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Original Article

Script Shift: South African pharmacists' knowledge and perspectives of e-prescribing

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Abstract

This study explored the knowledge and perceptions of pharmacists in Gauteng, South Africa, regarding electronic prescribing implementation. As South Africa commences digital transformation in healthcare, this study identifies factors that will facilitate implementation and barriers that will hinder e-prescribing adoption, the findings which may contribute to policy reform. A mixed-methods study using a self-administered questionnaire was used to assess pharmacists' knowledge and perception of electronic prescribing and distributed through email to pharmacists ($n = 386$). Knowledge and perceptions were measured using a 5-point Likert-scale, where percentage scores were categorized as per Bloom's cutoff point as follows: poor: (<60%), moderate: (60%–79%), good: (≥80%) for knowledge and negative (<60%), neutral (60%–79%), or positive (≥80%) for perceptions. A pilot study ($n = 50$) was conducted to assess reliability. Quantitative data were analyzed using descriptive statistics and ordinal regression, with significance set at $P < 0.05$. Thematic analysis was applied to qualitative responses, using an inductive and deductive approach. Integration of the quantitative and qualitative findings in the discussion ensured triangulation of the results. Pharmacists demonstrated moderate knowledge of e-prescribing (60%–79%) and positive perceptions of its usefulness (≥80%). Higher knowledge of e-prescribing was associated with positive perceptions ($P < 0.001$). Predictors for good knowledge include recently graduated pharmacists ($P = 0.010$), while pharmacists in management positions had 2.88 higher odds of perceiving e-prescribing as appropriate for the workplace ($P = 0.001$). Thematic analysis revealed four themes: the benefits of e-prescribing, software design recommendations, facilitators for implementation, and barriers to adoption. Key facilitators included education and training, and a standardized regulatory framework aligned with international standards. Resistance to adoption stemmed from poor knowledge, infrastructural and financial constraints. This study concludes that while pharmacists support electronic prescribing, addressing regulatory, financial, and infrastructural challenges will promote successful implementation.

Keywords: electronic prescribing / e-prescribing; pharmacist perceptions; pharmacist knowledge; e-prescribing barriers; e-prescribing facilitators; South Africa

Key Messages

- Electronic prescribing is the secure and electronic generation and transmission of a prescription between a prescribing healthcare professional and the pharmacy, which improves workflow, and addresses challenges associated with manual/handwritten prescriptions.
- Despite the regulatory framework in South Africa being reformed, allowing pharmacists to accept e-prescriptions from prescribers, the adoption of e-prescribing is considerably slow.
- The resistance to adopt e-prescribing in South Africa stems from poor knowledge or lack of experience with e-prescribing, infrastructural and financial constraints, and a limited regulatory framework supporting e-prescribing, while facilitators for e-prescribing implementation include previous experience with e-prescribing use, good knowledge and positive perceptions of e-prescribing.
- A comprehensive regulatory framework, aligned with international standards is needed, which is further supported by appropriate training, financial investment, and organizational leadership to promote e-prescribing adoption in South Africa.

Introduction

The integration of digital technologies in healthcare is a global priority, driven by growing evidence of its clinical and administrative benefits (Stoumpos et al. 2023, Yeung et al. 2023, Khosravi et al. 2024). Digital transformation in healthcare is

certainly more advanced in high-income countries (HICs), where strong policy frameworks support sustainability, efficiency, privacy, safety, and accessibility to healthcare as core components. In contrast, Low- and Middle-Income Countries (LMICs) are struggling to implement similar solutions (Al Meslamani 2024). Digital transformation in healthcare is a multifaceted effort that extends beyond technology adoption and requires comprehensive policy frameworks addressing the broader aspects of implementation requirements (Letunovska et al. 2022, Kwilinski et al. 2024), particularly where it is lagging in LMICs (Al Meslamani 2024).

Among these innovations is electronic prescribing (e-prescribing), allowing prescribers the direct transmission of prescriptions to pharmacies using specialized software, a safer and more efficient process compared to traditional prescribing methods (Alsahali et al. 2023, Alzahrani et al. 2024). Prescribers using e-prescribing software have access to comprehensive medical histories and updated information related to dosing guidelines, allergies, and medicine interactions during the prescribing process, thus increasing patient safety and reducing medication errors (Hareem et al. 2023). For pharmacists, e-prescribing benefits include reduced prescription error and improved patient outcomes, streamlined workflow, automated administrative tasks, and improved communication (Hareem et al. 2023, Alzahrani et al. 2024). In addition, the technology ensured continuous access to medicines during the coronavirus pandemic (COVID-19) (Hareem et al. 2023).

In many HICs, the adoption of e-prescribing is supported by robust policy frameworks, which extend to infrastructure and training requirements (Aldughayfiq and Sampalli 2021). However, the scenario differs markedly in LMICs, where the implementation of digital technology, including e-prescribing, faces numerous challenges, namely limited infrastructure, inadequate regulatory frameworks, and resistance to adopt from healthcare professionals (Al Meslamani 2024).

South Africa, an Upper Middle-Income Country (UMIC) with a dual healthcare system, presents a unique context for examining e-prescribing adoption. Despite the benefits, e-prescribing adoption in South Africa is sluggish. Regulatory reforms, including the South African National Digital Health Strategy and amendments to the Medicines and Related Substances Amendment (MRSA) Act, support e-prescribing implementation (South Africa, Medicines and Related Substances Act No. 101 of 1965, General Regulations to the Act, 2017, Department of Health, National Digital Health Strategy for South Africa: 2019-2024, 2019). However, the adequacy of this framework and pharmacists' readiness for this transition remains uncertain. Previous studies have not explored how pharmacists, as key stakeholders, perceive the potential benefits and challenges of e-prescribing adoption (Cohen et al. 2013). Pharmacists' engagement with e-prescribing is vital to realizing its full potential, given their central role in medication management.

The Unified Theory of Acceptance and Use of Technology (UTAUT) theoretical model suggests that technology adoption is influenced by four constructs, namely, performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al. 2016). By applying the UTAUT model in the context of e-prescribing, pharmacist's readiness for e-prescribing can be gauged. This research paper thus explored the knowledge and perceptions of South African pharmacists, practicing in Gauteng, in relation to e-prescribing. Using a mixed-methods approach, contextual challenges and recommendations are explored. Identifying predictors of positive perceptions and good knowledge can inform policy reform and targeted strategies to support adoption, ensuring effective implementation (Hareem et al. 2023).

Methodology

Study setting

South Africa's healthcare system remains deeply fragmented. A well-resourced private sector (funded by the patient) serves a minority, while a severely under-resourced public sector (funded by the government) is tasked with meeting the needs of the majority of South Africa's population. Significant disparities persist in the distribution of financial, human, and infrastructural resources between the public and private sectors (Coovadia et al. 2009, Katuu 2018).

The study was conducted in Gauteng, South Africa's most urbanized and densely populated province, with the highest number of registered pharmacists and operational pharmacies (Statistics South Africa 2024, South African Pharmacy Council 2025a, 2025b). Pharmacists in Gauteng typically practice in the following pharmaceutical sectors, namely, retail, institutional (hospital), industry (manufacturing), or wholesale (Gray et al. 2016). The institutional and wholesale pharmaceutical sectors employ pharmacists in both the private and public healthcare sectors, while retail and manufacturing sector pharmacists are employed in the private healthcare sector only (Gray et al. 2016). Current practices within both sectors are largely dependent on the use of manual prescriptions (Cline and Luiz 2013 , Cohen et al. 2013).

E-prescribing remains inconsistently implemented in South Africa due to the absence of a national regulatory framework. The 2017 amendment to the MRSA and associated regulations recognizes e-prescriptions validated with advanced electronic signatures (South Africa, Medicines and Related Substances Act No. 101 of 1965, General Regulations to the Act, 2017); however, there are no further provisions for the widespread implementation of e-prescribing that addresses the wider requirements of integration.

Previous South African studies reported low adoption rates, however, are outdated and focused on the prescriber's perspective (Cohen et al. 2013, du Toit et al. 2015). Progress is noted in the private sector, where e-prescribing software is implemented in a private hospital chain (Netcare 2023), or by smaller medical practices and pharmacies, where third-party e-prescription software, like EMGuidance (EMGuidance Script 2025) is implemented. E-prescribing use differs considerably in the public healthcare sector due to lack of infrastructure (Cohen et al. 2013).

Study design, population, and sampling

A mixed-methods design using a self-administered questionnaire gathered the quantitative and qualitative data over a 6-month period (May-October 2023). The study population included pharmacists registered with the South African Pharmacy Council (SAPC), practicing in Gauteng. In total, 5544 registered pharmacists were practicing in the province at the time of this study (South African Pharmacy Council 2023). A minimum sample size of 360 pharmacists was determined using Raosoft® (Sample Size Calculator; Raosoft, Inc., Seattle, WA, USA) with the following parameters: margin of error = 5%, confidence interval = 95%, response distribution = 50%. A purposive, convenience sampling method was used to recruit participants.

Questionnaire development

The questionnaire was adapted from previous studies (Devine et al. 2010, Palappallil and Pinheiro 2018, Sema et al. 2024) and included sections assessing sociodemographic details, computer literacy, dispensing practices, knowledge, and perceptions of e-prescribing. The perception domains applied three constructs of the UTAUT model: Performance Expectancy (PE) (belief that the system will improve performance), Effort Expectancy (EE) (ease of use of the system), and Facilitating Conditions (FC) (the support, both technical and organisational, available for users). The following perception domains were assessed: perceived usefulness (PE construct); improvement to practice and patient service (PE construct); perceived ease of use (EE construct); and perceived fitness (FC construct). Sociodemographic data were collected through multiple-choice or closed-ended questions, while knowledge and perceptions were assessed using Likert-scale questions, ranging from 1 (strongly disagree) to 5 (strongly agree). Qualitative data collected through open-ended questions explored pharmacists' expectations of e-prescribing, challenges experienced when dispensing e-prescriptions, and what factors the pharmacist perceives would facilitate or hinder e-prescribing adoption (additional details provided in Supplementary File S1).

A panel of experts reviewed questionnaire for clarity before pilot testing with 50 participants. Cronbach's coefficient alpha was applied to these results as a measure of internal consistency, with a value of 0.8588 obtained (good internal consistency). Amendments were applied to improve the survey. A Cronbach's coefficient alpha of 0.9359 (excellent internal consistency) was obtained on the final questionnaire (Supplementary Table S1). Pilot results were excluded from final analysis.

Questionnaire administration

Following ethical clearance (Committee and clearance number blinded for peer review), participants were recruited by email invitation, where a participant information sheet and a link to the web-based questionnaire was provided, which redirected participants to the Google Form where the questionnaire was hosted. Consent for participation was captured on the form. Participants were sent two reminders at 4-week intervals.

Study variables

The following outcome variables were assessed: e-prescribing knowledge, and perception toward the usefulness, improvement to practice and patient service, ease of use, and fitness of e-prescribing. The independent variables included sociodemographic variables (age, gender, pharmacy sector, healthcare sector, years of experience, level of education, position), computer use experience, computer literacy and current dispensing practices (i.e. variables like patient volume, legibility of prescriptions, preference for manual prescriptions, or the receipt of fraudulent/altered prescriptions potentially affecting participants knowledge or perceptions of e-prescribing). For further statistical analysis, the current position of the respondents was re-categorized as follows: recent graduates (community service and intern pharmacists), general pharmacists (pharmacist), and management pharmacists (responsible pharmacists and pharmacy managers).

