

E-prescription: views and acceptance of general practitioners and pharmacists in Greater Sydney

Phyllis Lau^{A,B,*} , Minh Thuan Tran^A , Ricky Yong Kim^A, Alsayed Hashem Alrefae^A, Sangwoo Ryu^A and Jim Chyuan Teh^A

For full list of author affiliations and declarations see end of paper

***Correspondence to:**

Phyllis Lau
School of Medicine, Western Sydney
University, Sydney, NSW 2751, Australia
Email: phyllis.lau@westernsydney.edu.au

ABSTRACT

Background. Electronic prescription (e-prescription) was introduced in 2020 in Australia during the COVID-19 pandemic. This research aimed to explore general practitioners (GPs) and community pharmacists' experience with, and facilitators and barriers to, the use of e-prescription. **Methods.** This qualitative study used semi-structured interviews with GPs and pharmacists in Greater Sydney to explore their experience with e-prescription. Thematic analysis used descriptive and mixed inductive and deductive approaches. The Technology Acceptance Model (TAM) was used to further interpret and organise the themes. **Results.** Eleven GPs and nine pharmacists were interviewed. Thirteen themes were elicited, seven of which were categorised as benefits (facilitators) and six were challenges (barriers). Four facilitator themes (convenience for healthcare providers (HCPs) and patients, addressing issues with paper prescriptions, contactless nature reducing access barriers during COVID-19 lockdown, and enabling patients to manage multiple prescriptions) were mapped to the TAM construct of 'perceived usefulness'; and one facilitator (an easier process) and two barrier themes (lack of information during implementation, and technological issues) were mapped to the TAM construct of 'perceived ease of use'. Themes that fell outside these constructs were separately categorised: four barrier themes (reluctance of some patients and HCPs to change, patient expectations of 'instant prescription' and lost opportunities for best-practice care, HCPs' perceptions of inadequate governmental governance, and ongoing costs) were 'other issues with e-prescription', and two facilitator themes (providing training on the use of e-prescription for HCPs and patients, and making e-prescription more streamlined) were 'suggestions to improve'. **Conclusion.** There are many facilitators and barriers to the use of e-prescription. Our findings may inform the future promotion of e-prescription post-COVID-19 pandemic. Further research should focus on consumers' perspectives of e-prescription.

Keywords: barriers, community pharmacists, facilitators, general practitioners, healthcare providers, perceptions, technology acceptance model, telehealth.

Introduction

Telehealth was introduced in Australia in 2011 to reduce barriers of distance, time, and cost, and improve access to care particularly for rural and remote populations ([Australian Government Department of the Prime Minister and Cabinet 2011](#)). During the COVID-19 pandemic lockdowns, telehealth's benefits of providing protection to healthcare providers (HCPs) and the community from exposure to infectious diseases, and the introduction of government subsidies, substantially increased its use under Medicare ([Taylor et al. 2021](#); [Australian Government Department of Health and Aged Care 2022a, 2022b](#)). In May 2020, the implementation of electronic prescription (e-prescription) was expedited to complement telehealth as part of the Australian government's response to the pandemic. The overarching aim was to provide convenience and choice to patients and improve the efficiency of prescribing and dispensing medications, reduce errors, and minimise the use of paper prescriptions ([Australian Government Department of Health and Aged Care 2022c](#)).

Prescriptions for medications have historically been hand-written, or printed and hand-signed on paper by medical practitioners, and provided to patients who present them to

Received: 25 October 2022

Accepted: 24 August 2023

Published: 15 September 2023

Cite this:

Lau P et al. (2024)
Australian Journal of Primary Health 30,
PY22240.
doi:[10.1071/PY22240](https://doi.org/10.1071/PY22240)

© 2024 The Author(s) (or their
employer(s)). Published by
CSIRO Publishing on behalf of
La Trobe University.

This is an open access article distributed
under the Creative Commons Attribution
4.0 International License (CC BY).

OPEN ACCESS

pharmacists for dispensing (Tsirtsakis 2020; Australian Digital Health Agency 2021–2022; Australian Government Department of Health and Aged Care 2022d). There are, however, many inherent issues with paper prescriptions including errors due to prescribers' poor handwriting and security issues with lost, stolen, or forged prescriptions (Velo and Minuz 2009; NSW Government 2023). As our world advances with technology, e-prescriptions are increasingly used (Samadbeik *et al.* 2017; Wrzosek *et al.* 2020). Patients in Australia can receive a paper prescription or, alternatively, choose an e-prescription where they receive a 'token' (QR code or barcode) either on paper, via SMS, email, or a mobile app, that can be scanned and dispensed by pharmacists (Australian Digital Health Agency 2022a, 2022b). Patients can also use a token management system, 'Active Script List' (ASL), with their chosen doctors and pharmacists, to organise multiple medications (Australian Government Department of Health 2021; Australian Digital Health Agency 2022a).

A systematic review of the perceptions of users (including physicians, nurses, pharmacists, patients, IT staff, and managers) of barriers and facilitators to the implementation of e-prescription in primary care highlights the importance of technical and organisational support (e.g. information technology, and material and human resources) and attitudes of users (e.g. users who do not believe in the value of e-prescription) on the adoption of e-prescription (Gagnon *et al.* 2014). A survey that explored the factors impacting doctors' acceptance of e-prescribing found considerable barriers, criticisms, and resistance from doctors to the implementation and utilisation of the new technology in Poland whose approach is similar to that in Australia (Wrzosek *et al.* 2020). In a comparative analysis of e-prescription systems in eight countries, the lack of technological infrastructure was identified as a barrier to the adoption of e-prescription in Australian telehealth (Aldughayfiq and Sampalli 2021; Fisher *et al.* 2022).

