of male patient. Meanwhile, older patients tend to have higher CRR than younger patients. Thus, Ha1 is supported. This finding is consistent with (Wu et al., 2011) that found patient age has a positive association with treatment cost of inpatient cases in Chinese Naval

hospitals. A positive and significant influence of patient gender on patient costs also documented by (Fahlevi et al., 2022), but the study does not provide empirical support on the impact of patient age and CRR of the cases. Besides, the result of this study is not fully consistent with some prior studies as patient gender may has negative influence of hospital treatment cost (see for instance Fahlevi et al., 2020). Thus, this finding aligns with prior studies' results, for instance (Fahlevi et al., 2020), (Rahayuningrum et al., 2016), and (Gümüş et al., 2019). The reasons could be that cases with higher severity most likely have higher reimbursement from the BPJS.

Severity and CRR

The multiple regression results showed that severity has positive and significant impact on CRR. Hence, Ha2 is supported. It means that increasing severity will lead to increasing CRR. In other words, the costs of patients experienced severed diasase is most likely fully covered by the reimbursement fees, vice versa. This is confirmed in this study. Thus, this finding aligns with prior studies' results, for instances, Fahlevi et al., (2020), Rahayuningrum et al., (2016), and Gümüş et al., (2019). The reasons could be that cases with higher severity most likely have higher reimbursement from the BPJS.

LOS and CRR

LOS of the inpatient cases has a significant contribution on cases' CRR. This result supports previous study, for instances, Wu et al., (2011), Aljunid & Jadoo (2018), and Kuo et al. (2018). In this study, however, LOS has a positive influence of CRR, and thus, this is contradictive with prior studies that found a negative relationship between LOS and CRR, for instance (Fahlevi et al., 2022) and (Fahlevi et al., 2021). The best possible explanation that in Indonesia, the DRG rates received by hospitals are differ and depends on the size of the hospitals. Bigger hospitals, for instance referral hospitals received significantly higher DRG rates compared to small size hospitals. These lead to variation of the cost recovery of the cases (CRR).

Treatment Class and CRR

This study found that Treatment class (bed class) has positive influence on cases' CRR. This is fully consistent with prior studies, for instance (Fahlevi et al., 2020). Thus, Ha4 is supported. This finding indicates that treatment of patients from low-income family tend to be fully covered compared to higher class

patients. The reason could be that the reimbursement fees for cases of treatment class III are relatively high enough to cover all incurred actual patient treatment costs. Another reason could be that hospitals were successfully contain patient costs through accelerating hospitalization days as the LOS is relatively short.

The results of data analysis have revealed determinants of CRR. All proposed and tested hyphoteses are supported. Thus, this study demonstrated the influence of patient profiles, severity, LOS and treatment class on CRR of the inpatient cases. Moreover, the R^2 is relatively higher (0.740) that indicated 74% of the CRR changes can be associated with the tested determinants. Hence, hospital can use the regression models to predict and evaluate each patient case, particularly to anticipate high-cost patients and cases with CRR less than 100. In the other words, hospital management can evaluate and predict profitability of patient treatments. Thus, potential used of big data analysis can be explored and optimized to predict patient costs (Fahlevi et al., 2021).

Key findings from the Questionnaire

This study also used questionnaires filled by respondents from the hospital management, case mix management team and doctors from the three Indonesian public hospitals. Table 5 shows perception of respondents on cost containment strategies in their hospitals. The highest average score of the respondents confirm that the hospitals have initiated cost control in the most frequent cases (4.89). Most respondents also reported that their hospitals are able to calculate CRR and cost of patient. From 100 respondents, more than 50% answered that they strongly agreed in the sense that cost control had been implemented, only 30% of hospitals had not fully implemented cost control.

Furthermore, respondents found that hospital management in general has ensured that every patient treated does not cause a financial deficit, as evidenced by the results of respondents who answered 80% agreed with the following statement. Then the respondent's results also show that hospital income and expenses are calculated using the CRR, this can be proven by more than 50% strongly agree with the statement that hospital income and expenses are calculated using the CRR, only 14% do not agree with the statement.

