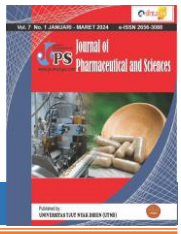
Journal of Pharmaceutical and Sciences
Electronic ISSN: 2656-3088 DOI: https://doi.org/10.36490/journal-jps.com
Homepage: https://journal-jps.com
REVIEW ARTICLE JPS. 2026, 9(2), 1501-1516



Comparative Barriers to Electronic Prescribing Across Healthcare Settings: A Systematic Review

Perbandingan Hambatan Implementasi Resep Elektronik di Berbagai Fasilitas Pelayanan Kesehatan: Sebuah Tinjauan Sistematis

Yusup Maulana [a], Susi Ari Kristina [b,*] and Chairun Wiedyaningsih [b]

[a] *Master of Pharmacy Management Study Program, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia.*
[b] *Department of Pharmaceutics, Faculty of Pharmacy, Universitas Gadjah Mada, Yogyakarta, Indonesia.*

Corresponding Authors: susiari_k@ugm.ac.id

Abstract

Background: Electronic prescribing (e-prescribing) is increasingly implemented to improve patient safety and healthcare efficiency. However, its implementation across different healthcare settings continues to face complex and varied barriers. **Aim:** This systematic review aims to identify barriers to e-prescribing implementation, compare variations in barriers across healthcare facility types, and develop evidence-based recommendations. **Methods:** A systematic literature search was conducted in Scopus, PubMed, and ScienceDirect following PRISMA guidelines, supplemented by manual reference screening and grey literature searches. Eligible studies included English-language qualitative and mixed-methods research focusing on implementation barriers. Data were analyzed using thematic synthesis, while methodological quality was assessed using the Joanna Briggs Institute (JBI) tools and the Mixed Methods Appraisal Tool (MMAT). **Results:** Ten studies met the inclusion criteria, covering hospitals, primary care clinics, community pharmacies, and residential aged care facilities. Four major categories of barriers were identified: technical and system challenges, workflow barriers, human and behavioral factors, and organizational and regulatory constraints. Barrier patterns varied significantly across facility types, with technical barriers being most dominant in hospitals, transitional barriers in primary clinics, operational pressures in pharmacies, and low user motivation in residential aged care facilities. **Conclusion:** Successful e-prescribing implementation requires an integrated approach addressing technical, organizational, and human factors. Implementation strategies must be tailored to the specific characteristics of each healthcare setting to support patient safety and sustainable healthcare quality.

***Keywords*: Electronic Prescribing, Implementation Barriers, Healthcare Settings, Digital Health, Systematic Review.**

Abstrak

Latar Belakang: Resep elektronik (*e-prescribing*) semakin luas diimplementasikan untuk meningkatkan keselamatan pasien dan efisiensi pelayanan kesehatan. Namun, implementasinya di berbagai fasilitas kesehatan masih menghadapi hambatan yang kompleks dan bervariasi. **Tujuan:** Tinjauan sistematis ini bertujuan untuk mengidentifikasi hambatan implementasi resep elektronik, membandingkan variasi hambatan antar tipe fasilitas pelayanan kesehatan, serta menyusun rekomendasi berbasis bukti. **Metode:** Pencarian literatur dilakukan pada basis data Scopus, PubMed, dan ScienceDirect sesuai panduan PRISMA, dilengkapi dengan penelusuran manual referensi dan literatur abu-abu. Kriteria inklusi mencakup studi kualitatif dan *mixed-methods* berbahasa Inggris yang berfokus pada hambatan implementasi. Analisis data menggunakan sintesis tematik, sedangkan penilaian kualitas metodologis menggunakan *Joanna Briggs Institute* (JBI) *tools* dan *Mixed Methods Appraisal Tool* (MMAT). **Hasil:** Sebanyak sepuluh studi memenuhi kriteria inklusi, mencakup rumah sakit, klinik layanan primer, apotek komunitas, dan fasilitas perawatan lansia. Empat kategori hambatan utama diidentifikasi: tantangan teknis dan sistem, hambatan alur kerja, faktor manusia dan perilaku, serta kendala organisasi dan regulasi. Pola hambatan menunjukkan variasi signifikan antar tipe fasilitas, dengan hambatan teknis paling dominan di rumah sakit, hambatan transisi di klinik primer, tekanan operasional di apotek, serta rendahnya motivasi pengguna di fasilitas perawatan lansia. **Kesimpulan:** Implementasi resep elektronik yang berhasil memerlukan pendekatan terintegrasi yang mencakup aspek teknis, organisasi, dan sumber daya manusia. Strategi implementasi harus disesuaikan dengan karakteristik spesifik masing-masing fasilitas kesehatan untuk mendukung keselamatan pasien dan kualitas layanan kesehatan secara berkelanjutan.

Kata Kunci: Resep Elektronik, Hambatan Implementasi, Fasilitas Pelayanan Kesehatan, Digitalisasi Layanan Kesehatan, Tinjauan Sistematis

Article History:
Received:14/03/2026,
Revised: 24/05/2026
Accepted: 28/05/2026
Available Online: 30/05/2026.

QR access this Article

https://doi.org/10.36490/journal-jps.com.v9i2.1530

Introduction

Ensuring patient safety and delivering high-quality healthcare require accurate and comprehensive patient information. However, achieving this remains challenging due to the fragmented nature of healthcare systems. This condition has driven the need for innovative technologies capable of managing medical records more effectively and supporting clinical decision-making. The emergence of digital healthcare services such as telehealth, electronic medical records, and remote monitoring alongside modern health technologies, including wearable devices and mobile health applications, has transformed healthcare delivery. These advancements emphasize improving safety and quality of care while maintaining patient privacy and confidentiality. Moreover, such technologies address the limitations of conventional methods and provide opportunities to enhance the quality of clinical care [1]. Furthermore, the development of digital health information systems is driven by the need for comprehensive integration of patient data to improve service efficiency and coordination among healthcare professionals. The integration of digital technology into healthcare systems also facilitates interprofessional collaboration and ensures continuity of care an outcome that was previously difficult to achieve with paper-based systems [2] [3] [4].

One key component of this digital transformation is the implementation of electronic prescribing (e-prescribing) systems. These systems replace traditional paper-based prescriptions with digital processes that enable faster, standardized, and well-documented prescribing, verification, and transmission of medication information. Numerous benefits have been reported, including reduced prescribing errors, improved medication safety, easier tracking of medication history, and enhanced clinical decision support for determining appropriate dosages and preventing drug interactions. As a result, e-prescribing has become an essential element of modern healthcare and has been widely adopted in many countries to improve the quality, safety, and efficiency of medication management. Through secure platforms, healthcare professionals can generate, transmit, and store prescriptions electronically, allowing pharmacies to receive and prepare medications more accurately and efficiently. Additionally, access to up-to-date information on drug interactions, allergies, and dosage guidelines further reduces the risk of medication errors, thereby enhancing patient safety [1]. Other studies have also demonstrated that e-prescribing significantly reduces medication errors and improves clinical workflow efficiency [5] [6].

Despite these advantages, the implementation of e-prescribing across healthcare systems continues to face complex and multidimensional challenges. Frequently reported barriers include limitations in information technology infrastructure, such as inadequate internet connectivity, lack of system interoperability, and issues related to hardware and software reliability [7]. Beyond technical factors, organizational and human resource issues also play a critical role, including insufficient managerial support, limited training and digital literacy, high workloads, and the need to adapt clinical workflows for effective system utilization [8]. In addition, policy and regulatory aspects such as national standards, data protection and privacy, financing mechanisms, and integration with insurance systems are key determinants of successful implementation [9]. Other studies highlight user resistance, system limitations, and lack of technical support as major barriers to adoption, particularly when systems are not designed to meet users' needs in real-world settings [10] [11]. Moreover, limited user involvement during the system design phase and poor usability have been identified as significant contributors to the failure of health technology implementation [12] [13].