E-prescription is a relatively new technology and understanding users' experience is critical to its continuing design. This study aimed to explore Australian general practitioners (GPs) and community pharmacists' experience with e-prescription, and the facilitators and barriers to its use.

Research question

What are the experiences, benefits (or facilitators) and challenges (or barriers) of e-prescription for Australian GPs and pharmacists?

Methods

Ethics approval

This study was approved by the Western Sydney University Human Research Ethics Committee (ID No. H14940,

sub-project H11327). The authors confirm that the research was undertaken with appropriate informed consent of participants or guardians.

Research team

The principal researcher PL was an academic pharmacist and a primary care researcher. The rest of the team consisted of five fourth-year Bachelor of Medicine, Bachelor of Surgery (MBBS) students, MTT, RYK, AHA, SR, and JCT, who were novice researchers.

Study design

This exploratory qualitative study used individual semi-structured interviews.

Setting

The project was conducted in Greater Sydney, which covers 12 367 km² and stretches from Wyong and Gosford in the north, to the Blue Mountains, Wollondilly, and Hawkesbury in the west, and to the Royal National Park in the south (New South Wales Government 2020). Greater Sydney has a resident population of 5 231 147 in 2021, and is covered by eight of the 15 local health districts in New South Wales (Australian Bureau of Statistics 2021; New South Wales Government 2022).

Participants

Any GPs and pharmacists practising in Greater Sydney, with or without e-prescription experience, were eligible for inclusion in this study. It was important to include HCPs without experience in e-prescription to understand their perception. Potential participants were identified and invited through the research team's professional networks. Invitations were also posted in Facebook and Twitter professional groups. People who expressed interest were emailed the Project Information Sheet and asked to contact the research team for more information. Participants were screened for inclusion criteria at recruitment, and participants without direct experience of e-prescribing were provided the link to view a short video and read information about e-prescribing prior to the interview (Australian Digital Health Agency 2022a). Verbal consent was obtained before each interview commenced.

Data collection

Five student researchers conducted semi-structured interviews in-person, or via Zoom or phone according to participants' preference and COVID-19 social distancing guidelines at the time (Archibald *et al.* 2019). Two sets of questions were developed for participants with and without experience in e-prescription (Box 1). The interview questions were piloted with three GP volunteers to improve comprehensibility.

Each interview was digitally audio-recorded and transcribed by the student researcher who conducted the

Box 1. Interview schedule

Interviews started with establishing whether the participants had experience with e-prescriptions:

In your professional practice have you had any experience with e-prescribing?

Question Set 1 – Participants who had experience with e-prescribing

Please describe your experience with e-prescribing as a general practitioner/pharmacist?

What issues/challenges have you encountered with the current hard copy prescribing system?

Has e-prescribing addressed the challenges faced by hardcopy prescribing? Please explain.

Please explain any issues/challenges inherent to the e-prescribing system.

What barriers have you encountered with the implementation of e-prescribing? Are any of these related to being in an urban location?

What has been the response from patients and the community to e-prescribing?

What do you perceive to be the benefits of an e-prescribing system?

How will e-prescribing affect you as an individual clinician in your day-to-day practice?

Is there anything else that you would like to share with us?

Question Set 2 – Participants who had no experience with e-prescribing

Participants were asked to watch a short video and read the information on the webpage: 'Electronic prescribing: For prescribers' by the Australian Digital Health Agency. Available from: <https://www.digitalhealth.gov.au/healthcare-providers/initiatives-and-programs/electronic-prescribing-for-prescribers> (Australian Digital Health Agency 2022a).

From the information presented can you please tell me your understanding of the e-prescribing program?

What issues/challenges have you encountered with the current hard copy prescribing system?

Given the information on e-prescribing do you think these current issues could be addressed with e-prescribing? Please explain.

Would you have any concerns or hesitations about implementing e-prescribing in your workplace? What issues do you foresee?

Have any community members/clients/patients enquired about e-prescribing services at your pharmacy/practice? If relevant, please explain.

Do you have any particular concerns about implementing e-prescribing in an urban community? What are these concerns?

What do you see as potential benefits of e-prescribing in your day-to-day practice and for the community?

Is there anything else that you would like to share with us?

interview. Transcripts were then cleaned by the student researchers, verified for accuracy by researcher PL against the audio-recordings, and deidentified before analysis.

Data analysis

Transcripts were analysed thematically using descriptive and mixed inductive and deductive approaches either manually or supported by NVivo qualitative data analysis software (Sandelowski 2000; Wong 2008; Neergaard *et al.* 2009).

Student researchers each inductively coded line-by-line the interviews they conducted. Their initial coding was cross-checked by researcher PL to ensure common understanding and a unified approach to coding. A coding framework was then developed collectively and used as a guide as data collection and analysis progressed, and additions and changes were made to reflect the data collected (Saldana 2015). Regular team discussions resolved any inconsistencies in coding and interpretation of data.

