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Development of a Drug Management Performance Application: A Needs Assessment in Indonesia

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Objectives: This study assessed the current state of pharmacy management information systems in Indonesia and systematically determined the improvements needed from the stakeholders' perspective. **Methods:** This descriptive study used focus group discussions and observations in 13 institutions, and 17 respondents were selected by purposive sampling. The PIECES (performance, information, economy, control, efficiency, service) framework was used to help identify needs. The research was conducted from September 2021 to November 2021 at primary health centers and health offices in Yogyakarta, Indonesia and involved pharmacists and information systems staff. **Results:** There was no standardized information system in place to support drug management and no format or rules for drug labeling (performance). Pharmacists were not able to provide non-prescription services outside the pharmacy warehouse (information). A new system needs to be developed, and budget availability needs to be determined (economy). System security decreases when users share accounts (control), and the existing systems have not been integrated as needed (efficiency). It is first necessary to plan and support regulations for system development (service). The authors formulated a recommended drug labeling format and a proposed system integration plan. **Conclusions:** The development of an information system to support drug management is eagerly awaited by pharmacists in Indonesia to assist in their work. Further research on the development and implementation of an information system is needed to improve the quality of drug management at primary health centers.

Keywords: Pharmacists, Indonesia, Primary Health Care, Pharmaceutical Services, Information Systems

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I. Introduction

Drug management includes ensuring the availability and affordability of drugs and directly affects public access to drugs, patient satisfaction, and public perceptions of the quality of health services [1-3]. Although the minimum standard for pharmaceutical services in primary health centers (PHCs) has been determined by the Indonesian Ministry of Health (MOH), the quality of drug management in many PHCs has not been optimal [4]. This results in low drug availability, as in Papua Province, where availability is still below 80% [5].

Official indicators for the quality of pharmaceutical services have not been established. However, a study by Satibi

et al. [6] compiled a list of quality indicators for drug management in PHCs. The 26 indicators included the stages of selection, planning, request and acceptance, storage, control, monitoring, and management evaluation. This list of indicators serves as a reference for measuring the efficiency of drug management in PHCs.

Manual data processing makes the pharmacist's work experience difficult [7,8]. One information system used in Indonesian PHCs (Sistem Informasi Manajemen Puskesmas [SIMPUS]) is limited to recording and reporting operational processes [9]. Previous research has been limited to developing systems for prescription services, screening outpatient installations [10-12], and developing a system for drug supply administration [7,8]. No studies have explored the need to develop information systems or applications that help pharmacists in PHCs monitor the performance of drug management.

The objective of this study was to explore the views, experiences, and expectations of pharmacists at Indonesian PHCs regarding the need for an information system that can help monitor the performance of drug management. No such study has been done in Indonesia. Thus, this research is a preliminary effort to improve the quality of drug management.

II. Methods

1. Study Participants

The study used purposive sampling. The inclusion criteria for respondents were pharmacists who worked at PHCs, pharmacists in health offices, and information systems staff at PHCs, each with a minimum of 3 years' work experience. The health offices had working relationships with the PHCs, primarily for coordination and coaching.

Respondents were recruited from three districts in Yogyakarta Province: Sleman Regency, Bantul Regency, and Yogyakarta City. These three areas were chosen because the pharmacy installations at the PHCs were supervised by pharmacists, the diversity of the region allowed broader perspectives, and the selected institutions had been involved in previous research related to identifying drug management indicators.

This research protocol was approved by the Ethics Commission of the Faculty of Medicine, Gadjah Mada University, Yogyakarta (No. KE/FK/1066/EC/2021).

Unfortunately, most of the PHCs did not have information systems staff. In addition, the representatives from one PHC and one health office could not attend the user needs analysis meeting. The distribution of the expert panel is shown in Table 1, and the demographic characteristics of the respondents are presented in Table 2.