In addition, variations in the characteristics of healthcare facilities such as hospitals, primary care clinics, community pharmacies, and long-term care facilities create diverse contexts for e-prescribing implementation.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Each setting has distinct operational needs, workloads, and levels of system complexity, leading to different types of barriers. Therefore, a comprehensive understanding of these variations is essential for designing more effective and context-specific implementation strategies.

Unlike previous studies that primarily focus on single healthcare settings or specific aspects of e-prescribing implementation, this systematic review provides a comprehensive cross-setting synthesis of barriers across multiple healthcare facilities, including hospitals, primary care clinics, community pharmacies, and aged care facilities. Furthermore, this study develops an integrated thematic framework that categorizes barriers into core system, operational, behavioral, and organizational-regulatory dimensions, while simultaneously highlighting contextual differences across facility types. This approach offers a more holistic understanding of implementation challenges and provides a foundation for developing tailored, context-specific strategies.

Given this complexity, a systematic review is necessary to comprehensively synthesize empirical evidence on barriers to e-prescribing implementation across healthcare settings. This review aims to identify these barriers, compare differences across facility types, and develop evidence-based recommendations to improve e-prescribing implementation according to the characteristics of each setting. The findings are expected to contribute to the scientific literature and provide a foundation for policymaking, as well as support the development of more effective, efficient, and patient safety–oriented e-prescribing systems.

Method

Search strategy

A systematic search strategy was employed to identify primary research articles addressing barriers to the implementation of electronic prescribing (e-prescribing) across various healthcare settings. The primary database searches were conducted in three electronic databases: Scopus, PubMed, and ScienceDirect. These databases were selected because they provide broad coverage of healthcare, medical informatics, pharmacy practice, and health technology implementation literature relevant to e-prescribing research. A combination of Boolean operators (AND, OR) and field restrictions (Title, Abstract, and All Fields) was used to ensure comprehensive coverage. In Scopus, the search terms included: “electronic prescribing,” “e-prescribing,” “barrier,” “challenge,” “obstacle,” “hurdle,” “implementation,” “adoption,” “acceptance,” “healthcare,” “hospital,” “clinic,” “pharmacy,” and “primary care.” In PubMed, the search terms included: “electronic prescribing,” “e-prescribing,” “electronic prescription,” “computerized physician order entry,” “CPOE,” “medication order,” “implementation,” “adoption,” “use,” “utilization,” and “practice.” In ScienceDirect, the search terms included: “electronic prescribing system,” “implementation,” and “challenge”.

To minimize publication bias and improve search comprehensiveness, supplementary searches were additionally conducted through grey literature sources and manual reference screening. Grey literature searches included conference proceedings and preprint repositories such as MedInfo, AMIA Symposium proceedings, and medRxiv. Manual searching of reference lists from relevant review articles and included studies was also performed to identify potentially eligible publications not captured through the primary database searches. However, no additional studies from supplementary searches met the final inclusion criteria; therefore, the PRISMA flow diagram reflects only studies identified from the three primary databases and manual reference searching..

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The review protocol was not prospectively registered in PROSPERO due to institutional and time limitations during the initial stage of the review process. However, the review methods were predefined prior to data extraction and consistently applied throughout the study to minimize selection and reporting bias.

Selection criteria

The selection criteria were established to ensure the inclusion of relevant, high-quality studies aligned with the research objectives. Eligible studies explicitly addressed electronic prescribing (e-prescribing), electronic prescriptions, or electronic prescribing systems (EPS). Studies were required to be conducted in healthcare settings, including hospitals, primary care or outpatient clinics, and community pharmacies. Qualitative, quantitative, and mixed-methods studies were included, provided they employed empirical research methods with clear and structured data collection. Studies had to report findings related to challenges

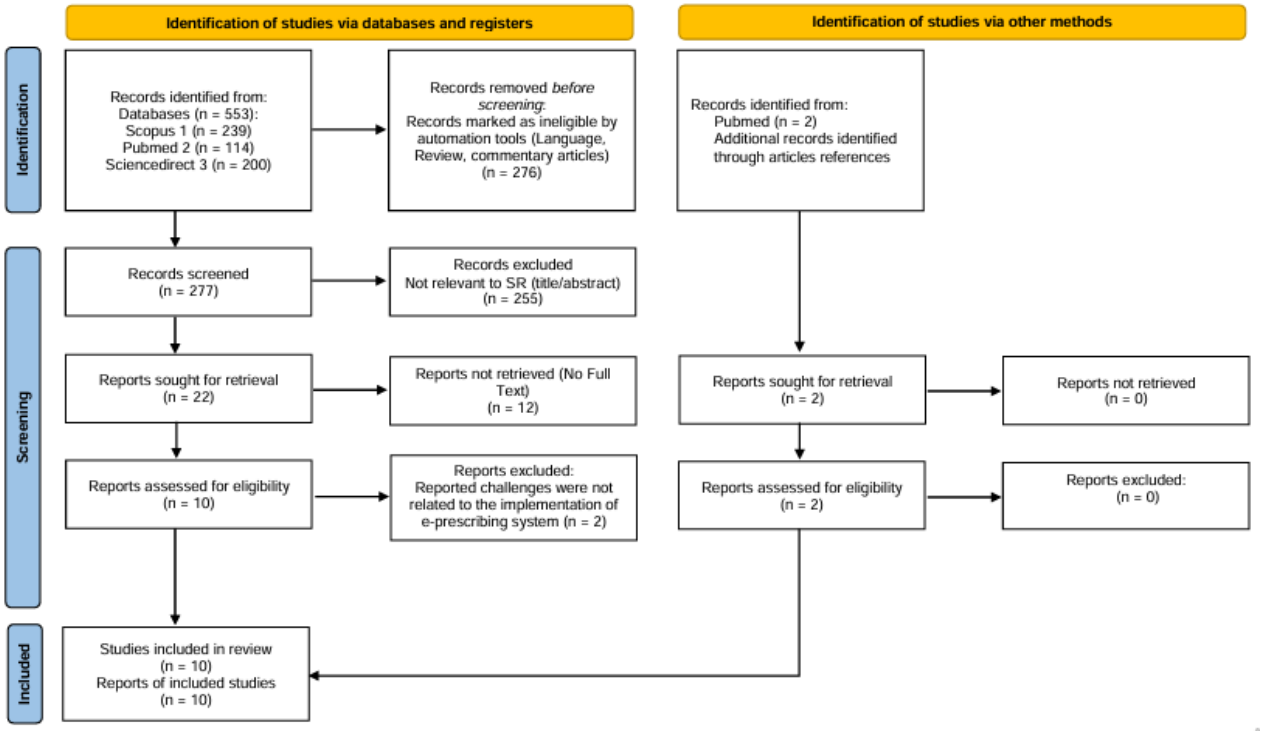
Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

or barriers to e-prescribing implementation, either as a primary outcome or within the results and/or discussion sections. No strict geographic or publication year restrictions were applied; however, studies published between 2010 and 2025 were prioritized, as this period reflects the development of modern e-prescribing systems. Only full-text articles published in English were included to enable thorough quality assessment and data extraction.

