



Observational Study of High-Alert and Look-Alike Sound-Alike (LASA) Medication Storage Systems at The Pharmacy Installation of Ratnasari Sehat 2 Primary Clinic, Ciwidey

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Abstract

Medication safety in pharmaceutical services requires rigorous management of high-alert and Look-Alike Sound-Alike (LASA) medicines because identification and dispensing errors may cause serious patient harm. This study evaluated the storage system for high-alert and LASA medicines at the Pharmacy Installation of Ratnasari Sehat 2 Primary Clinic, Ciwidey. A descriptive quantitative design was applied to 54 respondents consisting of pharmacists, pharmacy technical personnel, pharmacy administration and logistics staff, and supporting health professionals. Data were collected using Likert-scale questionnaires, direct observation with a checklist, and documentation review. The findings showed that 92% of respondents expressed positive responses regarding understanding of high-alert medication risks and LASA identification. Furthermore, 90% positively assessed the effectiveness of layout, lighting, warning labels, and Tall Man Lettering. Operational challenges related to workload and interprofessional coordination were acknowledged by 86% of respondents. Direct observation confirmed the use of red High Alert labels, yellow LASA labels, physical separation of LASA medicines, Tall Man Lettering, and shelf boundary markings. Concentrated potassium chloride 7.46% was not stocked at the clinic, while an updated High Alert and LASA medication list was not available at the workstation. Overall, the storage system met most patient-safety indicators, but managerial improvement is required through updated visual references, workload evaluation, and sustained monitoring.

Keywords: Medication Storage; High-Alert Medications; LASA; Patient Safety; Pharmacy Installation.

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Resive : 25 Agustus 2026

Revised : 27 Agustus 2026

Accept : 27 Agustus 2026

Publish : 27 Agustus 2026





1. Introduction

Pharmaceutical services and patient safety are fundamental pillars of clinical care. Therapeutic outcomes are strongly influenced by the accuracy of medication delivery to patients (Handoko et al., 2023). Patient-safety standards require healthcare facilities to implement preventive measures to minimize the risk of medical errors (Saputra and Rizky, 2023). High workload and emergency situations may increase the risk of medication-identification errors among pharmacy personnel, particularly for medicines with similar names or packaging, commonly referred to as Look-Alike Sound-Alike (LASA) medicines. Medication errors may occur during the management of LASA medicines, including medicines such as ephedrine and epinephrine (Dasopang et al., 2022a). Practical constraints such as limited storage capacity due to increasing medicine inventories, the adaptation needs of newly recruited staff, and accreditation requirements may increase risk. Failure to manage these storage risks may threaten patient safety, reduce institutional credibility, create medicolegal exposure, and compromise accreditation standards (Hasibuan et al., 2025). Therefore, storage conformity, including shelf separation, special warning labels, and staff adherence to Tall Man Lettering, requires systematic evaluation.

Previous studies have reported variable compliance in LASA medication storage. Madya et al. (n.d.) reported that the spatial arrangement in the Pharmacy Warehouse of the National Brain Center Hospital met requirements at 100%, while LASA storage compliance reached 85.72%, although Tall Man Lettering remained insufficient. Dasopang et al. (2022b) found that only 50% of 14 pharmacies complied with applicable storage regulations, with reported similarities in names, packaging, and identical names. These findings indicate that storage safety remains dependent on local implementation, visual differentiation, and consistent risk-management practices. Despite the existing literature, evidence from primary-care clinic pharmacy settings remains limited, particularly regarding the combined assessment of staff knowledge, procedural compliance, visual storage interventions, workload challenges, and direct physical observation. This study therefore addresses a practical research gap by integrating questionnaire findings with on-site observation of High Alert and LASA medication storage at a primary clinic. The study aimed to evaluate the High Alert and LASA medication storage system at the Pharmacy Installation of Ratnasari Sehat 2 Primary Clinic, Ciwidey, and to determine whether current storage practices support patient-safety standards and reduce the risk of medication-selection and dispensing errors.