Patterns found in the initial 152 codes were grouped inductively into 13 themes. To enable a clearer understanding of whether these 13 themes described 'facilitators' or 'barriers' of e-prescription, they were grouped deductively into these two categories.

The Technology Acceptance Model (TAM) was then further used to add another layer of interpretation and deductive analysis of the 13 themes to explore how each of the barriers and facilitators influenced the acceptance of e-prescriptions by GPs and community pharmacists. TAM is one of the most widely applied models of users' acceptance and usage of technology. Unlike the Theory of Reasoned Action (TRA) which is a general model or the Unified Theory of Acceptance and Use of Technology (UTAUT) which focuses on determinants that influence behavioural intention, TAM is specifically tailored for modelling user acceptance of technology (Rondan-Cataluña *et al.* 2015). It emphasises the perceptions of the users that influence their decision, when presented with a new technology, on how they will accept and use it;

and suggests that there are two constructs that determine whether a new technology will be accepted by its potential users: perceived usefulness i.e. ‘the degree to which a person believes that using a particular system would enhance their job performance’, and perceived ease of use i.e. ‘the degree to which a person believes that using a particular system would be free from effort’ (Davis 1989).

In the process of mapping the themes to the two TAM constructs, themes that fell outside these constructs were separately categorised.

Results

Eleven GPs – four of whom were GP registrars – and nine pharmacists were interviewed May–June 2022; they consisted of seven males and 13 females; they were aged (years) in their 20–50s; and had professional experience ranging between 2 and 32 years (Table 1). All participants had experience with e-prescription. Eight interviews were conducted via zoom, four by phone, and eight in-person, the durations of which lasted 7–30 min.

Thirteen themes were elicited, seven of which were categorised as benefits (facilitators) and six were challenges (barriers). Four facilitator themes were mapped to the TAM construct of ‘perceived usefulness’; and one facilitator and two barrier themes were mapped to the TAM construct of

‘perceived ease of use’. Themes that fell outside these constructs were separately categorised: four barrier themes were identified under the category ‘other issues with e-prescription’, and two facilitator themes were identified under the category ‘suggestions to improve’. Table 2 gives an overview of the themes and categories.

Data saturation both in the themes elicited and the meaning of the themes was determined by the team to have been reached.

The 13 themes are discussed below against the TAM constructs and the two additional categories to illustrate how they acted as barriers and facilitators to the acceptance of e-prescriptions by HCPs.

Perceived usefulness of e-prescription

Theme 1: Provide convenience for HCPs and patients

GP participants noted that e-prescription facilitated telehealth communication between patients and GPs.

... definitely more efficient ... taken the complications out from doing telehealth and making the telehealth process ... (GP6)

HCPs commented that e-prescriptions provided patients with an easy way to manage prescriptions.

They have their phones with them [all the time] so they don’t need to worry about where they left their prescription or where they might have lost it. (P6)

Easy access to e-prescriptions meant better assurance of continuity of medications in unusual circumstances.

... patients [who] are out of ... the area, or out of state ... on holiday, or they’ve recently moved away. It allows them to get their medication, especially, like, long-term medication, and ensures that they can continue taking it, rather than struggling to ... get into an appointment or set up ... a new GP. (GP2)

Theme 2: Address issues with paper prescriptions

Hand-written paper prescriptions were more prone to human errors, especially poor handwriting, and missing information often created issues for pharmacists.

... if I handwrite an S8 (Schedule 8) script for an opiate ... then it gets to the pharmacist and the pharmacist looks at it and goes, I can’t read your writing. I can’t dispense this medication. Electronic scripts just make it a lot easier ... (GP11)

They leave out information ... sometimes the dose is not there or the strength isn’t there ... (P8)

Table 1. Demographics of interview participants.

ID	Profession	Gender	Age range (years)	Professional experience (years)
GP1	GP registrar	Female	30–39	3
GP2	GP registrar	Female	20–29	2
GP3	GP registrar	Female	30–39	3
GP4	GP registrar	Female	20–29	3
GP5	GP consultant	Female	50–59	28
GP6	GP consultant	Female	30–39	7
GP7	GP consultant	Male	30–39	5
GP8	GP consultant	Male	40–49	10
GP9	GP consultant	Male	50–59	15
GP10	GP consultant	Female	50–59	20
GP11	GP consultant	Male	50–59	13
P1	Pharmacist	Female	20–29	2.5
P2	Pharmacist	Female	30–39	7
P3	Pharmacist	Male	20–29	3
P4	Pharmacist	Female	20–29	3
P5	Pharmacist	Male	50–59	32
P6	Pharmacist	Female	40–49	20
P7	Pharmacist	Female	20–29	7
P8	Pharmacist	Female	30–39	13
P9	Pharmacist	Male	20–29	2

Table 2. Categories and themes from the interviews.

Categories	Benefit (facilitator) themes	Challenge (barrier) themes
Perceived usefulness of e-prescription	1. Provide convenience for HCPs and patients 2. Address issues with paper prescriptions 3. Reduce access barriers during COVID-19 lockdown 4. Manage multiple prescriptions	
Perceived ease of use of e-prescription	5. Easier process	6. Lack of information provided 7. Technological issues
Other issues with e-prescription		8. Patients reluctant to change 9. Patient expectations and lost opportunities 10. Inadequate governmental governance 11. Ongoing costs
Suggestions to improve e-prescription	12. Education and training 13. More streamlined system	

The security and misuse of paper prescriptions, particularly for drugs of addiction (DDs), were concerns for HCPs.

