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Factors that influence the uptake of virtual care solutions in Australian primary care practice: a systematic scoping review

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ABSTRACT

Introduction: Uptake of virtual care solutions in primary care settings has increased exponentially, and current evidence suggests high patient satisfaction but mixed clinician views.

Aims: This paper aimed to identify factors influencing its' implementation to support delivery to the right patient, in the right clinical context, at the right time. Further, this paper evaluates how the updated Consolidated Framework for Implementation Research (CFIR) can be used to assess these factors that contribute to the uptake of virtual care innovations.

Methods: This systematic scoping review identified empirical research on factors influencing the uptake of virtual care solutions in the Australian primary care setting. Searches were undertaken in Embase, PubMed, Scopus, and Web of Science. The CFIR was used to code factors influencing the implementation of virtual care solutions. Inductive coding was used to generate new constructs where no appropriate CFIR construct could be identified.

Results: Fourteen eligible studies were identified as eligible for inclusion. Five common influencing factors were identified. Three are from the existing CFIR framework, and two are newly developed constructs. CFIR constructs included innovation relative advantage, capability, and IT infrastructure. New constructs included accessibility and suitability. A further six new constructs were identified (trust, privacy, governance, unintended consequences, preference, and choice) but these were not prominently mentioned.

Conclusions: Common factors influence virtual care uptake in Australian primary care. The CFIR assisted in conceptualizing these but was not sufficient for capturing factors unique to virtual care. Newly developed constructs are noted to be of importance in the literature, but further research is needed to understand whether they are applicable in multiple contexts.

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What is known about the topic?
- The COVID-19 pandemic accelerated the uptake of virtual care options in primary care settings.
- The factors influencing the uptake of virtual care within the primary care setting are not well articulated in the literature.
- Implementation frameworks that are specific to virtual care, while not entirely non-existent, are not fit for purpose.

What does this paper add?
- Identifies five key considerations when planning to implement virtual care in a primary care health setting.
- Highlights the lack of use of implementation theory and the suboptimal inclusion of patients as study participants when researching virtual care solution uptake in primary care settings.
- Offers new constructs relevant to virtual care that were developed as a result of this review.

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INTRODUCTION

Virtual care solutions can be defined as "any interaction between patients and members of their circle of care that occurs remotely, using any form of communication or information technology, to facilitate or maximize the quality and effectiveness of patient care."[1] Virtual care solutions assist stakeholders to deliver health services, independent of time or location, enabling the development of new or enhanced models of care where digital technology and patients interact with, and join clinicians and carers in the health care delivery team. Common forms of virtual care modalities include simple telehealth, videoconferencing, email, store and forward (e.g., recording health data that is forwarded to primary care physicians), as well as more complex remote monitoring which can be supported with mobile health applications.[1]

Virtual care solutions have the potential to transform the way health care is delivered, addressing lamented problems concerning access and equity of health care provision; achieving cost savings; and providing more efficient care. The literature reports on the effectiveness of, and satisfaction with virtual care solutions. One large systematic review that included 38 meta-analyses across 10 medical disciplines found that telehealth is equivalent to or is more clinically effective compared with usual care.[2] Another review that analyzed satisfaction with virtual care more broadly and included 102 studies found several advantages, including patient convenience and increased protection from viral spread.[3] However, the review also noted that virtual care is not always a perfect solution, with challenges including a feeling of being rushed, lack of physical contact or examination, difficulty with communicating symptoms, and technology issues.[3] However, on balance, the consensus is that virtual care is beneficial when used for the right patient, at the right time, for the right purpose, and its adoption has been encouraged.

In the Australian context, the use of virtual care has significantly increased in primary care settings. For example, telehealth consultations rose from 1% to 36% (of all consultations) after the introduction of a government-subsidized claim number.[4] That figure has now stabilized to around 20% of primary care consultations.[4] Although there is uptake of telehealth (and other virtual care solutions), there is scope to increase its use and improve its delivery, where appropriate. For example, one Australian study that surveyed 217 general practitioners, nurses, and allied health professionals found that key barriers included the inability to conduct a physical examination, reduced access for people from non-English-speaking backgrounds, and the risk of missed or delayed diagnosis.[5] Other reported problems have included the barrier it presents to opportunistic screening (e.g., blood pressure and cervical screening) and building rapport between physician and patient. Research is needed to identify components to develop and implement virtual care to the right patient, in the right circumstances, at the right time. To achieve this, it is necessary to understand the factors that influence the uptake and implementation of virtual care.