Table 2. Characteristics of the expert panel evaluating pharmaceutical drug management in Indonesia (n = 17)

Characteristic	n (%)
Profession	
Regency-level pharmacist officer	2 (12)
Pharmacist practitioners at primary health centers	11 (65)
Information system staff at primary health centers	4 (24)
Sex	
Male	3 (18)
Female	14 (82)
Age (yr)	
25–35	6 (35)
35–45	9 (53)
45–55	2 (12)
Region	
Yogyakarta City	7 (41)
Sleman Regency	6 (35)
Bantul Regency	4 (24)
Practice experience (yr)	
1–5	5 (29)
>5–10	6 (35)
>10–15	3 (18)
>15–20	3 (18)
Education	
Pharmacy	13 (76)
Medical record (D3)	3 (18)
Informatics management	1 (6)

Table 1. Distribution of the expert panel established to evaluate pharmaceutical drug management in Indonesia

Category	Number of persons invited	Focus group discussion
Representative of the regency health office	3	2
Pharmacist practitioners at primary health centers	12	11
Information system staff at primary health centers	12	4
Total	27	17

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2. Procedure

This study used a descriptive approach and data were analyzed descriptively. The user needs analysis began with observation and continued with a focus group discussion (FGD) (Figure 1). The PIECES (performance, information, economy, control, efficiency, service) framework was used to help categorize problems, opportunities, and directions [13]. The questionnaire consisted of nine questions (Supplementary Table S1).

III. Results

We found no research that explored the need for drug management information systems at PHCs in Indonesia. Therefore, determining the current conditions could provide directions and help identify opportunities for improvement in the future.

1. Observations

Each PHC had its own information management system. The major pharmacies operated with two systems: the Current Pharmacy Information System used by PHCs (Table 3) and the Information System for Stock Reports used by regional asset agencies to make routine reports. The existing systems generally had limited functionality, such as a lack of two-way access between the health offices and the PHCs, prolonged data loading times, and the lack of a drug management system for pharmacists who had to manually produce their daily drug usage reports. Except for the district PHC in Yogyakarta City, many PHCs had not implemented

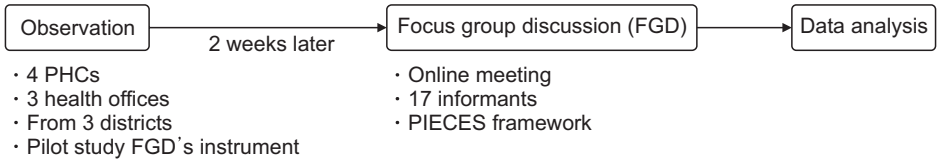

Figure 1. Flowchart of user needs analysis for the evaluation of drug management systems in Indonesia. PHC: primary health center, PIECES: performance, information, economy, control, efficiency, service.

Table 3. The observed distribution of pharmacy information systems in Indonesia

	District	Institution name	Name of current pharmacy information system	Condition
1	Sleman	PHC 1	No system yet	There is a system for medical records only, called Sistem Informasi Puskesmas (SISFOMAS). There is no e-prescribing pharmacy system yet. It is all done manually with Microsoft Excel.
2	Bantul	PHC 2	DGS Health	Loading on the pharmacy menu is slow; therefore, it is still completed using Microsoft Excel. There is no e-prescribing yet.
3	Yogyakarta City	PHC 3	SIMPUS	SIMPUS has e-prescribing but cannot show real-time stock information, cannot calculate correctly in the report menu, and has some unused menus.
4	Yogyakarta City	PHC 4	SIMPUS	SIMPUS has e-prescribing, but cannot show real-time stock information, cannot calculate correctly in the report menu, and has some unused menus.
5	Sleman	Health Office	SIMO	SIMO is still under development. It is a one-way system that can only be accessed by the health office.
6	Bantul	Health Office	E-LOG	The E-LOG system has been routinely used.
7	Yogyakarta City	Health Office	No system yet	There is no pharmacy system yet. It is all done manually using Microsoft Excel.

PHC: primary healthcare center, DGS: digital government services, SIMPUS: Sistem Informasi Manajemen Puskesmas (a PHC management information system), SIMO: Sistem Informasi Manajemen Obat (a drug management information system), E-LOG: Sistem Logistik Elektronik (an electronic logistics system).

e-prescribing. Manual drug management is carried out using Microsoft Excel.

Some PHCs and health offices still did not have an information management system. The reasons for this included a lack of guidance for the development of information systems, no support staff, and no infrastructure to support internet connection in the area. There was no uniformity in the PHC systems, and each PHC had different information system capabilities. The same pattern appears to exist in almost all other regions in Indonesia.