Data analysis

Collected data were checked and cleaned to remove inconsistencies or errors. Data were organized, coded, and prepared for analysis using Microsoft Excel. There were no missing data, as all questions were mandatory to complete. If a participant chose not to answer an open-ended question due to insufficient knowledge of, or experience with e-prescribing, the participant was asked to respond with 'N/A', 'Not applicable' or similar statement in the text box used to collect the open-ended responses.

Statistical analysis

Sociodemographic variables were summarized and presented using descriptive statistics, with categorical data expressed as frequencies and percentages. Shapiro–Wilk test evaluated normality of continuous variables. Continuous variables were presented as medians with interquartile ranges (Q_1-Q_3) (non-normal distribution), or as means with standard deviation (SD) (normal distribution). The responses for computer literacy, knowledge, perceived usefulness, ease of use, and fitness of e-prescribing were categorized according to Bloom's cutoff point, as described in Supplementary File S1 (Seid and Hussen 2018, Sema et al. 2024).

Associations between categorical variables and knowledge and perception domains were explored using Chi-square or Fisher's exact tests. The Kruskal–Wallis test assessed significant differences in the medians of continuous variables across the outcome variables. Ordinal logistic regression further explored associations between independent variables and outcome variables. Relationships between perception domains and knowledge were also assessed. Variables selected for inclusion in the adjusted model are described in Supplementary File S1. The results are reported as odds ratios (OR) with 95% confidence intervals (CI), and statistical significance set at $P < 0.05$. Statistical analyses of quantitative data were performed using Stata (V.16, Stata Corp, College Station, TX, USA).

Qualitative analysis

Open-ended responses were manually analyzed using Braun and Clarke's thematic analysis (described in Supplementary File S1). Qualitative analysis followed a well-established method as described in literature (Braun and Clarke 2006, Fereday and Muir-Cochrane 2006, Clark et al. 2008, Braun and Clarke 2019). Credibility was ensured through prolonged engagement, data triangulation and peer debriefing. A reflexive journal was maintained to document coding decisions, reflections, and theme generation (Nowell et al. 2017).

Results

Sociodemographic characteristics and current dispensing practices

Of the 5544 emails sent, 201 were not delivered, yielding a sample of 5343. In total, 388 responses were received (response rate = 7.3%), with 386 ($n = 386$) included for final analysis after removing duplicates. Majority of pharmacists ($n = 283$; 73.3%) practiced in the private healthcare sector, with approximately half of the total respondents ($n = 194$; 50.3%) practiced in the retail pharmaceutical sector. The majority were practicing as pharmacists ($n = 233$; 60.3%), while 113 (29.3%) held management positions. Majority ($n = 354$;

Table 1. Participant sociodemographic characteristics, computer use experience, and self-reported computer knowledge/literacy ($n = 386$).

Variables	Categories	n (%)/Median (Q_1–Q_3)
Age		34 (28–48)
Gender	Female	280 (72.5)
	Male	106 (27.5)
Pharmacy sector	Retail	194 (50.3)
	Hospital	110 (28.5)
	Industry (part-time)	42 (10.9)
	Academia (part-time locum)	17 (4.4)
	Other (part-time locum)	23 (6.0)
Healthcare sector	Private	283 (73.3)
	Public	68 (17.6)
	Both	30 (8.6)
	Other	5 (05)
Position	Pharmacist	233 (60.3)
	Responsible pharmacist/ Deputy RP	96 (24.9)
	Pharmacy manager	17 (4.4)
	Community service pharmacist	20 (5.2)
	Intern	20 (5.2)
Level of education	Bachelor's	285 (73.8)
	Postgraduate qualification	101 (26.2)
Years' experience	1–5 years	133 (34.5)
	6–10 years	72 (18.7)
	11–15 years	46 (11.9)
	16–20 years	26 (6.8)
	>20 years	109 (28.2)
Computer experience	1–5 years	25 (6.5)
	6–10 years	44 (11.4)
	11–15 years	76 (19.7)
	16–20 years	82 (21.2)
	>20 years	159 (41.0)
Computer Knowledge/literacy	Poor (<60%)	7 (1.8)
	Moderate (60%–79%)	25 (6.5)
	Good (≥80%)	354 (91.7)

91.7%) reported good computer literacy (≥80%). Further sociodemographic details are presented in Table 1.

As depicted in Fig. 1, only 53 (13.7%) preferred handwritten prescriptions, and most ($n = 255$; 66.1%) found that prescriptions are illegible. Many encountered fraudulent ($n = 227$; 57.3%) or altered ($n = 180$; 46.6%) prescriptions. Half of the respondents ($n = 201$; 52.1%) reported no experience with e-prescribing.

Knowledge and perception overview: overall scores and key themes

As depicted in Fig. 2, moderate knowledge of e-prescribing (60%–79%) was noted amongst almost half of the participants ($n = 179$; 46.8%). Participants demonstrated high variability in the knowledge of e-prescribing with a mean knowledge score of 66.6 ± 15.9 achieved by respondents (Supplementary Table S2). Approximately half viewed e-prescribing positively for usefulness ($n = 213$; 55.2%) and improvement to practice and patient service ($n = 188$; 48.7%). However, most respondents expressed uncertainty regarding the ease of use and fitness of e-prescribing, with 281 (72.8%) and 258 (66.8%) demonstrated neutral perceptions in these domains. The mean domain score for perceived usefulness and perceived fitness was 80.1 ± 12.6 and 71.2 ± 10.2, respectively. The medians for perceived improvement to practice and patient service, and perceived ease of use were 78.3 (68.3–88.3) and 66.7 (60.0–73.3), respectively.

Thematic analysis revealed four main themes: (i) perceived benefits of e-prescribing, (ii) recommendations for software design, (iii) perceived facilitators of e-prescribing implementation, and (iv) Barriers to e-prescribing adoption. Themes were further divided into subthemes (Table 2). For data integration, themes are presented alongside the perception domain it aligns closest with. Several participants ($n = 69$; 17.7%) did not respond to open-ended questions, citing a lack of knowledge of e-prescribing, a finding that reinforces *Theme 4.1: Poor acceptance due to lack of knowledge or negative user perceptions*.

Knowledge of e-prescribing

Although most respondents indicated familiarity with e-prescribing ($n = 239$; 61.9%), fewer ($n = 73$; 18.9%) were aware of the e-prescribing software available. Nearly half reported low awareness of the legal framework applicable to e-prescriptions ($n = 170$; 44.1%). Majority reported understanding the technical aspects, including differences between e-prescribing and other digital prescriptions ($n = 238$; 61.7%), and advanced electronic signatures ($n = 242$; 62.7%). Overall, results indicate that there is reasonable understanding of e-prescribing among pharmacists, however, notable gaps in the knowledge of the legal aspects exist (Fig. 3).

Perceived usefulness

This domain analyzed pharmacists' perceptions regarding the long-term benefits, including impact on health outcomes, cost-benefits and implications for national health, aligning with the PE construct. Respondents perceived most benefits of e-prescribing (Table 3). Respondents agreed that e-prescribing will decrease fraudulent prescriptions ($n = 288$; 74.6%), prescribing errors ($n = 308$; 79.8%) and dispensing errors associated with illegible handwriting ($n = 336$; 87.0%). Majority ($n = 319$; 82.7%) positively perceived the benefits in rational prescribing related to medication history access. However, perceptions regarding the cost-reduction benefits pharmacists' ability to intervene were mixed.

Perceived improvement to practice and patient service

This domain analyzed pharmacists' perceptions regarding the operational benefits of e-prescribing software, focusing on service growth, patient satisfaction, workflow, prescription processing and safety, contributing to the PE construct. Respondents agreed that e-prescribing will benefit the dispensing process ($n = 333$; 86.3%), ease workflow ($n = 271$; 70.2%), be received ($n = 277$; 71.7%) and processed faster ($n = 252$; 65.2%), be safer ($n = 280$; 72.5%), reduce prescriber contact ($n = 268$; 69.5%), and save storage space ($n = 297$; 76.9%). However, perceptions on the impact on pharmacist interventions and patient satisfaction were mixed (Table 3).

Participants were invited to comment on why they believe e-prescribing is appropriate for pharmacy, of which 320 (82.9%) responded. Reported e-prescribing benefits were organized into *Theme 1* (Fig. 4). Subthemes linked benefits to

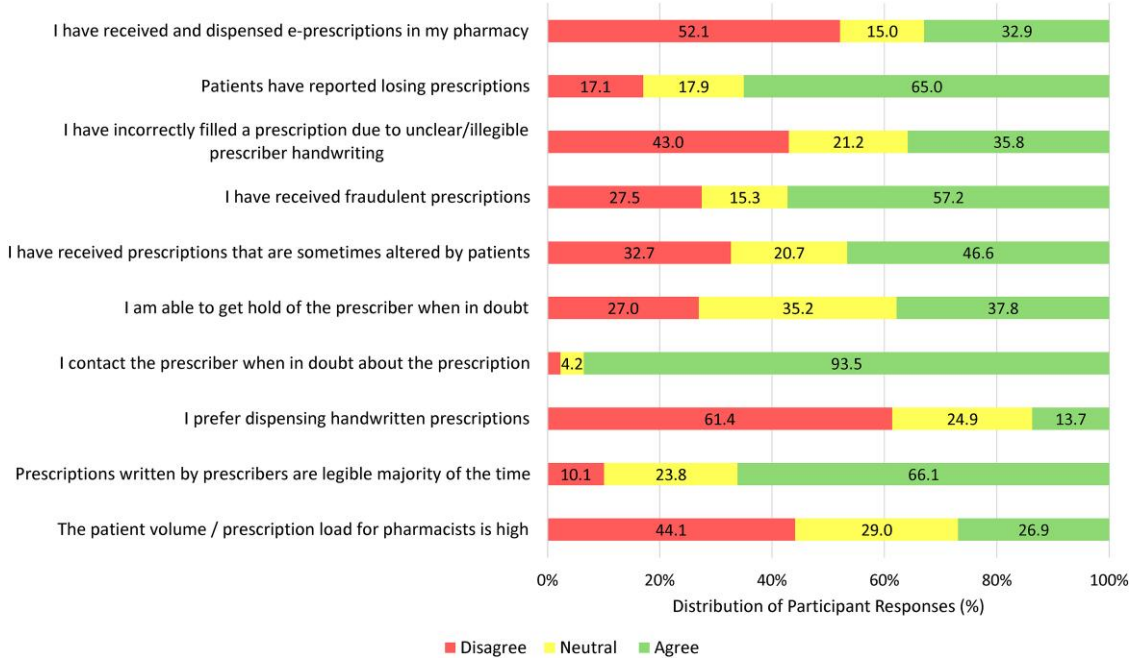

Figure 1. Response distribution for dispensing practices ($n = 386$).