Implementation science offers theories, models, and frameworks that assist with planning, implementing, and evaluating health care interventions.[6] One such model is the Consolidated Framework for Implementation Research (CFIR), which provides a multilevel lens from which to analyze implementation efforts.[7] The CFIR is the result of a systematic review of literature that identified available implementation frameworks and examined the overlap between them to create a combined framework that includes them all.[8] Originally, the CFIR contained 26 constructs and 13 sub-constructs across five domains; however, it was updated in 2022 following user feedback, with changes to the existing constructs to better meet contemporary needs.[7] The latest version now contains 48 constructs and 19 sub-constructs across the five domains (innovation, outer setting, inner setting, individuals, and implementation process).[7] The full list of constructs can be accessed at cfirguide.org.[9] The CFIR is the most commonly used framework to assess the implementation of digital health interventions, with a recent review finding 39/156 (25%) of included studies using it to support either data collection, analysis, or influencing factor identification.[10] Despite its utility and popularity, there remain gaps in the identification of constructs that are relevant to virtual care. This problem is not confined to virtual care, with a previous review undertaken that proposed an additional CFIR domain with 11 constructs specific for use in low- and middle-income countries.[11] Such research provides an opportunity to create "expansion packs" that can be used depending on user needs, while also recognizing the importance of not "creating yet another framework." In addition to scoping the factors influencing the uptake of virtual care in the context of Australian primary care, this review tested the revised CFIR to understand where there may be gaps in

relation to virtual care solution implementation and develop an "expansion pack" to better support the implementation of virtual models of care.

REVIEW QUESTIONS

What are the factors influencing the uptake of virtual care in Australian primary care settings?

Does the CFIR offer a comprehensive framework to support the reporting of factors influencing the implementation of virtual care interventions?

METHODS

Approach

A systematic, scoping review of the literature was conducted, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).[12]

Searches

Embase, PubMed, Scopus, and Web of Science were searched in December 2022. Limits on the search included a publishing year range of 2011–2022 (2011 is when the first telehealth Medicare Benefit Schedule item was introduced in Australia); studies in the English language; and studies using human participants. A search strategy was initially developed for the Scopus database with the guidance of an external health librarian. This strategy was subsequently adapted to the other databases. The resulting search strategy contained three key word groups, including text key words and Medical Subject Headings. The complete search strategy can be seen in Appendix I, http://links.lww.com/IJEBH/A287.

Inclusion criteria

The review included original empirical qualitative or mixed methods studies to investigate influencing factors that facilitate (enablers) or inhibit (barriers) the implementation of virtual care solutions in the Australian primary care context. The definition of virtual care as outlined by Wong and colleagues was used: "Virtual care can be defined as any interaction between patients and members of their circle of care that occurs remotely, using any form of communication or information technology, to facilitate or maximize the quality and effectiveness of patient care."[1] Study interventions must have been directly between a patient (with or without a carer/support person) and a clinician. Models that included a support health worker being physically present with the patient during virtual care episodes were not eligible for inclusion, as it was considered to be a form of face-to-face care. Outcomes must have included data on the factors influencing implementation of virtual care interventions (e.g., not just patient satisfaction). The population must have included health care professionals (see Table 1). The reference lists of the studies included after the final full-text screening were also screened for other potentially eligible articles. Papers relating to primary care, such as general practice, dietetics, nursing, mental health, psychology, and physiotherapy were included. Papers were included regardless of study quality to ensure a comprehensive and accurate recount of the available literature was performed. The following exclusions applied: meta-analyses and literature reviews; non-English language papers; conference abstracts; editorials; letters; press releases; opinion pieces; no full text available; conducted outside Australia or where the health professional population was not from Australia; published outside the 2011–2022 time period; papers with inadequate or insufficient information; pre-print publications or gray literature. The reasons for exclusion were documented in Covidence (Veritas Health Innovation, Melbourne, Australia) and are outlined in the PRISMA flow chart[13] in Figure 1.