2. Research Method

This study used a descriptive quantitative design. The study population comprised health personnel and staff involved in pharmaceutical-supply management at Ratnasari Sehat 2 Primary Clinic, Ciwidey. Because the number of eligible personnel was limited, total sampling was employed, resulting in 54 respondents from relevant professional groups. This approach was intended to represent the operational perspectives of personnel directly or indirectly involved in medication management.

Data were collected using three techniques: a Likert-scale questionnaire to assess perceptions, understanding of medication risks, procedural compliance, and operational challenges; direct observation using a checklist to assess physical layout, LASA separation, warning-color stickers, Tall Man Lettering, shelf markings, and the storage status of concentrated electrolytes; and documentation review of medication-management standard operating procedures and the clinic inventory list. Data were analyzed descriptively using frequencies and percentages.

Observational conformity was calculated using the formula $P = (f/n) \times 100\%$, where P represents the conformity percentage, f is the number of conforming items, and n is the total number of observed items. Conformity was classified as compliant/appropriate when the percentage was exactly 100%, moderately compliant when it ranged from 80% to 99%, and less compliant when it was below 80%.

3. Results And Discussions

a. Research Results

Table 1. Distribution of Respondents by Age

Age (years)	n	%
18-25	29	53.7
25-35	21	38.9
35-40	4	7.4
Total	54	100

Most respondents were aged 18-25 years (53.7%), followed by those aged 25-35 years (38.9%) and 35-40 years (7.4%).

Table 2. Distribution of Respondents by Sex

Sex	n	%
Female	40	74
Male	14	26
Total	54	100

Female respondents predominated, accounting for 40 respondents (74%), while 14 respondents (26%) were male.



**Table 3.** Distribution of Respondents by Occupational Category

Occupational Category	Main Responsibilities	n
Managing Pharmacists	Licensing, procurement, and overall medication-quality supervision	2
Pharmacy Technical Personnel	Prescription services, compounding, medicine preparation, labeling, and High Alert/LASA shelf labeling	24
Pharmacy Administration and Logistics Staff	Stock recording, goods receipt, and daily prescription-document archiving	6
Supporting Health Professionals (Nurses and Midwives)	Coordination of emergency and high-alert medicines in clinical service areas	22
Total		54

The sample included two managing pharmacists, 24 pharmacy technical personnel, six pharmacy administration and logistics staff, and 22 supporting health professionals.

Table 4. Questionnaire Results on Knowledge, Compliance, and Operational Conditions

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Understanding of High Alert Risks and LASA Identification	37 (68%)	13 (24%)	2 (4%)	0 (0%)	2 (4%)	54 (100%)
Effectiveness of Layout, Lighting, Stickers, and Tall Man Lettering	30 (56%)	18 (34%)	4 (8%)	1 (1%)	1 (1%)	54 (100%)
Compliance with Safety Procedures	21 (39%)	7 (13%)	6 (7%)	4 (12%)	16 (29%)	54 (100%)
Operational Challenges	18 (33%)	29 (53%)	6 (12%)	1 (2%)	0 (0%)	54 (100%)

Positive responses for understanding of High Alert risks and LASA identification reached 92% (68% strongly agree and 24% agree). For the effectiveness of visual systems and layout, 90% of respondents provided positive responses. The source data for the safety-procedure indicator include negatively worded behavior items; therefore, the high proportion of disagreement with unsafe practices was interpreted by the original study as evidence of procedural adherence. Operational challenges were acknowledged by 86% of respondents, particularly workload and interprofessional coordination.





Publish : Association of Indonesian Teachers and Lecturers

International Journal of Health Sciences (IJHS)Journal Homepage : <https://jurnal.agdosi.com/index.php/IJHS/index>

Volume 4 | Number 3 | September 2026 |

**Table 5.** Direct Observation of the Medication Storage System

No.	Observation Criterion	Finding	Field Note
1	Red 'High Alert' label for high-risk medicines	Yes	
2	Yellow 'LASA' label for medicines with similar names/appearance	Yes	
3	LASA medicines separated by at least 1-2 other medicines	Yes	
4	Tall Man Lettering/capitalization used on storage labels	Yes	
5	Concentrated electrolyte (KCl 7.46%) stored in a restricted/locked area	Not available	KCl 7.46% was not stocked
6	Updated High Alert and LASA medicine list available at the workstation	No	Not yet displayed
7	Special boundary lines/color markings used to distinguish high-alert areas	Yes	

