



Original Research

ASSESSMENT OF DRUG USE AND PROVIDER COMPLIANCE IN OUTPATIENT CARE

Rita Prameswari¹, Rina Kurniasri Kusumaratna², Erna Kristin³

¹Hospital Management, Graduate Program in Health Policy and Management, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia.

²Department of Public Health, Faculty of Medicine, Universitas Trisakti, Jakarta, Indonesia.

³ Department of Pharmacology and Therapy, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Yogyakarta, Indonesia.

Corresponding Author: ritaprameswari167@gmail.com

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Abstrak

Background: Outpatient services represent a major source of hospital revenue and require efficient resource management. At AN-NISA Hospital, the neurology and psychiatry outpatient clinics showed the largest negative gap between INA-CBGs tariffs and hospital costs. Drug expenditures accounted for approximately 95% of the total INA-CBGs tariffs.

Objective: To evaluate drug use indicators and provider compliance and to determine their association with drug use costs in neurology and psychiatry outpatient clinics.

Methods: This observational analytic study employed a cross-sectional design with total sampling. A total of 769 prescriptions from National Health Insurance (JKN) outpatients with the two most common diagnoses and the highest drug use costs during October 2021 were analyzed. Drug use indicators were evaluated using WHO and National Formulary standards. Simple linear regression assessed the relationship between each independent variable and drug use costs, while multiple linear regression identified the strongest predictors.

Results: Prescribing practices in both clinics did not meet WHO standards regarding adherence to the National Formulary, compliance with Referral Program (PRB) prescribing restrictions, the average number of drugs prescribed per prescription, and provider compliance. Generic prescribing met WHO standards only in the psychiatry clinic. Drug utilization costs in the psychiatry clinic were significantly associated with National Formulary prescribing ($R=0.774$), PRB prescribing ($R=-0.092$), generic prescribing ($R=-0.611$), the average number of drug items per prescription ($R=0.221$), and provider compliance ($R=-0.478$) (all $p<0.05$). In the neurology clinic, significant associations were found for National Formulary prescribing ($R=0.682$), PRB prescribing ($R=0.073$), generic prescribing ($R=-0.323$), and provider compliance ($R=-0.225$), whereas the number of drug items prescribed showed no significant association ($R=0.009$; $p>0.05$). Generic prescribing was the strongest predictor of drug utilization costs in both neurology ($\beta=-0.235$) and psychiatry ($\beta=-0.499$).

Conclusion: Drug use indicators and provider compliance in the neurology and psychiatry outpatient clinics have not fully met established standards and were significantly associated with drug use costs. Increasing generic prescribing may improve prescribing efficiency and reduce medication costs. Multidisciplinary collaboration among hospital management, pharmacists, information technology personnel, and clinicians is essential to promote rational prescribing and optimize healthcare costs.

Keywords: drug use costs, drug prescription, provider compliance, National Formulary

Introduction

Hospitals in Indonesia have experienced significant impacts since the government implemented the National Social Security System (SJSN) on January 1, 2014. This reform shifted hospital payment methods from a retrospective fee for service model to

a prospective payment system known as Indonesian Case Based Groups (INA CBGs).¹ The prospective system presents major challenges, as hospitals must continue to deliver high quality services that meet standards, introduce innovative service products, and maintain patient satisfaction, while simultaneously ensuring cost efficiency.²

Rational prescribing is a cornerstone of efficient health systems, and the World Health Organization (WHO) prescribing indicators are widely used to evaluate drug use patterns in both developed and developing countries.^{3,4} In Indonesia, several studies have reported that outpatient prescribing often fails to meet these standards, particularly in relation to generic drug use and formulary compliance.^{5,6,7} The National Drug Formulary (Formularium Obat Nasional) was introduced to improve efficiency and ensure equitable access, yet compliance remains variable across hospitals.^{8,9} Previous evaluations have shown that non compliance with formulary restrictions and suboptimal generic prescribing contribute to rising hospital drug costs and inefficiencies in the JKN (Jaminan Kesehatan Nasional or the National Health Insurance) system.^{10,11}

AN-NISA Hospital, a private Class C hospital in Tangerang, began collaborating with BPJS Kesehatan (Badan Penyelenggara Jaminan Nasional Kesehatan or The National Social Security Agency on Health in 2014. Since then, the hospital has experienced significant growth, reflected in the rising number of outpatient visits between 2014 and 2019. Outpatient services contributed substantially to hospital revenue. However, by 2019, declining margins became evident as the gap between INA CBGs tariffs and hospital tariffs narrowed, and by 2021, average hospital tariffs exceeded INA CBGs reimbursement rates.