Study selection and data extraction

Identified studies were imported to EndNote (Clarivate Analytics, PA, USA) for initial review and identification of duplicates. Following this, they were imported into Covidence for screening. Two reviewers independently screened the title and abstract of each article. Further duplicate studies were manually removed by the reviewers. After title and abstract screening, full-text

Table 1: Population, concept, and context (PCC) inclusion criteria

Population	Health care professionals
Concept	Virtual care provided, defined as "any interaction between patients and members of their circle of care that occurs remotely, using any form of communication or information technology, to facilitate or maximise the quality and effectiveness of patient care."
Context	Australian primary care settings.

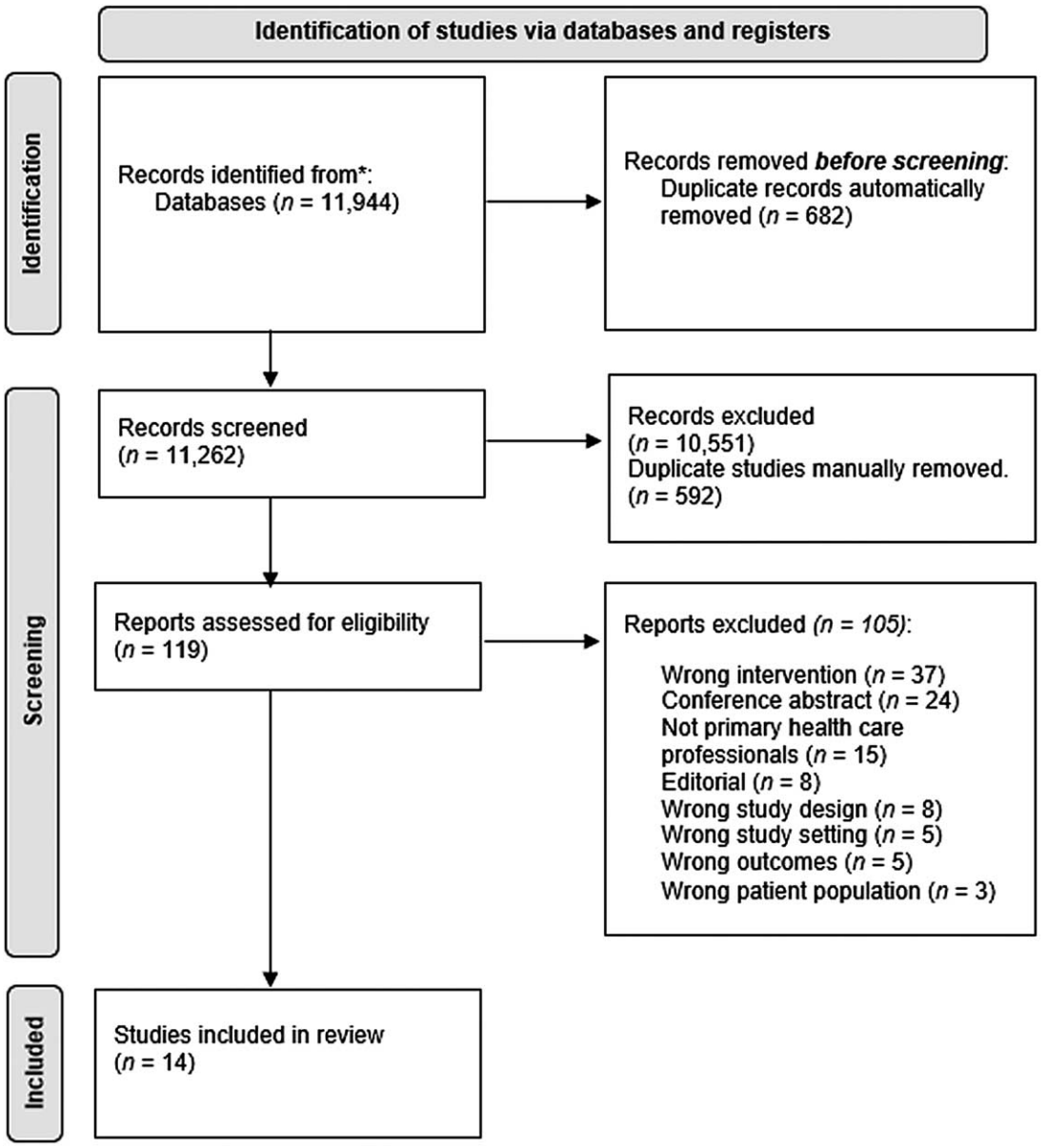


Figure 1: PRISMA flow diagram illustrating screening process.

screening occurred, where two reviewers assessed the full text of the eligible articles against the inclusion criteria. Full-text articles that met the criteria were included in the final review for data extraction and analysis. Conflicts during the screening process were resolved by consensus, or, if required, by a third reviewer (see Figure 1).

An extraction template was created in Covidence and included general study characteristics; methodology, frameworks or theories used; intervention details; identified outcomes; and identified barriers and enablers. Two reviewers independently extracted relevant information and quotes from each article into the relevant extraction template section in

Covidence. Conflicts were resolved by a consensus meeting, or, if required, a third reviewer.

Data synthesis and presentation