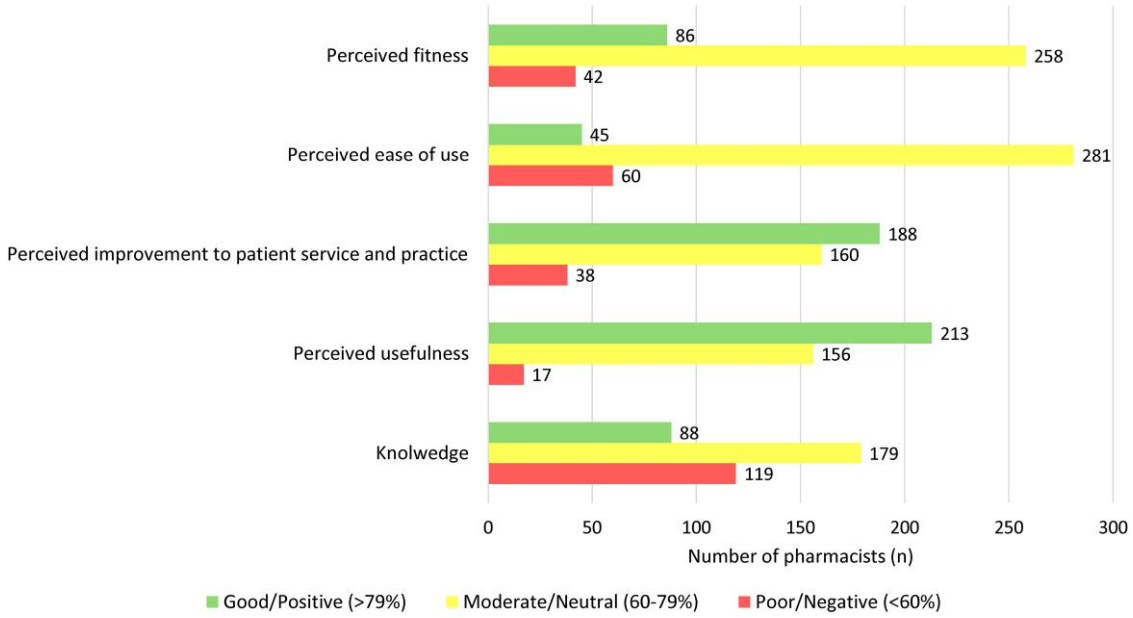

Figure 2. Distribution of knowledge and perception domains into ordinal ranks (knowledge score <60% = poor; 60%–79% = moderate; ≥80% = good. Perception score <60% = negative; 60%–79% = neutral; ≥80% = positive).

patient safety and satisfaction, prescription quality, and workflow.

In *Theme 1*, the subthemes were strongly associated with one another. For instance, legibility (*Theme 1.1*) decreased dispensing errors associated with illegible handwriting and minimized prescriber contact, thus improving patient safety (*Theme 1.2*) and workflow (*Theme 1.4*). Many respondents valued e-prescribing's role in patient-centred care (*Theme 1.2*), where access to medical histories reduces inappropriate prescribing. Integration with centralized Electronic Health Record (EHR) systems will allow patients to access prescription across all pharmacies within the network, (*Theme 1.5*), improving accessibility and continuity of care (*Theme 1.2*). Participants also report time-saving benefits (*Theme 1.4*), with more patients assisted, or more time for patient engagement, promoting better patient understanding and adherence to medication regimens (*Theme 1.2*).

Participants appreciated e-prescribing's role in mitigating medication misuse and abuse (*Theme 1.3*). Secure software prevents prescription tampering and reduces fraudulent

Table 2. Overview of themes.

Theme/subtheme	Perception domain
1) Benefits of e-prescribing	
1.1 Improved prescription quality	Perceived usefulness
1.2 Improved health outcomes and patient service	
1.3 Decreased medication misuse/abuse	Perceived improvement to practice and patient service
1.4 Streamlined workflows	
1.5 Systemic benefits	
2) Recommendations for software design	
2.1 Regulatory compliance and security	Perceived ease of use
2.2 Patient safety and service delivery features	
2.3 User Interface and functionality	
2.4 Features promoting pharmacist autonomy	
3) Perceived facilitators of e-prescribing implementation	
3.1 Financial investment and improved infrastructure	Perceived fitness
3.2 Addressing capacity and competence	
3.3 Availability of an approved, robust e-prescribing system	
3.4 Increased user adoption as a catalyst for pharmacist acceptance	
3.5 Change management through organizational leadership	
4) Barriers to e-prescribing adoption	
4.1 Poor acceptance due to lack of knowledge or negative user perceptions	Perceived fitness
4.2 Infrastructure and resource constraints	
4.3 Limited regulatory framework	
4.4 Previous negative experience	

prescriptions. Additionally, EHRs (*Theme 1.5*) would promote prescription tracking, preventing misuse (*Theme 1.3*). Some participants acknowledged that e-prescribing will automate accurate data collection (*Theme 1.5*), which aids drug utilization reviews, thus supporting public health initiatives, pharmacovigilance, and healthcare policy development.

Perceived ease of use and recommendations for e-prescribing software

This domain reports the pharmacists' perceptions regarding the usability and functionality of e-prescribing, aligning with the EE construct (Table 3). Approximately two-thirds ($n = 255$; 66.1%) indicated that using e-prescribing systems will not be time-consuming. However, one-third are uncertain about the complexity of e-prescribing software ($n = 128$; 33.2%), and 59 (15.3%) believe e-prescribing software to be complicated.

Recommendations for e-prescribing software design were collected from participants ($n = 321$) and arranged in *Theme 2: Recommendations for software design* (Fig. 5). Participants suggested features promoting patient safety, pharmacist autonomy and workflow. Security and compliance, in particular, adherence with regulatory standards, was highlighted as a necessity (*Theme 2.1*). Participants suggested the use of one-time-password (OTPs), preventing unauthorized access to patient's profiles to maintain patient confidentiality. Furthermore, strict access controls were considered necessary to prevent unauthorized individuals from gaining access. Participants recognized features that would promote patient safety in *Theme 2.2*: integration with Clinical Decision Support (CDS) tools offering real-time alerts and dose adjustments, treatment guidelines and EHRs were considered beneficial for rational prescribing and patient-centred care. Furthermore, participants expressed that real-time communication features between prescribers and pharmacists would foster collaboration (*Theme 2.3*).

Theme 2.3 underscored the need for user-friendly and intuitive e-prescribing software to minimize workflow disruption. Recommendations included interfaces with prepopulated fields, drop-down menus, and appropriate prompting. A complete drug file and interoperability with existing pharmacy software were considered important. In *Theme 2.4*, participants indicated that pharmacist's autonomy should not be affected, and that e-prescribing systems allow pharmacists to intervene and amend prescriptions, substitute medications when necessary, and monitor patient health effectively. Further recommendations include transparency, user customization, and offline capabilities.

Perceived fitness, facilitators and barriers to implementation

This domain explored the perceived fitness of e-prescribing systems, addressing their willingness to integrate new technology, costs concerns, and infrastructure requirements, contributing to the FC construct. Respondents had lower perceptions of the fitness of e-prescribing as compared to its benefits (Table 3). Majority agreed on its relevance to their sector of practice ($n = 282$; 73.0%) and were willing to integrate e-prescribing ($n = 289$; 74.9%). However, fewer believed that pharmacy environments can support it ($n = 225$; 58.3%) and that existing software requires drastic modifications for integration ($n = 194$; 50.3%). Some indicated that they will only accept e-prescriptions if mandated to by law ($n = 155$; 40.1%). Cost concerns were prevalent ($n = 259$; 67.1%), and opinions of the impact on patient confidentiality were divided.

Qualitative responses on perceived fitness were arranged into two themes: *Theme 3: Perceived facilitators of e-prescribing implementation* and *Theme 4: Barriers to e-prescribing adoption*, with subthemes illustrated in Figs 6 and 7, respectively. *Theme 3.1* highlights the need for significant financial investment and infrastructure improvement to facilitate readiness for implementation. Uninterrupted internet connectivity and stable power (no loadshedding) were also recognized as facilitators. Capacity building (*Theme 3.2: Addressing capacity and competence*) through comprehensive education and training was suggested. Clear policies and guidelines governing the use of e-prescribing to promote a standardized and regulatory compliant approach to implementing e-prescribing were recommended.

Participants indicated that availability of secure and compliant e-prescribing software would encourage e-prescribing uptake (*Theme 3.3*). Furthermore, they indicated that the software should be easy to use, demonstrate proven benefits and patient safety. Participants further expressed that ongoing technical support and regular improvements to the system would be essential to minimize disruptions to pharmacy

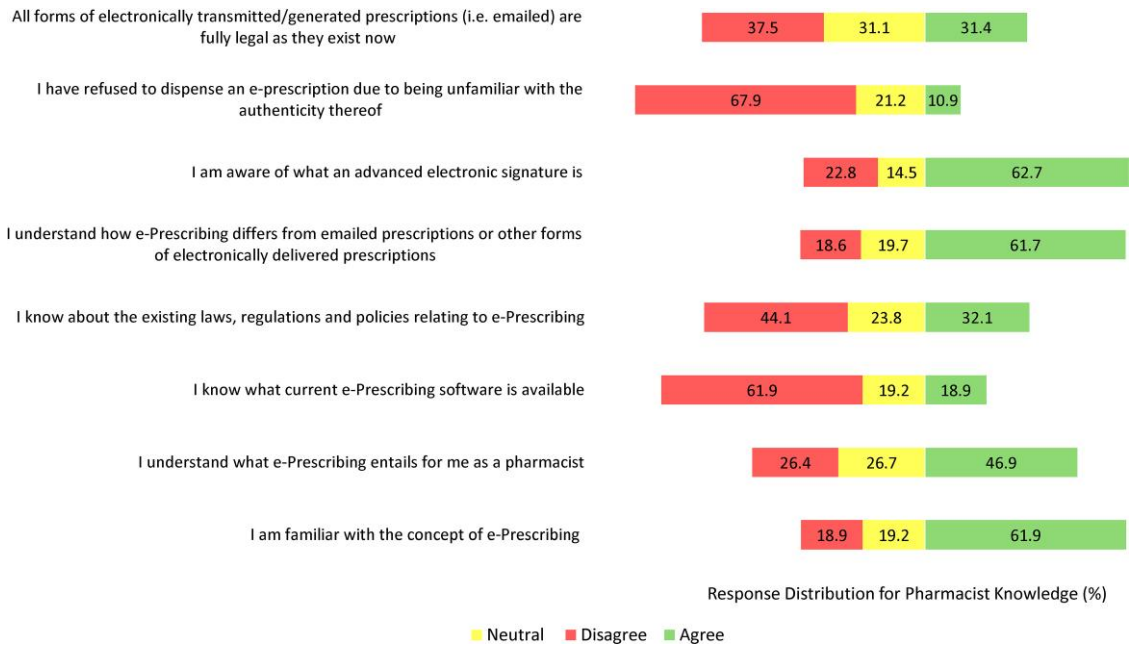

Figure 3. Response distribution (%) for knowledge domain ($n = 386$).

workflow. It was noted that increased user adoption serves as a catalyst for pharmacist acceptance of e-prescribing (*Theme 3.4*). However, for many participants, the implementation of e-prescribing in their workplace is dependent on institutional leadership, indicating that this process would rely on leadership that is proactive in adopting and implementing this change (*Theme 3.5*).

A key barrier to e-prescribing implementation emerging from the data is resistance driven by participants' lack of knowledge (*Theme 4.1*). Many pharmacists had misconceptions about the legality of e-prescriptions, believing them to be legally impermissible. Concerns about data security, potential hacking, and falsifying prescriptions further contributed to hesitation. Some participants raised concerns about transition challenges—specifically the time do adapt to e-prescribing, and technical challenges that cause further time wastage. In *Theme 4.2*, participants indicated that without sufficient resources, including basic computers, IT (information technology) support, and internet connectivity, e-prescribing could not be implemented in the public sector. Furthermore, affordability remains a concern, as pharmacists indicated that the initial financial outlay would prove challenging, regardless of the long-term cost–benefit ratio.

The absence of clear guidelines delays the progress in implementation and further contributes to misconceptions (*Theme 4.3*). Many participants commented that there is confusion regarding the technical standards and security protocols for e-prescriptions and reported difficulty in authenticating e-prescriptions received without the necessary guidelines. Past negative experiences with e-prescribing presented a significant barrier to adoption, with slow system processing, complex user interfaces, and delayed updates hindering timely prescription access for patients raised as concerns (*Theme 4.4*). Increased error rates, particularly in dosing instructions, and overlooked prescription releases by prescribers disrupt workflow. Users have further noted insufficient training, and poor interoperability complicates integration into existing workflows. Additionally, poor software design, frequent technical issues, and limited pharmacist capabilities to amend scripts or contact prescribers contribute to user frustration.