... if it is a lost Endone prescription [or] for opioid medication ... you are not sure ... did the patient really lose it or has it been misused ... (GP6)

... once [e-prescription] is dispensed, the QR code is no longer valid so they (patients) can't go to other pharmacy to like ... pick up another one. (P5)

E-prescriptions enhance the legitimacy of prescriptions and reduce potential misuse of DDs.

... you can send [DD script] straight to a patient's pharmacy where the pharmacist then has all of the repeats and will be able to inform you if the patient is filling repeats too quickly or ... coming back too quickly for follow-up scripts. (GP6)

Theme 3: Reduce access barriers during COVID-19 lockdown

Participants noted that the contactless nature of e-prescription increased in popularity exponentially during the COVID-19 lockdowns.

During the COVID time, it was quite hard to see doctors and hardcopy prescribing was not as available then, so ze-prescribing has sort of addressed that problem ... (P5)

Paper prescriptions were administratively demanding during the pandemic. Participants thought e-prescription made telehealth more efficient and effective.

During early Covid in 2020 we were having to fax scripts to pharmacies and then having to send a physical script over to the pharmacies ... that was very time and resource consuming. (GP5)

Theme 4: Manage multiple prescriptions
One participant found the e-prescription's ASL to be convenient for managing patients on multiple medications.

If a patient is on a long-term pain medication, for example ... you can activate an ASL for a patient where ... the token will go to a nominated pharmacy. (GP11)

Perceived ease of use of e-prescription

Theme 5: Easier process
Pharmacists described e-prescriptions to be easier and faster to dispense.

It was much quicker than dispensing from a paper prescription. It really took probably 3 minutes ... when you have a huge volume to go through, that is quite significant. (P6)

Some GP participants commented on reduced handwriting load because patients' details were automatically filled by the e-prescription software.

You just have to put in your password which is much quicker. (GP5)

Furthermore, e-prescriptions could be re-issued easily.

If the patient has deleted their SMS you can just click on the software ... and it will send them the link again. (GP6)

Theme 6: Lack of information provided during implementation

Most participants thought that insufficient training was provided when e-prescription was rolled out.

When e-scripts came out, no one really sat down and trained anyone. They just expected us to know how to deal with it. (P9)

Some said that consumers similarly did not have enough information.

There was not a lot of information provided to the public ... and how it would work from the patient's perspective. (P6)

Theme 7: Technological issues

Systems issues, such as the need for internet or cellular reception to access e-prescriptions, affected access to and dispensing of e-prescriptions.

I have one (older) patient who ... doesn't even have a smartphone ... [or] it doesn't have any internet ... (P2)

Scanning e-prescription QR codes can also be problematic due to device issues.

Some scanners are sensitive; it will scan twice or sometimes it gets cancelled automatically ... (P3)

A lot of phones have a screen protector ... seem to have an issue with ... pick up the QR code. (P5)

Pharmacist participants noted that e-prescription dispensing software could be challenging to use.

... some dispensing system is a bit more operator-friendly with e-prescription, some are a bit less. In [deidentified dispensing software] for example, you have to go through a separate website, scan [QR code] and that gets imported into the dispensing software whereas the one that we use in [deidentified pharmacy chain] you directly scan it into the dispensing system. (P3)

One pharmacist specifically mentioned the issue of not being able to review details of e-prescriptions after dispensing.

I'm only checking [the e-prescription] off the barcode ... I can't check the dose ... (P1)

Multiple e-prescription and repeat links caused confusion for some patients, particularly older patients who were not technologically inclined.

If I send someone their repeat via SMS, they will have that SMS forever ... when they look through their messages ... how will they know which has been dispensed ... unless they ... click on each individual link and figure it out. (P9)

When you got chronic care patients usually over 65 years old who got 6 to 7 different scripts ... and they are not computer or mobile savvy ... they don't have a good time with the computer or barcodes. (GP10)

Other issues with e-prescription

Theme 8: Patients reluctant to change

Participants said that some patients preferred paper prescription because they were unfamiliar with the new e-prescription technology.

Patients traditionally expect a paper script, just cause that's what they're used to. (GP2)

Some people were a little bit suspicious about it ... They sort of couldn't physically hold their prescription and then where does this script go or couldn't see what I'm taking (P6)

Theme 9: Patient expectations and lost opportunities

Ease of e-prescriptions inadvertently gave some patients unrealistic expectation of 'instant prescriptions'.

... sometimes the patients just expect, you know, 'Oh, it's easy, just send me an e-script ... I can go and get it now, like straight away'. (GP2)

Such expectations had meant lost opportunities for regular physical reviews and evidence-based best practice.

... the blood pressure, or like the antibiotics, but also things like contraceptive pill ... the script with the repeat will last a whole year, but it's important to get them to come in face-to-face for a check-up. (GP2)

Theme 10: Inadequate governmental governance

Some participants perceived an absence of governmental regulations around potential breaches of data confidentiality.

How do we make sure that there are confidentiality safeguards when transmitting information? What happens if some of the information gets breached? Who's held liable ...? (GP8)

Theme 11: Ongoing costs

Impending costs of the e-prescription service for HCPs post-COVID-19 were concerning to some GPs.