Studies were excluded if they focused solely on clinical outcomes without addressing implementation processes, user perceptions, or challenges. Non-empirical publications—such as editorials, opinion papers, commentaries, narrative reviews, and letters—were also excluded. Veterinary studies, as well as studies without accessible full-text versions, were not considered. In cases where multiple publications reported on the same study, only the most recent or most comprehensive version was included to avoid duplication. Overall, these criteria ensured that the included studies provided robust, evidence-based insights into barriers to e-prescribing implementation.

Screening, data extraction, and presentation

All titles and abstracts identified through the initial search were independently screened by two reviewers based on the predefined inclusion and exclusion criteria. Discrepancies were resolved through discussion until consensus was achieved. Subsequently, full-text screening was conducted to confirm eligibility and ensure that studies met methodological standards and provided relevant empirical data on e-prescribing barriers.



Source: Page MJ, et al. BMJ 2021 ;372:n71 . doi : 10.1136/bmj.n71.

Figure 1. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources

Data extraction was performed systematically using a structured template developed specifically for this review. The template was informed by prior studies on health technology implementation and tailored to the objectives of this research. Extracted variables included: author and year of publication, country and research setting, type of healthcare facility (e.g., hospital, clinic, pharmacy, aged care facility), participant characteristics, study design and data collection methods, research focus, and identified barriers to e-prescribing implementation. All data were independently extracted by two reviewers to ensure consistency and accuracy. The extracted information was compiled into a tabular matrix to facilitate comparison across studies and healthcare settings. This approach enabled the identification of key themes and patterns of barriers, as well as variations across different types of facilities.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

The extracted data were analyzed using thematic analysis. This approach allowed for the identification, comparison, and categorization of barriers into major themes, including technical, organizational, behavioral, human resource, managerial, and regulatory factors. Findings were presented in both narrative form and comparative tables across healthcare settings, in line with the objectives of this systematic review. All extraction and analysis processes were conducted manually using Microsoft Excel, enabling the development of a structured database and a transparent audit trail. The final results are presented as a detailed narrative synthesis supported by data extraction tables and cross-setting comparison tables.

In addition to thematic synthesis, a descriptive frequency analysis was conducted to determine how often each category of barriers was reported across the included studies. The frequency of reported barriers was summarized in comparative tables to support identification of the most commonly reported implementation challenges. Furthermore, heterogeneity across studies was explored narratively by comparing findings according to country, healthcare setting, participant characteristics, and study design.

Study quality assessment

The methodological quality of the included studies was assessed using appraisal tools appropriate to each study design. Qualitative studies were assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research [14], while mixed-methods studies were evaluated using the Mixed Methods Appraisal Tool (MMAT) version 2018 [15]. The use of multiple appraisal tools ensured that methodological components were evaluated comprehensively according to their respective study designs..

Each study was assessed based on methodological rigor, transparency of data collection and analysis, appropriateness of the study design, clarity of sampling procedures, ethical considerations, credibility of findings, and potential sources of bias. Each checklist item was rated as "yes," "no," or "unclear," and the results were summarized as the percentage of positive ("yes") responses.

Quality scores were interpreted as follows: low (<33% positive responses), moderate (33–66%), and high (>66%) [16]. All included studies were rated as either moderate or high quality; therefore, no studies were excluded based on quality assessment. This approach ensured a comprehensive understanding of the phenomenon while maintaining representation across diverse research contexts. Although variations in methodological rigor were observed, particularly in sampling transparency and depth of data analysis, studies with purely qualitative designs generally demonstrated more detailed methodological reporting than mixed-methods studies. Nevertheless, all studies met acceptable standards of credibility and analytical consistency and were considered suitable for inclusion in this systematic review.

Tabel 1. JBI Quality Assessment Criteria for Qualitative Studies

No	Question
1	Is there congruity between the stated philosophical perspective and the research methodology?
2	Is there congruity between the research methodology and the research question or objectives?
3	Is there congruity between the research methodology and the methods used to collect data?
4	Is there congruity between the research methodology and the representation and analysis of data?
5	Is there congruity between the research methodology and the interpretation of results?
6	Is there a statement locating the researcher culturally or theoretically?
7	Is the influence of the researcher on the research, and vice- versa, addressed?
8	Are participants, and their voices, adequately represented?
9	Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?
10	Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

Tabel 2. MMAT Quality Assessment Criteria for Mixed-Methods Studies

No	Question
1	Is there an adequate rationale for using a mixed methods design to address the research question?
2	Are the different components of the study effectively integrated to answer the research question?
3	Are the outputs of the integration of qualitative and quantitative components adequately interpreted?
4	Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?
5	Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Results And Discussion

Included studies

The study selection process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. In the initial identification stage, a total of 553 articles were retrieved from three scientific databases: Scopus (n = 239), PubMed (n = 114), and ScienceDirect (n = 200). In addition, two articles were identified through manual searches of reference lists from relevant publications. Prior to the screening stage, 276 records were excluded because they did not meet the basic eligibility criteria, including non-original research articles such as reviews, editorials, and commentaries, as well as records identified as irrelevant based on title and publication type through automated filtering. The remaining 277 articles underwent title and abstract screening, during which 255 articles were excluded for not addressing the objectives of this review, particularly the barriers or challenges associated with e-prescribing implementation. A total of 22 articles were assessed for full-text eligibility. However, 12 articles were excluded due to the unavailability of full-text access, preventing further analysis. The remaining 10 full-text articles were then evaluated for content relevance. At this stage, two articles were excluded because they did not explicitly discuss barriers to e-prescribing implementation, despite their relevance to broader healthcare digitalization topics. Ultimately, 10 studies met all inclusion criteria and were included in the final review, as illustrated in *Figure 1*.

The included studies employed qualitative and mixed-methods designs and were conducted across diverse healthcare settings, including hospitals, primary care clinics, community pharmacies, and aged care facilities. All selected studies provided empirical evidence on barriers to e-prescribing implementation at multiple levels, including system, organizational, healthcare provider, and user perspectives. The study selection process was conducted systematically and transparently to ensure methodological rigor and to include only studies that met both scientific standards and thematic relevance for this systematic review.

Table 3. Characteristics of included studies

Main Author and Year	Country / Background	Participant	Research Design (Data Collection Method)
Hamid *et al* ., (2024)	Iran	84 doctors	Survey study + Thematic analysis
Neda *et al* ., (2024)	Iran	12 doctors, 9 pharmacy staff, and 15 e-prescription representatives	Qualitative (descriptive, cross-sectional interview study)
Hakimeh *et al* ., (2025)	Iran	3 government health sector agencies, 2 health laboratory facilities, 2 pharmacists, 2 health insurance providers, 3 practicing doctors, and 6 patients	Qualitative
Aude Motulsky *et al* ., (2015)	Quebec, Canada	49 people (12 general practitioners, 2 managers, 33 community pharmacists, and 2 pharmacy staff)	Qualitative descriptive (semi-structured interviews)
Ali Zare Horoki *et al* ., (2024)	Yazd, Iran	Expert, physician, manager, doctor, hospital, insurance company	Mixed-methods: Focus group & In-depth interviews
Cindy Parks Thomas *et al* ., (2011)	United States of America	Doctor/prescriber of controlled drugs	Survey or interview
Olufunmilola K *et al* ., (2015)	Wisconsin, United States	13 Pharmacists, 14 Pharmacy Technicians	Qualitative cross-sectional: Direct observation, interviews
Mohammed S. Alharthi (2024)	Saudi Arabia	18 community pharmacists	Qualitative study use Theoretical Domains Framework (TDF)
Maryam Ahmadi *et al* ., (2014)	Iran	Doctors, pharmacists, insurance officers, regulatory staff (n=23)	Qualitative, semi-structured interviews, observations, document & guideline review
Elliott and Lee (2016)	Australia	General practitioners (GPs): 7 people (5 participated in the FG) , 12 nurses, and 2 pharmacists	Mixed-method: Retrospective audit + Focus Groups + Interviews & surveys