Direct observation showed that the pharmacy had implemented most visual and physical safety measures. Red High Alert labels and yellow LASA labels were used, LASA medicines were not stored immediately adjacent to one another, Tall Man Lettering was applied to distinguish similar names, and shelf markings were used to identify high-alert areas. Concentrated KCl 7.46% was not available at the clinic. The principal observed deficiency was the absence of an updated High Alert and LASA medicine list at the staff workstation.



**b. Discussion**

The questionnaire findings indicate a high level of theoretical understanding among staff regarding High Alert medicines and LASA identification, with 92% positive responses. This level of awareness is operationally important because similar medicine names and packaging can contribute to selection errors. The findings are consistent with the patient-safety emphasis described by Handoko et al. (2023) and Saputra and Rizky (2023), which places medication-management controls among the preventive strategies required to reduce medication errors. The visual storage system was also positively assessed by 90% of respondents and was supported by direct observation. The clinic used red warning stickers for High Alert medicines, yellow LASA stickers, Tall Man Lettering, spacing between LASA medicines, and shelf boundary markings. These interventions provide redundant visual cues and reduce reliance on memory alone. The findings also address limitations reported in earlier studies, particularly the inconsistent application of Tall Man Lettering described in the literature cited by the source manuscript.

Regarding concentrated electrolytes, the observation found that KCl 7.46% was not stocked at the clinic. Accordingly, the absence of a restricted storage area for this item should be interpreted in the context of non-availability rather than as evidence that an available concentrated electrolyte was stored incorrectly. The source study considered this condition consistent with the clinic's service capacity. Operational challenges remain important. Eighty-six percent of respondents agreed that daily workload and interprofessional coordination can affect accuracy, especially when new stock with similar packaging is introduced. This finding suggests that storage design alone cannot eliminate risk. Human-resource allocation, communication, orientation of new staff, and workload monitoring are also relevant components of a medication-safety system.

The absence of an updated High Alert and LASA medication list at the workstation was the clearest managerial deficiency identified through direct observation. A current visual reference can function as a rapid reminder during prescription review and medicine preparation. The source manuscript therefore recommends that clinic management regularly update and display the list and evaluate workload ratios to maintain safe pharmaceutical services. The source manuscript also presents a hypothetical risk scenario stating that a 30% increase in workload could raise the probability of LASA medication-selection error by up to 15% if physical separation and supervision were not maintained. Because no inferential model or empirical calculation supporting this scenario was provided in





the source data, it should be interpreted as a hypothetical illustration rather than an observed study result.

4. Conclusion

The High Alert and Look-Alike Sound-Alike medication storage system at the Pharmacy Installation of Ratnasari Sehat 2 Primary Clinic, Ciwidey, was generally effective and met most of the patient-safety indicators assessed in this study. Staff demonstrated a high level of understanding of High Alert medication risks and LASA identification, with 92% positive responses, while 90% positively evaluated the visual and layout system. Direct observation confirmed the use of standard warning labels, Tall Man Lettering, physical separation of LASA medicines, and shelf boundary markings. Nevertheless, workload and interprofessional coordination remained operational challenges for 86% of respondents, and an updated High Alert and LASA medication list was not available at the workstation. Clinic management should therefore provide and regularly update visual medication references, maintain periodic storage audits, strengthen staff coordination, and evaluate workload distribution to sustain patient safety.

5. Compliance with ethical standards

Acknowledgements

The authors express their appreciation to Ratnasari Sehat 2 Primary Clinic, Ciwidey, and to all respondents and staff who supported the data collection and observation process.

Disclosure of Conflict of Interest

The source manuscript does not report any conflict of interest among the authors.

Statement of Informed Consent

The source manuscript does not provide a specific formal informed-consent statement for respondents. This information should be completed by the authors according to the actual ethical and consent procedures used in the study before submission.

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