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THE RELATIONSHIP BETWEEN THE QUALITY OF PHARMACEUTICAL SERVICES AND PATIENT SAFETY

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ABSTRACT
Pharmaceutical services are a critical component of healthcare delivery in ensuring patient safety, particularly at Community Health Centers (Puskesmas). Suboptimal pharmaceutical service quality may increase the risk of medication errors and adverse drug events, thereby compromising patient safety. However, empirical evidence regarding the contribution of pharmaceutical service quality to patient safety in primary healthcare settings remains limited. A quantitative cross-sectional study was conducted at the Sipatana Community Health Center, Gorontalo City, Indonesia, in November 2025. The study population comprised patients receiving pharmaceutical services, with 295 respondents selected through purposive sampling. Data were collected using a structured questionnaire based on national pharmaceutical service standards. The instrument demonstrated acceptable validity and reliability, with item–total correlations above the critical value and Cronbach's alpha coefficients exceeding 0.60. Data were analyzed using the Chi-square test and stepwise logistic regression at a significance level of $p < 0.05$. The results showed that all dimensions of pharmaceutical service quality were significantly associated with patient safety. Management of pharmaceutical supplies and consumable medical materials, prescription review, prescription services, drug information services, prevention of medication errors, prevention of adverse drug events, and patient medication adherence were significantly associated with patient safety ($p = 0.000$). Monitoring of adverse drug reactions also showed a significant association ($p = 0.004$). Simultaneously, pharmaceutical service quality had a significant effect on patient safety ($F = 23.171$; $p = 0.000$) with an R-square value of 0.326. Stepwise regression analysis indicated that management of pharmaceutical supplies and consumable medical materials was the strongest predictor of patient safety ($B = 0.284$; $\beta = 0.278$). The quality of pharmaceutical services plays a significant role in ensuring patient safety at the Sipatana Community Health Center. Management of pharmaceutical supplies and consumable medical materials emerged as the primary predictor of patient safety. Strengthening pharmaceutical supply management, improving the competence of pharmaceutical personnel, and optimizing strategies for preventing medication errors and adverse drug events are essential to enhance patient safety in primary healthcare settings.

Keywords: community health center; medication error prevention; patient safety; pharmaceutical services; pharmaceutical supply management

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INTRODUCTION

Community Health Centers (Puskesmas) are primary healthcare facilities that play a strategic role in the national health system as the main entry point for promotive, preventive, curative, and rehabilitative services for the community. This role has been further strengthened through the National Health Insurance (Jaminan Kesehatan Nasional—JKN) program, in which Puskesmas function as Primary Health Care Facilities (PHCFs) as well as gatekeepers prior to referral to higher-level healthcare facilities (Anita et al., 2022). Therefore, the quality of services provided at Puskesmas is a key factor in ensuring the overall quality and safety of healthcare delivery. Patient safety is a core indicator of healthcare quality at Puskesmas, encompassing correct patient identification, effective communication, monitoring of high-risk medications, infection prevention, and incident reporting systems. The implementation of patient safety requires a strong safety culture supported by leadership commitment, active involvement of healthcare workers, and continuous training (Syam et al., 2025). However, its implementation continues to face challenges, including limited resources, inadequate infrastructure, and suboptimal incident reporting, thereby

necessitating strengthened regulations and enhanced capacity of healthcare personnel (Guspianto et al., 2025; Ministry of Health of the Republic of Indonesia, 2023).

In pharmaceutical services, patient safety is closely associated with the rational and safe management of medicines, ranging from prescribing to patient use. Errors at any stage may lead to medication errors and adverse drug events (Rachmawati et al., 2022). Pharmacists play a crucial role in prescription review, provision of drug information, and patient counseling, which have been shown to reduce the risk of medication errors and improve patient adherence (Nurjanah et al., 2023). Nevertheless, limitations in workforce capacity, high workload, and the lack of integrated drug information systems remain major barriers to the optimal delivery of pharmaceutical services (Arifin et al., 2021; Lestari et al., 2022). The Pharmaceutical Service Standards at Puskesmas, as stipulated in Regulation of the Minister of Health Number 26 of 2020, emphasize the management of pharmaceutical preparations, prescription review, drug information services, and monitoring of adverse drug reactions as efforts to ensure patient safety. Despite this, the implementation of these standards in practice remains suboptimal due to limited resources and the absence of integrated monitoring systems, which may increase the risk of medication errors and compromise patient safety (Rachmawati et al., 2022; Hidayati et al., 2022; Ministry of Health of the Republic of Indonesia, 2021).