Ten studies met the eligibility criteria and were included in this review. These studies were conducted across various countries and healthcare settings, including hospitals, primary care clinics, community pharmacies, primary healthcare services, and aged care facilities. The included studies employed qualitative and mixed-methods designs, utilizing data collection techniques such as in-depth interviews, focus group discussions, direct observations, questionnaire-based surveys, and retrospective audits. All studies provided empirical evidence on barriers to e-prescribing implementation from multiple perspectives, including physicians, pharmacists, nurses, pharmacy staff, healthcare facility managers, and other stakeholders such as insurance representatives and patients.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Overall, the findings indicate that barriers to e-prescribing implementation are multidimensional, encompassing technological, human resource, organizational, regulatory, and infrastructural factors, as well as issues related to workload, medication management systems, and user behavior. The diversity of study settings and methodological approaches contributes to a more comprehensive understanding of the challenges associated with e-prescribing implementation across different contexts and levels of healthcare delivery.

Quality assessment of included studies

The methodological quality of the included studies was assessed using two appraisal tools according to study design. Qualitative studies were evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research, while mixed-methods studies were assessed using the Mixed Methods Appraisal Tool (MMAT) version 2018.

Overall, the included studies demonstrated moderate to high methodological quality. Most qualitative studies showed clear congruity between research objectives, methodology, data collection procedures, and interpretation of findings. Ethical considerations and participant representation were generally well reported across studies. However, several studies demonstrated limited reporting regarding researcher reflexivity and the influence of researchers on the research process.

For mixed-methods studies, most articles demonstrated appropriate integration between qualitative and quantitative components and provided adequate interpretation of integrated findings. Nevertheless, several studies lacked detailed explanation regarding inconsistencies between datasets or the integration process itself.

No studies were excluded based on quality assessment because all included studies met acceptable methodological standards and were considered sufficiently rigorous to contribute meaningful evidence to this systematic review. The detailed quality appraisal results are presented in Table 4 and Table 5.

Table 4. JBI Critical Appraisal Checklist for Qualitative Studies

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Quality Score	Overall Quality
Neda et al. (2024)	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes	Yes	8/10	High
Hakimeh et al. (2025)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10/10	High
Motulsky et al. (2015)	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes	Yes	8/10	High
Odukoya et al. (2015)	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes	Yes	8/10	High
Alharthi (2024)	Yes	Yes	Yes	Yes	Yes	Unclear	Unclear	Yes	Yes	Yes	8/10	High
Ahmadi et al. (2014)	Yes	Yes	Yes	Moderate	Yes	Unclear	Unclear	Yes	Yes	Yes	7/10	High

Table 5. MMAT Appraisal for Mixed-Methods Studies

Study	Q1	Q2	Q3	Q4	Q5	Quality Score	Overall Quality
Hamid et al. (2024)	Yes	Yes	Yes	Unclear	Yes	4/5	High
Horoki et al. (2024)	Yes	Yes	Yes	Yes	Yes	5/5	High
Thomas et al. (2011)	Yes	Moderate	Yes	Unclear	Moderate	3/5	Moderate
Elliott & Lee (2016)	Yes	Yes	Yes	Yes	Yes	5/5	High

The analysis of the ten included studies demonstrates that challenges in e-prescribing implementation are not isolated; rather, they are interconnected and emerge from multiple layers of the healthcare system. From a simplified analytical perspective, the evidence can be grouped into four major categories of barriers: core system challenges, workflow and operational challenges, human and behavioral challenges, and external, organizational, and regulatory challenges. Although healthcare contexts vary across countries and facility types, the overall patterns of barriers remain relatively consistent across studies.

Core system challenges (core technical challenges)

Technical challenges were identified as the most dominant barriers in most studies, particularly those related to digital infrastructure stability, user interface design, system integration, and database reliability. Studies by Bouraghi et al. (2024) and Moghani et al. (2024) highlighted issues such as system downtime, unstable internet connectivity, OTP errors, and ineffective drug search functions as key contributors to reduced user trust in e-prescribing systems [8] [7]. Similarly, Motulsky et al. (2015) found that inconsistencies

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

in drug data and delays in information transmission not only reduce efficiency but also pose clinical risks, as inaccurate information may negatively affect decision-making [17].

In another context, Alharthi (2024) reported that system errors and functional limitations within the Wasfaty platform hindered real-time medication dispensing processes [18]. Even in a different context, namely a seniors' facility (RACF) in Australia, Elliott et al. (2016) observed that reliance on manual printing processes persisted, indicating that existing technologies are not yet fully capable of replacing traditional workflows [19]. These findings are consistent with earlier studies demonstrating that system errors, delays in data transmission, and lack of interoperability are major contributors to reduced effectiveness and increased risk of medication errors [20] [21] [5]. Overall, the evidence suggests that the success of e-prescribing implementation is highly dependent on the quality of technological infrastructure. Without a robust and reliable technical foundation, even strong user acceptance is unlikely to sustain long-term system adoption.

Table 6. Main obstacles/challenges to implementing e-prescribing

Main Author and Year	Country / Background	Health facilities	Main obstacles/challenges
Hamid *et al* ., (2024)	Iran	Hospital	Technical barriers and user resistance
Neda *et al* ., (2024)	Iran	Hospital	Organizational and system barriers
Hakimeh *et al* ., (2025)	Iran	Pharmacies, health laboratory facilities, clinics/hospitals	Cultural, management and workload barriers
Aude Motulsky *et al* ., (2015)	Quebec, Canada	Primary health care clinics and community pharmacies	System integration and data incompleteness
Ali Zare Horoki *et al* ., (2024)	Yazd, Iran	Pharmacies, hospitals, clinics	Financial and communication barriers from insurance companies
Cindy Parks Thomas *et al* ., (2011)	United States of America	Clinics, hospitals, doctors' practices that prescribe controlled drugs	Regulatory and authentication barriers
Olufunmilola K *et al* ., (2015)	Wisconsin, United States	Pharmacy	Human resource and work environment barriers
Mohammed S. Alharthi (2024)	Saudi Arabia	Pharmacy	Operational barriers and user behavior
Maryam Ahmadi *et al* ., (2014)	Iran	Outpatient clinic	Workflow and legality constraints
Elliott and Lee (2016)	Australia	Residential aged care facility (RACF)	Efficiency barriers and low adoption

Workflow and operational challenges

Another critical issue identified across studies is the disruption of clinical workflows. The implementation of e-prescribing does not merely replace paper-based processes but fundamentally alters work structures, roles, and service delivery mechanisms. Studies by Mostafavi et al. (2025) and Ahmadi et al. (2014) indicate that digital transformation can initially prolong processes, increase administrative burden, create duplication of tasks, and disrupt service continuity due to misalignment between manual and electronic workflows [22] [23].

Similarly, Odukoya et al. (2015) emphasized the influence of organizational factors such as communication, team coordination, time pressure, staff capacity, and physical work environments on the operational success of e-prescribing systems [24]. Thomas et al. (2012) further reported that the prescribing process for controlled drugs became more complex, slower, and less user-friendly compared to traditional methods [25].

These findings align with previous research indicating that electronic systems may introduce additional complexity during early implementation stages, particularly when system design does not align with existing clinical practices [26]. Misalignment between systems and workflows can result in inefficiencies, duplication of work, and increased risk of administrative errors. Therefore, the effectiveness of e-prescribing systems largely depends on their ability to integrate seamlessly with existing workflows rather than simply replacing them.

