



ANALYSIS OF INACCURACIES IN THE PREPARATION OF THE PLAN FOR HYPERTENSION DRUG NEEDS OF THE NEW SELAT HEALTH CENTER

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Abstract

Accurate drug needs planning is an important component in ensuring the continuity of hypertension therapy as a chronic disease with high prevalence. However, the UPT Puskesmas Selat Baru still faces inaccuracies in the preparation of the Drug Needs Plan (RKO), which is marked by the occurrence of 27 incidents of stock-out of antihypertensive drugs and stock accumulation that causes expired drugs and state losses. This study aims to analyze the root causes of RKO inaccuracies and formulate alternative data-driven solutions to improve the effectiveness of drug management. The research uses a qualitative approach with a case study design through in-depth interviews, observations, and document review on purposively selected informants, including the Head of the Health Center, the Pharmacist in Charge, the Person in Charge of the P2PTM Program, and the Regency IFLK Pharmacist. Data validity is obtained through triangulation of sources, methods, and data. The analysis is carried out using the problem solving cycle and Fishbone Analysis to identify the main cause of the problem. The results of the study showed that the inaccuracy of planning was caused by the use of historical consumption methods without considering epidemiological trends, manual stock recording, low data accuracy, and low competence of officers in disease-based forecasting. The consequences are the instability of the availability of drugs, the non-achievement of Hypertension SPM, and budget losses. The study concluded that increasing human resource capacity through technical training "Epidemiology-Based RKO Management" is the most effective solution to improve planning accuracy and prevent recurrence of drug availability problems.

Keywords : Antihypertensiveness, Forecasting, Drug Availability, Logistics Management, Drug Needs Plan

Introduction

Effective management of drug availability is a fundamental pillar in the global health system to ensure equitable and sustainable access to essential medicines, as affirmed by the World Health Organization (WHO). However, the reality on the ground shows persistent challenges in the form of planning inaccuracies that lead to two extremes of the problem: stock-out and over-stocking. This drug shortage is not just a local problem, but a global threat. The World Health Organization report (2023) confirms that disruptions to the supply chain of essential medicines have become a priority crisis that has weakened the resilience of health systems in many countries, requiring immediate management intervention¹. A global study in developing countries noted that healthcare facilities often experience stock-outs of up to 28.9% of uptime, which has a fatal impact on chronic patient compliance. The root of this problem refers to the weakness of forecasting methods that fail to integrate epidemiological trends with supply variability, thus creating budget inefficiencies and the risk of massive drug expiration.

In Indonesia, this problem is clearly illustrated in the First Level Health Facility (FKTP). Data from the Ministry of Health of the Republic of Indonesia (2023) reports that more than 33% of health centers are experiencing a shortage of essential medicines, including antibiotics and antihypertensives. In line with that, national research shows inefficient stock management that causes 8-12% of drugs in district pharmacy warehouses to expire. Previous research by Ismail et al. (2025) in eastern Indonesia confirmed that this ineffectiveness is due to the weak validity of logistics data and the lack of real-time communication between Puskesmas and Health Offices, which exacerbates the gap between procurement planning and realization².

More specifically, the inaccuracy of the preparation of the Drug Requirement Plan (RKO) often triggers a paradoxical phenomenon: a shortage of vital drugs on the one hand, but an overstock on the other. A study conducted by Kunnu and Rahem (2023) found that even though drug management was considered good administratively, there was still a category of excess stock (death stock) of 29.1% due to consumption methods that were not adjusted to actual disease patterns³. This is strengthened by the findings of Maulidie et al. (2023) which highlight that the absence of annual consumption trend analysis makes Puskesmas fail to anticipate a surge in the need for chronic disease drugs, thus having a direct impact on the decline in service quality⁴.

This paradoxical condition is reflected in the UPT Puskesmas Selat Baru, Bengkalis Regency. Internal data shows a consistent trend of increasing Hypertension cases, moving from 5,262 cases (2024) to 5,412 cases (2025). Theoretically, an increase in the burden of the disease should be followed by the proportionate availability of drugs. However, the facts on the ground show the opposite; There were 27 incidents of essential drug shortages in one year, while at the same time there was a buildup of vital antihypertensive drugs (such as Captopril and Bisoprolol) that ended up expiring with a total state loss of Rp 35,061,251. This inequality contributes directly to the non-achievement of the Minimum Service Standard (SPM) for hypertension services, which has only touched 80% (20% gap). The impact of this drug vacuum is crucial because Hypertension is "The Silent Killer" that requires lifelong continuity of therapy. Loss of access to medication (stock-out) due to misplanning not only thwarts blood pressure control, but also significantly increases the risk of fatal cardiovascular complications such as stroke, heart attack, and premature death. This clinical risk was confirmed by Olaniran et al. (2022), who in their study found that disruptions in the supply chain of essential medicines had a significant impact on decreased patient compliance with chronic diseases⁵. Furthermore, Bigdeli et al. (2015) emphasized that the availability of drugs is not just a logistical issue, but a reflection of health system resilience⁶. Therefore, the tolerance of planning errors for this vital category drug must be very low to ensure patient safety.

