



# Indian Journal of Public Health Research & Development

An International Journal

## SCOPUS IJPHRD CITATION SCORE

Indian Journal of Public Health Research and Development  
Scopus coverage years: from 2010 to 2018. Publisher:  
R.K. Sharma, Institute of Medico-Legal Publications  
ISSN:0976-0245E-ISSN: 0976-5506 Subject area: Medicine:  
Public Health, Environmental and Occupational Health  
CiteScore 2017-0.03  
SJR 2017 - 0.108  
SNIP 2017- 0.047



Website:

[www.ijphrd.com](http://www.ijphrd.com)

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**Print-ISSN:** 0976-0245-**Electronic-ISSN:** 0976-5506, **Frequency:** Quarterly  
(Four issues per volume)

**Indian Journal of Public Health Research & Development** is a double blind peer reviewed international journal. It deals with all aspects of Public Health including Community Medicine, Public Health, Epidemiology, Occupational Health, Environmental Hazards, Clinical Research, and Public Health Laws and covers all medical specialties concerned with research and development for the masses. The journal strongly encourages reports of research carried out within Indian continent and South East Asia.

The journal has been assigned International Standards Serial Number (ISSN) and is indexed with Index Copernicus (Poland). It is also brought to notice that the journal is being covered by many international databases. The journal is covered by EBSCO (USA), Embase, EMCare & Scopus database. The journal is now part of DST, CSIR, and UGC consortia.

**Website : [www.ijphrd.com](http://www.ijphrd.com)**

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Logix Office Tower, Unit No. 1704, Logix City Centre Mall,  
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### Printed, published and owned by

**Dr. R.K. Sharma**  
Institute of Medico-legal Publications  
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,  
Sector- 32, Noida - 201 301 (Uttar Pradesh)

### Published at

**Institute of Medico-legal Publications**  
Logix Office Tower, Unit No. 1704, Logix City Centre Mall,  
Sector- 32, Noida - 201 301 (Uttar Pradesh)



# Indian Journal of Public Health Research & Development

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# Performance Analysis of Indonesian Public Hospitals: A Panel Data Method

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## Abstract

Balanced Score Card approach to health sector organizations measures performance based on financial and non-financial aspects which are divided into four perspectives, namely customer perspective, business and internal process perspectives, learning and growth perspectives, and financial perspective. The study uses a quantitative approach with panel data regression analysis. Panel data is used to analyze the hospital performance with balanced scorecard approach in Indonesian public hospitals, based on patient satisfaction, service quality, human resources competencies and cost efficiency. Data analysis used the cross section data of 14 public hospitals in Indonesia and the time series data from 2015 to 2017 so that there are longitudinal data as many as 42 data. Based on the results of panel data regression analysis concluded that significantly patient satisfaction, service quality, human resources competencies and cost efficiency affect the hospital performance and they are the critical success factors of hospital performance with balanced scorecard approach in Indonesian Public Hospital.

**Keywords :** Health Sector Organization, Balanced Scorecard, Hospital Performance

## Introduction

Kaplan in 2001 states that balanced scorecard approach could be used in health sector organizations and non-profit organizations with the modification of balanced scorecard according to the characteristics of the organization itself. Modifications to balanced scorecard are very necessary because organizational characteristics in the private sector and public sector are different where the private sector prioritizes financial perspectives.<sup>(1,2)</sup>

Balanced scorecard approach has been used in many health service sectors, both profit and non-profit, including: a) Hospitals; b) Health Service System; c) University Hospital / Department of Health; d) Long-term Services; e) Center for Mental Health; f) Pharmacy

Services; g) Health Insurance Company.<sup>(3)</sup>

Hospitals as public service institutions must to implement a performance management that is oriented to patient satisfaction. Indonesia public hospitals must be able to create superior performance or performance excellence, as well as hospitals as providers of health services through the provision of services in accordance with service standards. One of the strategies carried out by hospital managers in increasing patient satisfaction is service quality.<sup>(4)</sup>

The central public hospitals as one of the government agencies must be able to provide accountability to the government and the community as service users. Therefore there needs to be a performance measurement that covers all aspects. Balanced scorecard is the right choice for measuring performance from both financial and non-financial aspects.<sup>(4)</sup>

Balanced Scorecard approach to public sector organizations measures performance based on financial and non-financial aspects which are divided into four perspectives, namely customer perspective, business

