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**MODE OF DELIVERY, HOSPITAL OWNERSHIP AND
PREDICTORS MATERNITY LENGTH OF STAY IN TWO
HOSPITALS IN JAKARTA**

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ABSTRACT

Background: Length of stay (LOS) is one of the most common indicator used for hospital performance assessment. The longer LOS for mothers giving birth can increase the risk of nosocomial infections and cause some psychological problems.

Aims: This study aims to analyze the determinants of maternal length of stay which can be used to evaluate the hospital efficiency and quality care improvement.

Methods: The cross-sectional study was conducted in two hospitals in Jakarta. We used the medical records of women who underwent delivery during the period of January 1 to December 31, 2011. Multivariate linear regression analysis with stepwise method was used to predict length of stay.

Results: The study found 2727 patients met the inclusion criteria and were included in the analysis. The overall mean length of hospital stay was 3 days and the mean of mother's age was 29,9 years old. Among all of the covariates, mode of delivery had largest impact on LOS, with cesarean section increasing LOS by 1.2 days on average (Coef=1,21; P=0,000), followed by hospital ownership with private hospital reducing LOS 0,79 days on average (Coef = 0,79; P=0,000).

Conclusion: Mode of delivery and hospital ownership were the strong predictors for maternal length of stay in two hospitals in Jakarta.

Keywords: mode of delivery, hospital ownership, length of stay

INTRODUCTION

Length of stay (LOS) is one of the most common indicator used for hospital performance assessment [1,2]. It is considered as the effective measure for efficiency of the hospital delivery process and quality of care indicator [3,4]. The excess length of stay has an economic consequences which would increase the costs per patient and make beds unavailable for other patients [5]. The longer LOS for mothers giving birth can increase the risk of nosocomial infections and cause some psychological problems such as sleep disturbance, breastfeeding problem, maternal dissatisfaction, paternal involvement and family bonding problems [6].

There is a wide variation in the length of stay after giving birth between countries. The mean length of stay ranged from 0.5 to 6.2 days for vaginal deliveries and 2.5 to 9.3 days for cesarean-section deliveries [6]. According to WHO recommendation the cut off LOS for uncomplicated vaginal deliveries was 24 hours, but for cesarean section there was less evidence for choosing cut off, yet the united states consider 48 – 72 hours for complicated cesarean section and allowed to stay until 96 hours [6]. In Indonesia, the length of stay for cesarean section

deliveries was reported ranging from 4 to 13 days in 2010 [7]. Meanwhile in 2015 most women with cesarean deliveries have less than 5 days of hospital stay [8].

Several studies showed various factors that contribute to the maternal length of stay after delivery including cesarean section, birthweight, multiple birth, infant survival status, advanced maternal age, birth attendants, gained excess weight during pregnancy and the presence of obstetric complications [6,9,10]. Indonesia still has limited data on how much is actually the mean of maternal LOS after delivery and its determinants. Therefore, this study aims to analyze the determinants for maternal length of stay in two hospitals in Jakarta which can be used to evaluate hospital efficiency and quality care improvement. It was hypothesized that mode of delivery and hospital ownership are more influential than demographic characteristics in predicting maternal length of stay.

METHODS

The cross-sectional study was conducted in two hospitals in Jakarta. We used the medical records of women who underwent delivery during the period of January 1 to December 31, 2011. The data that were collected including patient's demographic characteristics (mother's age, mother's education level, mother's occupations, funding source), hospital ownership, mode of delivery, clinical risk factors (gemelli, haemorrhagia antepartum/HAP, malpresentation, history of hypertension, (pre-)eclampsia, anemia), and delivery by social indications.

