



Identification Challenges Drug Management in the Selection and Procurement Stage in Indonesian Hospitals: A Systematic Review

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Abstract. Efficient drug management is essential to ensuring hospital-quality, affordability, and rational use of medicines. In Indonesia, the Ministry of Health has established national indicators through Regulation to evaluate the quality of drug selection and procurement. This systematic review aims to assess the conformity of hospital drug selection and procurement practices in Indonesia with national standards and to identify key barriers hindering efficient pharmaceutical management. A systematic literature search was conducted in April 2025 using Garuda Kemdikbud, Google Scholar, and Scopus databases. Articles published between 2021 and 2025 in English or Indonesian were screened using predefined eligibility criteria. Twelve cross-sectional studies were included, covering hospitals in Java, West Nusa Tenggara, and North Sulawesi. Most hospitals demonstrated partial conformity with the National Formulary (Fornas), with alignment ranging from 14.15 % to 100 %. Drug procurement was marked by budget constraints, discrepancies between planning and availability, delayed payments up to 123 instances, and prolonged lead times. While procurement frequency and invoice errors were within acceptable ranges, the planning accuracy varied considerably. These issues were more pronounced in type C government hospitals, which typically lack robust governance and financial systems. Type A and B hospitals showed better compliance in selection but still faced inefficiencies in procurement. The findings highlight significant gaps between policy standards and real-world practices in drug management, especially in resource-limited hospital settings. Strengthening pharmacy information systems, improving inter-unit coordination, and updating formularies are essential to optimizing drug selection and procurement processes in Indonesian hospitals

Keywords: Drug Management, Procurement, Planning Accuracy, Hospital Pharmacy, Drug Selection.

1 Introduction

Medicines are a vital component of healthcare services [1]. The medicine management system should be viewed as part of the overall hospital service system and organized in

a way that provides services based on safety, effectiveness, and economic use of medicines, thereby achieving effective and efficient medicine management. Medicine management is closely related to hospital budgets and expenditures [2]. Hospital medicine costs can account for 40% of total healthcare expenses. According to the Indonesian Ministry of Health, nationally, medication costs account for 40 % – 50 % of total healthcare operational costs [3]. Given the importance of funding and the role of medications for hospitals, their management must be carried out effectively and efficiently to maximize benefits for both patients and the hospital. This management encompasses selection, planning, procurement, distribution, and use [4].

However, in practice, hospitals in Indonesia still face various challenges in implementing effective medicine management, particularly in the selection, planning, and procurement stages. Evaluation results indicate that there is still a mismatch between the medications available in hospitals and the National Formulary (Fornas) and Hospital Formulary (Formularium RS), budget allocations that do not align with actual needs, and issues in the procurement administration process such as invoice errors and payment delays [1], [5]. Additionally, the inaccuracy of procurement frequency leads to two contradictory yet equally detrimental issues: drug shortages (stockouts) and excess stock (overstock), which impact service availability and budget wastage [6].

These challenges are further complicated by Indonesia's diverse geographical conditions, particularly in remote, frontier, and outermost (3T) areas. Hospitals in these regions often face difficulties in accessing distributors, limited human resources, and inadequate logistics infrastructure [7]. These geographical disparities result in delays in drug procurement and distribution, as well as increasing the risk of mismatches between drug demand and supply. Therefore, this study aims to identify and summarize the main issues in drug management during the selection and procurement stages in Indonesian hospitals through a systematic review approach based on national quality indicators to provide a comprehensive overview and serve as the basis for recommendations to improve the drug management system in the era of the National Health Insurance (JKN).

2 Methods

This study applied the PRISMA criteria to ensure a systematic and consistent approach was used in identifying relevant papers [4]. Literature searching was conducted in April 2025 using the following databases: Garuda Kemdikbud, Google Scholar, and Scopus. The search strategy employed both standardized Medical Subject Headings (MeSH terms) and non-standardized keywords related to "DRUG PROCUREMENT," "DRUG PLANNING," "DRUG MANAGEMENT INDICATORS," and "HOSPITALS." Boolean operators (AND, OR) were applied to combine synonyms and subcategories, and search terms were adapted according to each database's indexing system. In addition, manual searches were performed on the reference lists of all eligible studies. The database search was limited to publications from 2021 to 2025. The search period for articles was limited to 2021 to 2025 to ensure that the literature used reflects the latest practices, policies, and findings in hospital drug management, and that the review

results remain relevant to the current healthcare system context.” Studies were considered eligible for inclusion if they were published between 2021 and 2025 in either English or Indonesian, focused on drug management during the selection and procurement stages in hospitals, provided complete and relevant information regarding management indicators, and were published in journals with an International Standard Serial Number (ISSN). Studies were excluded if they were published before 2021, categorized as literature reviews, meta-analyses, theses, or guideline books, lacked full-text availability, or did not provide information relevant to the scope of this review.