Prescriptions right now are free because of COVID-19 pandemic; however, it cannot be free forever and at some point, we as a practice might need to stop giving (e-)prescriptions. (GP9)

Suggestions to improve e-prescription

Theme 12: Education and training

Our participants wished for more education and training on how to effectively use e-prescription.

There still has to be education about how to utilise an electronic script ... we have to continue educating our patients about what ... they can do with that token. (GP11)

Clear policies with a transition period between paper prescription and e-prescription was also suggested.

... we need to ... have a bit more consistency to switching over ... rather than ... chopping and changing all the time. (P6)

Theme 13: More streamlined system

Some participants suggested that a universal app may facilitate patients' access to e-prescriptions.

If there's a universal app where you can keep track of your e-scripts, it will make things a lot easier; if there's an app that can centralise how many repeats you have left or which repeat you have. (P9)

Integration with existing health databases may also be useful.

... link the e-prescription with the patient's MyHealth record to make it more useful. (GP7)

Finally, directly transmitting e-prescriptions to pharmacies to create a more seamless experience was suggested.

Ideally ... the pharmacy has a portal where they can access all the prescription that they have been given. That way ... it cuts ... the additional step ... patients show ... or ... email the prescription to the pharmacist. (GP7)

Discussion

This qualitative study explored Australian GPs and community pharmacists' experiences of e-prescription, and the facilitators and barriers to its use. Findings reveal many facilitators from the perspectives of HCPs. Using the two TAM constructs (perceived usefulness and perceived ease of use) to map the facilitators and barriers enabled a better understanding of the impact of different factors on the acceptance and use of e-prescription by our participants. They perceived e-prescription to be useful, as described in TAM, because it provides convenience, addresses paper prescription issues, reduced barriers to access during the COVID-19 pandemic, helps patients to manage multiple prescriptions, and its process is easy. Education and training for HCPs and consumers and a more streamlined e-prescription system are also potential facilitators. However, HCPs had mixed perceptions about e-prescription's ease of use described in

TAM. Whilst they perceived that the e-prescription process was easier than the paper prescribing and dispensing processes, they were challenged by the lack of information for HCPs and consumers, and technological issues. There were other challenges to the acceptance and use of e-prescription that were outside the TAM constructs of perceived usefulness and perceived ease of use, like patients' reluctance to change, patient expectations and lost opportunities to physically review patients, perceived inadequate governmental governance, and ongoing costs associated with e-prescription. Our results did not indicate any difference between the experiences of GP registrars and vocationally registered GPs, or between GPs and pharmacists. They mostly faced similar issues albeit from different perspectives, for instance, both GPs and pharmacists perceived e-prescriptions to be convenient, but poor handwriting and missing information with handwritten paper prescriptions were the issues for pharmacists, whereas the handwriting load of paper prescriptions was the issue for GPs.

The benefits of contactless e-prescription became particularly evident when its implementation was fast tracked as part of the Australian government's response to supporting telehealth during the COVID-19 pandemic ([Australian Government Department of Health and Aged Care 2022c](#)). E-prescription not only facilitated healthcare access, it also decreased the risk of infections. Experience with e-prescription around the world has consistently reported a significant reduction in unnecessary visits to GP clinics for prescriptions, patients' wait time at the pharmacy, and handling of paper prescriptions, which directly minimised COVID-19 infection transmission risks ([Aldughayfiq and Sampalli 2021](#)).

Compared to paper prescriptions, e-prescription processes of dispensing medications, tracking patients' medication history, managing patients' prescriptions, and making prescriptions more accessible were more convenient for the HCP participants in our study. [Bulut *et al.* \(2019\)](#) conducted a survey of 1564 family physicians in Turkey, and reported similar satisfaction with e-prescription in the management of patients' medications, facilitation and simplification of prescription writing, and optimisation of time.

E-prescription seemed to reduce GPs' handwriting and administrative load, and their burden of re-issuing prescriptions to replace lost prescriptions or repeats. Although existing medical software stores patients' information and automatically completes relevant details into a prescription for printing, the e-prescription system is additionally able to send the prescription directly to the pharmacy, eliminating third-party involvement. The prescription QR code is electronically stored in the system and can be easily retrieved, verified, and re-issued. [Bulut *et al.*'s \(2019\)](#) survey also identified e-prescription's ability to store patients' details, provide information regarding past medication history, and efficiently facilitate the process of writing prescriptions.

Elimination of the handwriting component of prescribing means that printed prescriptions and e-prescriptions also

eliminated the burden for pharmacists to verify illegible doctor handwriting. A 2014 systematic review similarly reported that e-prescriptions increase prescription legibility, decrease prescribing time, and decrease medication errors (Porterfield *et al.* 2014).

Safety issues, such as prescription fraudulences, are minimised since it is harder to forge an e-prescription, and the QR code automatically becomes invalid once dispensed. Enhanced legitimacy and trackability of e-prescription for DDs also reduced the legal burden placed on pharmacists. Reviews of the e-prescriptions of controlled substances (EPCS) in the United States similarly described an increase in patient's safety as fraud, forgery, medication pad theft, and illegitimate dose alteration were reduced, and an electronic record significantly assisted in addressing opioid misuse and diversion (Gabriel *et al.* 2016; Achar *et al.* 2021).