LOS as dependent variable was defined as the time from patient admission to the hospital until discharge (in days). This study excluded the patients less than 15 years of age and greater than 45 years of age, the patients with a length of stay of longer than 7 days (were considered to represent unusual cases) and the patients with incomplete data. The predictors for LOS as independent variables were mothers age (years), hospital ownership which was recorded as public and private hospital, mode of delivery was categorized as vaginal and cesarean delivery. Education level was categorized into three groups: low (uneducated until complete primary school), middle (complete junior high school) and high (complete senior high school or more). Mother's occupations were divided into 5 categories (unemployed/housewife, military/police/civil servants/state, private employees, entrepreneurs/traders and laborer). Payment sources were grouped into five categories: out of pocket, civil servants insurance (provided by *Askes*), company (*Jamsostek* or other company insurances), private insurance and social insurance (*Jamkesmas*, *Jamkesda*, or *Jampersal*).

Clinical risk factors were categorized as yes and no (diagnose was established by professional health workers in the hospital as gemelli, haemorrhagia antepartum/HAP, malpresentation, history of hypertension, (pre-) eclampsia, anemia). Delivery by social indications was operationalized as delivery based on patient's demand. Multivariate linear regression analysis with stepwise method was used to predict length of stay by using STATA version 9. The null hypothesis was accepted if mode of delivery and hospital ownership did not significantly influence maternal length of hospital stay. Ethical approval was obtained from National Institute for Health Research and Development Ethics Committee, Ministry of Health, Republic of Indonesia on July 25, 2012.

RESULTS

The study found 2727 patients met the inclusion criteria and were included in the analysis. The overall mean length of hospital stay was 3 days and the mean of mother's age was 29,9 years old. Table 1 shows the geometric length of stay means was almost distributed similarly in respect with mother's education level and occupation. Meanwhile those with company and civil servant

insurance, cesarean delivery, mothers with clinical risk factors and perform delivery in government hospital had higher geometric mean length of stay.

Table 2. presents patient's demographic characteristics, including age, education, and payment source had effect on LOS except occupation. Every addition of 1year mother's age seems to elevate length of hospital stay. Compared to the respective reference group, patients with insurance payment appears to stay longer meanwhile low and middle educated mothers were more likely to stay shorter. However such effects were very small, these variables contributed less than 15% of the difference on LOS. Otherwise mode of delivery, hospital ownership and clinical risk factors except anemia were more likely to have much contribution on LOS.

Table 1. Patients' demographic and clinical characteristics on the length of stay

Variable	Frequency		Mean length of stay (days)
	n (2772)	%	
Mother's education			
High ^R	730	26.8	2.87
Middle	1339	49.1	2.72
Low	658	24.1	2.51
Mother's occupation			
Unemployed/housewife ^R	1902	69.7	2.69
Military/police/civil servants/state	147	5.4	2.97
Private employees	551	20.2	2.75
Entrepreneur/traders	86	3.2	2.69
Laborer	41	1.5	2.20
Payment source			
Out of pocket ^R	1403	51.4	2.53
Company insurance	160	5.9	3.25
Private insurance	63	2.3	2.68
Civil servant insurance	254	9.3	3.09
Social insurance	847	31.1	2.81
Mode of delivery			
Vaginal delivery ^R	893	32.7	1.86
Caesarean section	1834	67.3	3.26
Hospital ownership			
Government ^R	1292	47.4	3.21
Private	1435	52.6	2.32
Malpresentation			
No ^R	2385	87.5	2.66
Yes	342	12.5	3.11
Haemorrhagia antepartum			
No ^R	2630	96.4	2.69
Yes	97	3.6	3.33
History of hypertension			
No ^R	2451	89.9	2.63
Yes	276	10.1	3.47
(Pre-)eclampsia			
No ^R	2559	93.8	2.66
Yes	168	6.2	3.58
Gemelli			
No ^R	2667	97.8	2.69
Yes	60	2.2	3.59
Anemia			
No ^R	1791	65.7	2.68
Yes	936	34.3	2.76