The existing information systems have not been helpful for analysis or decision-making because of their administrative nature. The systems were purchased from an IT developer who did not involve pharmacists in the development. As a result, drug management administration is still done manually using Microsoft Excel because not all necessary menus are available or can be used optimally (Table 3).

2. Focus Group Discussion

The results of the FGD are shown in Table 4. The main point was the urgent need for a system that helps pharmacists monitor drug management. Other needs were identified that, in one way or another, highlighted the weaknesses of the current information system. In terms of performance, the effectiveness of pharmaceutical services can be increased with a complete information system that facilitates drug management and clinical services. In terms of information, a system is needed that provides warnings when drugs are

Table 4. Summary of Indonesian pharmaceutical drug management needs according to the PIECES (performance, information, economy, control, efficiency, service) framework

Item	Problem
Performance	There are no guidelines in the current system to support drug management or measure drug management indicators. The formula for stock calculation in the current information system is not valid. Because the loading process for the pharmacy program takes a long time, it is not used. The format for labeling drug items in the current system is not standardized, creating a potential for errors when inputting the drug information. The system does not yet provide a menu for entering usage reports and drug request sheets (Laporan Pemakaian dan Lembar Permintaan Obat [LPLPO]), accessing drug information services, or for clinical screening.
Information	There is no alert for expired and near-expired drugs. The system has not been able to provide non-prescription services outside the pharmacy warehouse, such as requests from health sub-centers, laboratory units, inpatient care units, and delivery rooms.
Economic	An information system would reduce expired drugs, deadstock drugs, and reduce paper usage. The cost of developing a new system would be based on the budget, the price of the system, and the need for information systems staff to support the use of the system
Control	Security is currently reduced when a user saves their username and password on the desktop so that it can be opened by other users. The current systems back-up data routinely, and the security is good because they use an intranet instead of the internet.
Efficiency	The use of two systems makes the pharmacist's job inefficient. The systems need to bridge with each other to be efficient, such as integration between the primary health centers and the institutions receiving reports from the primary health centers. Currently, each district has its own system and the systems are not standardized. An integrated and standardized information system can save pharmacists up to 50% of their work time by automatically inputting data and making calculations that pharmacists now do manually.
Service	There have been no significant maintenance problems with system services to date. Implementation of a new information system for primary health centers requires permission from both the Health Office and the administrator of the SIK (Health Information System). Planning and regulatory support are needed for the development of this new information system for primary health centers.

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nearing expiration or have expired. In terms of efficiency, the input data was identical in the two available systems and duplication of input was inefficient and tiring. The pharmacists wanted an integrated system that connects institutions. The current differences in the systems used by PHCs create inefficiency, whereas standardized systems at each health center would increase efficiency. The pharmacists reported that an information system could save almost 50% of their work time. For example, if they needed data on drug usage per day, they could automatically retrieve the data from the system. Without information systems, pharmacists had to manually count each drug according to the number of filled prescriptions each day. The development of information systems would enable them to use that time to provide clinical services instead. It is important to develop plans and regulations that support the future development of information systems at PHCs to provide system integration and the standardization of drug labeling. Currently, pharmacists at health centers operate with two systems, and our proposed plan will add a third. However, without integration, the workflow would be burdensome and would not provide the solutions that pharmacists need. The concepts proposed by this study will be forwarded to the MOH.

The indicator drugs for Indonesia were the drugs that were mandatory at PHCs. These included 20 indicator drugs from the MOH's list and 40 indicator drugs from the PHCs under the Yogyakarta City Health Office in Yogyakarta Province. These numbers differ because Indonesia adheres to a regional autonomy system where each district has the authority to regulate its own community. The Usage Report and Drug Request Sheet (referred to as "LPLPO") is a document used by PHCs to report the drugs dispensed and drug requests, and is collected and monitored by the local health office (i.e., the drug provider). This document must be available at all PHCs in Indonesia.

Although the current information system has facilitated electronic medical records, daily dispensing of prescription and non-prescription drugs, and drug receipts, it has several limitations: (1) the formula for stock calculation in the current information system is not valid, (2) some things are included that are not suitable for use in the field, (3) the information technology developers do not follow up on complaints, and (4) there is no uniformity among the information systems within a district.