A key barrier to effective use of e-prescription is the lack of information provided to HCPs and patients during implementation, particularly at the start of the COVID-19 outbreaks in 2020. This challenge was also described in the e-prescription pre-implementation phase in Indonesia (Oktarlina 2020). Adequate information for HCPs and patients is necessary to ensure the continuation of e-prescription post-COVID-19.

Technical issues, such as internet and cellular reception requirements, unfamiliar e-prescription systems, and low digital literacy in some patients, are major challenges. Interviews with community pharmacy professionals that adopted the Electronic Prescription Service in England reported similar technical issues such as glitches, missing prescriptions, and download problems (Harvey *et al.* 2014).

Many participants perceived e-prescriptions to be especially demanding for older patients. They said that e-prescription SMS links without adequate information regarding the status of the prescriptions are particularly confusing for patients with multiple prescriptions and repeats for chronic illnesses because they had to scroll through many similar looking links. However, a survey of 75 participants of average age 66.9 ± 9.3 years in Pittsburgh, Pennsylvania, found that 84% preferred e-prescriptions over paper prescriptions for reasons of convenience, time optimisation, and prevention of lost prescriptions (Schleiden *et al.* 2015). More than half took four or more prescription medications daily, and about 20% took six or more. This shows that patients' age and technological ability are not reasons for the challenge of managing multiple e-prescriptions in the system. Improving the software, for instance optimising the display of tokens and the amount information provided, would significantly improve the utility for patients, especially patients with chronic diseases and on multiple medications.

E-prescription has inadvertently altered the communication between doctors and patients as consultations become prescription orientated with minimal in-person contact or follow up. Our participants talked about the potential overuse of telehealth consultations and a reduction in regular physical examination opportunities, and increased likelihood of

misdiagnosing or sub-optimal prescribing. Broader issues of telemedicine disrupting doctor-patient relationships and doctors' ability to perform physical examination, and the risks of increased morbidity and mortality rates are ongoing concerns for many medical practitioners (Burroughs *et al.* 2020).

Some participants perceived an absence of governmental regulations for e-prescription and were concerned about their increased risks and liability of privacy and information breaches. A review of the impact of e-prescription on pharmacists and patients likewise found virus attacks, patients' privacy invasion, and criminal compromise of the system to be concerns (Lanham *et al.* 2016).

The continual uncertainty of government subsidies and speculation that e-prescription costs will eventually be passed to prescribers were concerning for some GP participants (Australian Medical Association 2021, 2022; Liotta 2022). This concern is congruent with the findings of a systematic review that suggested implementation cost to be a financial toll (Porterfield *et al.* 2014). Long-term vision and a sustainable funding model are critical to providing clarity and confidence for HCPs to support provision and uptake of e-prescription beyond the COVID-19 era (Liotta 2022). In March 2022, the Department of Health requested tender applications from electronic prescribing service providers to try to ensure the ongoing improvement and continuation of e-prescription (Australian Government 2022). This 4 year contract was awarded in May 2023 to pharmacy IT solutions provider Fred IT who promised that the e-prescription service would continue without additional financial burden for patients, HCPs, and prescribing and dispensing software vendors (Ang 2023; Australian Government Department of Health and Aged Care 2023).

Our findings suggest that education and training are needed to promote and assist in the transition from paper to e-prescriptions. The Australian Digital Health Agency currently fills this gap by providing online e-prescription training and resources for HCPs (Australian Digital Health Agency 2023). Other possible facilitators include shifting e-prescriptions to a more streamlined system, creating a universal app that allows better access, and a clearer and more secure process of changeover. The provider tendered eventually to provide the e-prescription service in Australia should take these facilitators into consideration (Australian Government 2022). Not only is Fred IT promising increased cyber security and greater protections against clinical risks, enhanced capacity for all users will also be expected as part of their deliverables. With appropriate improvement, e-prescription will be the way of the future.

Considering the different factors through the lens of TAM helps us to understand the reasons HCPs and patients choose to use e-prescription (Davis 1989). There are other variables, including attitudes, professional opinions, and economic considerations, outside the TAM that drive individuals' acceptance and usage of e-prescription. We need to enhance or resolve these perceptions and explore solutions to increase

adoption by potential users. With appropriate improvement, e-prescription will be the way of the future.

The main strength of this study is the in-depth qualitative approach and the use of the TAM to organise the facilitator and barrier factors to gain a comprehensive understanding of e-prescription from the perspectives of GPs and community pharmacists. However, our participants were predominantly from the Greater Sydney region which may limit generalisability of the findings. We also did not collect information on whether the GP participants worked in bulk-billing, mixed-billing, group, or solo practices which may have aided further understanding of nuances between the groups. Furthermore, we did not manage to recruit any participant with no experience of e-prescription, which would have added perspectives from another angle. However, this research was conducted more than 2 years after the introduction of e-prescription and so most HCPs would have used e-prescription by then.

Conclusions

Transition from the established paper prescription to the more technology-driven e-prescription had sparked mixed opinions from HCPs. In general, HCPs perceive e-prescription to improve the quality of patient care, and there are several facilitators and barriers. These enable us to understand their perceptions of usefulness and ease of use, and other factors that influence their adoption of e-prescription. Findings may inform future promotion and use of e-prescription, and ensure continued optimisation of the system particularly post-COVID-19 pandemic. Further research should explore consumer perspectives of e-prescription.