This situation is partly due to INA CBGs tariffs remaining unchanged since 2017, while service costs have continued to rise in line with inflation and increases in regional minimum wages. Another contributing factor is the growing use of medications and diagnostic tests in outpatient care. Data show that drug costs account for the largest proportion of expenses, surpassing laboratory and radiology costs, and the percentage of drug use has increased annually.

Neurology and psychiatry outpatient services represent the departments with the largest negative margins. Drug costs per patient in these services are the highest, averaging 85–100% of the INA CBGs tariff. This indicates inefficiencies in service management. Approximately 55% of AN-NISA's outpatients are chronic disease patients enrolled in the Program Rujuk Balik (PRB or Back Referral Program), requiring long term pharmacological therapy and frequent diagnostic examinations. Therefore, evaluating PRB drug use is essential.

Physicians play a critical role in both service quality and cost efficiency. Non compliance with drug formulary guidelines in prescribing increases total treatment costs. Consequently, this study aims to evaluate factors related to drug utilization and provider compliance in prescribing practices within neurology and psychiatry outpatient services at AN-NISA Hospital.

Methods

This study employed an observational analytic design with a cross-sectional approach, conducted at the Outpatient Department of AN NISA Hospital in Tangerang between July and October 2022. The study population consisted of all 21,541 outpatient prescriptions recorded in October 2021.

Utilizing a total sampling method, the study included prescriptions from patients covered by the National Health Insurance (JKN) program and those diagnosed with the most frequent conditions involving the highest drug expenditures in neurology and psychiatry, specifically stroke, epilepsy, paranoid schizophrenia, and schizoaffective disorder of the depressive type. While World Health Organization (WHO) standards

require a minimum of 600 prescriptions for such retrospective studies, this analysis utilized 769 prescriptions that met all inclusion criteria.

Data collection involved a comprehensive prescription review to assess provider compliance and drug utilization based on WHO prescribing indicators and national formulary guidelines. Statistical analysis was performed using SPSS, where descriptive statistics summarized patient characteristics and compliance metrics. Bivariate analysis was conducted through linear regression to determine the direction and strength of associations, with variables reaching a significance of $p < 0.05$ subsequently included in a multivariate multiple linear regression model.

To ensure the validity of these models, all regression assumptions including normality, linearity, and homoscedasticity were rigorously verified. To maintain high data quality and minimize bias, prescription data were retrieved from electronic medical records and cross verified with pharmacy records. The team implemented standardized coding and double entry verification to reduce transcription errors, with any discrepancies resolved by two independent researchers. Selection bias was mitigated through the total sampling approach and strict adherence to diagnostic criteria. Additional quality control measures included periodic audits and random cross checks of 10% of the sample.

Ethical integrity was maintained through secure, password protected data storage and formal ethical clearance from the Ethics Committee on Medical and Health Research of the Faculty of Medicine, Public Health, and Nursing at Universitas Gadjah Mada (KE/FK/0930/EC/2022).

Results

Univariate analysis was conducted to describe patient characteristics, prescribing indicators, and provider compliance in the neurology and psychiatry outpatient clinics at AN-NISA Hospital. The analysis highlights differences in demographic profiles, formulary adherence, generic drug use, average number of items per prescription, and provider compliance. In addition, the financial impact of prescribing practices was calculated to estimate monthly and annual cost losses (Table 1).