Seeing the urgency of the gap between the high burden of hypertension and the inefficiency of pharmaceutical logistics management, this study is focused on analyzing the root causes of the inaccuracy in the preparation of the Drug Needs Plan (RKO) at the Selat Baru Health Center. In contrast to previous studies that only evaluated the availability of drugs in general, this study specifically highlighted the impact of inaccurate forecasting methods on the availability of antihypertensive drugs. Through a management analysis approach (Fishbone Analysis), this study aims to formulate a data-driven intervention strategy to minimize stock-out and expired drugs, in order to support the success of therapy for hypertension patients in a sustainable manner.

Method

This study uses a qualitative approach with a case study design that aims to describe in depth the real conditions related to drug planning, procurement, and management at the Selatbaru Health Center UPT, Bantan District, Bengkalis Regency. This approach allows researchers to comprehensively understand the phenomenon through direct observation, in-depth interviews, and the study of relevant documents, then relate them to the laws and regulations related to the problem being studied. The research was carried out on October 13-30, 2025 with the main location at the Selatbaru Health Center. The selection of informants was carried out using the purposive sampling technique, which is the determination of the sample based on certain goals and criteria. The informants consist of the Head of the Health Center as a policy determiner, the Pharmacist in Charge as the technical implementer of logistics, the Person in Charge of the P2PTM Program as a user of hypertension drugs, and the Pharmacist in Charge of IFLK Bengkalis Regency who plays a role in the provision and distribution of district-level drug logistics. Primary data was obtained through observation of the drug management process and in-depth interviews with all informants, while secondary data included RKO documents, stock cards, drug availability reports, LB1 reports, SPM, drug management SOPs, and related regulatory documents as additional sources of verification and analysis.

Data validity is obtained through source triangulation, method triangulation, and data triangulation. Source triangulation was carried out by comparing the results of interviews from the main informants, supporters, and keys; The triangulation method was carried out by matching the results of the interview with observations; Meanwhile, data triangulation is carried out by comparing field findings with literature and official documents. Data analysis uses a problem solving cycle approach, which includes situation analysis, problem identification, problem prioritization, and determination of alternative problem-solving solutions. The analysis process is strengthened by the use of fishbone analysis to systematically explore the root of the problem so as to produce a comprehensive picture of the factors that affect the drug planning and management process at the Selatbaru Health Center.

Result

Based on the analysis of the drug management situation at the Selat Baru Health Center UPT, it was found that the inaccuracy of the preparation of the Drug Needs Plan (RKO) and the instability of the availability of antihypertensive drugs still occur because planning has not fully considered the increasing trend of hypertension cases and the pattern of patient visits that continue to increase from 2024 to 2025. Problem identification is carried out through field observation, document review, as well as interviews and discussions with drug managers, program managers, field supervisors, and Puskesmas Heads to ensure that the findings truly reflect operational conditions and service priorities. The results of the process produce a list of main problems related to drug planning and management in health centers.

Table 1. Identification of Problems in the Management of Hypertension Drugs at the Selatbaru Health Center

Yes	Problem	Cause	Impact
1.	Inaccuracies in the preparation of Hypertension Drug needs plan	The calculation method still uses (historical) consumption data without adjusting for epidemiological trends	There were <i>stock-out incidents</i> that contributed to the non-achievement of the Hypertension SPM target (Gap 20%), as well as the risk of medical complications in patients with chronic inefficiency of logistics management at the Health Center.
2.	There is still an expired Hypertension drug	There is an accumulation of stock (<i>over-stocking</i>) due to the procurement of drugs that of misuse of drug waste and the cost are not in accordance with the real needs in the field.	Waste of state budgets, as well as the risk of misuse of drug waste and the cost of burden of destruction.
3.	Stock recording and logistics reporting system is still manual	There has been no implementation of an integrated (<i>real-time</i>) digital information system.	Stock data becomes invalid (the difference between physical and administrative stock), is prone to <i>human error</i> , and slows down the managerial decision-making process.