3. Proposed Drug Label Format

The format for labeling drugs currently uses the Indonesian language and sometimes English. The researchers propose a drug labeling format that considers: (1) that not all PHCs in Indonesia are managed by pharmacists, and not everyone who uses the system understands English; (2) that the number and variety of drugs in PHCs are relatively small and the majority are generic drugs; and (3) that, based on the Indonesian FDA regulations for drug registration, the naming of active substances on drug packaging must refer to the name designated by the International Nonproprietary Names Modified (INNM).

Our proposed format for labeling drugs includes: (1) the use of capital (uppercase) letters and no abbreviations; (2) the name of the active substance or generic drug name, trade name, packaging size, dosage form, and dosage strength on all drug packaging; (3) listing the name of the active substance according to its INNM designation, while other information is listed in Indonesian; and (4) writing labels using both the trade name and the generic name. The format for writing the drug label is as follows:

> [ACTIVE SUBSTANCE/GENERIC NAME],* [QUANTITY/VOLUME],** [PHYSICAL FORM OF PREPARATION],*** [STRENGTH OF PREPARATION].****

"*" Refers to the INNM designation and if there is a trademark, the format is: TRADEMARK (GENERIC NAME); "**" for those measured in volume, such as a syrup or injection solution, the unit strength/volume is included on the label; "***" the physical form of the drug preparation (e.g., tablet, ointment, suspension); "****" the drug strength in units (e.g., mg, g, mL). Additional information may be added to the packaging such as DRY POWDER, ENTERIC-COATED TABLETS, or EYE OINTMENT and information related to the route of administration such as INJECTION, VAGINAL, or SUBLINGUAL. Table 5 shows the format of drug names before and after the proposal.

4. Proposed System Integration in PHCs

Pharmacists need integration of the existing systems to facilitate e-prescribing, reports to the health office and regional asset agencies, and a drug management monitoring system (based on the 26 indicators). We suggest integration at the application level when possible because each system comes from a different developer. Integration can be done using service-oriented architecture (SOA), which is oriented to the deployment of services. With this approach, a combined application (i.e., composite integration) is created that is shared through source codes, business logic, and processes. The benefits of this approach include reusability, interoperability, scalability, and cost-efficiency [14].

Descriptions of systems before SOA is used (application-

Table 5. Examples of drug formats, before and after the newly proposed drug management system in Indonesia

Before being proposed		After being proposed	
Community health center A	Community health center B	Proposed drug name	Remarks
Hydrochlorothiazide tab 25 mg	Hydrochlorothiazide (HCT) tablet 25 mg	Epinephrine 1 mL injection solution, 1 mg/mL	The description of injection indicates the route of administration of the solution by injection.
Vitamin B12 (Cyanocobalamin) tablet 50 mcg	Cyanocobalamin (vitamin B12) tab 50 mcg	BCG Vaccine SSI 0.75 mg powder injection, 0.75 mg/mL	Powder and injection dosage forms indicate that administration or prescription requires a solvent and an injection route.
Paracetamol sir 120 mg/5 mL	Paracetamol syrup 120 mg/5 mL	Amoxicillin 60 mL dry syrup powder, 125 mg/5 mL	The description of dry syrup indicates that administration or prescription requires a solvent and is taken by the oral route.
Paracetamol tablet 500 mg	Paracetamol tablet 500 mg	Amoxicillin tablet 500 mg	Tablet is understood as drug that is taken by the oral route.
Oxytocin injection 10 IU/mL - 1 mL	Oxytocin injection 10 IU/mL (Syntocinon)	Isosorbide dinitrate tablet 5 mg sublingual	A description of the sublingual route is included.
Ointment 2–4 ointments (2% salicylic acid; 4% sulfur)	As.salicylates 2% + precipitated sulfur 4% (2–4 ointments)	Diclofenac sodium enteric-coated tablet 25 mg	Description of enteric-coated is included.
Sugar-coated multivitamin tablet containing Fe fumarate 250–300 mg (Hemafort)	Hydrochlorothiazide (HCT) tablet 25 mg	Licobion (cyanocobalamin, pyridoxine hydrochloride, thiamine hydrochloride) sugar-coated tablet, 200/100/0.2 mg	Generic names are listed.

