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Assessment of Prescribing Practice for Caesarean Section : Adherence to the Indonesian National Formulary

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ABSTRACT

Background: The increasing prevalence of *Caesarean Section* (SC*)* deliveries and non-compliance with the National Formulary can lead to financial burdens for hospitals due to claim failures and higher drug costs. Understanding this relationship is crucial for improving cost efficiency and ensuring sustainable healthcare financing.

Objectives: This study aims to analyse the percentage of prescribing compliance with the National Formulary and its impact on pharmacotherapy costs and the real costs of SC treatment at RSUD Dr. Soedarso.

Methods: This research is an observational study with a cross-sectional design. Used medical record data of mild severity SC patients for the period January-December 2023. The sample consisted of 472 patients selected by purposive sampling. Descriptive Analysis and Spearman correlation were used to evaluate the relationship between prescribing compliance, pharmacotherapy cost, and real cost.

Results: Adherence to the national formulary (97.10%). Spearman's correlation analysis shows a significant negative correlation between adherence and pharmacotherapy costs. However, adherence has no significant correlation with total treatment costs, suggesting that factors like length of stay play a greater role.

Conclusion: A significant negative correlation exists between compliance and pharmacotherapy cost, but no significant correlation with real costs. Future research should explore the relationship between total treatment costs and Length of Stay (LOS).

Keywords: National Formulary; Pharmacotherapy Costs; Prescribing Compliance; Real Costs; Sectio Caesarea

INTRODUCTION

Based on data from the 2023 Indonesian Health Survey, the prevalence of delivery by Caesarean Section (SC) has increased from 17.6% to 25.9%. West Kalimantan, in particular, experienced an increase of 4.5% from 9.9% in 2018 to 14.4% in 2023.[1–5] This increase also has implications for the cost of health services. The average real cost of SC in several hospitals was IDR 3,873,136.25, IDR 7,887,194, and IDR 1,014,125,684.[6–8.] The government implemented the National Health Insurance program to help alleviate the cost of SC treatment. Still, the amount covered varies depending on the type of hospital and the severity of the case. This can lead to cost overruns and deficits for hospitals as they still have to cover the shortfall in SC costs.

A previous study found that 79% of SC patients used drugs outside the National Formulary, resulting in a significant increase in total SC costs.[8] The use of drugs prescribed outside the National Formulary will cause losses to the hospital because the hospital experiences failure in billing (claims) for drugs to the finance department and the casemix team.[9] This condition will become a new problem for the hospital.

Prescribing compliance with the National Formulary is regulated in the Indonesian Ministry of Health No.129/Menkes/SK/II/2008; each hospital must achieve 100% compliance. Several studies have been conducted to analyse the percentage of prescribing compliance with the National Formulary, showing that the compliance rate remains below 100%. Non-compliance with prescription writing with the National Formulary can affect logistics in drug supply; besides that, it can lead to increased investment to complete drug needs outside the National Formulary. This is one of the causes of losses in the hospital.[1-2]

Therefore, this study is essential to be conducted at RSUD Dr. Soedarso, as no prior research on this issue has been reported despite its status as a type A referral hospital in West Kalimantan, with the purpose of is to determine the percentage of prescribing compliance based on the National Formulary and the pharmacotherapy cost value at RSUD Soedarso during 2023. This study will also analyse the relationship between the percentage of prescribing compliance based on the national formulary, the pharmacotherapy burden cost, and the real cost of SC.

METHODS

Study design

This study is observational. The type of observational research used is analytical research. The research design used was *cross-sectional*. The location of this study was RSUD Dr. Soedarso in Pontianak, West Kalimantan. The study was conducted from October to December 2024.

Population and samples

This study included a total population of 488 data, with 472 meeting the inclusion criteria. The inclusion criteria consisted of Caesarean Section (SC) patients with mild severity levels, INA-CBGs e-claim data with the INA-CBG code O-6-10-I, National Health Insurance program patients in Class III care, and patients aged over 18 years. A total of 16 data were excluded as they did not meet the inclusion criteria, including 3 cases where patients were transferred to a different care class and 13 cases with incomplete medical records and e-claim data. Data collection was conducted from October to November 2024 through patient medical records of those who underwent a Cesarean Section at RSUD Dr. Soedarso Pontianak.