Before determining alternative problem solving, a causal analysis is carried out with Fishbone Analysis or Ishikawa diagrams to systematically identify the root of the problem through a brainstorming process. This method breaks down the source of the problem into several categories such as human factors, materials, machines, methods/procedures, environment, and funding, which are then further explored to find the specific causes that contribute to the emergence of the problem.

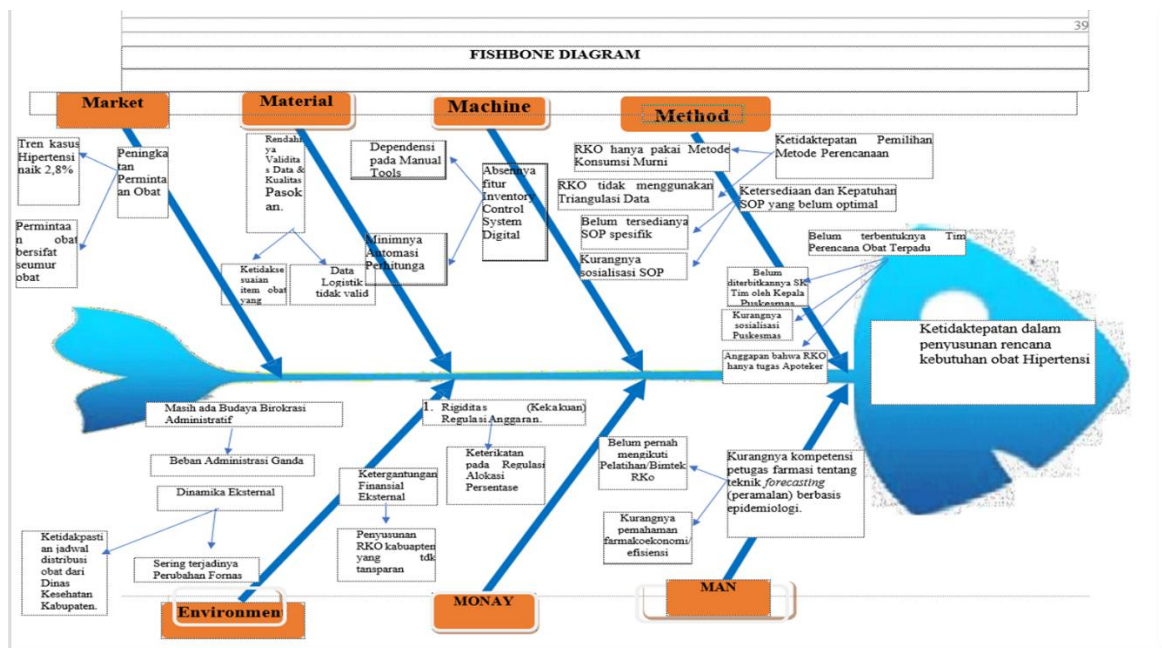


Figure 1. Diagram Fishbone

Based on the results of the root of the problem analysis using the Fishbone Diagram, the next stage is to develop relevant alternative problem solving to overcome various drug management problems at the Selat Baru Health Center UPT. The preparation of this alternative aims to formulate strategic steps that can improve the accuracy of drug needs planning (RKO), increase transparency and coordination with the district level, and strengthen the drug logistics management system to be more effective and efficient.

In order to ensure objectivity in the selection of alternative solutions, the weighting process in Table 2 is carried out through a *consensus decision-making mechanism* involving elements of leadership and technical implementers. The assessment was carried out with the Head of the Health Center as the strategic policy determinant, the Pharmacist in Charge as the holder of the logistics technical authority, and the Person in Charge of the P2PTM Program as the user of the service data. This three-party synergy is needed to ensure the selected solution has operational validity, managerial support, and strong clinical relevance

Table 2 Selection of Inaccuracy Problem Solving in the Preparation of Hypertension Drug Needs Plan

Alternative Solutions	Tivism effect	Efi Siensi	Resources	Squirrely	Total	Ranbir King
1. Conducting Technical Training/Technical Guidance on "Epidemiology-Based RKO Management".	5	4	5	5	19	1
2. Create a simple "Automated RKO Calculator" based on <i>Microsoft Excel</i> (Substitute for <i>Digital Stock Opname</i>).	5	5	4	4	18	2
3. Advocacy for the Formation of an Integrated Drug Planning Team (SK Kapus)	4	5	3	4	17	3
4. <i>Data Cleansing</i> & Recording Stock Intensification.	4	3	3	4	15	3
5. Budget Advocacy/Spending Priority Policy.	4	3	3	4	14	5

From the results of the assessment, the priority solution for the problem chosen is to conduct Technical Training/Guidance on "Epidemiology-Based RKO Management.