Similar conditions were identified at the Sipatana Community Health Center, where limited pharmaceutical personnel, short counseling durations, and suboptimal documentation of patient safety incidents have contributed to administrative prescription errors, delays in drug dispensing, and dosing inaccuracies. Based on these issues, this study was conducted to analyze the relationship between the quality of pharmaceutical services and patient safety at the Sipatana Community Health Center, as a basis for formulating recommendations to improve service quality in primary healthcare facilities.

METHOD

This study employed an analytical quantitative approach using a cross-sectional design to examine the relationship between the quality of pharmaceutical services and patient safety at a single point in time. The study was conducted at the Sipatana Community Health Center, Gorontalo City, Indonesia, in November 2025, covering the stages of preparation, data collection, and analysis. The study population consisted of all patients who received pharmaceutical services during the study period, from whom 295 respondents were selected using purposive sampling based on predefined inclusion criteria. Data were collected using a structured, closed-ended questionnaire developed in accordance with the Pharmaceutical Service Standards for Community Health Centers as stipulated in the Regulation of the Minister of Health of the Republic of Indonesia Number 26 of 2020. The questionnaire measured multiple dimensions of pharmaceutical service quality and patient safety using a Likert scale. Prior to data collection, the instrument was tested for validity and reliability. Validity was assessed using Pearson's Product–Moment correlation by examining the Corrected Item–Total Correlation values, all of which exceeded the critical r value of 0.361, indicating that all items were valid. Reliability testing using Cronbach's alpha demonstrated good to excellent internal consistency, with alpha values ranging from 0.634 to 0.823 for the independent variables and 0.857 for the dependent variable. Data analysis was performed through univariate analysis to describe variable distributions, bivariate analysis using the Chi-square test to examine associations between pharmaceutical service quality and patient safety with a significance level of $p < 0.05$, and multivariate analysis using stepwise logistic regression to identify the most dominant predictors of patient safety.

RESULT

The univariate analysis showed (Table 1) that the majority of respondents perceived the quality of pharmaceutical services at the Sipatana Community Health Center to be in the good category. For

the variable of pharmaceutical supply and consumable medical material management, nearly half of the respondents rated it as good (48.5%), followed by moderate (27.1%) and poor (24.4%) categories. Prescription review and prescription dispensing were also predominantly rated as good, accounting for 44.7% and 44.4% of respondents, respectively, although a proportion of respondents still rated these aspects as moderate or poor. Drug information services and monitoring of adverse drug reactions demonstrated relatively high proportions in the good category, each accounting for 46.4%, while the poor category was still reported by approximately one-fifth of respondents.

Table 1.
Univariate Analysis

Variable	Behavior Categories		
	Category	f	%
Management of Medicinal Preparations and Medical Consumables	Good	143	48,5
	Enough	80	27,1
	Poor	72	24,4
Prescription Review	Good	132	44,7
	Enough	102	34,6
	Poor	61	20,7
Prescription Services	Good	131	44,4
	Enough	108	36,6
	Poor	56	19,0
Drug Information Services	Good	137	46,4
	Enough	97	32,9
	Poor	61	20,7
Monitoring the Side Effects of Drugs	Good	137	46,4
	Enough	105	35,6
	Poor	53	18,0
Medication Error Prevention	Good	146	49,5
	Enough	90	30,5
	Poor	59	20,0
Adverse Drug Event Prevention	Good	137	46,4
	Enough	95	32,2
	Poor	63	21,4
Patient Medication Compliance	Good	136	46,1
	Enough	86	29,2
	Poor	73	24,7
Patient Safety	Good	110	37,3
	Enough	91	30,8
	Poor	94	31,9