Study instruments and Data collection

This study uses several tools, including stationery, journals and literature books, data collection sheets, National Formulary drug lists, and statistical analysis software. This study requires materials in the form of all medical record data, drug data, and drug payment claims for patients who received SC with mild severity (O-6-10-I) when submitting claims at RSUD Dr. Soedarso to the National Health Insurance program.

The study employed a purposive sampling technique, in which sample selection was based on specific considerations aligned with the research objectives. The research began with a preliminary study at RSUD Dr. Soedarso in August 2024, followed by obtaining ethical approval to proceed with the study. The data collected included patient characteristics such as patient age, length of hospital stay, care class, list of medications used during treatment, actual costs, and INA-CBG package costs for Analysis. Data processing and discussion preparation took place in December 2024.

Data Analysis

Data analysis in this study was carried out in several forms, including descriptive analysis for the characteristics of the study subjects, percentage of adherence, pharmacotherapy cost and real cost, normality test, and correlation test. The percentage of drug prescription compliance was calculated by dividing the number of drug items in the national formulary by the total number of drugs prescribed, then multiplying by 100%. Spearman's rank correlation analysis was used to see the relationship between the percentage of compliance with pharmacotherapy burden and real costs because the data were not normally distributed ($p<0.05$) based on the Kolmogorov-Smirnov test. The results of the analysis were considered significant if $p<0.05$.

RESULTS AND DISCUSSION

The population of this study were the Section Caesarea patients at RSUD Dr. Soedarso from January to December 2023. The number of samples used was 472 patients. The characteristics of the study subjects were grouped based on severity level, age, and prescribing compliance level based on the national formulary. The characteristics of this research subject are presented in Table 1.

Table 1. Sample characteristics by age

NO	AGE	AMOUNT (%)
1	<20 Years	27 (5.72)
2	20-35 Years	369 (78.17)
3	>35 Years	76 (16.10)

The highest percentage of Sectio Caesarea (SC) cases based on patient age, as shown in Table 1, is within the 20–35-year range (74.25%). In Indonesia, the distribution of SC births in this age range has increased from 17.36% to 23.67%.[10,11] Although this age group does not have the highest overall birth rate, it aligns with findings by Arief et al[12], who also reported the highest SC percentage in women aged 20–35 years. The ideal age for pregnancy is above 20 years, as reproductive organs are fully developed, ensuring a stronger uterus for conception. Pregnancy below 20 years poses risks for both the mother and baby. Other literature supports that the ideal reproductive age is 20–34 years, as women in this range are in optimal physical and mental condition for pregnancy. Women under 20 or over 35 face lower pregnancy probabilities, with younger women experiencing psychological and physiological challenges, while older women have higher risks of congenital abnormalities and complications. The maternal mortality risk for those under 20 and over 35 is three times higher than for women aged 20–34 years.[13]

Studies by Norbaiti et al.[14] indicate that parity and maternal age influence the decision to undergo SC, with women of higher parity being more likely to opt for SC due to reproductive health awareness and risk considerations. Another study found that education, health status, and childbirth experience affect SC decisions, with women in this age group often considering factors like comfort, pain avoidance, and birth timing.[15] However, research by Komarijah et al.[16] suggests that maternal age does not significantly impact SC decisions, as delivery method selection depends more on pregnancy complications than age itself. SC is often chosen to prevent complications rather than due to maternal age alone.

Percentage of drug prescribing adherence based on the National Formulary

Compliance with the Indonesian National Formulary was conducted on National Health Insurance Program inpatients who received SC treatment during the period January - December 2023 at RSUD Dr Soedarso. If the doctor gives a drug that is included in the National Formulary, then the drug is considered by the formulary. The calculation used is as follows:

$$\%\ Adherence = \frac{Drugs\ item\ compliance\ with\ FORNAS\ total}{Prescribing\ drugs\ total} \times 100\%$$

Table 2. Percentage of Adherence with Indonesian National Formulary by Months

Month	Mild		
	CD*	PD**	Adherence(%)
1	651	678	96.02
2	732	758	96.57
3	482	501	96.21
4	762	788	96.70
5	1044	1067	97.84
6	637	666	95.65
7	1120	1162	96.39
8	732	748	97.86
9	699	718	97.35
10	701	712	98.46
11	550	566	97.17
12	919	938	97.97
Total	9029	9302	97.06
Average			97.02