Discussion

Using the Root Cause Analysis approach (Ishikawa Diagram), this discussion outlines the root of the problem based on the 5M+1E category (Man, Method, Material, Machine, Money, Environment and Market) to find the most effective solution.

Man (Human Resources)

Based on the root of the problem analysis in the Human Resources (HR) dimension, two fundamental deficits were found that hindered the effectiveness of drug planning. First, the deficit of technical competence, where officers have limitations in applying epidemiology-based forecasting techniques due to the lack of frequency of specific training. This is in line with the study by Wiguna et al. (2023) which places technical competence as the main predictor of operational efficiency⁷. Therefore, intervention through In-House Training (IHT) and the Peer-Learning method is an absolute solution to improve competency standards according to the mandate of the Minister of Health Regulation No. 26 of 2020. Second, the deficit of pharmacoeconomic awareness (Cost-Awareness). The identified officers still view drug stocks solely as a logistics commodity, not as a state financial asset. This low sensitivity to loss values contributes to letting stocks die. Referring to the principles of pharmaceutical management by Satibi (2014) & Quick (1997) as well as the findings of Khairani et al. (2021), cost control is a vital performance indicator. Therefore, the intervention strategy implemented is not only educational, but also psychological, namely by requiring the reporting of losses in nominal Rupiah (not just the number of items) in monthly meetings as a form of visual shock therapy, as well as the application of financial warning labels on high-value drug storage shelves."⁸⁻¹⁰

Method

Based on the root of the problem analysis, aspects of work methods or procedures are one of the main contributors to planning inaccuracy. Problems in this aspect are identified at two critical points: non-adaptive calculation techniques and weak data validation procedures.

First, the dominance of the use of the Pure Consumption Method. Findings in the field show that in the preparation of the Hypertension RKO, the Selat Baru Health Center is still very dependent on the use of the Pure Consumption Method based on historical data on the use of drugs in the past period. This method is carried out without triangulating with morbidity data or disease trends. The weakness of this method is its inability to anticipate a surge in demand due to an increase in disease cases. This is contrary to the Indonesian Minister of Health Regulation (2019) concerning Technical Guidelines for Pharmaceutical Service Standards in Health Centers, which recommends the application of the Combination Method (Consumption and Morbidity) to ensure the availability of fluctuating but vital drugs such as antihypertensive drugs. Therefore, the strategic solution offered is the transition of calculations to the Combination Method to improve RKO precision.

Second, the availability and compliance of the RKO Validation SOP has not been optimal. In addition to the calculation technique, procedural problems can also be seen from the lack of a standard data cross-check mechanism. It was found that the RKO validation procedure is often skipped or carried out casually because the SOP that regulates data verification obligations has not been optimal. As a result, data bias between physical and administrative stocks is not detected prior to reporting. Referring to the pharmaceutical management theory by Satibi (2014), the validity of absolute planning data requires a rigorous triangulation process of data sources⁸.

To overcome this, the planned interventions include the revision/preparation of the RKO Validation SOP which explicitly requires data triangulation before the RKO document is sent. In order for this procedure to have strong legal and operational force, advocacy steps are also needed for the issuance of the Decree of the Head of the Health Center on the Establishment of an Integrated Drug Planning Team. This decree serves as a legal umbrella that binds the Pharmacy and Poly units to carry out the collaborative procedure in a disciplined manner.

Machine (Peralatan)

An in-depth analysis of the Machine aspect highlights the existence of significant technical barriers in the logistics data processing process. Based on field observations, it was found that the mechanism for calculating drug needs at the Selat Baru Health Center is still dominated by dependence on manual tools. Pharmacists recapitulated data on thousands of drug items with the help of conventional calculators and paper-based recordings. The absence of this automation system causes the RKO compilation process to be very slow and has a high level of vulnerability to human error, both in writing numbers and summing data. The condition of the infrastructure with minimal calculation automation is a weak point in data validation. Referring to the reference to logistics management standards by Quick (1997) in the book *MDS: Managing Access to Medicines*, it is emphasized that the use of Computerized Systems is an absolute prerequisite in modern drug management to ensure time efficiency and data accuracy⁹. Management that still persists in a manual way is considered no longer relevant to handle the complexity of logistics data that continues to increase as the number of patients increases.