However, participation of doctors and their collaboration with

Table 5. Respondents' Perceptions of Cost Control Strategies

No.	Question	Responses					Average
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
1.	The hospital where I work has implemented cost control on BPJS/ insurance claims	55	15	20	5	5	4.10
2.	Specialists at my hospital are already actively involved in controlling patient costs	15	39	25	15	6	3.42
3.	The hospital management is working together with doctors in controlling patient costs	31	36	21	10	2	3.84
4.	The hospital management ensures that every patient treated does not cause a financial deficit	39	41	15	5	0	4.14
5.	The hospital income and expenses are calculated and compared using CRR	71	15	14	0	0	4.57
6.	The hospital is able to calculate the cost per case-mix claim per patient	61	35	2	2	0	4.55
7.	The hospital where I work has implemented cost control in the 10 most cases of BPJS claims to the maximum	90	9	1	0	0	4.89
	Overall Average						4.22

SA = Strongly agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly disagree
Source: Primary data (processed), 2022

Table 6. Respondents' Perception Barriers to Cost Control

No.	Question	Responses					Average
		SA (5)	A (4)	N (3)	D (2)	SD (1)	
1.	So far, there have been obstacles in controlling patient costs	5	15	15	41	24	2.36
2.	Lack of hospital facilities do not fully support cost containment strategies	1	1	8	18	72	1.41
3.	The management hastheir own way of overcoming possible obstacles so that they can be resolved	9	8	16	51	16	2.43
4.	There are often obstacles in controlling hospital patient costs	5	9	12	44	30	2.15
5.	There are challenges and obstacles in implementing cost containment strategies in hospitals	6	9	15	40	30	2.21
	Overall average						2.06

SA = Strongly agree, A = Agree, N = Neutral, D = Disagree, SD = Strongly disagree
Source: Primary data (processed), 2022

managements regarding cost control are reported still lacking. Less than 50% of respondents stated that hospital management has coordinated with doctors in controlling patient costs. This might indicate that

hospital strategy to control cost is still lacking as doctors' participation is relatively low (Jacobs et al., 2004)

Furthermore, this study also elaborated challenges/ barriers of cost control in the Indonesian public hospitals. Table 6 shows responses of the 100 respondents to the issue. Based on the Table 6, it can be seen that the hospitals have relatively few obstacles in controlling costs. There are 65% of respondents who agree that so far there are no obstacles in controlling patient costs. Regarding the existing facilities at the hospital, more than 90% of respondents agreed that the hospital facilities had been fulfilled in carrying out the cost control strategy. However, most of respondents reported that their hospitals have not found a way to overcome existing obstacles. Only 17% respondents who confidents that their management can solve the current obstacles in cost management.

The questionnaires results revealed relatively strong commitment of the public hospitals to control patient costs. This result is not consistent with the earlier study results that show a weak interest and concern on patient costs (for instance, Fahlevi, 2016). The most potential explanation could be that the difference of scope and impact of DRG payment on hospitals. In the past, DRG rates or payment was used to reimbursed a small group of patients. Since 2016, the hospitals are paid using DRG rates for most of the patients, namely to pay the costs of treatment of patients in the scheme of BPJS (Mardiah & Rivany, 2017; Rawung & Sholihin, 2017).

Moreover, the result of this study found a less intense of collaboration between management and doctors in terms of cost controlling. This finding supports most of prior studies on doctors' involvement on cost containment strategies in hospitals. For instance, Sushmita et al. (2015) found that lack of doctors' participation in cost management was the reason behind the failure of accounting expansion in hospital activities, while Lehtonen, (2007) documented doctors' willingness to involve in cost management lead to a successful patient cost reduction. The best explanation could that the control strategies contradictive with values and priorities of the doctors (Leotta & Ruggeri, 2012).

In nutshell, this study has provided empirical evidence on the influence of patient profiles (gender and age), severity, LOS and treatment class on CRR of inpatient cases in Indonesian public hospitals. The

model can be used to predict and evaluate treatment of inpatient costs in hospitals. The hospital managements can further discuss the models and outcome with doctors to find most cost efficient and effective way to contain patient costs without reducing the quality of health care provision.

CONCLUSION, IMPLICATION AND LIMITATION

This study examined the influence of patient profiles, severity, length of stay (LOS), and treatment class/ bed class for case profitability proxied by CRR in three Indonesian public hospitals. The results show that patient gender, age, LOS, severity and treatment classhave a positive significant effect on CRR the inpatient cases. In addition, this study also used questionnaires to elaborate the perspective of managers and doctors in the public hospitals on cost management system and procedures in their hospitals. The results suggested that improved cost management system and procedures are required to facilitate CRR evaluation and improvement.