Comparison of the knowledge and perception domains of e-prescribing based on sociodemographic variables, computer literacy and dispensing practices

Chi-square and Fisher's exact tests showed significant associations between outcomes variables and the sociodemographic factors, computer literacy and dispensing practices (Table 4). Knowledge differed significantly based on gender, computer experience, and computer literacy. Furthermore, dispensing practices, including preference for handwritten prescriptions; receipt of altered prescriptions; and previous experience of e-prescribing were factors that showed a significant association with pharmacist knowledge.

Perception domains were significantly influenced by computer literacy, preference for handwritten prescriptions, the receipt of altered or fraudulent prescriptions, and incorrectly filled prescriptions (Table 4). Knowledge of e-prescribing significantly impacted pharmacists' perceptions. There was no significant association between sociodemographic variables and perception domains. Notably, pharmacists reporting previous e-prescribing experience did not significantly impact perceptions (Supplementary Table S3a–e).

Unadjusted ordinal regression identified factors ($P < 0.20$) associated with knowledge and perceptions of e-prescribing (Table 5). Associations between knowledge and perceptions were also assessed. Further variables not found significant in the unadjusted model, such as whether the pharmacist has experience in dispensing e-prescriptions, pharmacy sector, healthcare sector and the current position held by the pharmacist, were considered relevant, and thus also included in the final model. Any significant association highlighted by the Chi-square or Fishers Exact test was also included in the final models. The

Table 3. Response distribution to perception domains of e-prescribing among pharmacists ($n = 386$).

Question	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)
Perceived usefulness			
Receiving an e-prescription is helpful	12 (3.1)	33 (8.5)	341 (88.4)
E-prescribing will mitigate the risks of fraudulent scripts	26 (6.7)	72 (18.7)	288 (74.6)
E-prescribing will mitigate the risks of prescribing errors/medication misuse	24 (6.2)	54 (14.0)	308 (79.8)
E-prescribing will mitigate the risks of medication errors associated with illegible handwriting	18 (4.7)	32 (8.3)	336 (87.0)
E-prescribing will provide access to patient medication history, promoting rational prescribing	12 (3.1)	55 (14.2)	319 (82.7)
E-prescribing promotes health-related research through reliable data collection	10 (2.6)	74 (19.2)	302 (78.2)
E-prescribing promotes drug use surveillance through reliable data collection	10 (2.6)	59 (15.3)	317 (82.1)
E-prescribing will be a useful tool in the proposed National Health Insurance program	39 (10.1)	90 (23.3)	257 (66.6)
E-prescribing reduces overall costs for the health care system	57 (14.8)	163 (42.2)	166 (43.0)
E-prescribing will compromise the pharmacists' ability to intervene in the event of prescriber error	176 (45.6)	103 (26.7)	107 (27.7)
Perceived improvement to practice and patient service			
E-prescribing is a new opportunity for my pharmacy to grow in terms of a service profile	14 (3.6)	65 (16.8)	307 (79.6)
E-prescribing will ease my workflow	30 (7.8)	85 (22.0)	271 (70.2)
E-Prescribing ensures that I will always receive a prescription from a patient	66 (17.1)	111 (28.8)	209 (54.1)
Patient medication history provided by e-prescribing is beneficial to the dispensing process	9 (2.3)	44 (11.4)	333 (86.3)
E-prescriptions will be received quicker	31 (8.1)	78 (20.2)	277 (71.7)
E-prescriptions will be processed quicker	48 (12.5)	86 (22.3)	252 (65.2)
Compared to manual prescriptions, e-prescribing will be safer	27 (7.0)	79 (20.5)	280 (72.5)
Compared to manual prescriptions, e-prescribing will save time	30 (7.8)	73 (18.9)	283 (73.3)
E-prescriptions will reduce my need to contact the authorized prescriber	33 (8.5)	85 (22.0)	268 (69.5)
E-prescriptions will reduce my need to perform pharmaceutical interventions	136 (35.3)	121 (31.3)	129 (33.4)
E-prescriptions will save space as I will not need to collect/store physical prescriptions	35 (9.1)	54 (14.0)	297 (76.9)
E-prescribing improves patient satisfaction	35 (9.0)	142 (36.8)	209 (54.2)
Perceived ease of use			
I agree with the functionality of current forms of e-prescribing	31 (8.1)	233 (60.3)	122 (31.6)
Integrating e-prescribing into my pharmacy might require training and I am willing to be trained	9 (2.3)	37 (9.6)	340 (88.1)
E-prescribing software will require regular maintenance and technical support	11 (2.9)	57 (14.7)	318 (82.4)
Such technical support will cause time wastage	124 (32.2)	148 (38.3)	114 (29.5)
Amending an e-prescription will be difficult	86 (22.3)	148 (38.3)	152 (39.4)
E-prescribing will save time in the dispensing process	25 (6.4)	106 (27.5)	255 (66.1)
It will be easy to receive prescriptions	13 (3.4)	80 (20.7)	293 (75.9)
Prescribing/dispensing through software is complicated	199 (51.5)	128 (33.2)	59 (15.3)
E-prescribing software is secure and prevents unauthorized access	47 (12.2)	147 (38.1)	192 (49.7)
Perceived fitness			
I am comfortable with existing dispensing software and would not like to change to e-prescribing	170 (44.0)	98 (25.4)	118 (30.6)
E-prescribing has a place in my sector of pharmacy	45 (11.7)	59 (15.3)	282 (73.0)
I would be able to integrate e-prescribing software into my practice (with appropriate training).	24 (6.2)	73 (18.9)	289 (74.9)
My current working environment and practices can integrate e-prescribing software	53 (13.7)	108 (28.0)	225 (58.3)
Existing dispensing software needs drastic modifications to facilitate e-prescribing	49 (12.7)	143 (37.0)	194 (50.3)
I will willingly accept e-prescribing software and e-prescriptions	15 (3.9)	81 (21.0)	290 (75.1)
I will only accept e-prescriptions once it is mandated by law	120 (31.1)	111 (28.8)	155 (40.1)
E-prescribing software is ideal only for a pharmacy with a high patient load	186 (48.2)	104 (26.9)	96 (24.9)
e-prescribing should be limited to specific patient groups (e.g. patients on chronic medication)	211 (54.7)	113 (29.3)	62 (16.0)
e-prescribing should be limited to certain levels of prescribers (e.g. specialist practitioners)	232 (60.1)	106 (27.5)	48 (12.4)
E-prescribing software will be an additional cost to pharmacies	30 (7.8)	97 (25.1)	259 (67.1)
The cost-benefit ratio of purchasing an e-prescribing software is favorable	43 (11.1)	154 (39.9)	189 (49.0)
It should be mandatory for all pharmacies to have access to some form of e-prescribing software	44 (11.4)	86 (22.3)	256 (66.3)
It should be mandatory for all pharmacies to accept and dispense e-prescriptions	52 (13.5)	79 (20.5)	255 (66.0)
Handwritten and manual prescriptions will be phased out within 5–10 years	111 (28.8)	107 (27.7)	168 (43.5)
E-prescribing software may compromise patient confidentiality	93 (24.1)	132 (34.2)	161 (41.7)

adjusted regression analysis was performed with the significant factors for each domain and results are presented in Table 6.

Knowledge domain

The results of the adjusted ordinal logistic regression analysis for the knowledge domain revealed several predictors for good knowledge (Table 6). Pharmacists with e-prescription experience had nearly six times the odds for higher knowledge [adjusted odds ratio (AOR) = 5.6, 95% CI: 3.38–9.28, $P < 0.001$]. Recent graduates (AOR = 2.83, 95% CI: 1.28–6.27, $P = 0.010$); pharmacists with postgraduate degrees (AOR = 1.98, 95% CI: 1.16–3.37, $P = 0.012$) and those perceiving e-prescribing as easy to use (AOR = 1.04, 95% CI: 1.01–1.08, $P = 0.008$) had better knowledge of e-prescribing.

Perception domains

Recent graduates had better perceptions of the usefulness of e-prescribing (AOR = 2.28; 95% CI: 1.03–5.06, $P = 0.042$); pharmacists in management positions had higher odds of perceiving e-prescribing as well-suited to their practice needs, i.e. perceived fitness (AOR = 2.88; 95% CI: 1.52–5.46, $P = 0.001$). Retail pharmacists saw more benefits of e-prescribing, than those practicing in other sectors. In terms of dispensing practices, participants who were uncertain about having dispensed e-prescriptions positively

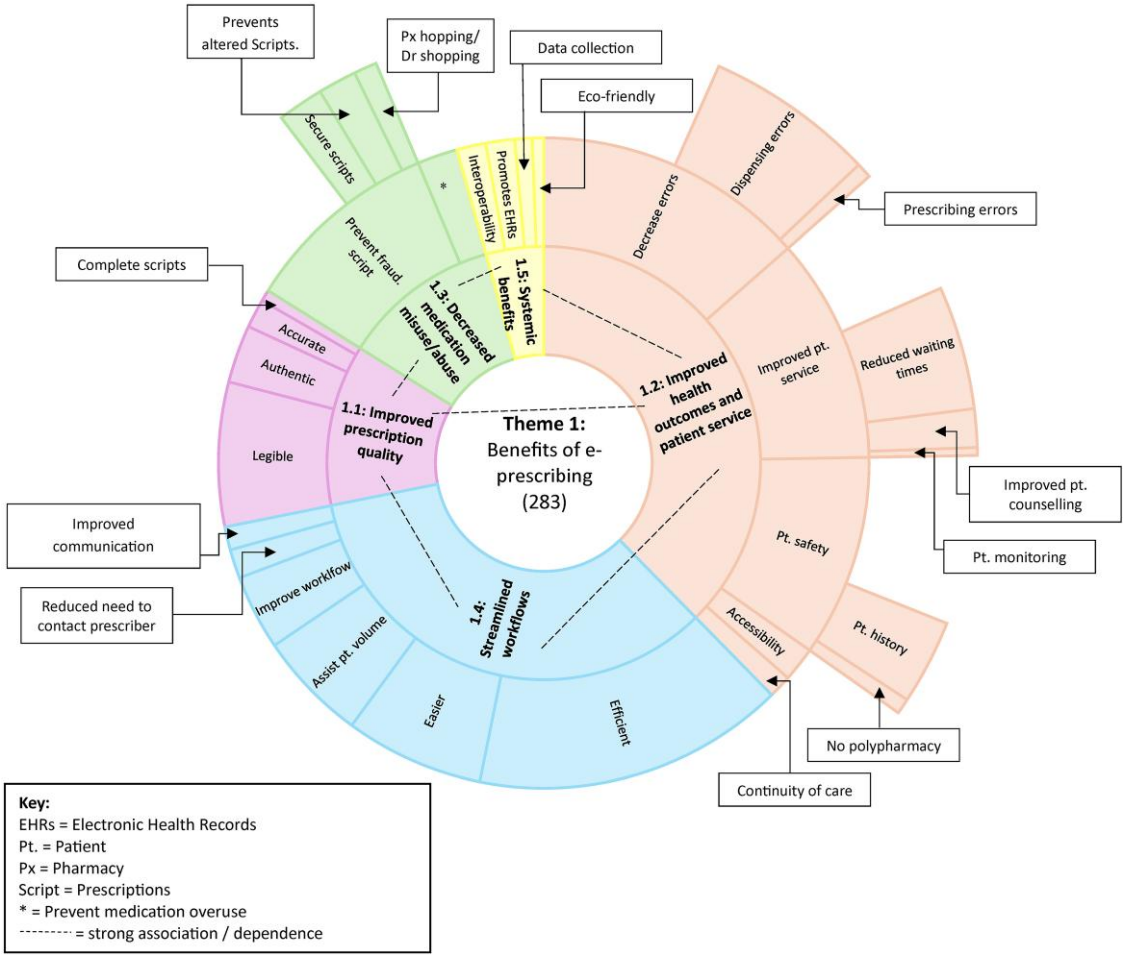

Figure 4. Sunburst chart depicting the hierarchical representation of Theme 1: benefits of e-prescribing (inner ring), the subthemes (middle ring) and defined codes (outer rings). Relative importance is indicated by area of segment.

perceived the fitness of e-prescribing (AOR = 4.54, 95% CI: 2.05–10.07, $P < 0.001$). Interestingly, respondents with a preference for handwritten prescriptions (i.e. resistant to change) did not positively perceive the fitness of e-prescribing (AOR = 0.3, 95% CI: 0.12–0.74, $P = 0.008$). The adjusted model further revealed that positive perceptions in one domain would likely lead to positive perceptions in another (Table 6).