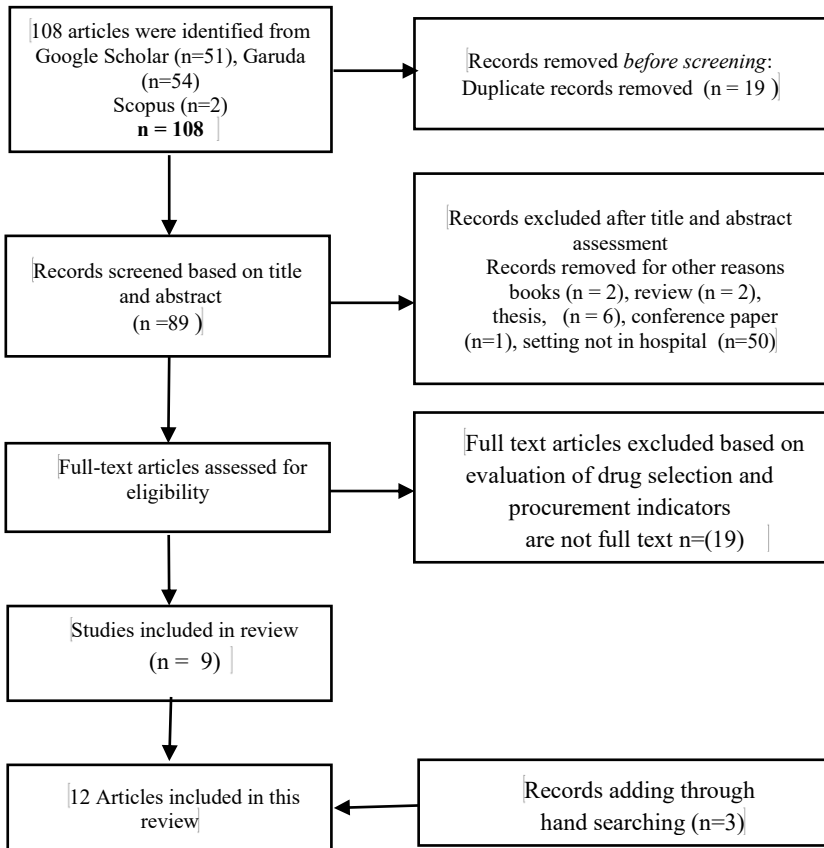


Fig 1. PRISMA Diagram

2.1 Data Extraction

Information was gathered from all the articles, which covered fundamental details such as the authors, titles, type of hospitals, where the studies took place, publication years, research goals, participant numbers, research tools, and the outcomes connected to drug management during the selection and procurement stages in Indonesian hospitals.

2.2 Study Quality Assessment

The results of methodological quality assessment for the twelve included studies, evaluated using the JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies. All studies fulfilled the first four criteria, which included clarity of inclusion criteria, adequate description of study subjects and setting, validity of measurement tools, and the use of standard objective criteria. However, none of the studies identified or reported potential confounding factors, nor did they employ appropriate statistical analysis to address them [8].

3 Results

3.1 Search Results

Figure 1 illustrates a PRISMA diagram detailing the search method employed in this review. The diagram reveals that 108 publications were identified from the electronic databases: 51 from Google scholar, 54 from Garuda, and 2 from Scopus. After eliminating 19 duplicate articles, 89 articles were screened. After excluding duplicates and articles irrelevant based on their titles and abstracts, 28 potentially relevant articles were retrieved for full-text evaluation. Of these, nine articles met the inclusion criteria and two additional records were found via manual searching were included in this literature review. In total, this study included 12 articles published between 2021 and 2025 met the inclusion criteria and were included in this literature review A summary of the included article characteristics can be found in Fig. 1.