The extracted data were exported to a Microsoft Excel spreadsheet. Two authors (AD, EM) used a deductive coding approach through framework analysis. Where there was disagreement in coding, consensus meetings were held, and where required, a third author (JP) was included to resolve conflicts. After initial coding (line by line), all data were organized in a separate Microsoft Excel workbook according to construct to check that all data had been coded consistently. Two authors (AD, JP) checked all the data by construct to ensure it was coded correctly. During this process, it was observed that some data were not coded correctly, and either did or did not have a suitable alternative. Where the authors felt that no CFIR code fitted a statement, it was initially coded as "uncodable." All uncodable statements were then reviewed to identify common themes. Two reviewers independently coded extracted article comments to appropriate CFIR and new construct theme in the Excel spreadsheet. Consensus meetings were held to confirm coding and resolve any conflicts. Both accompanying data dictionaries were used to guide the coding. Multiple coding and classification of statements occurred where appropriate. After coding, data were aggregated according to the CFIR and new constructs to enable the generation of statements reflecting the barriers and enablers (influencing factors), as they are relevant in the context of virtual health care provision. Barrier and enabler statements were only generated for the most frequently referenced factors that influenced implementation. Statements were iteratively generated and confirmed by all authors. Frequency tables were used to assess which barriers and enablers were most referenced in the included studies (Figure 2).

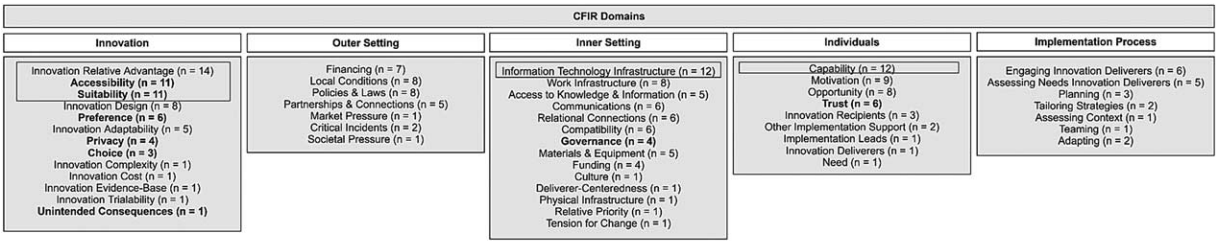
RESULTS

Study selection and data extraction

The literature search identified 11,944 studies from the databases, of which 682 duplicates were automatically removed by Covidence. During title and abstract screening (n = 11,262), further duplicate studies were manually removed by the reviewers (n = 592). After title and abstract screening, (n =119) full texts were reviewed against the inclusion and exclusion criteria. Following this (n = 14) articles were determined as suitable for inclusion (see Figure 1).