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and internal process perspectives, learning and growth perspectives, and financial perspective. Financial perspective looks at performance from the point of view of profitability in achieving financial targets, so it is based on sales growth, return on investment, operating income, cash flow, and cost efficiency. Customer perspective is based on patient satisfaction, customer profitability, customer retention, and market share. Business and internal process perspectives identify critical factors in the organization's internal processes by focusing on developing new processes that are customer needs. Service efficiency, service effectiveness and service quality are things that must be developed and improved to achieve the goals of increasing value for customers and stakeholders. Learning and growth perspective measures factors related to technology, development of human resources, systems and procedures, and other factors that need to be updated.<sup>(4)</sup>

Research conducted by Aurora seeks to implement balanced scorecard for use in public sector organizations. The results of the study indicate that performance measurement using balanced scorecard is better than using traditional performance measurements. Balanced scorecard is deemed appropriate to be used as a tool to measure public sector performance because it not only emphasizes the quantitative-financial aspects, but also considers the qualitative and non-financial aspects. This is in line with the objectives of the public sector which places profits not only as a key performance measure, but services that tend to be qualitative and non-financial<sup>(4)</sup>

The Mackay Memorial Hospital in Taiwan shows that balanced scorecard approach is useful in order to sharpen its competitive advantage. It helps to take a more strategic approach that would differentiate services and attract more business. Balanced scorecard approach also improve collaboration and communication between all levels of key stakeholders and staff.<sup>(5)</sup>

Hogland Hospital in Swedia also uses balanced scorecard as a tool to measure financial control and service quality improvement, along with human resources developments. At first, balanced scorecard was used as a two-year trial but continued because of the success of the trial.<sup>(6)</sup>

This study aims to analyze the hospital performance with balanced scorecard approach in Indonesian public hospitals, based on patient satisfaction, service quality,

human resources competencies and cost efficiency.

## Method

This study uses a quantitative approach with panel data regression analysis to determine factors that affect hospital performance with balanced scorecard approach in Indonesia public hospital. Data analysis used the cross section data of 14 public hospitals in Indonesia and the time series data from 2015 to 2017 so that there are longitudinal data as many as 42 data.

Data used for analysis is secondary data in the form of government agency performance accountability report, annual report, business strategy plan, and budget business plan from 2015 to 2017 at Indonesian Public Hospital. The following are described in the stages of this research.

## Results

Panel data regression analysis in this study is used to analyze several variables that affect the hospital performance based on four perspectives of balanced scorecard, which is based on previous theory and the results of previous studies. The independent variables used in panel data regression analysis in this research were patient satisfaction, service quality, human resources competencies and cost efficiency during 2015 to 2017.

Hospital performance variable is proxied from the percentage of hospital performance achievement figures based on indicator of public service agency. Patient satisfaction is proxied from the ratio of community satisfaction index assessment results divided by the maximum scale of the community satisfaction index value. Service quality are proxied from the ratio of each indicator of service timeliness, namely outpatient waiting time, emergency response time, length of stay, waiting time for radiology services, waiting time for laboratory service, waiting time before surgery, and speed of prescription services for finished drugs. Human resources competencies is proxied from the ratio of the number of hospital human resources divided by the number of human resources according to the hospital's minimum service standard. Cost efficiency is proxied from the ratio of PNPB income divided by operating costs. Data used in this study are time series data for three periods (2015-2017) and cross section data as many as 14 RSUP. So that the longitudinal data is 42 data.

One of the requirements in panel data regression analysis is that data must be met with normal elements. Data that is not met by normality, usually due to data that has extreme values or outliers or is also commonly used in terms of outliers. The purpose of this normality test is as a tool to see whether the standardized residual values on the model are normal or not. To find out, it can be seen with most of the standardized residual values approaching the mean.

Normality test in this study was carried out by using the graph method and histogram with Jarque-Bera test. Dependent variable is the average value of hospital performance depicted in the graph as the vertical axis. The horizontal axis shows standardized residual values. To see whether the distribution of data found to be normal or not is seen from the value of Jarque-Bera and its probability value. Data is not normally distributed if the statistical test results obtained p-value <0.05. Whereas, if the statistical test results obtained p-value > 0.05 then data is normally distributed. Based on the statistical test results, Jarque-Bera value is 0.625919 and p-value is 0.731280 (> 0.05), it can be concluded that data is normally distributed and panel data regression analysis can or is feasible.