References

- Achar S, Sinha N, Norcross W (2021) The adoption and increased use of electronic prescribing of controlled substances. *Journal of Medical Regulation* 107, 8–16. doi:10.30770/2572-1852-107.2.8
- Aldughayfiq B, Sampalli S (2021) Digital health in physicians' and pharmacists' office: a comparative study of e-prescription systems' architecture and digital security in eight countries. *OMICS: A Journal of Integrative Biology* 25, 102–122. doi:10.1089/omi.2020.0085
- Ang A (2023) Fred IT bags contract for national e-prescription service. *Healthcare IT News Australia*. Available at <https://www.healthcareitnews.com/news/anz/fred-it-bags-contract-national-e-prescription-service> [Retrieved 24 July 2023]
- Archibald MM, Ambagtsheer RC, Casey MG, Lawless M (2019) Using zoom videoconferencing for qualitative data collection: perceptions and experiences of researchers and participants. *International Journal of Qualitative Methods* 18, 1609406919874596. doi:10.1177/1609406919874596
- Australian Bureau of Statistics (2021) Greater Sydney: census all persons QuickStats. Australian Commonwealth Government, Canberra. Available at <https://abs.gov.au/census/find-census-data/quickstats/2021/1GSYD>
- Australian Digital Health Agency (2021–2022) Electronic transfer of prescriptions. Available at <https://developer.digitalhealth.gov.au/products/electronic-transfer-prescription> [accessed 17 October 2022]
- Australian Digital Health Agency (2022a) Electronic prescribing: for prescribers. Available at <https://www.digitalhealth.gov.au/healthcare-providers/initiatives-and-programs/electronic-prescribing/for-prescribers> [accessed 16 October 2022]
- Australian Digital Health Agency (2022b) Electronic prescribing: a convenient alternative to paper prescriptions. Available at <https://www.digitalhealth.gov.au/healthcare-providers/initiatives-and-programs/electronic-prescribing> [accessed 17 October 2022]
- Australian Digital Health Agency (2023) Training and support: electronic prescribing. Available at <https://www.digitalhealth.gov.au/healthcare-providers/training-and-support/electronic-prescribing-training-and-support>
- Australian Government (2022) Closed ATM view – RFTHealth/E21-576909: request for tender – electronic prescription services. Available at <https://www.tenders.gov.au/Atm/ShowClosed/f318621c-7a5e-4a7f-8337-8e6a74114f6a?PreviewMode=False> [accessed 22 October 2022]
- Australian Government Department of Health (2021) Electronic prescriptions: active script list release 1 – privacy framework (Version 1.0). Available at <https://www.health.gov.au/sites/default/files/documents/2021/05/electronic-prescribing-active-script-list-privacy-framework.pdf> [accessed 17 October 2022]
- Australian Government Department of Health and Aged Care (2022a) MBS telehealth services from January 2022. Available at <http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/Factsheet-Telehealth-Arrangements-Jan22> [accessed 16 October 2022]
- Australian Government Department of Health and Aged Care (2022b) Telehealth. Available at <https://www.health.gov.au/health-topics/health-technologies-and-digital-health/about/telehealth> [accessed 16 October 2022]
- Australian Government Department of Health and Aged Care (2022c) Electronic prescribing. Available at <https://www.health.gov.au/initiatives-and-programs/electronic-prescribing> [accessed 17 October 2022]
- Australian Government Department of Health and Aged Care (2022d) About prescriptions. Available at <https://www.health.gov.au/topics/medicines/about-prescriptions>
- Australian Government Department of Health and Aged Care (2023) Connecting to the national prescribing delivery service: strengthening electronic prescription exchange. Australian Government Department of Health and Aged Care.
- Australian Government Department of the Prime Minister and Cabinet (2011) Telehealth transforming health care. Available at <https://pmtranscripts.pmc.gov.au/release/transcript-17939> [accessed 17 October 2022]
- Australian Medical Association (2021) ePrescription SMS subsidy extension to 30 June 2022. Available at <https://www.ama.com.au/gpnn/issue-21-number-31/articles/eprescription-sms-subsidy-extension-30-june-2022> [accessed 22 October 2022]
- Australian Medical Association (2022) ePrescription SMS subsidy extension to 30 September 2022. Available at <https://www.ama.com.au/index.php/ama-rounds/3-june-2022/articles/eprescription-sms-subsidy-extension-30-september-2022> [accessed 22 October 2022]
- Bulut S, Yıldız A, Kaya S (2019) Evaluation of transition to electronic prescriptions in turkey: perspective of family physicians. *International Journal of Health Policy and Management* 8, 40–48. doi:10.15171/ijhpm.2018.89
- Burroughs M, Urits I, Viswanath O, Simopoulos T, Hasoon J (2020) Benefits and shortcomings of utilizing telemedicine during the COVID-19 pandemic. *Baylor University Medical Center Proceedings* 33, 699–700. doi:10.1080/08998280.2020.1792728
- Davis FD (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13, 319–340. doi:10.2307/249008
- Fisher K, Davey AR, Magin P (2022) Telehealth for Australian general practice: the present and the future. *Australian Journal for General Practitioners* 51, 626–629. doi:10.31128/AJGP-11-21-6229
- Gabriel MH, Smith JY, Sow M, Joseph S, Wilkins TL (2016) Electronic prescribing of controlled substances: a tool to help promote better patient care. *American Journal of Pharmacy Benefits* 8, 185–189.
- Gagnon M-P, Nsangou É-R, Payne-Gagnon J, Grenier S, Sicotte C (2014) Barriers and facilitators to implementing electronic prescription: a systematic review of user groups' perceptions. *Journal of the American*