Responding to the gap between the need for high accuracy and the limitations of the tool, the intervention strategy designed in this residency is the development of the innovative "Automatic RKO Calculator". This tool is developed based on Microsoft Excel by utilizing automatic calculation formulas that have been adjusted to standard planning formulas. The choice of the Excel platform is based on considerations of cost efficiency (low cost) and ease of use (user-friendly), but it can have a

significant impact in minimizing manual calculation errors. With this tool, calculation automation can be realized simply, ensuring that the RKO numbers produced are more precise and accountable.

Material (Material)

Material specs in logistics management at the UPT Puskesmas Selat Baru play a crucial role as a "raw material" for health services. Based on the results of the analysis, the problems in this aspect are polarized into two main issues: the validity of internal data and the quality of external supply.

First, related to the validity of the data. It was found that there was a persistent discrepancy between the physical stock of drugs in the warehouse and administrative records. This inaccuracy of input data is fatal because it creates the phenomenon of "Garbage In, Garbage Out"; When the remaining stock data used as the basis for the calculation is incorrect, the results of the Drug Needs Plan (RKO) are confirmed to be inaccurate. To overcome this data distortion, the priority solution set is to conduct "Data Cleansing" through a thorough Stock Taking activity that is carried out strictly before the RKO preparation period begins. This step aims to reset the data so that the planning base truly reflects the real conditions on the ground.

Second, related to the quality and suitability of supply. External factors that worsen material management are the distribution mechanism from the district which still implements the Push System. Often, the amount and type of drugs received are not in accordance with the RKO Puskesmas proposal, and have a very short expiration date (less than 1 year). This condition directly increases the risk of dead stock buildup and budget inefficiency.

Responding to these conditions, an accountability protection mechanism is needed. Puskesmas are recommended to discipline make a written Complaint Minutes to the Health Office every time they receive drugs with short ED or those that are not on demand. This administrative step is not only a matter of bureaucracy, but also an effort to ensure quality and safety. This is in line with the findings of Caillet et al. (2023), who affirm that strict supervision of the physical quality and distribution period of drugs in healthcare facilities is vital surveillance to prevent the risk of using substandard drugs that can endanger patient safety¹¹. Furthermore, this act of recording and reporting logistics complaints is a real implementation of the Puskesmas Accreditation Standards (2023) in the Facility Management and Safety (MFK) chapter, which requires Puskesmas to ensure the safety, quality, and availability of managed pharmaceutical preparations.

Environment

The analysis on environmental aspects highlights the internal working conditions and external supply chain ecosystem that affect the performance of drug management at the Selat Baru Health Center. Based on the identification of the problem, three main environmental barriers were found that distorted the focus of planning.

First, there is a double burden experienced by pharmacists. Situations where officers have to split the focus between daily prescription service to patients and drug warehouse administration cause inventory management to often be neglected in favor of patient service. Second, there is still a strong sectoral ego between units. The lack of constructive collaboration between the Poly Unit (Clinician) and the Pharmacy Unit creates a barrier of information; Clinicians prescribe drugs without knowing stock conditions, while pharmacists plan stocks without knowing the clinician's prescribing patterns. Third, external factors in the form of uncertainty in the distribution schedule from the District Health Office which makes it difficult for the Puskesmas to predict the arrival of stock. This uncertain condition of the supply chain and weak coordination is in line with the study of Atif et al. (2019), which found that supply chain inefficiency and lack of communication between stakeholders are the dominant factors causing the medicine shortages crisis in health facilities. The study confirms that without a strong coordination mechanism, the gap between demand and supply will continue to occur. As an intervention

strategy to break the communication freeze and sectoral ego, the solution offered is to initiate a Pre-RKO Coordination Meeting. This forum can be integrated into the monthly Mini Workshop (Minilok) activities of the Puskesmas. The goal is to equalize the perception (alignment) between the Poly and Pharmacy regarding the target of Hypertension services and the need for real drugs before the RKO document is prepared. This collaborative strategy is the implementation of the mandate of the Indonesian Minister of Health Regulation No. 43 of 2019 concerning Public Health Centers, which expressly emphasizes the Principle of Cross-Program Integration. By applying this principle, drug planning is no longer a partial task of the Pharmacy unit alone, but rather a collective responsibility to ensure the sustainability of health services.