Regarding medication error prevention, the majority of respondents rated this aspect as good (49.5%), followed by moderate (30.5%) and poor (20.0%). Similarly, prevention of adverse drug events was predominantly rated as good (46.4%), although a proportion of respondents (21.4%) still perceived it as poor. The variable of patient medication adherence showed that 46.1% of respondents were classified in the good category; however, nearly one-quarter of respondents (24.7%) remained in the poor category. For the patient safety variable, the analysis indicated that most respondents were in the good category (37.3%), followed by moderate (30.8%) and poor (31.9%). These findings suggest that although the overall quality of pharmaceutical services tends to be good, a substantial proportion of respondents still perceived patient safety and several pharmaceutical service indicators as moderate or poor, highlighting the need for continuous quality improvement efforts.

Table 2, it was found that for the variable of pharmaceutical supply and consumable medical material management, respondents who rated this aspect as good were predominantly classified in the good patient safety category, accounting for 68 respondents (23.1%), compared with those in the moderate patient safety category (45 respondents; 15.3%) and the poor category (30 respondents; 10.2%). In contrast, among respondents who rated pharmaceutical supply management as poor, a

higher proportion were classified in the poor patient safety category, comprising 48 respondents (16.3%), with a statistically significant association (p = 0.000).

Table 2.
Bivariate Analysis

Independent Variables	Category	Patient Safety						Total		*P Value*
		Good		Enough		poor				
		f	%	f	%	f	%	f	%	
Pharmaceutical Preparations and BMHP Management	Good	68	23,1	45	15,3	30	10,2	143	48,5	0,000
	Enough	30	27,3	34	37,4	16	17,0	80	27,1	
	Poor	12	4,1	12	4,1	48	16,3	72	24,4	
Prescription Review	Good	68	23,1	39	13,2	25	8,5	132	44,7	0,000
	Enough	29	9,8	41	13,9	31	10,8	102	34,6	
	Poor	13	4,4	11	3,7	37	12,5	61	20,7	
Prescription Services	Good	65	22,0	41	13,9	25	8,5	131	44,4	0,000
	Enough	34	11,5	37	12,5	37	12,5	37	36,6	
	Poor	11	3,7	13	4,4	32	10,8	56	19,0	
Drug Information Services	Good	67	22,7	38	12,9	32	10,8	137	46,4	0,000
	Enough	30	10,2	42	14,2	25	8,5	97	32,9	
	Poor	13	4,4	11	3,7	37	12,5	61	20,7	
Side Effect Monitoring Activities	Good	65	22,0	40	13,6	32	10,8	137	46,4	0,004
	Enough	31	28,2	37	40,7	37	39,4	105	35,6	
	Poor	14	4,7	14	4,7	25	8,5	53	18,0	
Medication Error Prevention	Good	67	22,7	34	11,5	45	15,3	146	49,5	0,000
	Enough	31	10,5	44	14,9	15	5,1	90	30,5	
	Poor	12	4,1	13	4,4	34	11,5	59	20,0	
Adverse Drug Event Prevention	Good	66	22,4	37	12,5	34	11,5	137	46,4	0,000
	Enough	31	10,5	39	13,2	25	8,5	95	32,2	
	Poor	13	4,4	15	5,1	35	11,9	63	21,4	
Patient Compliance Level	Good	68	23,1	31	10,5	37	12,5	136	46,1	0,000
	Enough	30	10,2	31	10,5	25	8,5	86	29,2	
	Poor	12	4,1	29	9,8	32	10,8	73	24,7	

For the prescription review variable, respondents with good prescription review were largely associated with good patient safety, with 68 respondents (23.1%), whereas among those with poor prescription review, the majority were classified in the poor patient safety category, accounting for 37 respondents (12.5%) (p = 0.000). A similar pattern was observed for prescription dispensing services, where good prescription services were associated with good patient safety in 65 respondents (22.0%), while poor prescription services were dominated by poor patient safety outcomes in 32 respondents (10.8%) (p = 0.000). Regarding drug information services, respondents who rated this aspect as good were mostly categorized under good patient safety (67 respondents; 22.7%), whereas the poor category was predominantly associated with poor patient safety (37 respondents; 12.5%), with a significant p-value of 0.000. The monitoring of adverse drug reactions also showed a significant association, with good monitoring corresponding to good patient safety in 65 respondents (22.0%), while poor monitoring was associated with poor patient safety in 25 respondents (8.5%) (p = 0.004).