To summarize, these findings hold important implications for other UMICs and LMICs pursuing digital health reforms. The South African experience illustrates that policy alignment alone is insufficient without concurrent investment in infrastructure, capacity-building through education and training, and user-centred software design. For e-prescribing to be successfully scaled in similar settings, strategic leadership, intersectoral coordination, and context-appropriate regulatory frameworks must be prioritized.

Discussion

To the best of the author's knowledge, this is the first study to assess South African pharmacists' knowledge and perceptions of e-prescribing. As South Africa begins the process of digitizing healthcare, it is essential to understand pharmacists' perceptions to inform the development and implementation of such systems. With a mixed-methods approach, this study explored the knowledge and perceptions of pharmacists in relation to e-prescribing, and reports the predictors for good knowledge, and positive perceptions. The use of the purposive convenience sampling method may have introduced selection bias, as pharmacists with greater interest in or exposure to digital technologies (like e-prescribing) may have been more likely to participate. This could limit the generalizability of the findings to the broader pharmacist population, particularly those with limited access to or experience with digital health systems. Despite this limitation, the results highlight persistent systemic and regulatory barriers that must be addressed to facilitate broader adoption of e-prescribing in South Africa.

e-Prescribing knowledge and user adoption

The study findings indicate that the adoption of e-prescribing in South Africa is still in early stages. This is in stark contrast to countries in Europe, where over 90% of prescriptions were transmitted to community pharmacies electronically (Organisation for Economic Co-operation and Development 2018). Literature reports that widespread adoption is related to the structured implementation of carefully designed e-prescribing systems. However, in many LMICs, such as South Africa and Ethiopia, e-prescribing implementation is lagging due to the significant challenges faced by these countries (Cohen et al. 2013, du Toit et al. 2015, Bouraghi et al. 2024, Sema et al. 2024). South African specific barriers related to e-prescribing implementation were described by

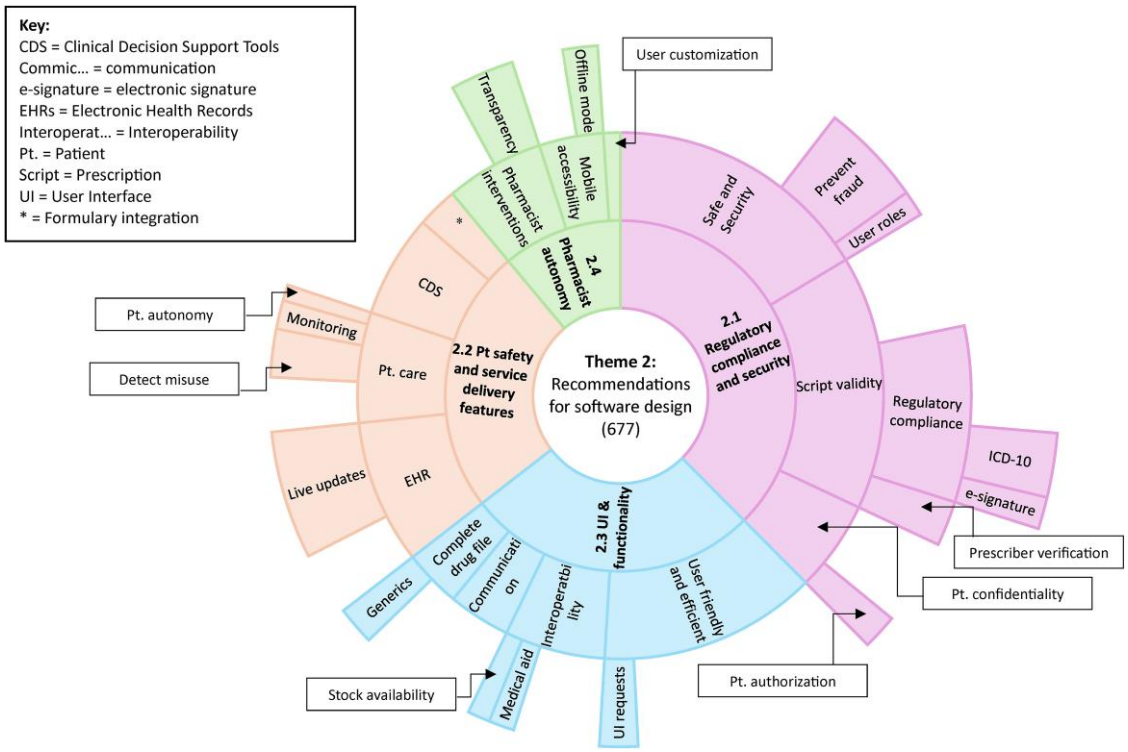

Figure 5. Sunburst chart depicting the hierarchical representation of Theme 2: recommendations for software design (inner ring), the subthemes (middle ring) and defined codes (outer rings). Relative importance is indicated by area of segment.

pharmacists in *Theme 4*. In *Theme 4.1*, poor knowledge was seen to promote negative perceptions, resulting in low adoption rates. The relationship between negative perceptions and slow adoption has been described in a comprehensive literature review by Hareem and co-workers (Hareem et al. 2023). Furthermore, pharmacists who preferred handwritten prescriptions are less likely to perceive e-prescribing as suitable for their practice, echoing similar concerns reported in literature (Gagnon et al. 2014, Hareem et al. 2023).

Although the quantitative data suggest that there is reasonable understanding of e-prescribing amongst South African pharmacists, which is consistent with other LMICs, like Ethiopia (Sema et al. 2024), there are significant gaps in knowledge about specific software, regulations, and legalities surrounding e-prescriptions. This is not surprising, given limited e-prescribing regulations:

- The MRSA Act dictates that e-prescriptions are acceptable if they contain an advanced electronic signature compliant with the Electronic Communications and Transactions Act (ECT Act) of 2002 (South Africa, Medicines and Related Substances Act No. 101 of 1965, General Regulations to the Act, 2017).
- The ECT Act stipulates that an electronic signature is valid if produced by an authentication product accredited by the Accreditation Authority, as appointed by the ECT Act (South Africa, Electronic Communications and Transaction Act 25 of 2002, 2021).

The resultant framework is vague when compared to the extensive guidelines available in other countries (United States of America 2003, Directorate-General for Health and Food Safety, European Commission, 2022), where e-prescribing is widely implemented. The lack of the regulatory support was also perceived by pharmacists as a barrier to e-prescribing implementation (*Theme 4.3: Limited regulatory framework*).

The study findings further suggest that pharmacists are aware that addressing these limitations will improve adoption rates (*Theme 3.2*). Pharmacists stressed the need for appropriate education, which is further supported by the quantitative data. Ongoing training ensures users remain updated with system developments and guideline updates. Furthermore, predictors of good knowledge include recently graduated pharmacists, pharmacists with a postgraduate degree or those with good computer literacy, reinforcing the importance of education in improving knowledge and subsequently, adoption. Previous research has highlighted the role of digital literacy in the implementation of health technologies (Chereka et al. 2024), and it is also likely that pharmacy curricula are updated to include e-prescribing, contributing to the higher knowledge scores observed. Furthermore, practical exposure (i.e. previous exposure to e-prescribing) contributed to better knowledge outcomes, a finding that is further substantiated in other studies (Burns and Okorie 2022). The high variations observed in the knowledge scores thus reflect the disparity in exposure of, and training for e-prescribing.

Professional background, including position, field of pharmacy, sector, or years of experience did not contribute to higher knowledge, suggesting that foundational computer skills are more critical to better knowledge. Many pharmacists indicated that mandatory implementation would drive willingness to adoption. Pharmacists expressed that clear policies, guidelines, and standards should be established to govern the use of e-prescribing, addressing concerns about legalities and operational consistency. These findings align with existing literature, which underscores that education and training (Hareem et al.

Figure 6. Sunburst chart depicting the hierarchical representation of Theme 3: facilitators for e-prescribing implementation (inner ring), the subthemes (middle ring) and defined codes (outer rings). Relative importance is indicated by area of segment.

2023), and detailed regulatory framework development (Friedman et al. 2009, Grossman et al. 2012), are necessary in overcoming resistance to e-prescribing adoption.

Perceived benefits

The positive perception scores for both the perceived usefulness and improvement to practice and patient service domains indicate that South African pharmacists recognize the benefits e-prescribing. They view e-prescribing as a tool that enhances patient safety, improves health outcomes, and optimizes pharmacy workflow and operational tasks. These findings are further supported by the qualitative results in *Theme 1: Perceived benefits of e-prescribing*, where pharmacists emphasized its potential to improve patient outcomes by enhancing prescription quality (*Theme 1.1*) and reducing prescribing errors through the integration of clinical decision support tools and access to comprehensive patient histories (*Theme 1.2*). The positive impact of e-prescribing on patient safety has been well-documented, with studies reporting a significant reduction in medication errors associated with illegible or inappropriate prescriptions (Ammenwerth et al. 2008, Porterfield et al. 2014, Annisa et al. 2023).

It is, however, noteworthy that the ordinal regression analysis revealed that pharmacists who found existing prescriptions legible were less likely to perceive e-prescribing as useful. Although this contradicts literature that argue for the improved clarity of e-prescriptions, it may reflect a preference for familiar processes and resistance to change among those who do not frequently encounter illegible handwriting. Pharmacists in this study also stressed the importance of integrating e-prescribing with CDS tools and patient histories through EHRs, which can prevent prescribing errors by flagging inappropriate drug selections based on drug interactions, medical conditions, or allergies. This view aligns with the literature, where such tools have been shown to substantially improve patient safety by decreasing prescribing errors (Tolley et al. 2018, Roumeliotis et al. 2019).