Regression equations can be estimated using three models, namely Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Common effect model and fixed effect model are estimated using panel least squares method, while random effect model is estimated using GLS method. Of the three models, one of the more appropriate models will be chosen to be used in analyzing the factors that influence the hospital performance using balanced scorecard approach in Indonesian public hospitals. Which approach estimation model will be used in analyzing the factors that influence the hospital performance with balanced scorecard approach in Indonesian public hospitals depending on the results of model selection. The selection of this model is done by testing the model using Chow test, Hausman test, and Lagrange Multiplier (LM) test.

**Table 1: Regression Model for Performance Analysis of Indonesian Public Hospital with Random Effect Model**

Independent Variables	Dependent Variable: Hospital Performance (HP <sub>it</sub> )		
	Koef. Regression	t-statistic	P-value
Constants (C)	0,153505	1,205712	0,2380
Patient Satisfaction (PS <sub>it</sub> )	0,119777	2,062061	0,0486*
Service Quality (SQ <sub>it</sub> )	0,013752	2,112694	0,0437*
Human Resources Competencies (HRC <sub>it</sub> )	0,045950	3,054089	0,0049*
Cost Efficiency (CE <sub>it</sub> )	0,110867	2,321495	0,0278*
F-Statistic	16,25336		
Prob (F-Statistics)	0,0001		
Coefficient of Determination (R <sup>2</sup> )	0,698968		
* significant at the 5% error rate			

Redundant fixed effect test/chow test shows that the probability of cross-section chi-square is 0.0003 (<0.05), it can be concluded that the most appropriate model used between common effect and fixed effect is fixed effect.

Correlated random effect test/hausman test shows that the probability of cross-section random is 0.3478 (<0.05), it can be concluded that the most appropriate model used between fixed effect and random effect is random effect.

Omitted random effect test/lagrange multiplier test shows that the probability of cross-section breusch-pagan is 0.0017 (>0.05), it can be concluded that the most appropriate model used between common effect and random effect is random effect. Based on chow test and hausman test, it can be concluded that the most appropriate model used for panel data regression analysis in this study is random effect model.

Model that has been prior to analysis is conducted prior classical assumptions underlying panel data regression model in order to obtain a model that is efficient, visible and consistent. With the Random Effect model selected, it is not relevant to do the Classic Assumption test. This is because the Random Effect model uses the estimated Generalized Least Square (GLS) method. GLS technique can overcome

the time series autocorrelation and correlation between observations (cross section). GLS method produces an estimator to fulfill the Best Linear Unbiased Estimation (BLUE) characteristic which is a treatment method to overcome violations of heteroscedasticity assumptions and autocorrelation.

Goodness of fit test in this study consisted of three tests. There are F-statistic, t-statistic and coefficient of determination. F-statistic test was conducted to determine whether the independent variables in the overall significantly affect the dependent variable.

Based on Table 1. the probability of F-statistic is 0.0001 (<0.05). It can be concluded that the regression model is used to explain the effect worthy of patient satisfaction, service quality, human resources competencies and cost efficiency of the hospital performance. t-statistic test was done to see how far the influence of independent variables individually explain the variations of dependent variable. Table 5 shows that patient satisfaction (p=0.0486), service quality (p=0.0437), human resources competencies (p=0.0049), and cost efficiency (p=0.0278) significantly

affect the hospital performance.

Coefficient of determination test was conducted to measure that the independent variables in the regression model was able to explain the dependent variable. Table 1 shows that the value of  $R^2$  is 0.698968, it means patient satisfaction, service quality, human resources competencies and cost efficiency has an influence on the proportion of hospital performance by 69.90%. Indeed, 1.57% is influenced by other variables that are not in the regression model.