Furthermore, for medication error prevention, the good category was associated with good patient safety in 67 respondents (22.7%), whereas the poor category was dominated by poor patient safety outcomes in 34 respondents (11.5%) (p = 0.000). A similar trend was observed for adverse drug event prevention, where good prevention was associated with good patient safety in 66 respondents (22.4%), while poor prevention was dominated by poor patient safety in 35 respondents (11.9%) (p = 0.000). In terms of patient medication adherence, respondents with good adherence were predominantly classified in the good patient safety category (68 respondents; 23.1%), whereas poor adherence was associated with a higher proportion of poor patient safety outcomes (32 respondents; 10.8%), with a statistically significant association (p = 0.000). Overall, the cross-tabulation results

demonstrated a consistent trend indicating that higher quality pharmaceutical services were associated with higher levels of patient safety at the Sipatana Community Health Center.

Subsequently, multivariate analysis was conducted using multiple linear regression. Prior to regression analysis, classical assumption tests were performed to ensure the suitability of the data for regression modeling. The normality test using the Normal P–P Plot showed that the residuals were distributed closely along the diagonal line, indicating that the residuals approximated a normal distribution. Multicollinearity testing revealed that all independent variables had Variance Inflation Factor (VIF) values below 10 and tolerance values greater than 0.10, indicating the absence of multicollinearity. In addition, the heteroscedasticity test based on scatterplot analysis demonstrated that the residuals were randomly dispersed around the zero axis without forming any discernible pattern, suggesting no heteroscedasticity. As all classical assumptions were met, the data were deemed appropriate for further multiple linear regression analysis.

The variable selection analysis examining the relationship between pharmaceutical service quality and patient safety using multiple linear regression indicated that pharmaceutical supply and consumable medical material management ($p = 0.000$), prescription review ($p = 0.000$), drug information services ($p = 0.000$), monitoring of adverse drug reactions ($p = 0.025$), medication error prevention ($p = 0.036$), and patient medication adherence ($p = 0.004$) were statistically significant predictors of patient safety ($p < 0.05$). Meanwhile, prescription dispensing services ($p = 0.052$) and adverse drug event prevention ($p = 0.051$) did not reach statistical significance ($p > 0.05$) and were therefore excluded from the subsequent multiple linear regression model. Based on this selection process, the variables simultaneously tested in the final regression model were pharmaceutical supply and consumable medical material management (X1), prescription review (X2), drug information services (X3), monitoring of adverse drug reactions (X4), medication error prevention (X5), and patient medication adherence (X6), with the detailed results presented in the subsequent table.

Table 3.
Multiple Linear Regression Analysis

Variable	*Unstandarized Coefficients*	t-value	*Sig.*	F-value	*Sig.*	*R-squared*
(Constant)	22,155	2,819	0,005			
Management of Drug Inventories and Medical Consumables	0,284	5,630	0,000			
Prescription Review	0,241	4,584	0,000			
Drug Information Services	0,278	5,264	0,000	23,171	0,000[b]	0,326
Monitoring Side Effects	0,157	2,840	0,005			
Preventing Medication Errors	0,121	2,345	0,020			
Patient Compliance with Medications	0,164	3,314	0,001			