Most respondents believed that e-prescribing will mitigate fraudulent prescriptions through a centralized patient information database. This would prevent behaviour's like 'pharmacy hopping' or 'doctor shopping,' where patients visit multiple healthcare providers to obtain excessive quantities of controlled medicines. E-prescribing systems enable real-time tracking of a patients' prescriptions and medication use, which discourages these actions and ensures medications are prescribed based on necessity. The qualitative findings further describe that centralized access to patient prescription histories is considered a valuable tool in preventing abuse while ensuring patients who genuinely need controlled substances receive them safely (*Theme 1.3*). Additionally, the co-ordination between healthcare providers is improved, minimizing the risk

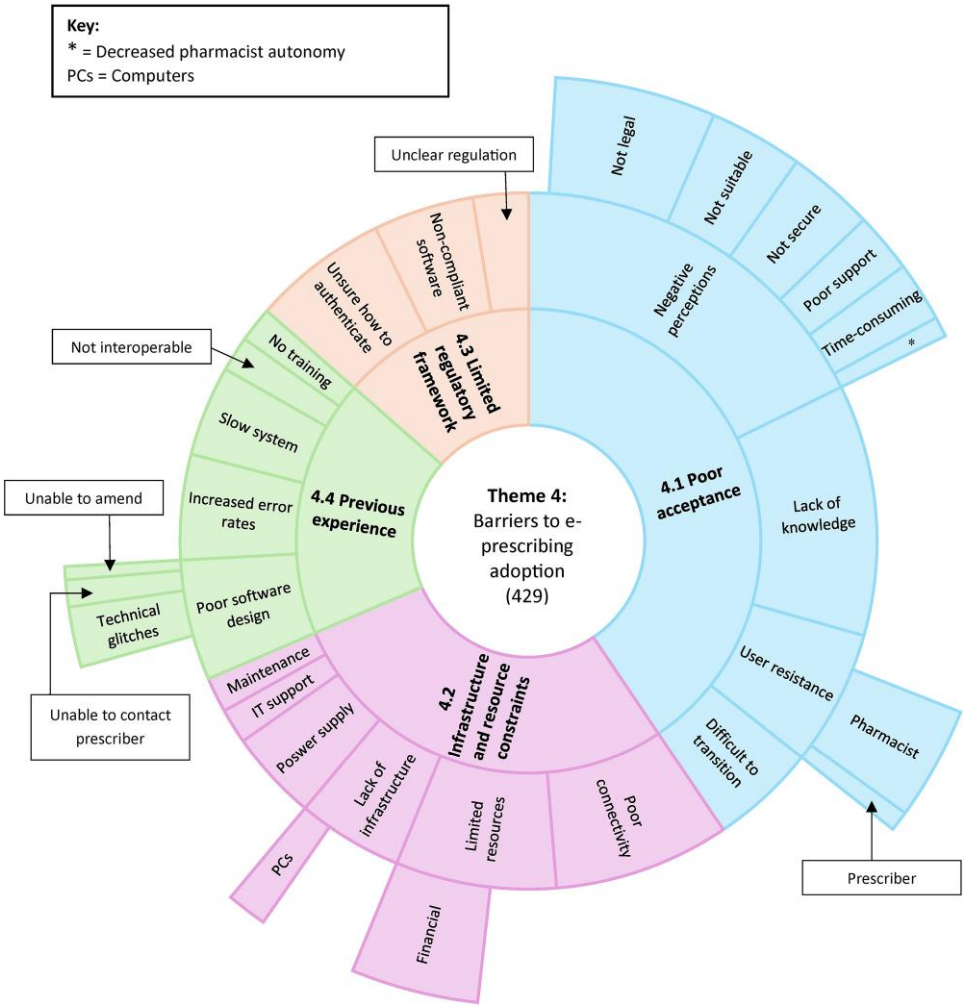

Figure 7. Sunburst chart depicting the hierarchical representation of Theme 4: barriers to e-prescribing adoption (inner ring), the subthemes (middle ring) and defined codes (outer rings). Relative importance is indicated by area of segment.

of unintentional overprescribing, which further contributes to medication misuse (Kaldy 2016, Achar et al. 2021). Studies conducted in the USA demonstrate how this technology can be applied to Prescription Drug Monitoring Programs (PDMPs), where commonly misused prescription medications are strictly controlled (Danovich et al. 2019). However, the qualitative findings revealed that pharmacists are concerned that e-prescribing systems can be taken advantage of by unauthorized users who will generate fraudulent e-prescriptions for prescription medications. This finding relates to the misconceptions that some pharmacists have in relation to the security and robustness of e-prescribing systems (*Theme 4.1*). This is further substantiated by the ordinal regression analysis, which revealed that pharmacists who had encountered fraudulent prescriptions in the past had lower odds of perceiving e-prescribing as useful.

Both qualitative and quantitative data reveal that respondents perceive e-prescribing as a tool to significantly enhance workflow and daily operations, suggesting that pharmacists recognize the convenience and efficiency that e-prescribing offers. Majority agree that e-prescriptions will be easier and faster to process, improve documentation and data collection, and streamline communication with the prescriber. Reducing unnecessary contact with the prescriber due to illegible prescriptions will minimize disruptions and allow pharmacists to work through larger patient loads (*Theme 1.4*). Furthermore, pharmacists have highlighted streamlined communication as a recommended design feature to be included in e-prescribing systems (*Theme 2.3*). This perception has merit, as studies evaluating e-prescribing systems, have reported that the time spent resolving prescription related issues was reduced due to the streamlined communication offered by e-prescribing (Gagnon et al. 2014, Hareem et al. 2023).

Interestingly, while most pharmacists felt that e-prescribing would reduce the need to contact prescribers, opinions were divided on whether pharmaceutical interventions would decrease. The qualitative findings described in *Theme 2.4* indicate that pharmacists believe that professional judgment should still be necessary, even in a digitized system, and pharmacists should still have the capability of adjusting the prescription when an intervention is necessary. This reflects ongoing concerns about the balance between automation and professional judgment, which is a critical consideration in the implementation of e-prescribing systems (Naik et al. 2022). Ooi et al. (2021) further emphasized that medication errors still occur, even when technology supports the prescribing process and thus pharmacists must continue applying clinical expertise. A Finnish study evaluating the post-implementation effectiveness of e-prescribing software revealed that pharmacists faced difficulties when attempting to make

Table 4. Factors showing significant association with pharmacist knowledge and perception of e-prescribing (Chi-square/Fisher's exact).[a]

Variables	*P*-value
Knowledge domain	
Gender	0.046
Computer experience	0.034
Computer literacy	0.003
I prefer dispensing handwritten prescriptions	0.024
I have received prescriptions that are sometimes altered by patients	0.006
I have received and dispensed e-prescriptions* in my pharmacy	<0.001
Perception domains	
Perceived usefulness	
Computer literacy	<0.001
I prefer dispensing handwritten prescriptions	<0.001
I have received prescriptions that are sometimes altered by patients	0.002
I have received fraudulent prescriptions	0.002
I have incorrectly filled a prescription due to unclear/illegible prescriber handwriting	0.003
Knowledge score	<0.001
Perceived improvement to practice and patient service	
Gender	0.004
Computer literacy	0.002
I prefer dispensing handwritten prescriptions	< 0.001
I have incorrectly filled a prescription due to unclear/illegible prescriber handwriting	0.022
Patients have reported losing prescriptions	0.014
Knowledge score	<0.001
Perceived ease of use	
I prefer dispensing handwritten prescriptions	0.001
I am able to get hold of the prescriber when in doubt	0.017
Knowledge score	<0.001
Perceived fitness	
Computer literacy	0.007
I prefer dispensing handwritten prescriptions	<0.001
I have received fraudulent prescriptions	0.049
Knowledge score	<0.001

[a]Table contains only significant associations. Full results of Chi-square/Fisher's exact results for all factors (with and without significant associations) are included in Supplementary Table S3a–e.

interventions on inappropriate e-prescriptions, as compared to manual prescriptions (Kauppinen et al. 2017), further substantiating these concerns and thus, recommendations for e-prescribing must ensure that system design should not limit pharmacist interventions.

Beyond the immediate pharmacy space, participants were somewhat uncertain about the broader benefits of e-prescribing. There were mixed responses regarding its impact on healthcare costs. This benefit was not reported in *Theme 1*, highlighting that pharmacists have not considered the long-term cost benefit of e-prescribing, or as is described in *Theme 4.2*, perceive that the initial financial outlays will be too great to allow for implementation. The uncertainty of the financial impact of e-prescribing systems is further substantiated in literature. Some studies have demonstrated cost savings through reduced prescription errors and improved medication management, while others have noted the significant initial investment required for e-prescribing implementation (Garrido et al. 2005, Porterfield et al. 2014, du Toit et al. 2015, Ross et al. 2016, Hareem et al. 2023).

From a pharmacovigilance perspective, participants recognized the role of e-prescribing in clinical research and monitoring drug use. The quantitative findings reflect broad agreement

Table 5. Unadjusted ordinal regression analysis summarizing factors associated with knowledge, perceived usefulness, improvement to practice and patient service, ease of use, and fitness.[a]

Variable	Category	Knowledge		Perceived usefulness		Perceived improvement to practice and patient service		Perceived ease of use		Perceived fitness	
		Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value
Age	–	–	–	0.98 (0.96–0.99)	0.004	0.98 (0.97–1.00)	0.021	–	–	0.99 (0.97–1.00)	0.094
Gender	Female	–	–	–	–	Reference	0.169	Reference	0.075	–	–
	Male	–		–		1.36 (0.87–2.13)		1.58 (0.95–2.62)		–	
Pharmacy Sector	Retail	Reference	0.075	Reference	0.199	–	–	–	–	–	–
	Hospital	0.72 (0.46–1.13)		1.70 (1.06–2.73)		–		–		–	
	Industry	0.66 (0.36–1.23)		1.19 (0.62–2.30)		–		–		–	
	Academia	1.14 (0.44–2.93)		1.89 (0.68–5.25)		–		–		–	
	Other	2.13 (0.97–4.68)		1.00 (0.42–2.37)		–		–		–	
Health Sector	Public	Reference	0.154	–	–	–		Reference	0.015	–	–
	Private	1.55 (0.94–2.56)		–		–		0.66 (0.37–1.20)		–	
	Both	1.95 (0.89–4.26)		–		–		0.27 (0.11–0.65)		–	
Postgraduate qualification	No	Reference	0.016	Reference	0.104	–	–	–	–	–	–
	Yes	1.69 (1.10–2.59)		1.46 (0.92–2.30)		–		–		–	
Years of experience	1–5 years	–	–	–	–	Reference	0.067	–	–	–	–
	6–10 years	–		–		0.78 (0.45–1.34)		–		–	
	11–15 years	–		–		1.58 (0.82–3.07)		–		–	
	15–20 years	–		–		1.29 (0.56–2.96)		–		–	

(*continued*)