Social indication				
No ^R	2484	91.1	2.63	
Yes	243	8.9	3.71	

^R used as reference category for dummy variables

Table 2. Effect of demographic and clinical risk factors on the length of stay

Variable	Estimate	Difference (%)	95% CI	p value
Mother's age	0.03	3.0	0.02 - 0.04	0.000
Mother's education	-0.14	-14.0	-0.21 - 0.08	0.000
Mother's occupation	-0.02	-2.0	-0.07 - 0.03	0.422
Payment source	0.07	7.0	0.05 - 0.10	0.000
Mode of delivery	1.37	137.0	1.28 - 1.46	0.000
Hospital ownership	-0.87	-87.0	-0.96 - -0.77	0.000
Clinical risk factors				
Malpresentation	0.34	34.0	0.19 - 0.48	0.000
HAP	0.59	59.0	0.33 - 0.85	0.000
History of hypertension	0.73	73.0	0.57 - 0.88	0.000
(Pre-)eclampsia	0.84	84.0	0.65 - 1.04	0.000
Gemelli	0.84	84.0	0.51- 1.17	0.000
Anemia	0.09	9.0	-0.01- 0.19	0.066
Social indication	0.89	89.0	0.73 – 1.06	0.000

Table 3 demonstrates among all of the covariates, mode of delivery had largest impact on LOS (with cesarean section increasing LOS by 1.2 days on average), followed by hospital ownership (with private hospital reducing LOS by 0,79 days on average), clinical risk factors (HAP, pre- eclampsia, gemelli, anemia) and payment source. Patients with cesarean section delivery and clinical risk factors except malpresentation had longer hospital stay compared to the reference group. In term of hospital effect, patients who perform delivery in private hospital stay shorter than in government hospital.

Table 3. Final fitted model to predict LOS

Variable	Estimate	95% CI	P
Mode of delivery	1.21	1.12 – 1.31	0.000
Hospital ownership	-0.79	-0.88 - -0.72	0.000
Clinical risk factors			
Malpresentation	-0.13	-0.25 – 0.01	0.042
HAP	0.26	0.05 – 0.47	0.015
(Pre-)eclampsia	0.42	0.24 – 0.61	0.000
Gemelli	0.29	0.02 – 0.55	0.034
Anemia	0.10	0.02 – 0.18	0.015
Payment source	0.07	0.04 – 0.09	0.000
Intercept	2.39	2.28 – 2.49	0.000
R-squared		36,0%	

DISCUSSION

Some limitations for this study were the absence of severity for clinical risk factors and neonatal condition information which made the prediction on LOS for more than 4 days was less accurate. This study only conducted in one private and government hospital, the prediction

hospital ownership on LOS may not represent large hospital. This study demonstrated that mode of delivery was the strongest predictor on maternal LOS. This finding was consistent with a review by Cseh who revealed the type of delivery has the largest effect on length of stay, with cesarean section increasing length of stay by 1.4 days on average [11]. The study done by Campbell reported that cesarean section delivery was one of the important factors associated with longer stay [6]. Ahlen stated Length of stay was longer for cesarean section (emergency and elective) compared to vaginal delivery [12]. Cesarean section was indicated when vaginal delivery put the mother or baby's health or life at risk [13]. The impact of anesthetic and adverse event following caesarean section also was related with extended hospital length of stay [14].

Another finding in this study is patients who perform delivery in private hospital stay shorter than in government or public hospital. Lin also found that women who underwent vaginal delivery in public hospital had longer LOS than in private hospital [15]. Meanwhile a review by Cseh stated that hospital ownership had very little effect on LOS [11]. The difference in the hospital ownership finding may be due to the private hospitals in this study was a teaching hospital for midwives where the number of vaginal delivery was higher than the government hospital. However, this result enables an interaction effect between covariates.

CONCLUSION

In conclusion, mode of delivery and hospital ownership were the strong predictors for length of stay in two hospitals in Jakarta. It is recommended that clinicians both in public or private hospitals always plan for a vaginal delivery, cesarean section should not be the delivery of choice unless it is medically required, moreover the hospitals should provide cesarean service as family-friendly as possible.

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