



HEALTHCARE PROFESSIONALS' PERCEPTIONS OF E-PRESCRIBING DISPENSING STRENGTHS AND WEAKNESSES IN MEDICATION ERRORS

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ABSTRACT

The implementation of electronic prescribing (e-prescribing) integrated with electronic medical records (EMR) represents a key innovation in enhancing patient safety and healthcare service quality. This study explores healthcare professionals' perceptions of e-prescribing utilization and its impact on the prescribing and dispensing phases. This study employed a qualitative approach with a phenomenological design. Data were collected through in-depth interviews with nine informants, comprising medical specialists, general practitioners, pharmacists, pharmacy technicians, and IT staff. Data analysis was conducted using a thematic analysis approach assisted by NVivo 12 software. The findings indicated five primary themes: strengths of e-prescribing, weaknesses of e-prescribing, impacts on medication errors, patient care and satisfaction, and recommendations for system development. During the prescribing phase, e-prescribing enhanced the clarity of medication information, improved ease of use, and reduced prescribing errors. However, limitations persist, including sub-optimal usability, the absence of prescription templates, and insufficient system validation, which lead to residual errors. In the dispensing phase, e-prescribing implementation has not fully improved service efficiency, as evidenced by prolonged waiting times and a tendency for patients to fulfill prescriptions outside the healthcare facility. This study concludes that while e-prescribing plays a pivotal role in enhancing prescribing quality, it has yet to optimize efficiency in the dispensing phase. Therefore, it is imperative to develop a more integrated, responsive, and user-centric system.

Keywords: dispensing; medication error; perceptions; prescribing

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INTRODUCTION

Medication errors represent one of the primary challenges in the healthcare delivery system, carrying the potential to cause serious impacts on patient safety. These errors can occur at various stages of medication use, particularly during the prescribing and dispensing phases, which constitute the most crucial steps in the patient's therapeutic process. A medication error is defined as any preventable event that leads to inappropriate medication use or patient harm (Mahardika & Rozany, 2025). Various studies indicate that errors most frequently occur during the prescribing phase, such as inaccuracies in drug selection, dosage, frequency, and route of administration. This issue is compounded using manual prescriptions, which are often illegible, incomplete, and hold the potential to cause misinterpretation by pharmacy personnel (Karimi et al., 2025). Furthermore, research demonstrates that the rate of medication errors in manual prescriptions can reach 23.44%, substantially higher than that of electronic prescriptions, which stands at only approximately 7.13% (Yulianto et al., 2025).

As an effort to enhance patient safety and the quality of healthcare delivery, health information technology has been increasingly implemented, notably through electronic prescribing (e-prescribing) systems. E-prescribing is an electronic medication prescribing system that enables direct communication between physicians and pharmacists, thereby reducing handwriting-related

errors, improving accuracy, and accelerating the dispensing process (Khairani et al., 2025). The implementation of e-prescribing has been proven to significantly reduce medication error rates, by up to 50% when optimally utilized (Alanazi et al., 2024).

The Regulation of the Minister of Health of the Republic of Indonesia Number 24 of 2022 mandates that all healthcare facilities implement an electronic medical record system by December 31, 2023, at the latest. Prior to implementing electronic medical records, adopting an e-prescribing system serves as an essential preliminary step to facilitate effective medication history recording (Putri et al., 2023). Furthermore, this initiative aims to streamline the monitoring of patient medication therapy, thereby enhancing both effectiveness and efficiency (Junaidi et al., 2025).

Furthermore, the utilization of e-prescribing offers various advantages, including enhanced service efficiency, accelerated dispensing processes, and improved communication quality among healthcare professionals (Lestari & Dharmayanti, 2025). Nevertheless, the implementation of this system is not without challenges and limitations, such as infrastructural constraints, internet connectivity disruptions, a lack of user training, and system complexities that may affect ease of use (Karimi et al., 2025). In fact, several studies indicate that human error and system design remain contributing factors to medication errors, despite the adoption of e-prescribing systems (Annisa et al., 2023).

In their study, although electronic prescribing has the potential to reduce medication errors, it cannot eliminate them entirely. (Awad et al., 2023) found that electronic medication systems generally reduced medication errors, particularly prescribing errors, but their effect on patient harm remained inconsistent. Moreover, the implementation of electronic prescribing may introduce system-related errors that are not typically observed with paper-based prescribing. (Kinlay et al., 2021) reported that such errors may persist over time despite the reduction of conventional medication errors. These findings suggest that medication safety in electronic prescribing depends not only on the availability of electronic systems but also on system design, usability, workflow integration, and user adaptation. Poorly designed electronic medication management systems may create usability problems and contribute to patient safety risks, while prescribers may encounter barriers related to system interfaces and workflow (Feather et al., 2023; Kinlay et al., 2021).