Prior studies unveiled a lacking of patient cost management and hospital management is still using tradition and aggregate cost analysis although DRG based payment system has been adopted (Jovanović et al., 2019). The reason could be that hospitals are not able to define cost drivers of patient treatment and their profitability. Therefore, the determinants and regression models tested in this study can be used to facilitate more case-based cost control and case mix accounting adoption in hospitals (Fahlevi, et al., 2022).

This study is not free from limitation. Firstly, patient data only collected from public hospitals in an Indonesian province. Thus, statistical generalization of the results should be taken carefully because this study only used patient costs from three public hospitals. The results may be different if the study conducted in private hospitals or special hospitals (for instance hospital for cancer treatment) Secondly, questionnaires used in this study do not able to provide depth insight how hospital control patient costs and obstacles their faced. Therefore, some important questions are remained unaddressed. Hence, it is imperative to involve private hospitals to gain a more complex and representative results. In-depth interviews using specific theories might be beneficial to gain insights of cost management in hospitals particularly in DRG era where profitability of cases plays a crucial role.

ACKNOWLEDGEMENT

This research is funded by Universitas Syiah Kuala under Penelitian H Indeks research scheme 2021.

REFERENCES

Aljunid, S. M., & Jadoo, S. A. A. (2018). Factors influencing the total inpatient pharmacy cost at a tertiary hospital in Malaysia: A retrospective study. *Inquiry (United States)*, *55*, 0–7. https://doi.org/10.1177/0046958018755483

Angstman, K.B., Doganer, Y.C., Dejesus, R.S. & Rohrer, J.E. (2016), Increased medical cost metrics for patients 50 years of age and older in the collaborate care model of treatment for depression, *Psychogeriatrics*, *16*(2), 102-106.

Annisa, R., Winda, S., Dwisaputro, E., & Isnaini, K. N. (2020). Mengatasi Defisit Dana Jaminan Sosial Kesehatan Melalui Perbaikan Tata Kelola. *INTEGRITAS: Jurnal Antikorups*, *6*(2), 209–224. https://doi.org/10.32697/integritas.v6i2.664

Ariwardani, B.N., Tamtomo, D.G. and Murti, B. (2019), Factors affecting the cost gap between INA CBGs tariff and hospital tariff for patients with dengue hemorrhagic fever in Ngawi regional public hospital, East Java, *Journal of Health Policy and Management, 4* (3), 204-213

Arfiani, M., Fahlevi, H., Akuntansi, P. S., & Aceh, P. (2020). Cost Recovery Rate dan Pengendalian Biaya di Rumah Sakit: Studi kasus pada Rumah Sakit Pemerintah. *Jurnal ASET (Akuntansi Riset)*, *12*(2), 372–383. https://doi.org/10.17509/jaset.v12i2.26317

Aulia, S., Supriadi, S., Sari, D. K., & Mutiha, A. (2016). Cost Recovery Rate Program Jaminan Kesehatan Nasional Bpjs Kesehatan. *Akuntabilitas*, *8*(2), 111–120. https://doi.org/10.15408/akt.v8i2.2767

Aurelia, A., & Pujiyanti, E. (2017). Biaya Satuan dan Pemulihan Biaya (Cost Recovery Rate) Layanan Pasien Acute Coronary Syndrome dengan Rawat Inap di Rumah Sakit X Tahun 2015. *Jurnal Ekonomi Kesehatan Indonesia*, *1*(3), 132–137. https://doi.org/10.7454/eki.v1i3.1778

Camilleri, C., Jofre-Bonet, M., & Serra-Sastre, V. (2018). The suitability of a DRG casemix system in the Maltese hospital setting. *Health Policy*, *122*(11), 1183–1189. https://doi.org/10.1016/j.healthpol.2018.08.002

Chaikledkaew, U., Pongchareonsuk, P., Chaiyakunapruk, N. & Ongphiphadhanakul, B. (2008), Factors affecting health-care costs and hospitalizations among diabetic patients in Thai public hospitals", Value in Health, 11, 69-74.