Human and behavioral challenges (behavioral challenges, perceptions, resistance, skills)

Human factors emerged as a critical and consistent dimension across nearly all studies. Perspectives from physicians, nurses, pharmacists, and patients indicate that technological systems cannot function effectively without user acceptance and engagement. Bouraghi et al. (2024) reported a strong preference for paper-based prescriptions due to familiarity and perceived efficiency, which was further reinforced by negative technical experiences [8]. At the community pharmacy level, Alharthi (2024) identified low self-

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

confidence among newly trained pharmacists, resistance from elderly patients, unclear team roles, and insufficient formal training as factors that hinder effective system use [18]. Thomas et al. (2011) also highlighted issues such as technical anxiety, authentication difficulties, regulatory uncertainty, and increased administrative burden as contributors to user resistance [25].

In addition, Elliott et al. (2016) found that healthcare providers' motivation to use e-prescribing systems declined when perceived benefits were minimal or when patient volumes were low [19]. These findings are supported by broader literature indicating that technology acceptance is strongly influenced by perceived usefulness and ease of use. Systems perceived as complex or lacking immediate benefits are more likely to face resistance from healthcare professionals [27]. Furthermore, insufficient training, limited digital literacy, and inadequate user involvement during system development contribute to low adoption rates and reduced trust in e-prescribing systems.

From a socio-technical perspective, these findings demonstrate that successful e-prescribing implementation depends not only on technical system performance but also on the interaction between technology, user behavior, organizational culture, and workflow adaptation. Human resistance frequently emerges when digital systems are perceived as disrupting established clinical routines or increasing cognitive and administrative burden. This issue is particularly evident among older healthcare professionals and users with limited experience using digital technologies.

Patient-related barriers were also identified, although they were less frequently explored across the included studies. Several studies briefly reported resistance among elderly patients, particularly due to low digital literacy, limited understanding of electronic prescriptions, and concerns regarding reliability and privacy [18]. However, patient perspectives were not comprehensively investigated in most included studies, indicating an important knowledge gap in the current literature. Future research is therefore needed to explore patient acceptance, especially among elderly populations and individuals with low digital literacy, to better understand how patient-related factors influence the success and sustainability of e-prescribing implementation. Overall, these findings suggest that human and behavioral factors are often as critical as, or even more critical than, technical factors in determining the success of e-prescribing implementation.

External, organizational and regulatory challenges (institutional challenges and national policies)

The final category of barriers relates to broader structural factors, including organizational capacity, policy frameworks, financial support, and regulatory environments. Several studies conducted in Iran consistently highlighted systemic challenges such as fragmented insurance systems, weak management structures, limited governmental support, insufficient funding, and the absence of strong legal frameworks [8] [7] [22] [28] [23] .

Moghani et al. (2024) emphasized that external factorsmsuch as referral systems, organizational incentives, and implementation oversight significantly influence the sustainability of e-prescribing systems. Similarly, Ahmadi et al. (2014) noted that the lack of legal protection for electronic prescriptions reduces healthcare providers' confidence in fully adopting the system [7] [23].

In international contexts, Thomas et al. (2012) highlighted that unclear regulations surrounding controlled substances create additional barriers to implementation. Elliott et al. (2016) further reported that limited operational support, inadequate training, and lack of financial and administrative incentives hinder adoption in aged care facilities. These findings are consistent with Gagnon et al. (2014), who identified organizational support, leadership, and regulatory frameworks as key determinants of successful implementation [25] [19] [29].

Moreover, Kaushal et al. (2010) demonstrated that the benefits of e-prescribing for patient safety can only be fully realized when supported by strong policies and integrated systems. Adler-Milstein et al. (2013) also emphasized the importance of national policies and financial incentives in accelerating health technology adoption. In line with this, the World Health Organization (2017) highlighted the need for robust governance and regulatory frameworks to support digital health transformation [5] [30] [31].

Overall, these findings indicate that organizational and regulatory challenges represent structural barriers that cannot be addressed solely through technical improvements or user-level interventions. Instead, they require coordinated policy, institutional, and system-level strategies.

The comparative findings indicate that barriers to electronic prescribing (e-prescribing) implementation are strongly influenced by the characteristics of each healthcare setting.

In hospital settings, the most prominent barriers relate to system infrastructure, technical disruptions, limited system integration, and resistance from medical personnel, particularly physicians. Studies by

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Bouraghi et al. (2024) and Moghani et al. (2024) demonstrate that system instability, unreliable internet connectivity, and user interface and database errors contribute to inefficient prescribing processes. Moreover, the involvement of multiple units such as pharmacy, laboratory, radiology, and insurance services creates complex integration requirements. When systems are not fully interoperable, the overall service workflow becomes fragmented. Physician resistance also emerges due to the perception that e-prescribing increases workload compared to paper-based prescribing, particularly when systems are prone to errors [8] [7].

Table 7. Comparison of Barriers Between Settings (Comparative Setting Analysis)

Health facilities	Main differences and reasons
Hospital	Main problems: unstable system infrastructure, technical glitches, poor system integration, physician resistance, multi-platform insurance issues. Reason: Hospitals involve multiple units (pharmacy, laboratory, radiology, insurance), making system integration very complex . If the system is slow or has errors, it immediately disrupts services. In addition, physicians are still comfortable with paper prescriptions and feel that e-prescribing increases their workload.
Clinic (Outpatient and Primary Clinic)	Key issues: reliance on paper documents, lack of decision support, unintegrated systems, weak internet connections, legal barriers. Reasons: Clinics are in the transition phase from manual to electronic systems , resulting in duplication of work , doctor-pharmacist communication is not yet digital, and electronic prescriptions are not yet fully legally recognized .
Pharmacy	Main problems: increased workload, system errors, drug shortages, manual communication with doctors (telephone), lack of training, high time pressure. Reason: Pharmacies are the final point of prescription execution , so all system errors from upstream (doctors & systems) end up in the pharmacy. High prescription volumes and unstable systems lead to work stress and an increased risk of errors .
Residential Aged Care Facilities (RACF)	Main issues: low doctor adoption, slower process than handwritten prescriptions, need to print MARs, system not integrated with doctor's clinic software. Reasons: Doctors are not fully staffed and only see a small number of patients, so motivation to use the system is low . Digital processes are considered impractical and slow down service delivery.

In contrast, primary care and outpatient clinics primarily face transitional barriers associated with the shift from manual to digital systems. Ahmadi et al. (2014) and Motulsky et al. (2015) report continued reliance on paper-based processes, duplication of tasks, lack of clinical decision support systems, and weak system integration. Additionally, limited internet connectivity and legal constraints such as the incomplete recognition of e-prescriptions within regulatory frameworks further hinder adoption. As a result, communication between physicians and pharmacists often remains manual (e.g., via telephone), preventing the full realization of e-prescribing benefits in terms of efficiency and patient safety [23] [17].

In community pharmacies, the primary barriers are associated with high workload, time pressure, system instability, medication availability issues, and limited communication with prescribers. Studies by Odukoya et al. (2015), Mostafavi et al. (2025), and Alharthi (2024) highlight that pharmacies function as the final checkpoint in the e-prescribing process, where upstream errors accumulate. High prescription volumes combined with unstable systems increase the risk of dispensing errors and contribute to work-related stress among pharmacists. Furthermore, limited formal training, difficulties in system navigation, and unclear role distribution within pharmacy teams further complicate implementation. The need for manual clarification with physicians when errors occur also delays service delivery [24] [22] [18].