Characteristics of eligible studies

Fourteen papers were chosen for final inclusion (see Table 1).[14–27] Study designs included descriptive exploratory (57%, *n* = 8),[14–17,19,22,23,27] cross-sectional cohort (7%, *n* = 1),[18] action research (7%, *n* = 1),[20] observational cohort comparison (7%, *n* = 1),[24] mixed methods (14%, *n* = 2),[21,25] and longitudinal exploratory (7%, *n* = 1).[26] Most of the studies used a semi-structured interview method of qualitative data collection (71%, *n* = 10),[14–17,19,21–23,26,27] with the remaining four studies using a feedback survey (7%, *n* = 1),[18] focus group (7%, *n* = 1),[20] qualitative interview and survey (7%, *n* = 1),[24] or semi-structured interview and workshop (7%, *n* = 1).[25] Study interventions included telehealth (42%, *n* = 6),[17,18,20,22,26,27] telemonitoring (35%, *n* = 5),[15,16,21,24,25] information technology, ICT (email, text messaging, video linking) (7%, *n* = 1),[19] and telephone-based cognitive behavioral therapy (7%, *n* = 1).[14–27] Notably, no studies used implementation theories or frameworks to inform their study (see Table 2).



Note. Bold text indicates proposed new constructs. Boxed constructs are those that were included in the top 5.

Figure 2: Original and new CFIR identified as influencing factors (barriers and/or enablers) to implementation per paper.

Table 2: Included study demographics

Authors (year)	Study design	Qualitative data collection method	Implementation theory / framework	Data population (staff / patients)	Patient population	Intervention
Bassilios *et al.* (2014)[13]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	Mental health	Telephone-based cognitive behavioral therapy
Chow *et al.* (2019)[14]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	Chronic Illness	Telemonitoring
Chow *et al.* (2021)[15]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	Chronic Illness	Telemonitoring
De Guzman *et al.* (2022)[16]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	General - primary	Telehealth (general)
Dham *et al.* (2018)[17]	Cross-sectional cohort	Feedback survey	Nil	Staff and Patients	Mental health	Telehealth
Hanna *et al.* (2013)[18]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	General - primary	ICT (email, text messaging, video linking)
Hardie *et al.* (2022)[19]	Action research	Focus group	Nil	Staff	General - primary	Telehealth
Indraratna *et al.* (2021)[20]	Mixed methods	Semi-structured interviews	Nil	Staff	Cardiac	Telemonitoring (mobile app)
James *et al.* (2021)[21]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	General - primary	Telehealth
Jones *et al.* (2018)[22]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	Dietetics	Information technology
Katz *et al.* (2018)[23]	Observational cohort comparison	Qualitative interviews and survey	Nil	Staff and patients	Chronic kidney disease	Telemonitoring
LaMonica *et al.* (2020)[24]	Mixed methods	Semi-structured interviews and workshop	Nil	Staff	Mental health	Telemonitoring
O'Sullivan *et al.* (2022)[25]	Longitudinal exploratory	Semi-structured interviews	Nil	Staff	General - primary	Telehealth
Smyth *et al.* (2022)[26]	Descriptive exploratory	Semi-structured interviews	Nil	Staff	General - primary	Telehealth

Characteristics of study participants

Most studies collected data from health care professionals (85%, $n = 12$),[14–17,19–23,25–27] while two studies collected data from both professionals and patients.[18,24] Patient population studied included general primary care (42%, $n = 6$),[17,19,20,22,26,27] mental health (21%, $n = 3$),[14,18,25] chronic illness (14%, $n = 2$),[15,16] cardiac (7%, $n = 1$),[21] dietetics (7%, $n = 1$),[23] and chronic kidney disease (7%, $n = 1$).[24] The reported occupations of health care professional participants in each paper included psychologists (14%, n = 2),[13,24] social workers (14%, n = 2),[13,24] nurses (29%, n = 4),[13,17,21,24] counselors (14%, n = 2),[13,24] general practitioners (79%, n = 11),[14–20,23–26] psychiatrists (7%, n = 1),[17] cardiologists (7%, n = 1),[20] dieticians (7%, n = 1),[22] dentists (7%, n = 1),[24] pediatricians (7%, n = 1),[26] neurologists (7%, n = 1),[26] immunologists (7%, n = 1),[26] orthopediatricians (7%, n = 1).[26] Three studies reported the biological sex[16,18,25] and three studies reported the gender[17,21,22] of health care professional participants. Two studies reported whether the sample was of female or male majority but did not label this as sex or gender.[15,19] Two studies reported the gender/biological sex of a mixed sample of health care professionals and other participants, making it difficult to parse the health care professionals' gender/biological sex.[17,19] Of studies reporting the biological sex or gender of health care professionals only, the percentage of male participants included ranged from 4% to 70%, and females from 30% to 96%.[15–16,18,21–22,25]