3.2 Characteristic of the Included Study

Twelve eligible studies were included in this review in Table 1, all conducted in various regions of Indonesia, including Java, West Nusa Tenggara, and North Sulawesi. The study sites encompassed public hospitals in cities and districts such as Surakarta, Sragen, Boyolali, Jakarta, Madiun, Lombok, and Minahasa. Most studies were carried out in government type C hospitals under regional classifications, particularly Region 1 and Region 9, while one study involved type B and type A hospitals. All studies employed a cross-sectional design appropriate for evaluating drug management practices at a specific time. The studies primarily used a quantitative descriptive approach, with four incorporating qualitative methods, such as interviews, to deepen the analysis. Data sources included administrative documents such as stock cards, prescriptions, National Formulary reports, procurement records, LPLPO reports, and purchase invoices. Although most studies did not report explicit sample sizes, the data collection period from 2017 to 2023 offered broad temporal insights. In contrast, Lubis' research employs a quantitative approach based on individual drug items, due to the availability of more complete and structured data per item. These studies consistently

evaluated hospital pharmacy performance based on administrative and logistical indicators related to drug selection and procurement

Table 1. Characteristic Study

No	Author (Year)	Location	Hospital Type	Study Design	Data Period	Collection Method
1	Soka et al. (2022)	Surakarta	Gov. Type C, Reg. 1	Cross-sectional	2017	Financial reports, drug procurement reports, drug invoices, purchase orders, stock cards, interviews
2	Erma et al. (2023)	Central Lombok, NTB	Gov. Type C, Reg. 9	Cross-sectional	Aug-Sep 2023	Financial reports, stock cards, prescriptions, Fornas utilization reports, Inventory Drugs reports
3	Arfianingsih et al. (2023)	Sragen, C. Java	Gov. Type C, Reg. 1	Cross-sectional	2023	Financial reports, stock cards, prescriptions, Fornas reports, ,Inventory Drugs reports
4	Falinda et al. (2022)	West Jakarta	Gov. Type C, Reg. 1	Cross-sectional	May 2022	Financial reports, stock cards, prescriptions, Fornas reports, , Inventory Drugs reports
5	Indriana et al. (2021)	East Jakarta	Gov. Type C, Reg. 1	Cross-sectional	Oct-Dec 2020	Financial reports, stock cards, prescriptions, Fornas reports, , Inventory Drugs reports
6	Karauwan et al. (2022)	Minahasa, N. Sulawesi	Gov. Type C, Reg. 9	Cross-sectional	Jun-Aug 2020	Financial reports, stock cards, prescriptions, Fornas reports, ,Inventory Drugs reports
7	Lubis et al. (2024)	Purwokerto, C. Java	Gov. Type C, Reg. 1	Cross-sectional	Jan-Dec 2022	Financial reports, stock cards, prescriptions, Fornas reports, , Inventory Drugs reports
8	Nugroho et al. (2022)	Madiun, E. Java	Gov. Type C, Reg. 7	Cross-sectional	2020	Financial reports, stock cards, prescriptions, Fornas reports, Inventory Drugs reports
9	Rumagit et al. (2024)	Minahasa, N. Sulawesi	Gov. Type C, Reg. 9	Cross-sectional	2019	Financial reports, stock cards, prescriptions, Fornas reports, ,Inventory Drugs reports

No	Author (Year)	Location	Hospital Type	Study Design	Data Period	Collection Method
10	Yulien (2025)	Boyolali, C. Java	Gov. Type B, Reg. 1	Cross-sectional	2022	Financial reports, stock cards, prescriptions, Fornas reports, Inventory Drugs reports
11	Ismaya et al. (2024)	Jakarta	Gov., Reg. 1	Cross-sectional	NA	Fornas drug list, hospital formulary list, drug procurement list, budget reports, lead time evaluation reports
12	Ghozali et al. (2021)	Magelang, C. Java	Gov. Type A, Reg. 1	Cross-sectional	Dec 2020–Apr 2021	Financial reports, stock cards, prescriptions, Fornas reports, Inventory Drugs reports