In Indonesia, the implementation of e-prescriptions has begun in various hospitals, including referral hospitals such as Dr.M.Djamil Central General Hospital (RSUP) Padang. However, the successful implementation of this system is heavily influenced by the perception and acceptance of healthcare professionals as the primary users, including doctors, pharmacists, and pharmacy technicians. Perceptions regarding ease of use, benefits, and perceived barriers will determine the effectiveness of the system in reducing the risk of medication errors (Um et al., 2024). Therefore, it is essential to conduct an in-depth analysis of healthcare professionals' perceptions regarding the strengths and weaknesses of e-prescription use, particularly in the prescribing and dispensing phases. This study is expected to provide a comprehensive overview of the effectiveness of e-prescription implementation and serve as a basis for developing system improvement strategies to enhance patient safety and the quality of healthcare services at Dr. M. Djamil Central General Hospital (RSUP) Padang.

METHOD

This study was conducted at Dr. M. Djamil Central General Hospital (RSUP) Padang using a qualitative approach with a descriptive-analytic design. Research respondents were selected using a purposive sampling method, with the inclusion criteria being respondents who have been directly involved in using e-prescriptions for approximately one year or more and were willing to be interviewed. A total of 9 respondents participated in this study, consisting of 2 medical specialists, 3 resident physicians (PPDS), 1 Head of the Pharmacy Department, 2 pharmacy technicians, and 1 IT

staff member. Data collection was carried out through semi-structured in-depth interviews and Focus Group Discussions (FGD) using a pre-designed interview guide and a voice recorder. Data analysis was performed using a thematic analysis approach, which included verbatim transcription, repeated reading (data familiarization), open coding, grouping codes into categories, and identifying main themes. To enhance the rigor and systemization of the analysis, this study utilized NVivo 12 software to assist in the coding process, data organization, as well as the visualization of results through nodes, word clouds, and hierarchy charts. This study adhered to research ethical principles and obtained ethical clearance from Dr. M. Djamil Hospital under ethical approval number DP.04.03/D.XVI.2.3/38/2026.

RESULT

Data analysis in this study was performed using a thematic analysis approach assisted by NVivo 12 software. The analytical process began with the verbatim transcription of the interviews, followed by data familiarization through repeated reading, and subsequently open coding to identify units of meaning. Codes sharing similar meanings were then grouped into categories, from which the main themes representing healthcare professionals' perceptions of e-prescription use were identified. Based on the analysis, five main themes emerged: (1) strengths of e-prescriptions, (2) weaknesses of e-prescriptions, (3) impact on medication errors, (4) impact on patient service and satisfaction, and (5) recommendations for system development.

Table 1.
List of Respondents in the in-Depth Interviews (n=9)

Code	M/F*	Education Level	Position / Assignment
IF 1	M	Postgraduate (Medical Specialist)	e-RMR application user
IF 2	M	Postgraduate (Medical Specialist)	e-RMR application user
IF 3	M	Medical Doctor Degree	e-RMR prescription entry from DPJP (Attending Physician)
IF 4	F	Medical Doctor Degree	e-RMR prescription entry from DPJP (Attending Physician)
IF 5	F	Medical Doctor Degree	e-RMR prescription entry from DPJP (Attending Physician)
IF 6	F	Pharmacist Degree	Head of the Pharmacy Department
IF 7	F	Diploma in Pharmacy (D3)	Pharmacy Depot Drug Dispensing
IF 8	F	Diploma in Pharmacy (D3)	Prescription Labeling Staff
IF 9	F	Bachelor of IT	Person in Charge of e-RMR

*(Note: *IF = Informants; M = Male; F = Female)

Table 2.
Interview Result Matrix per Informant (IF1–IF9)

Informants	Profession	Strengths	Weaknesses	Recommendations
IF1	Medical Specialist	Easy to use and clear	Validation is not yet optimal	Add validation and ensure the medicine names match their standard spelling.
IF2	Medical Specialist	Simplifies the prescribing process	Lack of simple and specialized templates	Simplify the prescription template, especially for high-speed filling.
IF3	General Practitioner	System-assisted data entry	Difficulty selecting medicines due to unfamiliar drug naming	Remove unnecessary columns, and ensure the drug types are clearly named
IF4	General Practitioner	Clear information	Requires re-entry; contains many unnecessary fields	Simplify the application's data entry process by reducing the number of required fields. Additionally, the app occasionally lags, so please optimize the system's performance.
IF5	General Practitioner	Integrasi e-RME	Manual input required during signal disruptions	Automate the addition of allowed drug types and set a maximum order limit to prevent duplicate orders.