*Compliance Drugs: Drugs that comply with the Indonesian National Formulary
**Prescribing Drugs: All drugs that are prescribed by the doctors

Based on Table 2, an analysis of the percentage of adherence by month showed fluctuations in prescription writing adherence rates. Some months show high compliance, while others show lower compliance. Factors that can influence drug availability and changes in the stock of formulary-compliant drugs can affect compliance. If drugs are not available, doctors may prescribe alternatives outside the formulary. Hospital policy changes or an emphasis on formulary adherence at a particular time may also affect adherence rates. This result is in line with Research by Nurfikri and Sadinanti,[17] who found that doctor compliance in writing prescriptions based on the formulary at the outpatient pharmacy was 91.73%, with the highest variation in March and the lowest in December. This suggests that seasonal factors or particular events in the month may affect compliance.

Table 3. Percentage of Adherence with the Indonesian National Formulary by Doctors

Doctor	Mild		
	CD*	PD**	Adherence (%)
A	3073	3137	97.96
B	290	296	97.97
C	1145	1184	96.71
D	780	846	92.20
E	766	806	95.04
F	2965	3033	97.76
Total	9029	9302	97.07
Average			96.27

*Compliance Drugs: Drugs that comply with the Indonesian National Formulary
**Prescribing Drugs: All drugs that are prescribed by the doctors

Based on Table 3, the average prescription adherence rate was 96.27%, with variations among doctors. Doctor B had the highest adherence rate at 96.81%, consistently prescribing medications by the national formulary, aligning with Nurfikri and Sadinanti [17], which found inpatient pharmacy adherence at 94.34%. Factors such as drug availability and systemic support contribute to higher adherence. In contrast, Doctor D recorded the lowest adherence at 92.20%, which may be influenced by patient pressure or lack of hospital management support. Studies also indicate a correlation between doctors' knowledge, attitudes, and adherence to formularies. Additionally, some doctors showed consistently high compliance, while others showed lower compliance. Some of the influencing factors include knowledge and awareness, doctors with a good understanding of the importance of the formulary tend to be more compliant, experience and specialisation, and doctors with certain specialities may have different drug preferences, which may influence. Previous studies have shown that factors such as information received and doctors' attitudes have a significant effect on formulary compliance.[18]

Table 4. Percentage of Adherence with the Indonesian National Formulary by its compliance

Compliance with the Indonesian National Formulary	Amount	Percentage (%)
Compliance	9,029	97,07
Not Compliance	273	2,93
Total	9,302	100

Doctors often prescribe non-national formulary drugs to meet specific patient needs, especially in medical procedures like SC. The primary reason is that some clinical conditions cannot be adequately addressed by drugs listed in the national formulary. Physicians may choose medications they consider more effective or safer for specific medical conditions based on their expertise and experience. Research indicates that doctors' familiarity with certain drugs influences their prescribing decisions, even if those drugs are not included in the national formulary.[19,20]

According to Pratiwi et al[21], several factors contribute to non-compliance with the national formulary, including medical aspects related to the patient's clinical condition and non-medical factors such as field

conditions, drug availability, and individual physician preferences. Other studies suggest that non-compliance may also occur in emergencies.[22]

From a cost perspective, prescribing non-national formulary drugs can increase hospital and patient expenses. These medications are often more expensive, leading to potential resource wastage. For example, the high usage of Marcain Epidural suggests that although the quantity may be small, the associated costs could be significant. Previous studies reveal that non-compliant prescribing may reduce cost efficiency in treatment since hospitals must bear additional expenses for non-national formulary drugs.[23]

Table 5. Descriptive Analysis of mild severity level (O-6-10-I)

Descriptive Analysis					
	N	**Minimal**	**Maximal**	**Average**	**SD**
% Adherence	472	81	100	97.10	3.539
Pharmacotherapy Cost (IDR)	472	67,261	1,327,384	392,802.39	180,123.585
Riil Cost (IDR)	472	5,559,930	17,972,995	8,793,341.04	1,488,044.347