Money

From a financing perspective, the root of the problem analysis shows that the main obstacle is not solely the absence of funds, but rather the allocation strategy and flexibility of the use of the budget. Problems were identified in two managerial aspects: regulatory rigidity and resource dependence.

First, the limitation of flexibility in the use of JKN Capitation funds. Although the Puskesmas manages the JKN Capitation fund, its use is faced with strict spending percentage regulations. This makes it difficult for Puskesmas to carry out emergency medicine shopping (emergency procurement) quickly when there is a sudden stock vacuum. As a result, the response to stock-out incidents has been slow due to the collision of financial administration mechanisms.

Second, budget planning (BLUD) which depends on dropping. The budget planning mindset at the Selat Baru Health Center is still very dependent on the assumption that the need for drugs will be fully met through the drug dropping mechanism from the District Health Office. As a result, the allocation of the independent budget (BLUD) for the procurement of buffer stock is very minimal. This passive strategy makes the Puskesmas not have a "safety net" when distribution from the district is late or not on demand.

To solve this impasse, the solution offered is to conduct Budget Advocacy to the Budget User Authority (KPA/Head of Puskesmas) with a data-based approach, namely Cost-Benefit Analysis (CBA). In this advocacy, it is necessary to show real calculations that the cost of buying Hypertension buffer drugs (such as Amlodipin/Captopril which is relatively cheap) is much more efficient than the cost that must be borne by the state/BPJS to treat patients who have complications of stroke or heart failure due to discontinuation due to empty stock. This inefficiency is in line with the findings of Acosta et al. (2019), who affirm that strategic purchasing policies are crucial to improve cost efficiency and ensure the sustainable availability of medicines. This step has a strong legal basis, namely the Indonesian Minister of Health Regulation No. 6 of 2022 concerning the Use of JKN Capitation Funds, which in principle allows flexibility in the use of funds to support health service operational costs, including the provision of essential medicines for patient safety, as long as planned in the Budget Work Plan (RKA).

Market

In the Market aspect, the analysis is focused on the dynamics of patient demand as end users of pharmaceutical services. A crucial problem identified is the undetectable surge in demand in the current planning system. Patient visit patterns often experience dynamic fluctuations, but the drug planning method that runs tends to be static and only looks at past usage averages without predicting future upward trends. The inability to detect this "market" movement is the main cause of stock unreadiness when there is a surge in visits.

The importance of understanding market behavior is in line with the theory of marketing management by Kotler & Keller (2016), which emphasizes that market demand analysis is the main foundation for maintaining product availability for consumers¹². In the context of health services, failure

to map demand is a fatal risk to patient safety due to the interruption of access to medicines. This is also strengthened by the regulation of the Minister of Health No. 26 of 2020, which mandates that clinical pharmacy services are not only a matter of logistics, but also include therapy monitoring and counseling to ensure continuity of treatment. This continuity is impossible to achieve if the supply of drugs is not in sync with patient demand.

As a strategic solution to overcome this gap, it is recommended to implement Demand Management Implementation through "Internal Market Research" or Morbidity Trend Analysis. Technically, this step requires the Pharmacy Team to pull data on new and old patient visits periodically per quarter through the SIMPUS application. This data is then analyzed to predict an increase in demand in the following months. By changing the work pattern from reactive to predictive based on real data, Puskesmas can anticipate drug needs more accurately before vacancies occur

Conclusion

Based on the results of residency activities at the Selatbaru Health Center on October 13–November 17, 2025, it can be concluded that this program has succeeded in identifying and analyzing the main problems in planning drug needs, especially the inaccuracy of the preparation of hypertension drug RKO which causes the phenomenon of stock-out and over-stocking due to weaknesses in manual recording and non-conformity with real needs. Through the analysis of the situation and the assessment of risk priorities, this issue was determined as the most urgent issue because it has a direct impact on the failure to fulfill the Hypertension SPM as well as the increased risk of irregularities in patient therapy. The root causes are mapped using the Fishbone Diagram (5M+1E+1Market), which shows the contribution of HR factors, calculation methods, means, data validity, funding, market dynamics, and interrelated work environment. To overcome this, a Plan of Action (POA) was prepared which includes data cleaning through stock taking, the development of an Automatic RKO Calculator, improving the competence of officers through in-house training, as well as advocating for the formation of an Integrated Drug Planning Team and revision of SOPs, so that all of these strategic steps can support the creation of a more accurate, efficient, and sustainable drug planning system.

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