Table 5. Continued

Variable	Category	Knowledge		Perceived usefulness		Perceived improvement to practice and patient service		Perceived ease of use		Perceived fitness	
		Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value	Unadjusted OR (95% CI)	*P*-value
	>20 years	–		–		0.64 (0.39–1.05)		–		–	
Computer Experience	1–5 years	Reference	0.086	Reference	0.150	–	–	–	–	–	–
	6–10 years	0.52 (0.21–1.32)		0.40 (0.15–1.08)		–		–		–	
	11–15 years	0.84 (0.36–1.98)		0.77 (0.30–1.94)		–		–		–	
	15–20 years	1.20 (0.52–2.77)		0.95 (0.38–2.40)		–		–		–	
	>20 years	1.19 (0.54–2.65)		0.64 (0.27–1.53)		–		–		–	
Computer Literacy	Poor <60%	Reference	0.002	Reference	<0.001	Reference	0.001	–	–		0.003
	Moderate 60%–79%	0.51 (0.10–2.51)		6.00 (1.08–33.42)		5.85 (1.08–31.56)		–		2.97 (0.58–15.35)	
	Good ≥80%	1.90 (0.46–7.80)		17.46 (3.61–84.52)		12.44 (2.68–57.85)		–		7.92 (1.83–34.37)	
Prescriptions are legible	Disagree	–	–	Reference	0.053	–	–	–	–	–	–
	Neutral	–		0.90 (0.56–1.46)		–		–		–	
	Agree	–		0.56 (0.35–0.91)		–		–		–	
Prefer handwritten prescriptions	Disagree	Reference	0.005	Reference	<0.001	Reference	<0.001	Reference	<0.001	Reference	<0.001
	Neutral	0.59 (0.38–0.91)		0.36 (0.23–0.58)		0.33 (0.21–0.52)		0.44 (0.25–0.75)		0.20 (0.11–0.36)	
	Agree	0.46 (0.26–0.81)		0.18 (0.09–0.33)		0.19 (0.10–0.35)		0.32 (0.16–0.63)		0.14 (0.07–0.28)	
Able to get hold of the prescriber	Disagree	–	–	–	–	–	–	Reference	0.095	–	–
	Neutral	–		–		–		1.55 (0.88–2.75)		–	
	Agree	–		–		–		1.86 (1.05–3.30)		–	
Received altered prescriptions	Disagree	Reference	0.003	Reference	<0.001	Reference	0.029	–	–	Reference	0.026
	Neutral	1.27 (0.76–2.14)		0.76 (0.44–1.31)		0.94 (0.57–1.54)		–		0.82 (0.45–1.49)	
	Agree	2.05 (1.33–3.17)		1.88 (1.19–2.97)		0.76 (0.46–1.23)		–		1.63 (1.01–2.63)	
Received fraudulent prescriptions	Disagree	Reference	0.038	Reference	<0.001	Reference	0.041	–	–	Reference	0.045
	Neutral	1.38 (0.77–2.49)		0.40 (0.21–0.75)		0.67 (0.37–1.23)		–		0.62 (0.32–1.21)	
	Agree	1.76 (1.14–2.72)		1.28 (0.80–2.02)		1.34 (0.86–2.08)		–		1.32 (0.82–2.15)	
Incorrectly filled a prescription	Disagree	–	–	Reference	<0.001	Reference	0.004	–	–	Reference	0.030
	Neutral	–		0.88 (0.52–1.47)		1.09 (0.66–1.80)		–		0.76 (0.43–1.34)	
	Agree	–		2.13 (1.34–3.39)		2.05 (1.31–3.20)		–		1.58 (0.99–2.53)	
Patients have lost prescriptions	Disagree	Reference	0.060	–	–	Reference	0.136	–	–	Reference	0.036
	Neutral	0.94 (0.50–1.76)		–		1.35 (0.70–2.61)		–		1.25 (0.61–2.59)	
	Agree	1.56 (0.94–2.57)		–		1.70 (0.99–2.90)		–		1.99 (1.10–3.59)	
Experience with e-prescribing	Disagree	Reference	<0.001	Reference	0.063	Reference	0.228	Reference	0.054	Reference	0.107
	Neutral	1.19 (0.68–2.08)		0.70 (0.40–1.23)		1.02 (0.59–1.77)		0.56 (0.30–1.07)		1.53 (0.83–2.80)	
	Agree	5.07 (3.23–7.96)		1.42 (0.90–2.22)		1.44 (0.93–2.21)		1.32 (0.80–2.17)		1.59 (1.00–2.54)	
Associations between domains	Knowledge	–	–	1.05 (1.03–1.06)	<0.001	1.04 (1.02–1.05)	<0.001	1.05 (1.03–1.06)	<0.001	1.05 (1.03–1.06)	<0.001
	Usefulness	1.06 (1.04–1.08)	<0.001	–	–	1.17 (1.14–1.20)	<0.001	1.11 (1.08–1.13)	<0.001	1.16 (1.13–1.19)	<0.001
	Service	1.05 (1.03–1.06)	<0.001	1.17 (1.14–1.20)	<0.001	–	–	1.10 (1.07–1.11)	<0.001	1.10 (1.08–1.12)	<0.001
	Ease	1.08 (1.06–1.10)	<0.001	1.16 (1.12–1.19)	<0.001	1.16 (1.13–1.19)	<0.001	–	–	1.14 (1.11–1.17)	<0.001
	Fitness	1.08 (1.06–1.10)	<0.001	1.18 (1.15–1.22)	<0.001	1.14 (1.11–1.16)	<0.001	1.12 (1.09–1.15)	<0.001	–	–

– = No statistical significance observed within variable.
[a]Table contains only significant associations. Full table of results from ordinal regression analysis (unadjusted) are included in Supplementary Tables S4a–e.

Table 6. Predictors of good knowledge and positive perceptions of e-prescribing.[a]

Variable	Category	AOR (95% CI)	*P*-value
Knowledge domain			
Position[b]	Recent graduate	2.83 (1.28–6.27)	0.010
Level of education	Postgraduate degree	1.98 (1.16–3.37)	0.012
Computer literacy	Moderate (60%–79%)	0.14 (0.02–0.86)	0.034
I have dispensed e-prescriptions in my pharmacy	Agree	5.60 (3.38–9.28)	<0.001
Perceived ease of use score		1.04 (1.01–1.08)	0.008
Perceived usefulness domain			
Level of education	Postgraduate degree	2.28 (1.03–5.06)	0.042
Prescriptions written by prescribers are legible most of the time	Agree	0.39 (0.18–0.86)	0.019
I have received fraudulent prescriptions	Neutral	0.23 (0.08–0.62)	0.004
Perceived ease of use score		1.15 (1.11–1.19)	<0.001
Perceived fitness		1.12 (1.07–1.18)	<0.001
Perceived improvement to practice and patient service			
Pharmacy sector[b]	Hospital	0.40 (0.21–0.79)	0.009
	Academia	0.19 (0.05–0.77)	0.020
	Other	0.15 (0.05–0.47)	0.001
Position[b]	Recent graduate	0.36 (0.13–0.97)	0.043
Perceived usefulness score		1.14 (1.10–1.18)	<0.001
Perceived ease score		1.08 (1.04–1.12)	<0.001
Perceived ease of use			
Health Sector	Both	0.21 (0.07–0.61)	0.004
I contact the prescriber when in doubt about the prescription	Agree	2.29 (1.19–4.43)	0.013
Knowledge score		1.03 (1.01–1.05)	0.008
Perceived usefulness score		1.04 (1.00–1.08)	0.045
Perceived improvement to practice and patient service score		1.04 (1.01–1.07)	0.008
Perceived Fitness score		1.05 (1.02–1.09)	0.005
Perceived Fitness			
Position	Management	2.88 (1.52–5.46)	0.001
I prefer dispensing handwritten prescriptions	Neutral	0.27 (0.14–0.55)	<0.001
	Agree	0.30 (0.12–0.74)	0.008
I have received and dispensed e-prescriptions in my pharmacy	Neutral	4.54 (2.05–10.07)	<0.001
Perceived usefulness score		1.15 (1.10–1.20)	<0.001
Perceived ease score		1.07 (1.03–1.11)	0.001

[a]Table contains only significant associations. Full table of results from ordinal regression analysis (adjusted model) are included in Supplementary Tables S4a–e.
[b]Factors included as relevant for study but not found significant with other tests.

among pharmacists; yet, this theme was less pronounced in the qualitative analysis. Literature emphasizes that integrating electronic health records and e-prescribing with pharmacovigilance strategies may strengthen drug safety initiatives (Lavertu et al. 2021), as e-prescribing systems can enable real-time reporting of adverse drug reactions.

Predictors of positive perceptions of usefulness included higher education levels, which is consistent with studies reporting that higher education levels are often correlated with greater acceptance of health technologies, likely due to a deeper understanding of their potential benefits (Venkatesh et al. 2003). Pharmacists working in hospitals, academia, and other sectors outside of retail were less likely to perceive e-prescribing as beneficial to practice improvement and patient service. The lower perception of usefulness in these sectors may reflect institutional challenges, system design flaws or a slower rate of adoption compared to retail settings (Ash et al. 2003 , Gagnon et al. 2014, Kauppinen et al. 2017). Conversely, recent graduates were also less likely to perceive these improvements, which could indicate that their limited experience with traditional prescribing methods might make the advantages of e-prescribing less apparent to them.

Perceived ease of use and system recommendations

Pharmacists were mostly neutral about whether they believed that current forms of e-prescribing software are acceptable. This neutrality indicates a lack of experience or confidence in current systems' functionality. Most pharmacists have indicated that they would be willing to undergo training on e-prescribing, which, through the qualitative findings in *Theme 3.2*, was highlighted as a perceived facilitator to e-prescribing implementation. Furthermore, pre-implementation studies have indicated a similar willingness amongst participants to undergo training, a positive attitude toward adopting new technology and recognition of the potential benefits of e-prescribing (Gagnon et al. 2014, Palappallil and Pinheiro 2018, Oktarlina 2020). Post-implementation studies have underscored training and education as vital, with studies indicating that inadequate training and lack of resources have negatively affected user perceptions. Furthermore, where comprehensive training programs are implemented, users report improved ease of use and reduced resistance to the software (Ross et al. 2016, Palappallil and Pinheiro 2018, Hailiye Teferi et al. 2022, Bouraghi et al. 2024).

The participants did anticipate that regular maintenance and technical support is needed to ensure smooth functioning of the system. There does, however, appear to be some uncertainty of the impact of technical support on workflow. *Theme 3.3* describes that pharmacists consider that regular maintenance and support will facilitate the adoption of e-prescribing (Fig. 6); however, it is also considered that such maintenance will be time-consuming (*Theme 4.1*). This reflects an awareness of the complexity of e-prescribing, as reported in post-implementation studies. For instance, in studies conducted

Table 7. Policy recommendations supported by the study findings.

Identified facilitators	Existing barriers	Recommended policy actions
Financial investment and infrastructure improvement	• Public-sector facilities are underfunded, under-resourced; and lack infrastructure for e-prescribing	• Prioritise digital health funding for public-sector facilities • Establish minimum ICT infrastructure requirements and sufficient ICT support • Address internet connectivity and electricity supply challenges
Addressing capacity and competence	• Pharmacists lack legal clarity and technical confidence in using e-prescribing systems • Absence of clear e-prescribing regulations, policy and national guidelines	• Continuing Professional Education and training campaigns for e-prescribing users • Mandatory inclusion of e-prescribing training in undergraduate curricula for e-prescribing users • Policy reform providing procedural clarity and regulatory guidance for e-prescribing • Develop national e-prescribing strategies and implementation guidelines following stakeholder engagement • Phasing out traditional paper-based prescriptions and mandating the use of e-prescribing
Compliant and user-centred e-prescribing system availability	• Current e-prescribing systems are fragmented, difficult to use, and complicate existing workflows • Uncertainty in recognising regulatory compliant e-prescriptions	• Develop an accreditation framework for e-prescribing software that addresses security, data protection, technical requirements, interoperability and regulatory compliance • Promote system co-design, testing and feedback loops with end users to improve usability and alignment with workflows
Organisational leadership driving change	• Pharmacists unable to implement e-prescribing within institutions without support from management	• Establish taskforces at national, local, and institutional levels to drive change • Mandate e-prescribing adoption timelines in alignment with national strategies • Monitoring and evaluation activities to determine successes and weaknesses

after system integration, users report frequent technical issues that require ongoing IT support, particularly during early stages of use. Where sufficient IT support was provided, the success of e-prescribing implementation improved (Grossman et al. 2012, Ross et al. 2016, Hareem et al. 2023).