3.3 Selection Stage

Table 2. Compliances Selection Indicator

References	Indicator	
	Conformity of medicinal items with the National Formulary	Conformity of available medicines with the hospital formulary
[11]	86.83 %	94.7 %
[12]	96.8 %	100 %
[13]	93 %	NA
[14]	60 %	NA
[15]	100 %	72 %
[16]	NA	NA
[17]	NA	NA
[18]	92.51 %	80 %
[19]	65.28 %	NA
[20]	72 %	NA
[21]	14.15 %	68.15 %
[22]	NA	81 %

Table 2 presents the indicators used to evaluate the drug selection stage in hospitals, based on the results of several studies. There are two leading indicators used. First, the level of drug item conformity with the National Formulary (Fornas) indicates the percentage of drug items available in hospitals that are on the list of drugs specified in Fornas, with a standard of 100 % [9]. Second, the level of conformity with drug availability and the hospital formulary, which describes the extent to which available drugs align with the hospital’s internal formulary, is measured against a standard of

100% [10]. Both indicators are expressed as percentages and are used to measure the alignment between drug selection policies and national standards.

There are 12 articles that were reviewed and for Compliance of medicinal items with the National Formulary indicator there are 3 studies that NA and for Compliance of available medicines with the hospital formulary indicator there are 6 studies.

Based on Table 3, the conformity of available drug items with the National Formulary indicates that just one study meets the standards [15], while eight studies fall below them [11], [12], [13], [14], [18], [19], [20], [21]. Meanwhile, two studies did not measure these two indicators, so they are marked NA [16], [17]. Furthermore, regarding the suitability of available drug items with the hospital formulary, only one study was found to meet the standard [12]. Five studies were still below 100% [11], [15], [18], [21], [22]. Meanwhile, six studies did not measure this item.

The challenges identified in this review are the outdated national formulary, hospitals treating patients other than BPJS members, lack of compliance by doctors in prescribing drugs by the formulary, inactivity of the hospital's pharmacy and therapy committee, and the influence of the industry, such as empty drugs and discounted prices for drugs outside Fornas.

Table 3. Challenges in Selection Stages

Challenges	Number of Studies	References
Formularies not updates	3	[11], [15], [19]
Hospital serves patient other than BPJS	4	[11], [13], [14], [19]
Lack of compliance by doctors in prescribing drugs	5	[11], [12], [14], [20], [21]
Underutilization of the Pharmacy and Therapeutic Committee (PTC)	3	[18], [19], [21]
External influences from the pharmaceutical industry	3	[11], [20], [21]

3.4. Procurement Stage

Table 4 presents various indicators used to evaluate the drug procurement stage in hospitals based on the results of several studies and the challenges in Table 5. These indicators cover five main aspects. First, the percentage of drug procurement funding allocation indicates the proportion of the special budget allocated for drug purchases from the total hospital budget. Second, the percentage of available funds relative to total needs describes the extent to which the funds available to the hospital are sufficient to meet drug procurement needs. Third, the frequency of procurement per drug item is classified into low, middle, or not available (NA) categories.

Based on standards established from previous studies, procurement frequency is considered low if it occurs 1 times per year – 9 times per year, moderate if it occurs 12 times–24 times per year, and high if it occurs more than 24 times per year. Fourth is the

number of invoice errors, which is assessed based on the errors that occur and are reported in the “Low” or not available (NA) categories. Finally, the fifth indicator is the frequency of late payments by hospitals, which shows how often hospitals experience delays in making payments compared to the set time. These indicators provide a comprehensive picture of the effectiveness and efficiency of the drug procurement process in various hospitals [9].

Procurement Budget Allocation. Based on Table 4, the Percentage of Drug Procurement Fund Allocation indicator shows that only nine articles provide information about the budget allocation given by hospitals. The remaining four articles do not contain information related to this indicator. The Standard Percentage of the available budget compared to the total required budget for drug procurement is 30 % – 40 % of the hospital budget. The highest drug procurement fund allocation was found in the study [18] at 35.42 % and the lowest allocation was recorded in the study at only 7.21 % [22].