Informants	Profession	Strengths	Weaknesses	Recommendations
IF6	Pharmacist	Easy verification	The system is not yet optimal	Automated validation is necessary to prevent medication errors.
IF7	Associate Degree in Pharmacy	Clear prescriptions	Slow process due to occasional application loading/	Optimize system speed, and create a dedicated column for doctors with an asterisk to mark required fields
IF8	Associate Degree in Pharmacy	Clearer labeling	Long waiting times: doctors sometimes prescribe the same medication twice or more	Improve service efficiency and app quality; if possible, speed up the system and reduce the number of fields to avoid confusing the pharmacy department.
IF9	IT Staff	Integrated system	No monitoring system in place yet	Perform the system and UI/UX upgrade

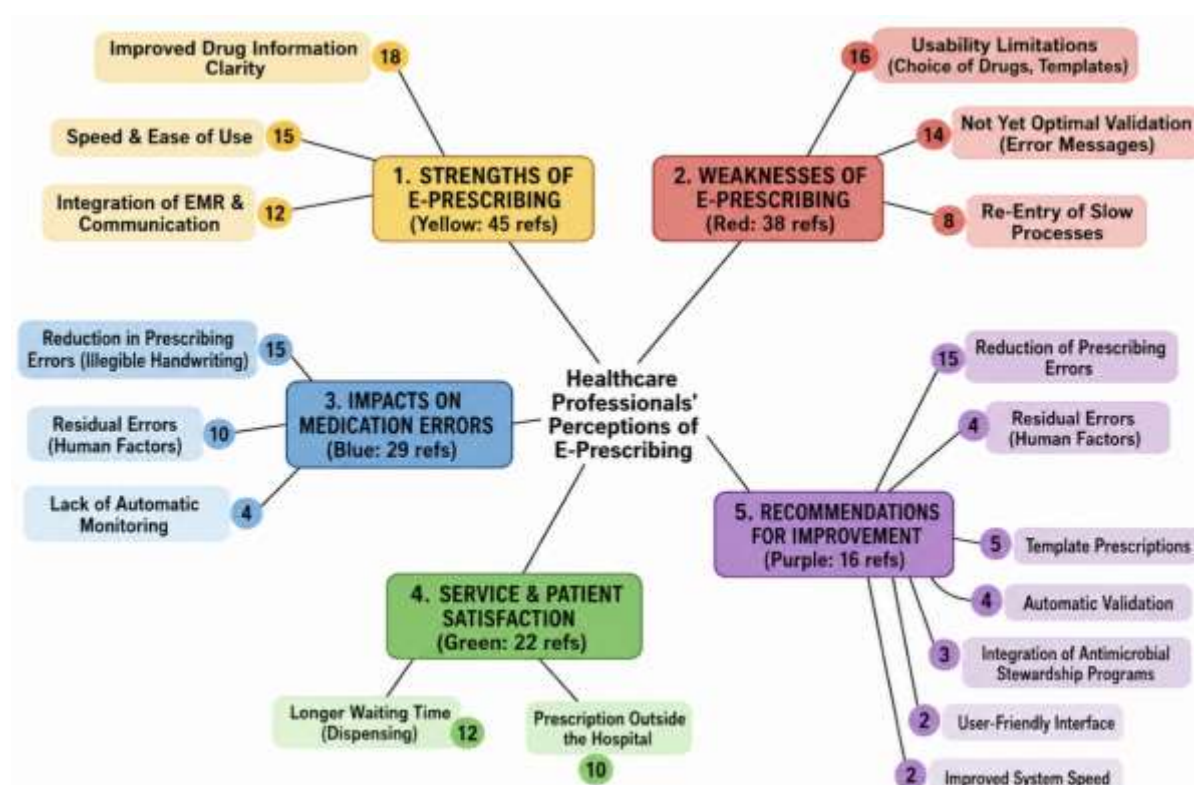


Figure 1. Results of Node Visualization Analysis

DISCUSSION

Based on the informant characteristics table, this study involved nine informants (IF 1–IF 9) from various professional backgrounds and education levels relevant to the use of the e-RME-based e-prescription system. In terms of gender, the informants consisted of three males and six females, indicating a predominance of female participation in this study. Regarding education levels, most of the informants held high qualifications, including medical specialists with master's degrees/postgraduate education (IF 1 and IF 2), and general practitioners with professional degrees (IF 3, IF 4, and IF 5). Additionally, the pharmacy staff comprised a pharmacist (IF 6) and pharmacy technicians with an associate degree in pharmacy (IF 7 and IF 8), along with one informant from the IT field (IF 9). This variation in educational backgrounds demonstrates that the study incorporates multidisciplinary perspectives on the implementation of the e-prescription system. Based on their positions or assignments, the informants play distinct roles within the e-prescription workflow. Medical specialists (IF 1 and IF 2) serve as users of the e-RME application, while general

practitioners or residents (IF 3–IF 5) are responsible for entering e-RME prescriptions from the attending physician (DPJP), which directly relates to the prescribing stage. On the pharmacy service side, or the dispensing stage, the informants include the head of the pharmacy department (IF 6), a pharmacy dispensing at the pharmacy depot (IF 7), and a prescription ticket labeling officer (IF 8). Additionally, there is an e-RME system administrator (IF 9) from the IT department who is responsible for system management and sustainability. Overall, the composition of these informants reflects the involvement of various key actors in the e-prescription system, spanning from the prescribing stage (doctors) and dispensing stage (pharmacy staff) to system support (IT). This strengthens the validity of the research data as it comprehensively covers the entire e-prescription workflow.

Based on Figure 1, the word cloud frequency and hierarchy chart coding results in this study indicate that “prescription clarity” is the most dominant theme, followed by error reduction, ease of use, as well as issues such as waiting time, automated validation, and feature limitations like prescription templates and manual input. When linked to the stages of medication use, these findings are highly relevant to two main phases: prescribing and dispensing. In the prescribing phase, the dominance of the themes of prescription clarity and error reduction shows that e-prescriptions provide a positive impact by eliminating handwriting issues, improving the accuracy of medication information, and minimizing errors in prescription writing (Rahma et al., 2025).