The univariate analysis revealed notable differences between the neurology and psychiatry outpatient clinics. Neurology patients were predominantly older adults, while psychiatry patients were younger, yet both groups were mostly male. Prescribing indicators showed suboptimal compliance with the national formulary and WHO standards in both clinics, with neurology performing worse in generic drug use and average number of items per prescription. The neurology clinic incurred higher monthly and annual cost losses (Rp225.6 million/month; Rp2.7 billion/year) compared to psychiatry (Rp187.6 million/month; Rp2.25 billion/year). The largest contributors to inefficiency were polypharmacy (average 4.2 items per prescription) and low provider compliance (58%) in neurology, which significantly increased drug use costs. These findings suggest that improving formulary adherence, reducing unnecessary prescribing, and strengthening provider compliance are critical strategies to minimize cost losses and enhance efficiency in outpatient services.

The bivariate analysis shows that formulary adherence and generic prescribing were the strongest contributors to rising drug costs, particularly in psychiatry. Provider compliance also had a notable impact, while polypharmacy influenced costs only

Assessment Of Drug Use and Provider Compliance in Outpatient Care

in psychiatry. Overall, psychiatry incurred higher financial losses (nearly Rp 575 million/month; Rp 6.9 billion/year) compared to neurology (nearly Rp 486 million/month; Rp 5.8 billion/year), underscoring the need to improve prescribing practices and compliance to reduce inefficiencies (Table 2).

The regression analysis revealed distinct drivers of cost increases across the two specialties. In the neurology clinic, the strongest predictor of cost escalation was formulary adherence ($p = 0.000$, $R^2 = 0.096$), although the overall explanatory power was modest. Both generic prescribing and provider compliance yielded negative coefficients, suggesting that these factors possess potential cost reducing effects within this department.

Table 1. Prescription Indicators and Cost Inefficiencies: Neurology vs. Psychiatry Outpatient Services

Variable	Description – Neurology Clinic	Description – Psychiatry Clinic	Monthly Cost Loss (Neurology)	Monthly Cost Loss (Psychiatry)
Patient Characteristics				
Age	Predominantly early elderly (46–55 years) and late elderly (56–65 years)	Predominantly young adults (26–35 years) and late adults (36–45 years)	-	-
Gender	Predominantly male (56%)	Predominantly male (60%)	-	-
Prescribing Based on National Formulary	83%, below WHO standard	99.5%, below WHO standard	Rp11,514,780	Rp160,329
PRB Drug Prescribing Based on National Formulary Restrictions	81.8%, below standard	87.3%, below standard	Rp3,390,169	Rp4,359,707
Generic Drug Prescribing	79%, below WHO standard	84.9%, meets WHO standard	Rp50,729,700	Rp43,315,532
Average Number of Drug Items per Prescription	4.2 items, below WHO standard	3.3 items, below WHO standard	Rp91,041,473	Rp86,224,566
Provider Compliance	58%, below WHO standard	76%, below WHO standard	Rp68,987,132	Rp53,530,121
Total Monthly Cost Loss			Rp225,663,254	Rp187,590,255
Total Annual Cost Loss			Rp2,707,959,048	Rp2,251,083,060

Table 2. Prescribing Indicators and Cost Losses Analysis

Variable	Neurology Clinic	Psychiatry Clinic	Monthly Cost Loss (Neurology)	Monthly Cost Loss (Psychiatry)
Prescribing Based on National Formulary	Significant negative correlation, strong (sig = 0.000, $R = 0.682$); explains 46.5% of drug cost increase ($R^2 = 0.465$)	Significant negative correlation, strong (sig = 0.000, $R = 0.774$); explains 59.9% of drug cost increase ($R^2 = 0.599$)	Rp 69,344,678	Rp 57,486,186
PRB Drug Prescribing (Formulary Restriction)	Significant negative correlation, weak (sig = 0.003, $R = 0.073$)	Significant negative correlation, weak (sig = 0.001, $R = 0.092$); explains 0.8% of drug cost increase ($R^2 = 0.008$)	–	Rp 3,688,398
Generic Drug Prescribing	Significant negative correlation, moderate (sig = 0.000, $R = 0.323$); explains 10.5% of drug cost increase ($R^2 = 0.105$)	Significant negative correlation, strong (sig = 0.000, $R = 0.611$); explains 37.3% of drug cost increase ($R^2 = 0.373$)	Rp 243,065,602	Rp 292,884,030
Average Number of Drug Items per Prescription	No correlation (sig = 0.865, $R = 0.009$)	Significant negative correlation, weak (sig = 0.000, $R = 0.221$); explains 4.9% of drug cost increase ($R^2 = 0.049$)	–	Rp 18,424,622
Provider Compliance	Significant negative correlation, weak (sig = 0.000, $R = 0.225$); explains 5% of drug cost increase ($R^2 = 0.050$)	Significant negative correlation, moderate (sig = 0.000, $R = 0.478$); explains 22.8% of drug cost increase ($R^2 = 0.228$)	Rp 173,278,430	Rp 202,480,830
Total Monthly Cost Loss			Rp 485,688,710	Rp 574,964,066
Total Annual Cost Loss			Rp 5,828,264,520	Rp 6,899,568,792