The results of the multivariate analysis (Table 3) using multiple linear regression on the six variables identified as significant in the previous stage indicated that all variables had a statistically significant effect on patient safety at the Sipatana Community Health Center ($p < 0.05$). These variables included the management of pharmaceutical supplies and consumable medical materials, prescription review, drug information services, monitoring of adverse drug reactions, medication error prevention, and patient medication adherence. The partial test (t-test) confirmed that each variable individually exerted a significant influence on patient safety, assuming that the other variables in the model were held constant. Based on the unstandardized coefficients (β), the management of pharmaceutical supplies and consumable medical materials demonstrated the greatest influence on patient safety ($\beta = 0.284$), followed by drug information services ($\beta = 0.278$), prescription review ($\beta = 0.241$), patient medication adherence ($\beta = 0.164$), monitoring of adverse drug reactions ($\beta = 0.157$), and medication error prevention ($\beta = 0.121$). The resulting multiple linear regression model was formulated as:

$$\mathbf{Y = 22{,}155 + 0{,}284X_1 + 0{,}241X_2 + 0{,}278X_3 + 0{,}157X_4 + 0{,}121X_5 + 0{,}164X_6 + e,}$$

The constant value of 22.155 indicates the baseline level of patient safety influenced by factors outside the variables included in this study. The simultaneous test (F-test) yielded an F statistic of 23.171, which exceeded the critical F value (2.13), with a p-value of 0.000, indicating that the six variables collectively had a statistically significant effect on patient safety. The R-squared value of 0.326 suggests that 32.6% of the variation in patient safety can be explained by the regression model, while the remaining 67.4% is attributable to other factors not examined in this study. Further analysis was conducted using stepwise regression to identify the variable with the strongest contribution to patient safety based on the magnitude of its statistical effect.

Table 4.
Stages of Stepwise Regression, R Square Value, ANOVA Test on Stepwise Regression

Model	Variables That Go to the Model	R-squared	F-value	Sig.
1	Medication Inventory Management and BMHP	0,120	40,070	0,000
2	+ Drug Information Services	0,201	36,822	0,000
3	+ Prescription Review	0,263	34,536	0,000
4	+ Patient Medication Compliance	0,295	30,356	0,000
5	+ Monitoring of Side Effects	0,313	26,296	0,000
6	+ Medication Error Prevention	0,326	23,171	0,000

Table 4 shows that the management of pharmaceutical supplies and consumable medical materials was the first variable entered into the stepwise regression model, with an R-squared value of 0.120 (12.0%). The subsequent stepwise inclusion of additional variables progressively increased the R-squared value to 0.326 in the final model, indicating that the six variables collectively explained 32.6% of the variation in patient safety, while the remaining 67.4% was influenced by factors outside the model. All regression models demonstrated statistical significance ($p < 0.05$), confirming their adequacy and validity.

Table 5.
Final Model Regression Coefficient (Model 6)

Variable	B	Beta	t	Sig.
Constants	-22,155	–	-2,819	0,005
Management of Drug Inventories and BMHP	0,284	0,278	5,630	0,000
Drug Information Services	0,278	0,256	5,264	0,000
Prescription Review	0,241	0,226	4,584	0,000
Patient Compliance with Medication	0,164	0,162	3,314	0,001
Monitoring Side Effects	0,157	0,139	2,840	0,005
Prevention of Medication Errors	0,121	0,117	2,345	0,020

Table 5 shows that all variables included in the final model (Model 6) had p-values below 0.05, indicating that each variable had a statistically significant effect on patient safety after controlling for the other variables in the model. Based on the standardized coefficients (Beta), the management of pharmaceutical supplies and consumable medical materials exhibited the largest Beta value ($\beta = 0.278$), indicating the strongest association with patient safety. Drug information services ($\beta = 0.256$) and prescription review ($\beta = 0.226$) ranked as the next most influential variables, while patient medication adherence, monitoring of adverse drug reactions, and medication error prevention provided smaller yet statistically significant additional contributions.

DISCUSSION

The results of this study indicate that all examined dimensions of pharmaceutical service quality were significantly associated with patient safety. However, multivariate analysis and further stepwise regression analysis identified the management of pharmaceutical supplies and consumable medical materials as the variable most strongly associated with, and contributing the greatest effect to, patient safety at the Sipatana Community Health Center. The strength of this association was evidenced by several statistical indicators: this variable entered the stepwise regression model as the first predictor, accounted for an initial contribution of 12.0% to the variance in patient safety, and demonstrated the highest standardized coefficient (Beta) in the final model compared with other dimensions of pharmaceutical service quality. These findings confirm that the management of

pharmaceutical supplies and consumable medical materials is the most dominant factor in determining patient safety.