Cook, A., & Averett, S. (2020). Do hospitals respond to changing incentive structures? Evidence from Medicare's 2007 DRG restructuring. *Journal of Health Economics*, *73*, 102319. https://doi.org/10.1016/j.jhealeco.2020.102319

di Giacomo, M., Piacenza, M., Siciliani, L., & Turati, G. (2017). Do public hospitals respond to

changes in DRG price regulation? The case of birth deliveries in the Italian NHS. Health Economics (United Kingdom), 26(May), 23–37. https://doi.org/10.1002/hec.3541

Dumaris, H. (2015). Analisis Perbedaan Tarif Rumah Sakit dan Tarif INA-CBG ' s Pelayanan Rawat Jalan di RSUD Budhi Asih Jakarta Tahun 2015 Analysis on Tariff Differences Between Hospital' s Tariff and INA - CBG ' s Tariff for Outpatient In Budi Asih Hospital Jakarta on 2015. *Jurnal ARSI*, *3*, 20–28.

Eldenburg, L. G., Krishnan, H. A., & Krishnan, R. (2017). Management Accounting and Control in the Hospital Industry: A Review. *Journal of Government & Nonprofit Accounting*, *6*(1), 52–91. https://doi.org/10.2308/ogna-51922

Fahlevi, H. (2016). Understanding why the role of accounting is unchanged in Indonesian public hospitals. *Journal of Accounting and Organizational Change*, *12*(2). https://doi.org/10.1108/JAOC-03-2014-0020

Fahlevi, H., Irsyadillah, I., Indriani, M., & Oktari, R. S. (2022). DRG-based payment system and management accounting changes in an Indonesian public hospital: exploring potential roles of big data analytics. *Journal of Accounting and Organizational Change*, *18*(2), 325–345. https://doi.org/10.1108/JAOC-10-2020-0179

Fahlevi, H., Mustika, V. M., Mulyany, R., Rahavu, M., Yasir, M., & Dawood, R. (2021). Predicting Cost Recovery Rate of Inpatient Cases: The Application of Machine Learning Approaches. *2021 International Conference on Decision Aid Sciences and Application, DASA 2021*, 1002–1006. https://doi.org/10.1109/DASA53625.2021.9682351

Fahlevi, H., Putra, T. R. I., & Oktari, R. S. (2020). Predicting Cost Recovery Rate of Ischemic Stroke Patients: A Potential Application of Big Data Analysis in Hospital. *Journal of Physics: Conference Series*, *1500*(1). https://doi.org/10.1088/1742-6596/1500/1/012106

Gümüş, A., Çilli, A., Çakın, Ö., Karakurt, Z., Ergan, B., Aksoy, E., & Cengiz, M. (2019). Factors affecting cost of patients with severe community-acquired pneumonia in intensive care unit. *Turkish Thoracic Journal*, *20*(4), 216–223. https://doi.org/10.5152/TurkThoracJ.2018.18084

Handayani, L., Suharmiati, S., & Pratiwi, N. L. (2019). Unit Cost Rumah Sakit Dan Tarif Ina-Cbgs: *Buletin Penelitian Sistem Kesehatan*, *21*(4), 219–227. https://doi.org/10.22435/hsr.v21i4.45

Jacobs, K., Marcon, G., & Witt, D. (2004). Cost and performance information for doctors: An international comparison. *Management Accounting Research*, *15*(3), 337–354. https://doi.org/10.1016/j.mar.2004.03.005

Jovanović, T., Dražić-Lutilsky, I., & Vašiček, D. (2019). Implementation of cost accounting as the economic

pillar of management accounting systems in public hospitals–the case of Slovenia and Croatia. *Economic Research-Ekonomska Istrazivanja* , *32*(1), 3754–3772. https://doi.org/10.1080/1331677X.2019.1675079

Kulkarni, S., Ambekar, S.S. and Hudnurkar, M. (2021), Predicting the inpatient hospital cost using a machine learning approach", *International Journal of Innovation Science*, *13* (1), 87-104. https://doi.org/10.1108/IJIS-09-2020-0175

Kuo, C. Y., Yu, L. C., Chen, H. C., & Chan, C. L. (2018). Comparison of models for the prediction of medical costs of spinal fusion in Taiwan diagnosis-related groups by machine learning algorithms. *Healthcare Informatics Research*, *24*(1), 29–37. https://doi.org/10.4258/hir.2018.24.1.29

Lehtonen, T. (2007). DRG-based prospective pricing and case-mix accounting — Exploring the mechanisms of successful implementation. *Management Accounting Research*, *18*, 367–395. https://doi.org/10.1016/j.mar.2006.12.002

Leotta, A., & Ruggeri, D. (2012). Changes in performance measurement and evaluation systems as institutional processes: The case of an italian teaching hospital. *Studies in Managerial and Financial Accounting*, *25*, 427–463. https://doi.org/10.1108/S1479-3512(2012)0000025019

Liputan 6. Bertahun-tahun Defisit, Keuangan BPJS Kesehatan Akhirnya Surplus Rp 38,7 Triliun. https://www.liputan6.com/bisnis/read/5005877/bertahun-tahun-defisit-keuangan-bpjs-kesehatan-akhirnya-surplus-rp-387-triliun.