Table 4. Compliances Procurement Stage Indicator

First Author, Year	Indicator				
	Percentage of Drug Procurement Fund Allocation	Percentage of funds available relative to total funds required	Frequency of procurement for each item of medicine	Number of Invoice Errors	Frequency of delayed payments by hospitals
Soka, et al., (2022)	32.56 %	136.05 %	12 times	No Errors	No Delays
Erma, Alawiyah dan Sulaiman Lalu (2023)	NA	50 %	12 times	No Errors	10 times
Arfianingsih, et al (2023)	NA	NA	4-6 times	8 times	No Delays
Falinda et al (2022)	33 %	100 %	4 times	NA	No Delays
Indriana, et al (2021)	19 %	100 %	9 times	2 times	15 times
Karauwan, et al (2022)	30 %	45 %	20 times	NA	29 times
Lubis et al (2024)	30.68 %	75.38 %	NA	6 times	32 times
Nugroho, et al (2022)	35.42 %	NA	NA	NA	123 times
Rumagit, et al (2024)	14.74 %	100 %	7 times	No errors	NA
Yulien, Dewi Kartika (2025)	NA	NA	4 times	NA	21 times
Ismaya, et al (2024)	NA	NA	5 times	NA	NA
Ghozali et al (2021)	7.21 %	NA	NA	No Errors	2 times

Percentage of funds available relative to total funds required. The suitability of the indicator, which is the percentage of the available budget to the total budget required for medicines, was examined in four articles. The rest varied from 45% to 75.38%. Five articles did not contain information on the suitability of this indicator. The standard set for the indicator is 100 % [9].

Procurement Frequency. Based on the quality indicator standards developed by Pudjaningsih, procurement frequency is assessed using three criteria: low (1-9 times per year), medium (12 times per year – 24 times per year), and high (>24 times per year) [23]. The frequency of drug procurement in hospitals, as determined by this review, shows a low to moderate level. Three studies reported a moderate procurement level, while six others reported a low level. Meanwhile, four other studies did not provide information on the suitability of these indicators.

Frequency of Errors Invoice. The criteria for purchase invoice errors used are discrepancies in the type of medicine, the quantity of medicine in an item, or the type of medicine on the invoice compared to the order form. The results in Table 4 indicate that there were no invoice errors in four of the studies [11], [12], [19], [22]. Five studies did not report this indicator [13], [16], [18], [20], [21]. Meanwhile, other hospitals continued to experience discrepancies between invoices and order forms, with discrepancies ranging from two to eight times the amount [13], [15], [17]. Based on the established standards, this is still considered low. Low criteria apply if the error frequency is <12 times per year, moderate if 12 times per year – 24 times per year, and high if >24 times per year.

Table 5. Challenges in Procurement Stages

Challenges	Number Studies	of References
Limited Budget	5	[12], [15], [16], [17], [22]
Drug shortages in supplier	2	[13], [21]
Long lead time medicines	1	[15]
Lengthy financial administrative process	4	[15], [16], [17], [18]
Delayed BPJS reimbursement	2	[18], [20]
Deviations Planning Drug	1	[17]

Delayed Payment. Based on the standard indicator of the frequency of delayed payments by hospitals beyond the specified time, the rate is 0 %. In the table, three hospitals were found to meet the standard [11], [13], [14], while other studies still showed delays in payments ranging from 2 times a year to 123 times a year [12], [15], [16], [17], [18], [20], [22]. Two studies did not show this information.

4 Discussion

4.1 Selection stage

This review provides detailed information on compliance of medicinal items with the National Formulary and Compliance of available medicines with the hospital formulary. The evaluation of drug selection showed that the percentage of medicines aligned with the National Formulary (Fornas) varied widely across hospitals, ranging from 14.15 % – 100 % , with an overall average falling below the expected 100 % compliance standard [15], [21]. This variation reflects inconsistencies in formulary management, where hospital formularies were either outdated [11], [15] or not fully aligned with Fornas due to hospital policies that accommodate non-BPJS patients [14], [19]. From the literature review, it was found that only one hospital achieved 100 % compliance in the study [[12], [15], while other studies showed low compliance, even as low as 14.15 % in the studies [20], [21].