In contrast, prescribing practices in the psychiatry clinic demonstrated a much more substantial impact on financial outcomes. The prescribing of PRB drugs emerged as the most significant factor ($p = 0.000$, $R^2 = 0.442$), showing a strong correlation ($R = 0.665$). Additionally, generic prescribing in psychiatry exhibited a large negative coefficient of -0.499 , which points toward existing inefficiencies in current practices. Comparing the two, the psychiatry model provided significantly higher explanatory power than the neurology model, indicating that psychiatric prescribing patterns contribute more heavily to cost increases. These findings carry important clinical and

managerial implications. Because prescribing practices in psychiatry have a more pronounced effect on costs, hospital management should prioritize interventions within psychiatric outpatient services. Strategic focus should be placed on stricter enforcement of formulary adherence, the optimization of generic drug utilization, and the enhancement of provider compliance. Implementing targeted improvements in these specific areas can help hospitals mitigate financial losses, reduce operational inefficiencies, and ultimately improve the quality of patient care.

Table 3. Multiple Linear Regression Analysis of Drug Utilization Factors and Cost Increases in Neurology and Psychiatry Outpatient Clinics

Variable	Neurology Clinic		Psychiatry Clinic		p-value	R	R ²
	Coef B	Coef Beta	Coef B	Coef Beta			
Constanta	161,671.033		69,440.937				
Prescribing Based on National Formulary	61,515.093	0.096	60,667.634	0.035	0.000	0.310	0.096 (Neurology) / 0.304 (Psychiatry)
PRB Drug Prescribing (Formulary Restriction)	-19,981.826	-0.078	47,039.304	0.296	0.000	0.665	0.442 (Psychiatry)
Generic Drug Prescribing	-138,820.492	-0.235	-161,725.504	-0.499	—	—	—
Average Number of Drug Items per Prescription	—	—	5,616.090	0.064	—	—	—
Provider Compliance	-67,368.158	-0.138	-68,237.330	-0.239	—	—	—

Discussion

This study highlights several critical issues in prescribing practices at AN-NISA Hospital's neurology and psychiatry outpatient clinics, with implications for both clinical quality and financial sustainability.

Formulary Adherence and PRB Restrictions

Prescribing outside the National Formulary was common, with nearly half of non formulary drugs consisting of supplements and neuroprotectants. While neuroprotectants are included in Clinical Practice Guidelines (CPG) for stroke, their use in outpatient care requires stricter regulation regarding dosage and indication. Supplements, which are not listed in the CPG for the studied diagnoses, contributed substantially to cost losses. Similar findings have been reported in other Indonesian hospitals, where non formulary prescribing undermines efficiency and increases expenditures.^{10,11} PRB prescriptions also showed frequent non compliance with formulary restrictions, particularly in psychiatry where quantities often exceeded monthly limits. In neurology, non compliance was observed in quantity (16.2%), diagnosis (0.7%), and laboratory result restrictions (1.1%). These deviations resulted in costs that could not be reimbursed under JKN, shifting the financial burden to the hospital. Physician compliance is influenced by knowledge, available information, pharmaceutical industry pressures, and attitudes.^{12,13}

Generic Prescribing

Generic prescribing met WHO standards in psychiatry but not in neurology. Limited physician awareness and frequent stockouts in the national e catalog contributed to reliance on patented drugs. This has major financial implications, as the cost difference between patented and generic drugs is substantial, particularly in psychiatry where drug tariffs are high. The lower proportion of generic prescribing in neurology resulted in greater cost differences. These findings are consistent with WHO recommendations that emphasize generic

prescribing as a key strategy for rational drug use and cost containment.^{3,14,15}