Maghfira, K., Fahlevi, H., & Basri, H. (2018). The Role of Doctor in Accounting and Cost Containment Strategy in Public and Private Hospitals in Banda Aceh. *Account and Financial Management Journal*, *3*(03), 1437–1442. https://doi.org/10.18535/afmj/v3i3.11

Mardiah. (2016). Cost Recovery Rate Tarif Rumah Sakit dan Tarif INA-CBG's Berdasarkan Clinical Pathway pada Penyakit Arteri Koroner di RSUP Dr. Mohammad Hoesin Palembang Tahun 2015. *Jurnal Administrasi Rumah Sakit Indonesia*, *2*(3), 245–259.

Mardiah, M., & Rivany, R. (2017). Cost Recovery Rate Tarif Rumah Sakit dan Tarif INA-CBG's Berdasarkan Clinical Pathway pada Penyakit Arteri Koroner di RS Pemerintah A di Palembang Tahun 2015. *Jurnal Ekonomi Kesehatan Indonesia*, *1*(4), 175–184. https://doi.org/10.7454/eki.v1i4.1794

Perelman, J., & Closon, M. C. (2007). Hospital response to prospective financing of in-patient days: The Belgian case. *Health Policy*, 84(2–3), 200–209. https://doi.org/10.1016/j.healthpol.2007.05.010

Pettersen, I., & Solstad, E. (2014). Managerialism and profession-based logic: The use of accounting information in changing hospitals. *Financial*

Accountability & Management, 30(4), 363–382.

Rahayuningrum, I. O., Tamtomo, D., & suryono, A. (2016). Comparison Between Hospital Inpatient Cost and INA-CBGs Tariff of Inpatient Care in the National Health Insurance Scheme in Solo, Boyolali and Karanganyar Districts, Central Java. *Journal of Health Policy and Management*, *01*(02), 102–112. https://doi.org/10.26911/thejhpm.2016.01.02.05

Rawung, L. C., & Sholihin, M. (2017). Does Extended Autonomy of Public Service Agency Lead to A Better Performance? A Case of Indonesian Community Health Centers. *Jurnal Dinamika Akuntansi Dan Bisnis*, *4*(2), 231–248. https://doi.org/10.24815/jdab.v4i2.8082

Rauliajtys-Grzybek, M., Baran, W., & Macuda, M. (2017). Cost accounting in public hospitals in Poland: Usefulness for internal and external purposes. *Journal of Health Management*, 19(2), 275–291. https://doi.org/10.1177/0972063417699690

Sari, R. P. (2014). Perbandingan Biaya Riil Dengan Tarif Paket INA CBGs. *Journal Spread*, *4*(April), 61–70.

Suhartoyo, S. (2018). Klaim Rumah Sakit Kepada BPJS Kesehatan Berkaitan Dengan Rawat Inap Dengan Sistem INA– CBGs. *Administrative Law and Governance Journal*, *1*(2), 182–195. https://doi.org/10.14710/alj.v1i2.182-195

Sushmita, S., Newman, S., Marquardt, J., Ram, P., Prasad, V., De Cock, M., & Teredesai, A. (2015). Population cost prediction on public healthcare datasets. *ACM International Conference Proceeding Series*, *2015-May*, 87–94. https://doi.org/10.1145/2750511.2750521

Sutoto. (2014). Perubahan Tarif INA-CBGs. *Info BPJS Kesehatan*, *8*, 1–12.

Wang, C., Pan, X., Zhuang, W., & Ma, F. (2018). Forecast of hospitalization costs of child patients based on machine learning methods and multiple classification. J*ournal of Advances in Information Technology*, 9(4). https://doi.org/10.12720/jait.9.4.89-96

Wu, A., Dong, H., Wu, Q., & Ling, L. (2011). A survey of application-level protocol identification based on machine learning. *Proceedings - 2011 4th International Conference on Information Management, Innovation Management and Industrial Engineering, ICIII 2011*, *3*, 201–204. https://doi.org/10.1109/ICIII.2011.331