These findings align with recent studies stating that e-prescription systems can improve the clarity of medication information and significantly reducing medication errors. A 2025 meta-analysis demonstrated that electronic system-based interventions could reduce the risk of medication errors by approximately 15%, particularly when equipped with a clinical decision support system (Colin et al., 2025). Furthermore, a study by Alanazi (2024) also reported a significant reduction in prescribing errors by nearly 50% following the development of an e-prescription system. This reinforces the finding that the dominance of the terms “error reduction” and “prescription clarity” in the word cloud reflects the tangible benefits of prescribing digitalization (Alanazi et al., 2024). However, this study also identified the presence of residual errors, indicating that mistakes can still occur despite the use of electronic systems. This suggests that the prescribing phase still contains gaps that could potentially lead to errors, particularly related to human error and limitations in system features. This finding is consistent with a recent study stating that although e-prescriptions improve time efficiency, errors can still happen due to human factors such as input errors or inappropriate medication selection (Farghali & Borycki, 2024).

Meanwhile, in the dispensing phase, findings regarding waiting times, slow system performance, and their correlation with patient satisfaction indicate that the implementation of e-prescriptions has not yet fully enhanced the efficiency of pharmacy services. The dispensing process still faces bottlenecks in both technical aspects and workflow, thereby impacting patient waiting times. This is critical because the dispensing phase is the final stage before the medication reaches the patient; thus, delays or inefficiencies at this stage can diminish the benefits previously gained from improvements in the prescribing phase (Kumorowani et al., 2024). This slightly contrasts with some studies stating that e-prescriptions can boost service efficiency and productivity (Alfah & Megariani, 2018), yet it remains aligned with other research emphasizing that system success depends heavily on implementation quality and infrastructure readiness (Suriadi et al., 2025).

Furthermore, the need for automated validation, e-RME integration, and the development of prescription templates that emerged in this study is also supported by recent literature. These studies confirm that integrated electronic systems equipped with clinical validation features can enhance therapeutic safety and reduce errors reaching the patient (Roumeliotis et al., 2019). Additionally, recent research demonstrates that digital transformation in healthcare overall contributes to a decrease in the incidence of medication errors and an increase in patient safety (Engstrom et al.,

2023). Overall, the results of this study confirm that e-prescriptions play a vital role in improving clarity and reducing medication errors, but they also highlight implementation gaps in the field, particularly concerning system efficiency, feature completeness, and optimization of use by healthcare professionals.