There appears to be overall uncertainty with regards to how pharmacists perceive the overall functionality of e-prescribing. Pharmacists are uncertain about whether e-prescriptions will be easy to amend and whether e-prescribing software will be complex to use. Qualitative findings highlight the necessity of user-friendly software as critical in the design of the software (*Theme 2.3*). Post-implementation findings often show that complexity is a barrier to adoption, as complex systems cause workflow disruptions and decreases efficiency. Systems with clear workflows and intuitive user interfaces lead to greater acceptance (Gagnon et al. 2014, Peikari et al. 2015, Ross et al. 2016, Kauppinen et al. 2017, Oktarlina 2020, Hareem et al. 2023). While research demonstrates that ease of use improves acceptance (Alsweed et al. 2014, Armada et al. 2014, Ayatollahi et al. 2015, Peikari et al. 2015), others highlight concerns that e-prescribing is more time-consuming and prone to error (Mohsin-Shaikh et al. 2019, Vejdani et al. 2022).

e-Prescribing adoption can be further improved by ensuring that the system is interoperable with existing pharmacy management and dispensing systems (*Theme 2.3; Theme 3.3*). Literature has reported that such integration is vital to avoid disruption and maintain streamlined operations (Gagnon et al. 2014, Ross et al. 2016, Hareem et al. 2023). Further advantages are achieved through broader interoperability with EHRs, medical aid systems, formularies, and treatment guidelines. Integration with medical aid systems supports better insurance coverage, while alignment with formularies and treatment protocols promotes adherence to standardized care plans, thus ensuring that patients receive appropriate, cost-effective treatments (Devine et al. 2010, Farghali et al. 2021, Poojitha and Bhoomadevi 2021).

Surprisingly, the ordinal regression analysis has indicated that there is no association between whether a pharmacist has used e-prescribing and their perception of the ease of use, with similar findings reported by other studies (Palappallil and Pinheiro 2018, Sema et al. 2024). It is possible that this perception is affected by previous experiences with poorly designed e-prescribing software. In contrast, a good knowledge score was associated with perceived ease of use, which further supports the necessity for adequate training and education during the pre-implementation phases, a finding that is consistent with the UTAUT model (Cohen et al. 2013).

In *Theme 4.1*, pharmacists expressed apprehensions about the vulnerability of e-prescribing systems to hacking and misuse. The quantitative data support this concern, with respondents indicating uncertainty about the security of e-prescribing. The negative perception indicates concerns about data security and unauthorized access, which literature indicates are critical for the acceptance and trust in e-prescribing systems (Gagnon et al. 2014, Cochran et al. 2015, Norouzi Aval et al. 2022, Samadbeik et al. 2022, Vejdani et al. 2022). In this study, pharmacists have provided several recommendations in *Theme 2.1*, which they believe will mitigate safety concerns, which include blockchain technology, multi-layered encryption, and multi-factor authentication (OTPs) and user-role access controls. Furthermore, systems should prevent misuse through authentication measures. Post-implementation studies indicate that security remains a top concern, but

improved encryption, authentication, and audit trails have helped mitigate these fears to some extent (Cochran et al. 2015, Norouzi Aval et al. 2022, Samadbeik et al. 2022, Vejdani et al. 2022). Ongoing updates and improvements in system security are essential for maintaining trust in e-prescribing technology. However, Norouzi Aval *et al.* (2022) emphasize that security measures must not hinder workflow with time-consuming log in procedures, highlighting the need for a balance between system security and accessibility.

Pharmacists further highlighted that immediate interaction with the prescriber is needed to resolve prescription concerns (*Theme 2.3*). Additionally, participants emphasized that transparency and continuity of care is important, and prescribers should be updated on amendments made or medications dispensed. However, while real-time communication is beneficial, prolonged response rates can cause delays in patient treatment (Hincapie et al. 2019, Mohsin-Shaikh et al. 2019, Aldughayfiq and Sampalli 2021). Further recommendations include the incorporation of CDS tools to support prescribing and dispensing (*Theme 2.2*); the benefits of which have been discussed in *Theme 1.2*. Additionally, tools like dose calculators, treatment guidelines, and notifications for renal or hepatic impairment were deemed crucial by participants to ensure individualized treatment. As described previously, pharmacists emphasized that their role should not be affected through e-prescribing (*Theme 2.4*). Pharmacists should retain the authority to intervene, particularly in substituting medications, such as switching to generics, when appropriate. This aligns with their scope of practice and contributes to cost savings and improved patient outcomes. This concern is validated by literature reporting that pharmacists found it more difficult to intervene with e-prescriptions (Kauppinen et al. 2017, Farghali et al. 2021, Ooi et al. 2021). In addition, features like patient monitoring tools and e-counselling functionalities can empower pharmacists to deliver high-quality pharmaceutical care. With these tools, pharmacists can engage more effectively in patient education and medication adherence support, as noted by Grossman et al. (2012). Such features acknowledge the central role of pharmacists in patient-centred care, even in a digital healthcare environment (Warholak and Rupp 2009, Gagnon et al. 2014, Peikari et al. 2015).

Detailed literature reviews and research publications have noted features necessary for e-prescribing systems. Whilst the qualitative findings described in this study align with these findings, particularly in terms of security and system operability/functionality, pharmacists have not considered some of the more technical aspects related to e-prescribing. Although it is imperative to understand the pharmacist perspective, additional stakeholder engagement is needed to ensure all aspects of e-prescribing requirements are addressed (Odukoya and Chui 2012, Gagnon et al. 2014, Ross et al. 2016, Grammatikopoulou et al. 2024).

Perceived fitness, facilitators and barriers of e-prescribing

The variable responses to whether pharmacists would be willing to change existing software suggests that pharmacists perceive challenges even with existing software and this may indicate willingness to change if given adequate incentives (Alanazi et al. 2018). The facilitators described in *Theme 3* highlight the key factors pharmacists believe will improve e-prescribing adoption, aligning with findings from other studies (Gagnon et al. 2014, Peikari et al. 2015, Oktarlina 2020, Wrzosek et al. 2020, Hareem et al. 2023).

The data reveal uncertainty amongst pharmacists regarding the suitability of current infrastructure and systems for e-prescribing. Many authors have reported that sufficient infrastructural and technical resources are crucial in improving adoption and implementation (Gagnon et al. 2014, Vejdani et al. 2022, Hareem et al. 2023). Pharmacists in this study expressed further concerns regarding the financial burden and infrastructural limitations, including the ongoing issue of loadshedding (interrupted power supply) in South Africa, as barriers to e-prescribing implementation (*Theme 4.2*). Many have indicated that the current infrastructure in healthcare institutions, particularly in the public (or government funded) healthcare sector, is not appropriate, and suggest that significant financial investment and infrastructural improvement is needed (*Theme 3.1*). Reliable infrastructure, uninterrupted internet connectivity, and stable power were particularly noted as crucial facilitators. This is consistent with findings from other settings where technological readiness significantly influenced implementation success (Gagnon et al. 2014, Peikari et al. 2015, Hareem et al. 2023). While HICs countries may primarily focus on integration with existing systems and workflow, LMICs and UMICs, like South Africa, face dual concerns, i.e. technological readiness and infrastructural reliability (Vejdani et al. 2022). Furthermore, the financial investment needed is substantial, particularly as pharmacies and hospitals must simultaneously address power cuts and internet instability. Studies have shown that successful e-prescribing adoption is heavily reliant on external infrastructure and environmental stability, not merely on the willingness of healthcare professionals (Gagnon et al. 2014, Hareem et al. 2023). Furthermore, financial constraints are a widely documented issue in healthcare innovation, particularly in lower-income settings, where healthcare providers are often reluctant to invest in new systems without sufficient guarantees of return or benefits (Gagnon et al. 2014). Mohsin-Shaikh *et al.* (2019) emphasized the need for incentives and adequate financial support to mitigate these barriers, ensuring pharmacists are more willing to transition to e-prescribing.

The quantitative results and qualitative themes indicate a strong preference for mandatory e-prescribing adoption in pharmacies. The quantitative data show that pharmacists believed that e-prescribing software should be mandatory, signaling a desire for uniformity across the profession. The qualitative findings (*Themes 3.4 and 3.5*) reinforce this by emphasizing that organizational leadership is critical for e-prescribing success. These findings highlight that while pharmacists recognize the benefits of e-prescribing, they rely heavily on top-down leadership to facilitate widespread adoption, suggesting that pharmacists view external pressures and mandates as catalysts for change. This is consistent with the UTAUT model, which highlights that organizational support are key factors in the adoption of new technologies (Cohen et al. 2013), where studies report that organizational leadership provides necessary resources and direction, pivotal in the successful implementation of new technology (Gagnon et al. 2014, Peikari et al. 2015, Ross et al. 2016). It is thus encouraging that pharmacists in management positions are more likely to view e-prescribing as a good fit for practice. Furthermore, those who had previous experience with e-prescriptions were more likely to see

them as fitting, further substantiating that good knowledge and practical exposure can shape positive perceptions.

Policy implications and recommendations

This study identifies key enablers for the successful implementation of e-prescribing within the South African healthcare context, many of which are relevant to other LMICs and UMICs. These facilitators include financial investment and infrastructure strengthening; building capacity and competence through legal and technical training; ensuring the availability of an approved, functional, and user-friendly e-prescribing platform; and driving change through strong organisational leadership. Table 7 outlines a set of policy actions that align with these findings and can guide national implementation efforts.

Conclusion

Pharmacists in South Africa recognize the benefits of e-prescribing but face challenges in adoption. Resistance is due to negative perceptions and lack of knowledge. Key barriers include a lack of clear guidelines, cost concerns, infrastructure limitations, and integration challenges. A regulatory framework, addressing security, interoperability, and stakeholder roles, is essential, while education and training will address user resistance. Furthermore, institutional leadership is considered a key facilitator, indicating strategic engagement with decision-makers is needed to ensure top-down support. Despite e-prescribing aligning with national health strategies, substantial efforts are needed to address infrastructural and educational gaps. These concerns were reported a decade ago in previous South African studies, and it is disappointing that they are yet to be addressed. Several nations have implemented legal and regulatory frameworks facilitating adoption and mandated the use of e-prescriptions. The lack of progress in South Africa emphasizes the urgent need for policy reform and strategic implementation to overcome these longstanding barriers.

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Supplementary data

Supplementary data is available at *Health Policy and Planning* online.

Authorship contributions

Rubina Shaikh: Conception, Data collection, Data analysis and interpretation, Drafting the article, Critical revision of the article, Final approval of the version to be submitted. Paula Barnard-Ashton: Critical revision of the article, Final approval of the version to be submitted. David N. Bayever: Conception, Critical revision of the article, Final approval of the version to be submitted. Lisa C. du Toit: Critical revision of the article, final approval of the version to be submitted.

Reflexivity statement

This research was conducted by a diverse team with expertise in pharmacy, health policy, and qualitative research methods. The lead author is female, supported by two female co-authors and one male co-author. The authors represent different career stages, including two senior researchers and one mid-career researcher, supporting the lead author (early-career, PhD candidate) contributing a balanced perspective of extensive experience and new ideas. All authors are based in South Africa, ensuring that the research is contextually grounded and reflective of local healthcare dynamics. Additionally, the team's expertise spans pharmacy practice, policy development, and qualitative research, enabling a comprehensive analysis of the knowledge and perceptions of pharmacists regarding e-prescribing. The authors believe that through this interdisciplinary approach, the research can inform health policy reforms and contribute to effective e-prescribing implementation in South Africa.

Ethical approval

Ethical approval was obtained from the University of the Witwatersrand Human Research Ethics Committee (HREC Medical; clearance number: M210457).

Conflict of interest

The authors declare that they have no competing interests.

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Data availability

The data underlying this article cannot be shared publicly to protect the confidentiality of the participants. Survey respondents that were willing to continue in further research related to this publication were requested to share personal details at the end of the survey. These respondents were assured raw data would remain confidential and would not be shared (personal details were delinked during data preparation and analysis). The data will be shared on reasonable request to the corresponding author.

Prior publication of the work

The findings from this research study have not been previously published or submitted elsewhere for consideration.

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