Meanwhile, in Residential Aged Care Facilities (RACFs), the main barriers include low adoption among general practitioners (GPs), slower processing compared to handwritten prescriptions, and poor integration with existing clinical software [19]. Physicians who are not permanently based at these facilities and who manage relatively small patient volumes tend to have lower motivation to adopt e-prescribing systems. In addition, the continued requirement to manually print and sign medication administration records (MARs) reduces system efficiency, limiting the potential benefits of digital prescribing.

Overall, these findings demonstrate that barriers to e-prescribing implementation vary significantly across healthcare settings. Technical and integration challenges are more dominant in hospitals, transitional and regulatory barriers are more evident in primary care settings, operational pressures are more pronounced in pharmacies, and motivational and workflow-related issues are more prominent in aged care facilities.

These cross-setting differences can be better understood using a socio-technical systems perspective, which emphasizes that successful health information technology implementation is shaped by the interaction between technological infrastructure, human factors, organizational processes, communication patterns, and external regulatory environments. Hospitals tend to experience more severe interoperability problems because they operate with multiple interconnected systems, including laboratory, radiology, pharmacy,

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

insurance, and billing platforms. The complexity of these interdependent systems increases the likelihood of workflow disruption when interoperability standards are weak or system performance is unstable.

Primary care clinics generally operate with fewer digital systems but demonstrate lower digital maturity and incomplete transition from paper-based workflows, resulting in workflow duplication and continued manual verification processes. In community pharmacies, operational barriers are strongly influenced by workload intensity, staffing limitations, and dependence on upstream prescribing accuracy, positioning pharmacies as the final control point for identifying and resolving prescribing errors. Meanwhile, RACFs face barriers related to low physician availability, smaller patient volumes, and limited perceived usefulness of e-prescribing systems. Human factors such as digital literacy, resistance to workflow change, and user motivation also interact closely with technological factors across all settings.

These findings suggest that e-prescribing implementation is not solely a technological issue, but rather a socio-technical transformation process involving interactions between technology, people, workflow, organizational culture, and policy environments. Therefore, implementation strategies should be tailored according to the socio-technical characteristics of each healthcare setting rather than applying uniform approaches across facilities.

Table 8. Comparison of E-Prescribing Barrier Categories Based on Type of Health Facility

Obstacle Categories	Hospital	Clinic / Primary Care	Community Pharmacy	Residential Aged Care Facilities (RACF)
Technical system constraints	✓✓	✓✓	✓✓	✓✓
Infrastructure limitations	✓✓	✓✓	✓✓	✓
Limited human resources	✓✓	✓✓	✓✓	✓
Workflow disruption	✓✓	✓✓	✓✓	✓✓
Regulatory and legal barriers	✓	✓✓	✓✓	✓
System integration and compatibility issues	✓✓	✓✓	✓✓	✓✓
Workload and operational pressure	✓✓	✓✓	✓✓	✓
Lack of training and competence	✓✓	✓✓	✓✓	✓
Barriers to interprofessional communication	✓✓	✓✓	✓✓	✓

[1] Symbol description:

- ✓✓ = Very frequently reported
- ✓ = Rarely reported

The findings of this systematic review indicate that barriers to e-prescribing implementation occur consistently across healthcare settings, although their patterns vary depending on the operational context and workload of each type of facility. Technical barriers emerged as the most dominant challenge across all settings, including hospitals, primary care clinics, community pharmacies, and aged care facilities. Common issues include system errors, non-user-friendly interfaces, prescription inaccuracies, transmission delays, and platform instability [8] [7] [17] [18]. These findings confirm that system stability and reliability are fundamental determinants of successful e-prescribing implementation.

Infrastructure-related barriers, such as unstable internet connectivity, lack of interoperability with insurance platforms, and insufficient hardware, were more pronounced in hospitals and clinics compared to other settings [7] [23]. However, infrastructure challenges were also evident in community pharmacies, particularly in the form of limited system support and the absence of integrated communication features with prescribers [18]. In Residential Aged Care Facilities (RACFs), infrastructure barriers were less prominent but still present, particularly in technical processes such as the need to reprint medication administration records (MARs) and limitations in electronic medication management systems [19].

Human resource–related barriers were identified across all healthcare settings, albeit with varying manifestations. In hospitals and clinics, physician resistance to system adoption was a major concern, often driven by preferences for paper-based prescribing, increased data entry burdens, and reduced confidence in using new technologies [8] [22]. In community pharmacies, high workloads and insufficiently trained staff limited pharmacists' capacity to effectively manage e-prescribing-related issues [24]. In aged care facilities, human resource challenges were primarily associated with low physician engagement, often due to limited patient volumes, which reduced the perceived value of system use [19].

Workflow disruption also emerged as a critical barrier, particularly in hospitals, clinics, and community pharmacies. E-prescribing systems often introduce additional steps, prolong clinical processes, increase the need for verification, and require manual corrections, thereby reducing efficiency [17] [25]. In RACFs,

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

workflow challenges were also observed, particularly when compared to the relative simplicity and speed of paper-based prescribing.

Regulatory and legal barriers were especially prominent in clinics and pharmacies, including delays in identity verification, issues with one-time password (OTP) authentication, restrictions related to controlled substances, and complexities in insurance regulations [25] [28]. In certain contexts, such as Iran, unclear legal recognition of e-prescriptions has significantly hindered implementation [23].

System integration challenges were consistently reported across all healthcare settings. Poor interoperability leads to duplication of tasks, repeated data entry, and fragmented communication between healthcare providers, pharmacies, laboratories, and insurance systems [22] [17] [28]. In addition, operational workload was reported to be particularly high in hospitals, clinics, and community pharmacies, not only due to patient volume but also because of the additional demands for verification, error correction, and system navigation within electronic platforms [8] [18].

Training was identified as a critical cross-cutting factor, although its specific needs varied by setting. Hospitals and clinics primarily require training related to system interfaces and clinical integration, whereas pharmacies require more practical training in system navigation and prescription processing [18]. Insufficient training prolongs the adaptation process and increases the likelihood of errors.

Interprofessional communication barriers were also significant across all settings, involving interactions between physicians, pharmacists, insurers, and IT personnel [28] [18] [17]. Fragmented communication systems often necessitate manual verification through phone calls or email, which delays service delivery and increases the risk of miscommunication and errors.

Overall, the interconnected nature of these barriers suggests that failures in e-prescribing implementation are rarely attributable to a single factor. Instead, they arise from a complex interplay of technical, human, organizational, regulatory, and infrastructural challenges. These findings highlight the need for a comprehensive and systemic approach to implementation one that extends beyond technological improvements to include enhancements in organizational culture, interprofessional coordination, user training, system standardization, and supportive policy frameworks.

To improve the practical applicability of the findings, the identified barriers were further mapped into targeted implementation strategies using the Expert Recommendations for Implementing Change (ERIC) framework. This approach enables the translation of identified socio-technical barriers into actionable interventions tailored to the characteristics of each healthcare setting. The intervention mapping presented in Table 5 demonstrates that implementation barriers in e-prescribing require different strategies depending on the operational context, system complexity, and user characteristics within each facility type.