Substantively, these findings demonstrate that patient safety is highly dependent on the readiness and effectiveness of the medicine management system within healthcare facilities. Proper pharmaceutical supply management ensures the availability of the right medicines in the right quantities, of appropriate quality, and at the right time. When pharmaceutical supply management systems do not function optimally, patients are at increased risk of delayed therapy, inappropriate substitution of medicines, and medication administration errors, all of which may directly compromise patient safety. The dominance of pharmaceutical supply management also highlights that patient safety is not determined solely by direct clinical actions but is strongly influenced by systemic factors that support the overall delivery of pharmaceutical care. Continuous medicine availability forms the foundation for safe dispensing practices, accurate prescription review, and the effective provision of drug information to patients.

The subsequent contributions of drug information services and prescription review indicate that, once a robust medicine management system is in place, patient safety is largely influenced by the quality of pharmaceutical care processes. Clear and comprehensible drug information supports correct medication use by patients, while careful prescription review plays a critical role in preventing dosing errors, drug interactions, and inappropriate therapy. Meanwhile, patient medication adherence, monitoring of adverse drug reactions, and prevention of medication errors function as supporting factors that further strengthen patient safety. Patient adherence reflects the effectiveness of health education and communication, whereas adverse drug reaction monitoring and medication error prevention serve as surveillance mechanisms to detect and prevent undesirable events during medication use.

Overall, the findings of this study emphasize that the management of pharmaceutical supplies and consumable medical materials is the variable most strongly associated with patient safety and serves as the primary foundation for other dimensions of pharmaceutical service quality. Therefore, efforts to improve patient safety at the Sipatana Community Health Center should prioritize strengthening pharmaceutical supply and consumable medical material management systems, alongside enhancing the quality of drug information services, prescription review, and continuous monitoring of medication use. These findings are consistent with the theory of quality pharmaceutical care, which posits that pharmaceutical service quality is a key determinant in ensuring the safety and effectiveness of medication use. High-quality pharmaceutical care encompasses systematic, patient-oriented medicine management processes aimed at preventing drug-related problems and improving patient safety (Cipolle et al., 2020).

Furthermore, patient safety systems theory emphasizes that patient safety is achieved through a systems-based approach that integrates multiple components of healthcare delivery. Within this framework, pharmaceutical service quality is regarded as a critical subsystem that directly contributes to patient safety. Improvements in each aspect of pharmaceutical services are therefore expected to strengthen the overall patient safety system (WHO, 2021). Consistent with the present findings, a study conducted by Putri et al. (2021) at Gondokusuman II Community Health Center in Yogyakarta City reported a significant association between overall pharmaceutical service quality and patient safety, with pharmaceutical supply management identified as the most dominant influencing variable. Similarly, research by Sari and Handayani (2022) at Gamping I Community Health Center, Sleman Regency, demonstrated that pharmaceutical service quality had a significant simultaneous effect on patient safety. Their study concluded that comprehensive improvements in pharmaceutical service quality are more effective in enhancing patient safety than interventions focused on a single service aspect alone.

CONCLUSION

This study concludes that the quality of pharmaceutical services is significantly associated with patient safety at the Sipatana Community Health Center. Among the various dimensions examined, the management of pharmaceutical supplies and consumable medical materials emerged as the most dominant determinant of patient safety, serving as the foundational element that supports other pharmaceutical service processes. Effective medicine supply management ensures timely availability, appropriate quality, and accurate use of medications, thereby reducing the risk of medication errors and adverse drug events. Furthermore, the quality of drug information services and prescription review plays a crucial role in enhancing patient safety once a robust supply management system is in place, while patient medication adherence, adverse drug reaction monitoring, and medication error prevention function as reinforcing components. These findings underscore the importance of a systems-based approach to pharmaceutical care, in which strengthening pharmaceutical supply management should be prioritized alongside continuous improvement of clinical pharmaceutical services to achieve sustainable patient safety in primary healthcare settings.

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