Hospitals that demonstrate 100 % compliance with the National Formulary and their internal formulary indicate that they have implemented effective pharmaceutical management. The positive impacts include ensuring rational drug use by national standards, promoting cost efficiency, ensuring compliance with regulations, and facilitating more accurate drug planning and procurement to prevent overstocking and stockouts. In some cases, physicians' non-compliance with formulary-based prescribing further contributed to low conformity [11], [21] . This finding is consistent with a study previous [24], which emphasized that updating hospital formularies and promoting formulary adherence among clinicians is key to rational drug use in Indonesian hospitals. Improving doctors' understanding of prescription writing based on FORNAS, and hospital formulary will affect drug availability. Hospitals that demonstrate 100 % compliance with the National Formulary and their internal formulary indicate that they have implemented effective pharmaceutical management. The positive impacts include ensuring rational drug use by national standards, promoting cost efficiency, ensuring compliance with regulations, and facilitating more accurate drug planning and procurement to prevent overstocking and stockouts [9]

4.2 Procurement stage

Drug procurement is a process of determining drug items and the quantity of each drug item based on a predetermined plan, selecting suppliers, writing purchase orders, and ensuring that the purchase orders are received by suppliers. The objective is to obtain the required drugs at reasonable prices, with good quality, guaranteed timely delivery,

a smooth process, and without requiring excessive time and effort [9]. Based on the findings of the five indicators in the procurement stage, discrepancies were still found in each quality indicator.

Regarding budget allocation, several studies by Soka et al., Falinda et al., Karauwan et al., Nugroho et al., and Lubis et al. demonstrated compliance with the 30 % – 40 % standard, reflecting sound budget planning and contributing to better drug availability and timely procurement. Conversely, hospitals allocating less than 30 %, as reported by Indriana et al. [15] and Ghozali et al. [22], faced systemic challenges including drug shortages, dependence on suboptimal drug choices, and increased risk of pharmacy service disruptions [25].

The alignment between available budgets and actual pharmaceutical needs was reasonably adequate in several hospitals, enabling smooth procurement and preventing stock shortages [3]. However, hospitals with low budget alignment faced procurement delays, forced selection of the cheapest drugs, and delayed payments to suppliers, as evidenced by Nugroho et al. reporting 123 payment delays [18]. This situation suggests a lack of integration between pharmaceutical and financial planning, which could compromise service quality and patient safety [26].

Procurement frequency variations indicate the absence of standardized integration between needs planning and inventory control systems. The predominance of low-frequency procurement suggests many drugs fall into the slow-moving category, with associated financial implications [27]. High procurement frequency and payment delays were influenced by limited operational budgets, imprecise demand planning, shortage of pharmacy management experts, and inadequate information technology in procurement systems [28,29].

Invoice error rates across studies remained within low and acceptable ranges, primarily attributable to prompt verification practices by pharmacy staff upon delivery. However, hospitals experiencing discrepancies cited supplier stock shortages and high order volumes that prevented thorough checks, potentially disrupting drug services and increasing costs [24].

The frequency of delayed payments, which should be zero, ranged from 2 to 123 occurrences annually across included studies. Only three hospitals reported no payment delays [11,13,14]. Weak internal financial management and heavy reliance on BPJS claim reimbursements contributed to high delay rates [18]. The challenges identified in this review were predominantly observed in type C regional hospitals, which typically operate with limited budgets, fewer trained pharmacists, and minimal automation. Type A and B hospitals demonstrated better compliance in selection but still faced procurement inefficiencies, indicating that administrative weaknesses are not exclusive to lower-tier facilities [20,22].

This review has several limitations. Most included studies relied heavily on secondary data from administrative documents, which may not fully capture the actual dynamics of implementation or qualitative aspects such as stakeholder perspectives. Additionally, the geographical coverage was predominantly concentrated in Java and a few selected provinces, potentially limiting the generalizability of findings to hospitals in eastern Indonesia or other remote regions.

5 Conclusions

This systematic review reveals substantial gaps between national pharmaceutical management standards and their implementation in Indonesian hospitals, particularly in the drug selection and procurement stages. While most hospitals demonstrated partial compliance with the National Formulary, inconsistencies were evident in planning accuracy, budget allocation, procurement frequency, and supplier payment timelines. These challenges were especially pronounced in type C public hospitals, which often operate under limited resources, fragmented systems, and administrative inefficiencies. Addressing these systemic issues requires strengthening cross-unit coordination, improving human resource capacity, updating formularies, and reinforcing the integration pharmacy information systems to promote rational and efficient drug management.

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