Table 9. Frequency of Reported E-Prescribing Barriers Across Included Studies

Barrier Category	Number of Studies Reporting (n=10)	Percentage (%)	Common Healthcare Settings
Technical system barriers	10	100%	Hospital, clinic, pharmacy, RACF
Workflow disruption	8	80%	Hospital, clinic, pharmacy
Human and behavioral barriers	8	80%	Hospital, pharmacy, RACF
Organizational/management barriers	7	70%	Hospital, clinic
Regulatory/legal barriers	6	60%	Clinic, pharmacy
Infrastructure limitations	7	70%	Hospital, clinic
Interoperability/integration issues	8	80%	Hospital, clinic, pharmacy
Training and competency limitations	6	60%	Pharmacy, clinic
Communication barriers	5	50%	Pharmacy, clinic
Workload and operational pressure	7	70%	Pharmacy, hospital

The frequency analysis demonstrated that technical system barriers were the most consistently reported challenges, appearing in all included studies. Interoperability problems, workflow disruption, and human-related barriers were also highly prevalent across healthcare settings. In contrast, communication barriers and training limitations were reported less consistently but remained important contributors to implementation difficulties in pharmacies and primary care settings. These findings indicate substantial heterogeneity in barrier patterns depending on organizational structure, workflow complexity, and level of digital maturity across healthcare facilities.

The evidence synthesized in this review suggests that technical barriers identified in hospital settings, such as OTP verification failure, unstable systems, and interoperability problems, should be mapped to infrastructure-focused ERIC strategies including system redesign, infrastructure enhancement, and

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

interoperability standardization. Studies by Bouraghi et al. (2024) and Moghani et al. (2024) showed that unstable authentication systems, connectivity disruptions, and fragmented digital platforms significantly reduce user trust and interfere with prescribing workflows [8] [7]. Therefore, interventions such as biometric authentication, backup SMS gateways, and national interoperability standards may strengthen system reliability and reduce workflow interruptions. These findings are also supported by Motulsky et al. (2015), who emphasized that incomplete data exchange and delayed information transmission contribute to inefficiencies and patient safety risks [17].

Table 10. Evidence-Based Recommendations for E-Prescribing Implementation Barriers

Barrier	Setting	Root Problem	Recommended Intervention	ERIC Strategy
OTP verification failure	Hospital	Unstable authentication system	Biometric login integration and backup SMS gateway	Change infrastructure
Poor interoperability	Hospital	Multiple fragmented systems	Adoption of national interoperability standards and integrated health information exchange	Develop stakeholder interrelationships
Workflow disruption	Clinic / Primary care	Misalignment between paper and electronic workflow	Workflow redesign and pilot simulation before implementation	Adapt and tailor to context
Pharmacist workload	Community pharmacy	High prescription volume and repeated manual verification	Automated refill queue system and staffing adjustment	Revise professional roles
Elderly patient resistance	RACF	Low digital literacy and preference for paper-based systems	Patient education programs and hybrid prescribing transition phase	Train and educate stakeholders

In primary care and outpatient clinic settings, workflow disruption and duplication between paper-based and electronic processes were identified as major implementation barriers. These barriers were mapped to ERIC strategies focused on adapting and tailoring interventions to local workflow contexts. Ahmadi et al. (2014) and Motulsky et al. (2015) demonstrated that incomplete digital transition processes often result in duplicated documentation, inefficient communication, and increased administrative burden [23] [17]. Consequently, workflow redesign prior to implementation, pilot simulations, and gradual transition strategies may reduce resistance and improve system adaptation among healthcare providers. These findings reinforce the importance of aligning digital systems with existing clinical processes rather than imposing entirely new workflows.

In community pharmacy settings, pharmacist workload, time pressure, and communication barriers with prescribers emerged as dominant operational challenges. These barriers were mapped to ERIC strategies involving task redistribution, revision of professional roles, and organizational restructuring. Odukoya et al. (2015) and Alharthi (2024) reported that pharmacists frequently function as the final checkpoint for detecting prescribing errors, resulting in increased workload and operational stress [24] [18]. Interventions such as automated refill queues, staffing adjustment, integrated communication systems, and targeted practical training may reduce dispensing burden and improve operational efficiency. Furthermore, Mostafavi et al. (2025) highlighted that unclear role allocation and inadequate organizational support further contribute to implementation difficulties in pharmacy settings [22].

Patient-related barriers were particularly evident in Residential Aged Care Facilities (RACFs), where elderly patients and some healthcare providers demonstrated resistance toward digital prescribing systems. These barriers were mapped to ERIC strategies emphasizing stakeholder education and gradual implementation approaches. Elliott et al. (2016) found that low physician engagement, limited digital familiarity, and continued reliance on manual medication administration records reduced motivation to adopt e-prescribing systems [19]. Similarly, Alharthi (2024) identified resistance among elderly patients due to limited digital literacy and preference for conventional prescribing methods [18]. Therefore, interventions such as patient education programs, simplified user interfaces, hybrid prescribing transition periods, and continuous technical support may facilitate smoother adoption among older populations and digitally vulnerable users.

Collectively, these findings demonstrate that successful implementation of e-prescribing systems requires a combination of technical, organizational, behavioral, and educational interventions aligned with socio-technical system principles and the ERIC implementation framework. The evidence further indicates that implementation strategies should not be universally standardized across healthcare facilities, but instead

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

adapted to the operational characteristics, digital maturity, workflow structure, and user readiness of each healthcare setting to ensure sustainability and meaningful improvements in patient safety and healthcare efficiency.

Limitations

This systematic review has several limitations. First, the included studies were dominated by research conducted in Iran, which may limit the generalizability of the findings to countries with different healthcare systems, regulatory structures, and levels of digital maturity. Second, only English-language publications were included, potentially introducing language bias and excluding relevant evidence published in other languages. Third, the relatively small number of included studies (n = 10) may contribute to small-study effects and limit the overall strength of the synthesized evidence. Fourth, this review did not perform a formal publication bias analysis because most included studies employed qualitative and mixed-methods designs, making quantitative bias assessment less applicable.

Conclusion

The findings of this systematic review indicate that the implementation of electronic prescribing (e-prescribing) across various healthcare settings faces multidimensional and interrelated barriers, including technical, organizational, and human factors. These challenges vary across settings, highlighting the importance of context-specific considerations in implementation. Successful adoption of e-prescribing cannot rely solely on technological improvements but requires integrated strategies involving system readiness, workflow optimization, capacity building, and supportive regulatory frameworks. Future efforts should focus on developing adaptive implementation models and strengthening cross-sector collaboration to ensure sustainability. A comprehensive and coordinated approach is therefore essential to enhance patient safety, improve healthcare efficiency, and support the advancement of digital health systems.

Conflict of Interest

The authors report no financial or any other conflicts of interest in this work.

Acknowledgment

The authors would like to express their sincere gratitude to the Faculty of Pharmacy, Universitas Gadjah Mada, for the academic support and guidance provided throughout this study. The authors also appreciate all parties who have contributed, directly or indirectly, to the completion of this research.

Supplementary Materials

No supplementary materials are associated with this article.

References

[1] Hareem A, Lee J, Stupans I, Park JS, Wang K. Benefits and barriers associated with e-prescribing in community pharmacy – A systematic review. Exploratory Research in Clinical and Social Pharmacy 2023;12:100375. https://doi.org/10.1016/j.rcsop.2023.100375.

[2] Kruse CS, Kristof C, Jones B, Mitchell E, Martinez A. Barriers to Electronic Health Record Adoption: a Systematic Literature Review. J Med Syst 2016;40:252. https://doi.org/10.1007/s10916-016-0628-9.

[3] Campanella P, Lovato E, Marone C, Fallacara L, Mancuso A, Ricciardi W, et al. The impact of electronic health records on healthcare quality: a systematic review and meta-analysis. Eur J Public Health 2016;26:60–4. https://doi.org/10.1093/eurpub/ckv122.