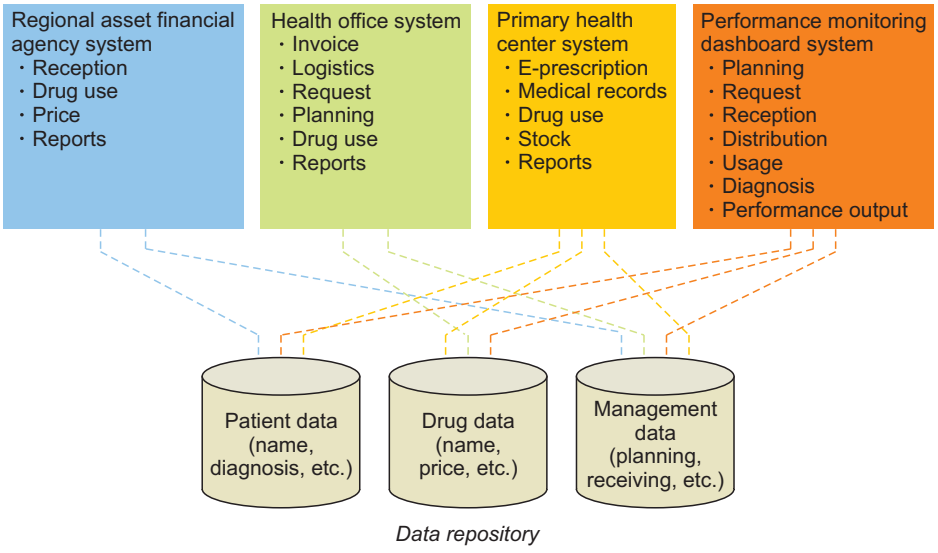

Figure 2. Description of the information systems before service-oriented architecture (SOA) was applied.

dependent business functions) and after SOA is used (composite applications) are shown in Figures 2 and 3. Prior to the application of SOA, the three institutions (regional asset agencies, health offices, PHCs) each had their own systems for their own purposes that used the same data source, namely drug management data. The Performance Monitor-

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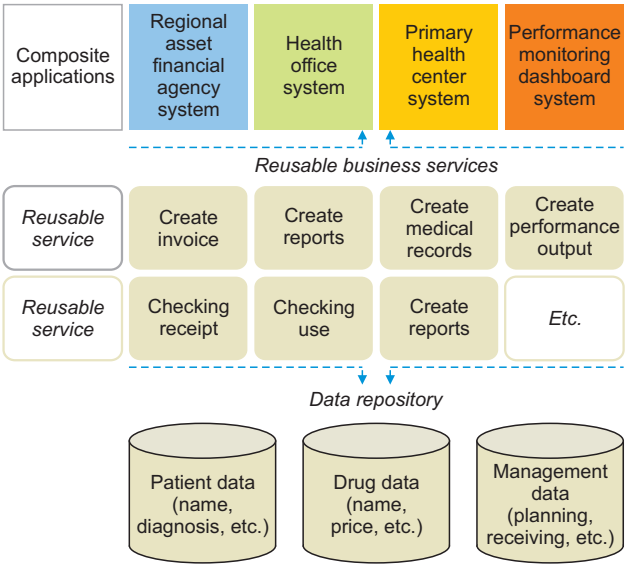

Figure 3. Description of the information systems after service-oriented architecture (SOA) was applied.

ing Dashboard System is the new system that the PHCs are willing to develop using this research information, which also requires data sources like those used in the other three systems. By applying the SOA, a composite application and re-usable business service can be formed from the data sources that can then be shared according to service needs. Thus, duplicate inputs are not needed with the shared database, making the work more efficient. The new Performance Monitoring Dashboard System will also be integrated with other systems, making it easier for pharmacists to automatically monitor the performance of their drug management and update it with changes or new data.

IV. Discussion

Pharmaceutical sector information systems are better known globally as pharmacy information systems (PISs). The function of a hospital PIS is to assist in both clinical decisions and drug management. A survey at a hospital in Saudi Arabia found that a PIS had been used for 15 years. Pharmacists acknowledged that it was important to use the PIS more broadly in medication-related processes [15].

This is the first study in Indonesia to assess pharmacy information systems and drug management. This may be because the development of health information technology has been slow and uneven. Currently, the implementation of a comprehensive electronic health record is only in the development stage. This is influenced by the geography of Indonesia, which consists of many islands with unequal internet access. The development of digital health information systems has just recently been prioritized by the new Minister of Health. In addition, there are few universities that have a master's level education program in pharmacy informatics. Finally, the existing regulations only address service standards, and there are no regulations that address drug management.