The descriptive analysis results for the severity levels of SC cases indicate variations in adherence percentage, pharmacotherapy costs, and real costs, highlighting the impact of severity on prescription adherence and overall treatment expenses. In terms of adherence percentage, mild severity cases had the highest adherence rate, with an average of 97.10%. The average compliance percentage with the National Formulary is 97.10%, which is higher than previous studies that reported compliance rates of 79.4%, 79.6%, and 87.65%.[1,2,19] However, this value still does not meet the Ministry of Health's standard, which requires 100% compliance with the national formulary. A possible explanation is that mild cases generally follow standard treatment protocols, making it easier for physicians to comply with national formulary guidelines. However, in moderate and severe cases, doctors may need to adjust therapy based on clinical conditions, leading to variations in compliance.[21]

In terms of pharmacotherapy cost, mild cases had an average cost of IDR 392,802.39 with a lower standard deviation. Admaja & Marhenta[24] reported an average pharmacotherapy cost of IDR 695,109.61 for SC patients. This difference may be attributed to variations in drug use. According to Saadah et al[25], branded generic drugs incur higher costs compared to unbranded generics.

Similarly, the real cost (total treatment cost) of mild severity cases had an average total treatment cost of IDR 8,793,341.04. The significant increase in real costs for severe cases is likely due to longer hospital stays, intensive monitoring, and additional interventions required for these patients. Research by Mildawati and Faizah[6] indicates that the Length of Stay (LOS) significantly impacts real hospital costs. Other studies confirm that real costs are calculated per hospitalisation day, meaning that the longer a patient stays, the higher the overall cost.[6]

Table 6. Normality test mild severity level (O-6-10-I)

Normality Test						
	Kolmogorov-Smirnov			**Shapiro-Wilk**		
	Statistic	**N**	**Sig.**	**Statistic**	**N**	**Sig.**
% Adherence	.323	472	.000	.788	472	.000
Pharmacotherapy Cost	.112	472	.000	.899	472	.000
Riil Cost	.211	472	.000	.697	472	.000

The normality test results, conducted using Kolmogorov-Smirnov and Shapiro-Wilk tests, indicate that all variables (% adherence, pharmacotherapy cost, and real cost) do not follow a normal distribution. This is evidenced by significance (Sig.) values in both tests, all of which are below 0.05, with varying sample sizes (N = 472 for mild). Since all significance values are below 0.05, these findings indicate that none of the variables are generally distributed across the three severity levels. Therefore, non-parametric statistical methods should be used for further Analysis.

Table 7. Correlation test mild severity level (O-6-10-I)

Correlation Test				
			Pharmacotherapy Cost	**Real Cost**
Spearman's rho	% Adherence	Correlation Coefficient	-.209**	-.043
		Sig. (2-tailed)	.000	.348
		N	472	472

Based on the Spearman correlation test, a significant negative correlation was found between prescription adherence and pharmacotherapy costs. For mild severity ($rs = -0.209$, $p < 0.001$), the correlation indicates that lower adherence to the National Formulary (FORNAS) leads to higher pharmacotherapy costs. This aligns with previous research by Mildawati and Faizah[6], who stated that adding non-formulary drugs increases costs. Similarly, Istianisa and Oktamianti[8] reported that the use of non-national formulary drugs significantly raises total (SC) costs. In severe cases, a stronger negative correlation was observed ($rs = -0.577$, $p = 0.024$), reinforcing the impact of prescription adherence on cost reduction.

However, no significant correlation was found between prescription adherence and real hospital costs in these cases ($rs = -0.043$, $p = 0.206$). This suggests that prescription adherence does not substantially influence total hospital costs. Instead, other factors, such as the length of stay (LOS), have a more dominant role in determining costs; as highlighted in previous studies, a longer LOS increases medical interventions, medication needs, diagnostic tests, and accommodation expenses, leading to higher real hospital costs.[6]

CONCLUSION

Prescription adherence was higher in mild cases (97.10%), but remained below the Ministry of Health's 100% compliance standard. Lower adherence to the National Formulary was associated with higher pharmacotherapy costs. At the same time, no significant correlation was found with total treatment costs, suggesting that factors such as length of stay (LOS) may have a greater impact. Future research should examine the role of LOS in cost dynamics using models that include it as a mediator or independent variable.

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STATEMENT OF ETHICS

This study was granted Ethical approval by the Ethics Committee of RSUD Dr. Soedarso with number: 87/RSUD/KEPK/X/024 on 31 October 2024.

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