[4] Egwudo AE, Jegede AO, Oyeniyi TA, Ezekwelu NJ, Abdu-Aguye SN, Okwuraiwe AP, et al. Integrating digital health technologies into the healthcare system: Challenges and opportunities in Nigeria. PLOS Digit Health 2025;4:e0000928. https://doi.org/10.1371/journal.pdig.0000928.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

[5] Kaushal R, Kern LM, Barrón Y, Quaresimo J, Abramson EL. Electronic Prescribing Improves Medication Safety in Community-Based Office Practices. J GEN INTERN MED 2010;25:530–6. https://doi.org/10.1007/s11606-009-1238-8.

[6] Black AD, Car J, Pagliari C, Anandan C, Cresswell K, Bokun T, et al. The Impact of eHealth on the Quality and Safety of Health Care: A Systematic Overview. PLoS Med 2011;8:e1000387. https://doi.org/10.1371/journal.pmed.1000387.

[7] Moghani NB, Hooshmand E, Zarqi M, Meraji M. Challenges and solutions in implementing electronic prescribing in Iran's health system: a qualitative study. BMC Med Inform Decis Mak 2024;24:393. https://doi.org/10.1186/s12911-024-02737-3.

[8] Bouraghi H, Imani B, Saeedi A, Mohammadpour A, Saeedi S, Khodaveisi T, et al. Challenges and advantages of electronic prescribing system: a survey study and thematic analysis. BMC Health Serv Res 2024;24:689. https://doi.org/10.1186/s12913-024-11144-3.

[9] Apte A, Bright HR, Kadam S, Sundarsanam TD, Chandy SJ. Facilitators, Barriers, and Potential Impacts of Implementation of e-Pharmacy in India and its Potential Impact on Cost, Quality, and Access to Medicines: Scoping Review. Online J Public Health Inform 2024;16:e51080. https://doi.org/10.2196/51080.

[10] Abdekhoda M, Morovati P. Adopting electronic prescribing by pharmacists. International Journal of Medical Informatics 2025;199:105877. https://doi.org/10.1016/j.ijmedinf.2025.105877.

[11] Alzghaibi H, Hutchings HA. Barriers to the implementation of large-scale electronic health record systems in primary healthcare centers: a mixed-methods study in Saudi Arabia. Front Med 2025;12:1516714. https://doi.org/10.3389/fmed.2025.1516714.

[12] Cresswell K, Sheikh A. Organizational issues in the implementation and adoption of health information technology innovations: An interpretative review. International Journal of Medical Informatics 2013;82:e73–86. https://doi.org/10.1016/j.ijmedinf.2012.10.007.

[13] Greenhalgh T, Wherton J, Papoutsi C, Lynch J, Hughes G, A'Court C, et al. Beyond Adoption: A New Framework for Theorizing and Evaluating Nonadoption, Abandonment, and Challenges to the Scale-Up, Spread, and Sustainability of Health and Care Technologies. J Med Internet Res 2017;19:e367. https://doi.org/10.2196/jmir.8775.

[14] Martin J. © Joanna Briggs Institute 2017 Critical Appraisal Checklist for Qualitative Research 2017.

[15] Hong Q, Pluye P, Fàbregues S, Bartlett G, Boardman F, Cargo M, Et Al. Mixed Methods Appraisal Tool (Mmat) 2018.

[16] Van Eikenhorst L, Salema N-E, Anderson C. A systematic review in select countries of the role of the pharmacist in consultations and sales of non-prescription medicines in community pharmacy. Research in Social and Administrative Pharmacy 2017;13:17–38. https://doi.org/10.1016/j.sapharm.2016.02.010.

[17] Motulsky A, Sicotte C, Gagnon M-P, Payne-Gagnon J, Langué-Dubé J-A, Rochefort CM, et al. Challenges to the implementation of a nationwide electronic prescribing network in primary care: a qualitative study of users' perceptions. Journal of the American Medical Informatics Association 2015;22:838–48. https://doi.org/10.1093/jamia/ocv026.

[18] Alharthi MS. Exploring challenges and enablers for community pharmacists using electronic prescriptions (Wasfaty) in Makkah region, Saudi Arabia: a qualitative study using the theoretical domains framework. Front Med 2024;11:1487852. https://doi.org/10.3389/fmed.2024.1487852.

[19] Elliott R, Lee C, Hussainy S. Electronic prescribing and medication management at a residential aged care facility: Uptake by general practitioners and qualitative evaluation of the benefits and barriers. Appl Clin Inform 2016;07:116–27. https://doi.org/10.4338/ACI-2015-08-RA-0098.

[20] Odukoya OK, Stone JA, Chui MA. E-prescribing errors in community pharmacies: Exploring consequences and contributing factors. International Journal of Medical Informatics 2014;83:427–37. https://doi.org/10.1016/j.ijmedinf.2014.02.004.

[21] Hincapie AL, Warholak T, Altyar A, Snead R, Modisett T. Electronic prescribing problems reported to the Pharmacy and Provider ePrescribing Experience Reporting (PEER) portal. Research in Social and Administrative Pharmacy 2014;10:647–55. https://doi.org/10.1016/j.sapharm.2013.08.007.

[22] Mostafavi H, Takian A, Mostafavi S, Bakhtiari A, Mohamadi E, Yaftian F, et al. Challenges of Implementing Electronic Prescribing in a Low-Income Country: A Qualitative Study. HTAA 2025. https://doi.org/10.18502/htaa.v9i3.19643.

[23] Ahmadi M, Samadbeik M, Sadoughi F. Modeling of Outpatient Prescribing Process in Iran: A Gateway Toward Electronic Prescribing System 2014.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

[24] Odukoya OK, Stone JA, Chui MA. Barriers and facilitators to recovering from e-prescribing errors in community pharmacies. Journal of the American Pharmacists Association 2015;55:52–8. https://doi.org/10.1331/JAPhA.2015.13239.

[25] Thomas CP, Kim M, McDonald A, Kreiner P, Kelleher SJ, Blackman MB, et al. Prescribers' expectations and barriers to electronic prescribing of controlled substances. Journal of the American Medical Informatics Association 2012;19:375–81. https://doi.org/10.1136/amiajnl-2011-000209.

[26] Devine EB, Hansen RN, Wilson-Norton JL, Lawless NM, Fisk AW, Blough DK, et al. The impact of computerized provider order entry on medication errors in a multispecialty group practice. Journal of the American Medical Informatics Association 2010;17:78–84. https://doi.org/10.1197/jamia.M3285.

[27] Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. BMC Health Serv Res 2010;10:231. https://doi.org/10.1186/1472-6963-10-231.

[28] Horoki AZ, Abolhasani MS, Khah ES, Heydaripour M, Zarezadeh M. Identifying Barriers to the Adoption of Electronic Prescribing: A Stakeholder Analysis Approach Using a Power-Interest Matrix. JEBHPME 2025. https://doi.org/10.18502/jebhpme.v8i3.18076.

[29] Gagnon M-P, Nsangou É-R, Payne-Gagnon J, Grenier S, Sicotte C. Barriers and facilitators to implementing electronic prescription: a systematic review of user groups' perceptions. J Am Med Inform Assoc 2014;21:535–41. https://doi.org/10.1136/amiajnl-2013-002203.

[30] Adler-Milstein J, Green CE, Bates DW. A Survey Analysis Suggests That Electronic Health Records Will Yield Revenue Gains For Some Practices And Losses For Many. Health Affairs 2013;32:562–70. https://doi.org/10.1377/hlthaff.2012.0306.

[31] World Health Organization. Global diffusion of eHealth: making universal health coverage achievable: report of the third global survey on eHealth. World Health Organization. 2017.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com