There was considerable variation in the PHCs and health offices involved in this study. This is largely influenced by the high degree of regional autonomy in Indonesia. Of the PHCs available for review in this study, some were supported by an information system and some were not. Most did not have information systems staff and, even if they did, they were not from an informatics engineering background. These factors have resulted in the slow development of information systems in PHCs. Furthermore, those PHCs with information systems usually used two separate systems, one system for pharmacy (owned by the PHC), and another system for inventory reports (owned by the regional asset agencies). This added to the work of pharmacists who had to input the same data for different reports. This has triggered the need for system integration.

Previous studies showed that no management information system could efficiently support drug management in multiple hospitals [16] or PHCs [5]. The existing systems performed poorly with delayed upload and download speeds, data insufficiently protected from unauthorized access, a lack of confidentiality, and frequent errors [17]. In Kenya, the adoption of e-procurement was delayed because of the lack of e-procurement system for developers to provide services [18].

The standardization of drug labels was also identified as an important need in this study. Drug nomenclature affects the accuracy of doctors in prescribing and the accuracy of services provided by pharmacists, which in turn can contribute to the incidence of medication errors. Previous research showed that inconsistent drug labeling can lead to confusion and medication errors [19]. Several things need to be considered in drug labeling, including nomenclature (trade and generic names), drug synonyms, drug units, special drug characteristics (e.g., sustained release), type of drug salt, and dosage strength or percentage [20].

This study found that a system to help pharmacists monitor drug management is urgently needed. This system should be designed according to the 26 drug management indicators that have been formulated in previous studies. Although not yet part of the current regulations, the 26 indicators were adopted in the pharmaceutical service standard regulations and

are highly relevant. The system should be able to perform analytical calculations and generate data that describes the performance of drug management. This can be automatically monitored by pharmacists and they can more easily improve the quality of drug management. System development should start by developing the user interface design desired by the user, making a prototype model, and then testing the prototype.

The strengthening of PHCs must proceed in stages and may not be easy. Even the largest primary service facilities in Indonesia have at least two important areas to develop: human resources and budget. Not all PHCs have pharmacists, especially in remote areas, and often there is only one person to manage the workload. In some regional centers there is a lack of resources, and not all pharmacists are knowledgeable in pharmacy management. Inadequate budgets for drug distribution and planning, internet access, road access, and PHC access to information systems or technology have led to the substandard quality of drug management at some health centers [2,5,21].

The aim of this study was to fill some of the existing gaps. First, by providing information on the current variation in PHC information systems and the urgent need for an integrated information system for pharmacies, as well as directions for developing an information system to support drug management. Second, by providing information on the development of health information systems in developing countries, the current problems, and the need for improvement. Third, by providing an overview of the need to strengthen plans and policies for the development and implementation of health information systems, which includes budget, human resources, and strategic plans.

In conclusion, we found that the capabilities of the current pharmacy information systems in PHCs are significantly limited from the pharmacist's perspective as a user. We identified an urgency for further research and suggest implementing a Performance Monitoring Dashboard System or application, designed to provide more output for PHCs, integrate the PHC systems with other related institutions, and implement the standardization of drug labeling.

1. Strengths and Limitations of the Study

The strengths of this research are that it involved pharmacists and health office representatives and was the first such research in Indonesia. This research can be used as a background study for the development of pharmaceutical information systems in developing countries, including some of the most populous and diverse countries in the world. However, this study also had limitations, such as the assessment of participants from only one province. Second, this research was based on qualitative data only. Therefore, we recommend that future research determine the desired user interface for the system, involve more provinces, and support results with quantitative data. Research that includes a prototype design and prototype testing would also be beneficial.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Supplementary Materials

Supplementary materials can be found via https://doi.org/10.4258/hir.2023.29.2.103