The regression equation (1) indicates that  $HP_{it}$  is the hospital performance,  $PS_{it}$  is patient satisfaction,  $SQ_{it}$  is service quality,  $HRC_{it}$  is human resources competencies and  $CE_{it}$  is cost efficiency.  $\beta_0$  is the regression coefficient constants,  $\beta_1$  is the regression coefficient of patient satisfaction,  $\beta_2$  is the regression coefficient of service quality,  $\beta_3$  is the regression coefficient of human resources competencies and  $\beta_4$  is the regression coefficient of cost efficiency.  $t_0$  is the t-statistic constants,  $t_1$  is the t-statistic of patient satisfaction,  $t_2$  is the t-statistic of service quality,  $t_3$  is the t-statistic of human resources competencies and  $t_4$  is the t-statistic of cost efficiency.

$$HP_{it} = \beta_0 + \beta_1 * PS_{it} + \beta_2 * SQ_{it} + \beta_3 * HRC_{it} + \beta_4 * CE_{it} \tag{1}$$

$(t_0) \quad (t_1) \quad (t_2) \quad (t_3) \quad (t_4)$

$$HP_{it} = 0,153505 + 0,119777*PS_{it} + 0,013752*SQ_{it} + 0,045950*HRC_{it} + 0,110867*CE_{it} \tag{2}$$

$(1,205712) \quad (2,062061) \quad (2,112694) \quad 3,054089) \quad (2,321495)$

The regression equation (2) means that for any increase in patient satisfaction indicator by 1 if the other variable is assumed to remain, the hospital performance will increase by 0.119777. Any increase in service quality indicator by 1 if the other variable is assumed to remain, the hospital performance will increase by 0.013752. Any increase in human resources competencies indicator by 1 if the other variable is assumed to remain, the hospital performance will increase by 0.045950. Any increase in cost efficiency indicator by 1 if the other variable is assumed to remain, the hospital performance will increase by 0.110867.

**Discussion**

Ramon-Jeremino et al. shows that the balanced

scorecard would allow a proper monitoring and tracking system for the main healthcare indicators. This contributes to a better control in comparison with standards that are associated with adequate quality assistance. It is necessary to adapt the balanced scorecard to the specific characteristics of the clinical field, redefining both perspectives and indicators.<sup>(7)</sup>

Chang and Wu examined the implementation of the Balanced Scorecard in hospital cases in Taiwan. In order to improve its competitive position, hospitals began implementing the Balanced Scorecard in 2001. This was the first hospital to implement the Balanced Scorecard in the health system in Taiwan and one of the few successful implementations. The hospital is a pioneer in implementing the Balanced Scorecard



for health organizations in Taiwan. Furthermore, the implementation of the Balanced Scorecard in hospitals is for all entities, not just for certain departments. The implementation of the Balanced Scorecard is initiated and evaluated through four sequential phases, which take a complete eight years. By identifying the determinants of success, it can overcome some serious challenges and difficult conditions faced by the Balanced Scorecard that will be implemented.<sup>(5)</sup>

Edward et al. began examining trends from 29 key performance indicators over a period of 5 years (2004-2008). The findings show that the Balanced Scorecard was successfully used to increase the capacity of the health and service systems through the performance of benchmarking over a 5-year research period. The most important thing is that the use of the Balanced Scorecard helps to show the effects of investment, facilitates policy changes, and culture-based decision making in the primary health care system in Afghanistan. Furthermore, the researchers reminded that the continued success of the Balanced Scorecard in Afghanistan will greatly depend on the ability to accommodate all changes in existing health system policies.<sup>(8)</sup>

Edward et al. also stated that significantly there was an increase in the domain of patient and community satisfaction with services with  $p < 0,0001$ . There was also a significant increase in the service quality domain from 2004-2008 with  $p < 0,0001$ . The availability of drugs, equipment, clinical guidelines, laboratory use, and knowledge of service providers and training shows a significant increase since 2004.<sup>(8)</sup>

According to Bitner argues that perceived service quality is the result of a comparison of performance and received by consumers from service providers.<sup>(9)</sup> Oliver and Burke state that overall service quality is determined by the suitability of desires that result from a comparison of wants and performance perceived by consumers. Quality services will create satisfaction for service users who can ultimately provide benefits, including harmonious relationships between service providers and customers, providing a solid basis for repurchase, and creating customer loyalty.<sup>(10)</sup>

### **Conclusion**

Patient satisfaction, service quality, human resources competencies and cost efficiency affect the hospital performance significantly and they are the critical

success factors of hospital performance with balanced scorecard approach in Indonesian Public Hospital.

**Conflict of Interest Statement:** The authors declare that there is no conflict of interest.

**Ethical Clearance:** Research ethics approval was obtained from the Faculty of Medicine, University of Andalas Padang, granted number 352/UN.14.2/KEP/2018.

**Source of Funding:** The study was funded by Center of Standardization and Continuous Education of Indonesian Ministry of Health of Indonesia and The Government of Bengkulu Province.

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