- Medical Informatics Association* 21, 535–541. doi:10.1136/amiajnl-2013-002203
- Harvey J, Avery AJ, Barber N (2014) A qualitative study of community pharmacy perceptions of the Electronic Prescriptions Service in England. *International Journal of Pharmacy Practice* 22, 440–444. doi:10.1111/ijpp.12107
- Lanham AE, Cochran GL, Klepser DG (2016) Electronic prescriptions: opportunities and challenges for the patient and pharmacist. *Advanced Health Care Technologies* 2, 1–11. doi:10.2147/AHCT.S64477
- Liotta M (2022) Extension to subsidised SMS e-scripts 'needs long-term plan'. NewsGP. Available at <https://www1.racgp.org.au/newsgp/professional/extension-to-subsidised-sms-e-scripts-needs-long-term-plan#:~:text=Reimbursements%20of%20electronic%20prescription%20tokens,at%20least%2030%20September%202022> [accessed 16 October 2022]
- Neergaard MA, Olesen F, Andersen RS, Sondergaard J (2009) Qualitative description - the poor cousin of health research? *BMC Medical Research Methodology* 9, 52. doi:10.1186/1471-2288-9-52
- New South Wales Government (2020) City of Sydney: the city at a glance. Available at <https://www.cityofsydney.nsw.gov.au/guides/city-at-a-glance>. [accessed 17 December]
- New South Wales Government (2022) Our structure. Available at <https://www.health.nsw.gov.au/about/nswhealth/Pages/structure.aspx> [accessed 17 December]
- NSW Government (2023) Lost, stolen or forged prescriptions. Available at <https://www.health.nsw.gov.au/pharmaceutical/Pages/lost-stolen-prescriptions.aspx>
- Oktarlina RZ (2020) E-Prescribing: benefit, barrier, and adopting challenge in electronic prescribing. *Journal of Medicine* 21, 98–101. doi:10.3329/jom.v21i2.50213
- Porterfield A, Engelbert K, Coustasse A (2014) Electronic prescribing: improving the efficiency and accuracy of prescribing in the ambulatory care setting. *Perspectives in Health Information Management* 11, 1g.
- Rondan-Cataluña FJ, Arenas-Gaitán J, Ramírez-Correa PE (2015) A comparison of the different versions of popular technology acceptance models. *Kybernetes* 44(5), 788–805. doi:10.1108/K-09-2014-0184
- Saldana J (2015) 'The coding manual for qualitative researchers.' pp. 1–31. (SAGE Publications: Arizona)
- Samadbeik M, Ahmadi M, Sadoughi F, Garavand A (2017) A comparative review of electronic prescription systems: lessons learned from developed countries. *Journal of Research in Pharmacy Practice* 6, 3–11. doi:10.4103/2279-042X.200993
- Sandelowski M (2000) Whatever happened to qualitative description? *Research in Nursing & Health* 23(4), 334–340. doi:10.1002/1098-240X(200008)23:4<334::AID-NUR9>3.0.CO;2-G
- Schleiden LJ, Odukoya OK, Chui MA (2015) Older adults' perceptions of E-prescribing: impact on patient care. *Perspectives in Health Information Management* 12, 1d.
- Taylor A, Caffery LJ, Gesesew HA, King A, Bassal A-R, Ford K, Kealey J, Maeder A, McGuirk M, Parkes D, Ward PR (2021) How Australian health care services adapted to telehealth during the COVID-19 pandemic: a survey of telehealth professionals. *Frontiers in Public Health* 9, 648009. doi:10.3389/fpubh.2021.648009
- Tsirtsakis A (2020) What does electronic prescribing mean for GPs in the fight against coronavirus? NewsGP. Available at <https://www1.racgp.org.au/newsgp/professional/what-does-electronic-prescribing-mean-for-gps-in-t>. [accessed 7 April 2022]
- Velo GP, Minuz P (2009) Medication errors: prescribing faults and prescription errors. *British Journal of Clinical Pharmacology* 67, 624–628. doi:10.1111/j.1365-2125.2009.03425.x
- Wong LP (2008) Data analysis in qualitative research: a brief guide to using nvivo. *Malaysian Family Physician* 3(1), 14–20.
- Wrzosek N, Zimmermann A, Balwicki Ł (2020) Doctors' perceptions of E-Prescribing upon its mandatory adoption in Poland, using the unified theory of acceptance and use of technology method. *Healthcare* 8(4), 563. doi:10.3390/healthcare8040563

Data availability. The data that support this study will be shared upon reasonable request to the corresponding author.

Conflicts of interest. The authors declare that they have no conflicts of interest.

Declaration of funding. This research did not receive any specific funding. This research is part of an MBBS Year 4 Community Research Project at Western Sydney University, which students undertook with supervision.

Acknowledgements. The authors acknowledge the contributions of the GP and pharmacist participants who were interviewed, and Doctors Janine Bailey and Kam Wong who contributed to the initial conceptualisation of this research.

Author affiliations

^ASchool of Medicine, Western Sydney University, Sydney, NSW 2751, Australia.

^BTranslational Health Research Institute, Western Sydney University, Sydney, NSW 2751, Australia.