Based on Figure 3 the thematic analysis results using NVivo 12 yielded five main themes that describe healthcare professionals' perceptions of e-prescription utilization, namely: (1) strengths of e-prescriptions, (2) weaknesses of e-prescriptions, (3) impact on medication errors, (4) patient service and satisfaction, and (5) recommendations for system development. The first theme, the strengths of e-prescriptions (45 references), indicates that the e-prescription system provides various benefits in healthcare service practice. The most dominant subtheme is the clarity of medication information (18 references), demonstrating that e-prescription utilization can improve prescription legibility and accuracy. Additionally, speed and ease of use (15 references) also emerged as primary advantages, followed by integration with EMR and communication (12 references), which supports coordination among healthcare professionals (Suriadi et al., 2025).

The second theme, the weaknesses of e-prescriptions (38 references), identifies various constraints in the system's implementation. The most frequently occurring subtheme is usability limitations (16 references), particularly in drug selection and the unavailability of prescription templates. Additionally, there is suboptimal validation (14 references) that still allows for spelling or typing errors in medications. Another constraint found is data re-entry or slow processes (8 references), which impacts service efficiency (Pratiwi et al., 2025). The third theme, the impact on medication errors (29 references), demonstrates that e-prescriptions contribute to enhancing patient safety. This is evident from the subtheme of reduced prescribing errors due to the elimination of handwriting issues (15 references). However, residual errors due to human factors (10 references) and the lack of an automated monitoring system (4 references) were still found, indicating that the system is not yet fully capable of preventing errors (Pramesona et al., 2025).

The fourth theme, patient service and satisfaction (22 references), indicates that the impact of e-prescribing on service delivery is not yet optimal. The primary subtheme was long waiting times during the dispensing process (12 references), which may negatively affect patients' experiences and satisfaction. This finding is consistent with (Leemanza & Kristin, 2024) who reported that prolonged waiting times for prescription services were associated with patient complaints, while interventions aimed at reducing waiting times resulted in a significant improvement in patient satisfaction. Similarly, recent evidence from Indonesian hospitals indicates that prescription waiting times may exceed recommended standards, with workload, prescription volume, and limited pharmacy personnel contributing to delays (Yulia et al., 2025). Furthermore, (Siwi et al., 2025) found a significant relationship between prescription waiting time and patient satisfaction in an outpatient pharmacy setting. These findings suggest that the implementation of e-prescribing alone does not necessarily guarantee optimal patient service, as the efficiency of the dispensing workflow and availability of pharmacy resources remain important determinants of the patient experience.

The fifth theme, recommendations for system development (16 references), outlines various suggestions from the informants to improve the quality of e-prescriptions. The primary recommendations include the development of prescription templates (5 references), the addition of automated validation (4 references), and integration with antibiotic stewardship programs (3 references) (Cassidy et al., 2023). Additionally, the informants suggested simplifying the system interface to make it more user-friendly (2 references) and increasing system speed (2 references) (Putri et al., 2023). Overall, the findings of this study indicate that e-prescribing provides greater benefits during the prescribing phase, particularly by improving prescription clarity and reducing prescribing errors. However, these benefits are not necessarily translated into optimal dispensing services, where workflow efficiency and waiting time remain important challenges. Recent

evidence suggests that although e-prescribing can improve medication safety and reduce prescribing errors, its effects on broader patient and health-system outcomes remain variable and depend on the integration of the system within the medication-use process (Osmani et al., 2023). Therefore, further development of an integrated, end-to-end electronic prescribing system is needed to connect prescribing, verification, dispensing, and medication delivery processes more effectively. Such integration may help ensure that the benefits of e-prescribing extend beyond prescription accuracy to improvements in patient safety, service efficiency, and overall healthcare quality.

CONCLUSION

Overall, e-prescriptions have the potential to enhance patient safety and the quality of healthcare services. However, their effectiveness is influenced by the quality of system implementation, user readiness, and the level of integration across service stages, from prescribing to dispensing. The findings of this study indicate that the benefits of e-prescriptions are more evident during the prescribing phase, particularly in improving prescription clarity and reducing errors, while challenges remain in the dispensing phase, particularly regarding workflow efficiency and waiting times at Dr. M. Djamil Central General Hospital.

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