References

1. Bruno O, Onchweri AN, Ondieki MC, Nyabayo MJ. Availability of essential medicines and supplies during the dual pull-push system of drugs acquisition in Kaliro District, Uganda. J Pharma Care Health Syst 2015 [Epub]. https://www.longdom.org/open-access/availability-of-essential-medicines-and-supplies-during-the-dual-pullpush-system-of-drugs-acquisition-in-kaliro-district-34382.html.
2. Indriawan I, Wahyudi WT, Rahayuningsih A. [Analysis of drug management at Gaya Baru Health Center V, Bandar Surabaya District, Central Lampung Regency]. J Holist Health 2014;8(1):1-6.
3. Latifah E, Kristina SA, Suryawati S. Overview of drug availability and influencing factors in several low, lower

and upper-middle countries: a systematic review. Syst Rev Pharm 2019;10(1):67-72.
4. Chaira S, Zaini E, Augia T. [Drugs management evaluation at community health centers in Pariaman City, Indonesia]. J Sains Farm Klin 2016;3(1):35-41. https://doi.org/10.29208/jsfk.2016.3.1.97
5. Carolien I, Fudholi A, Endarti D. Evaluation medicine availability before and after NHI implementation at health centers in Keerom District, Papua Province. J Manag Pharma Pract 2017;7(1):30-39. https://doi.org/10.22146/jmpf.30294
6. Satibi S, Rokhman MR, Aditama H. Developing consensus indicators to assess pharmacy service quality at primary health centres in Yogyakarta, Indonesia. Malays J Med Sci 2019;26(4):110-21. https://doi.org/10.21315/mjms2019.26.4.13
7. Hidayat MK. [Design and build a drug supply information system at the Babelan I Health Center, Bekasi Regency]. JIMP 2019;4(1):8-17. http://doi.org/10.37438/jimp.v4i1.193
8. Wardani RR, Devitra J. [Analysis and design of drug supply information systems at Payo Selincah Health Center Jambi]. J Inf Syst Manag 2017;2(2):455-69.
9. Wibisono S, Munawaroh S. [Management information system for community health centers (Simpuskesmas) based on cloud computing]. J Teknol Inf Dinamik 2012;17(2):141-6.
10. Jaelani AK, Andayani TM. [Development of management information system models for outpatient patient screening at community health centers in the city of Yogyakarta]. J Manag Pharm Pract 2015;5(4):301-12.
11. Nilansari AF, Putri PH. [Requirements analysis and design of information systems model for outpatient prescription screening in Kotagede I Health Center]. Indones J Pharm Nat Prod 2020;3(2):1-10. https://doi.org/10.35473/ijpnp.v3i2.543
12. Tabrani M. [Implementation of the waterfall method in the design of information systems on outstanding services Telagasari Community Health Center Karawang]. Indones J Bus Intell 2019;2(2):79-89. http://dx.doi.org/10.21927/ijubi.v2i2.1125
13. Whitten JL, Bentley LD. Systems analysis & design methods. Boston (MA): McGraw-Hill; 2007.
14. Pratama IP. IT system Integration and Migration. Bali, Indonesia: Universitas Udayana; 2016.
15. Alanazi A, Al Rabiah F, Gadi H, Househ M, Al Dosari B. Factors influencing pharmacists' intentions to use pharmacy information systems. Inform Med Unlocked 2018;11:1-8. https://doi.org/10.1016/j.imu.2018.02.004
16. Nesi G, Kristin E. [Evaluation of medicine planning and procurement in pharmaceutical installations Kefamenanu Hospital, Timor Tengah Utara Regency]. Indones J Health Policy 2018;7(4):147-53.
17. Karimah C, Arso SP, Kusumastuti W. [Analysis of drug management at the procurement stage at Roemani Muhammadiyah Hospital Semarang]. J Public Health 2020;8(2):182-7.
18. Matunga DA, Nyanamba SO, Okibo W. The effect of e-procurement practices on effective procurement in public hospitals: a case of Kisii level 5 hospital. Am Int J Contemp Res 2013;3(8):103-11.
19. Quist AJ, Hickman TT, Amato MG, Volk LA, Salazar A, Robertson A, et al. Analysis of variations in the display of drug names in computerized prescriber-order-entry systems. Am J Health Syst Pharm 2017;74(7):499-509. https://doi.org/10.2146/ajhp151051
20. Miller AS. Pharmacy issues: drug nomenclature. Hospital Pharmacy 2000;35(11):1249-51. https://doi.org/10.1177/001857870003501116
21. Sumiarni L, Gustina R. [Evaluation of drug management at the Rantau Panjang Health Center, Merangin Regency in 2015]. J Health Appl Sci 2018;(1):12-28.