Polypharmacy

The average number of drug items per prescription exceeded WHO standards in both clinics, indicating polypharmacy. In psychiatry, this had a stronger correlation with drug costs due to higher medication tariffs. In neurology, polypharmacy was driven by elderly patients with multiple comorbidities. While combination therapy may be clinically necessary in psychiatry, excessive prescribing increases costs and risks. Hospital management could mitigate this by setting maximum prescription limits for JKN patients, integrating automatic restrictions into electronic prescribing systems, and developing geriatric clinics with multidisciplinary teams to reduce inappropriate polypharmacy.¹⁶

Provider Compliance

Provider compliance with the National Formulary, hospital formulary, and generic prescribing standards was below 100% in both clinics. Non compliance was partly linked to physician employment status, as many were not full time staff. Prior research has shown that non permanent physicians often pay less attention to hospital programs, including cost control measures.^{2,17} To improve compliance, hospitals should implement regular performance evaluations, introduce reward and punishment systems, and recruit full time specialists. These organizational strategies are consistent with evidence that institutional policies and physician engagement are critical to improving formulary adherence and reducing unnecessary expenditures.^{18,19}

Policy Implications

Beyond clinical and hospital management concerns, these findings carry broader policy implications. Strengthening compliance with the National Formulary requires a multi level approach. Hospital management should establish written

policies prohibiting non formulary supplements, regulate neuroprotectant prescribing with clear dosage and indication limits, and embed automatic restriction alerts into electronic prescribing systems. Pharmacy teams must be empowered to intervene in non compliant prescriptions, supported by hospital leadership to overcome physician resistance.

National policymakers could enhance the e catalog system to ensure consistent availability of generics, reducing reliance on patented drugs. BPJS and the Ministry of Health should consider linking reimbursement incentives to formulary compliance, thereby encouraging hospitals and physicians to adhere more strictly to national standards. Broader healthcare systems in Indonesia and similar settings may benefit from adopting integrated monitoring systems, clinical decision support tools, and continuous education programs for prescribers to reinforce rational drug use.⁹

Implications and Recommendations

By addressing both institutional and national barriers, these measures could improve compliance, reduce inefficiencies, and strengthen the sustainability of universal health coverage programs. The findings confirm that prescribing practices in neurology and psychiatry clinics have not fully met established standards, with generic prescribing emerging as the most influential factor driving drug costs. Inefficiencies were greater in neurology, underscoring the need for targeted interventions.

To address these challenges, hospital management should adopt comprehensive strategies that integrate pharmacy teams, IT systems, and medical staff. In the short term, policies should regulate maximum prescription limits, prohibit supplement use, and mandate generic prescribing for JKN patients, supported by guaranteed availability of fast-moving generics and regular physician performance evaluations. In the medium term, hospitals should strengthen electronic prescribing systems with formulary restriction features and develop geriatric clinics to manage elderly patients with comorbidities, thereby reducing polypharmacy. These measures would improve compliance, reduce inefficiencies, and contribute to the sustainability of Indonesia's universal health coverage program.

Conclusion

This study demonstrates that prescribing practices in neurology and psychiatry outpatient clinics at AN-NISA Hospital—including formulary adherence, PRB restrictions, generic drug use, polypharmacy, and provider compliance—have not fully met established standards, with generic prescribing in psychiatry meeting WHO benchmarks but neurology falling short. These factors were correlated with increased drug costs, with generic prescribing emerging as the most influential driver. Inefficiencies were greater in neurology, underscoring the need for targeted interventions.

To improve compliance and reduce financial losses, hospital management should adopt a coordinated strategy that integrates the roles of pharmacy teams, IT systems, and medical staff. Pharmacy teams must actively monitor prescriptions and intervene when non-compliance occurs, while IT systems should embed formulary restrictions and automatic alerts into electronic prescribing platforms to prevent inappropriate orders. Medical staff, particularly full-time specialists, should be engaged through clear policies, performance evaluations, and continuous education to strengthen adherence to the National Formulary. By aligning these functions, hospitals can enhance rational drug use, optimize efficiency, and contribute to broader health system sustainability under Indonesia's JKN program.

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