None of the studies reporting gender or biological sex of health care professional participants included analysis that investigated sex- or gender-based differences in their results.

Factors that influence implementation

Factors influencing implementation that were identified in each article are shown in Figure 2 and summarized in Appendix II, http://links.lww.com/IJEBH/A288. From the CFIR constructs identified, 43 of the 67 (64%) were factors influencing implementation. During the qualitative coding process, it was observed there were several emerging themes related to virtual care implementation in the data that could not be appropriately represented by coding to the available constructs in the current CFIR framework. Consequently, a suite of eight new constructs (including three sub-constructs) across three CFIR domains were produced and proposed by the research team (see Table 3 for construct definitions). The top five influencing factors identified for implementation of virtual care interventions included Innovation Relative Advantage (n =14), Capability (n = 12), Information Technology Infrastructure (n = 12), Accessibility (n =11), Suitability (n = 11) (see Figure 2). Barrier and enabler statements were generated for the top five influencing factors and are presented in Table 4.

DISCUSSION

This paper is the first to investigate and report factors influencing implementation of virtual care interventions in an Australian primary care context using the CFIR framework, with several key findings. Firstly, no included papers used implementation frameworks to structure their evaluation of the implementation of virtual care. Secondly, there was a notable imbalance of patients' perspectives in the included studies. Thirdly, CFIR helped identify a cluster of common influencing factors, including innovation relative advantage, information technology infrastructure, and capability; however, it was necessary to develop new constructs to capture the unique factors influencing the implementation of virtual care interventions. These factors should inform future implementation of virtual care that is delivered to the right patient, in the right circumstance, at the right time.

While multiple theories and framework exist to guide the identification of barriers and enablers to

Table 3: Definitions of proposed New Virtual Care CFIR Constructs

Domain	Construct	Sub-construct	Definition
Innovation	Equity		The degree to which an innovation and the way in which it is delivered promotes equity (*for use when coding equity aspects outside the scope of below*).
		Accessibility	The degree to which an innovation as designed can be accessed by everyone.
		Choice	The degree to which an innovation allows the recipients/deliverers to choose.
		Preference	The degree to which an innovation considers the preferences of the innovation deliverers and recipients.
	Privacy		The degree to which the innovation can be delivered in a way that preserves the privacy of the innovation deliverers and recipients.
	Suitability		The degree to which an innovation is clinically appropriate or useful as delivered to target populations.
	Unintended consequences		The degree to which the innovation results in unintended consequences (negative or positive) that could be relevant at patient, provider, or system levels.
Individual	Trust		The degree to which innovation deliverers or recipients believe that the care provided will not be compromised when providing the innovation.
Inner setting	Governance		The degree to which an innovation can be or is being supported by local, inner setting policies, and procedures.

Table 4: Influencing factor statements (by barrier and enabler) with exemplar quotes

CFIR domain / Construct	Influencing factor statement	Exemplar quotes
Innovation / Innovation Relative Advantages	Barriers • Virtual care solutions must facilitate a standard of care that is the same or enhanced. • Patients need to feel that there is an advantage to the digital health intervention. • Virtual care solutions that allow for audio and visual interactions; facilitate access to more comprehensive patient information; and enhance the efficiency of care are favored among clinicians.	*"When comparing telehealth with in-person consultations, GPs had mixed views on quality of care. They highlighted that in-person consultations are needed for physical examinations and added that more subtle aspects of care may be missed though telehealth. However, they also discussed that a physical examination is often not required to provide comparable care."* [de Guzman, 2022] *"Low uptake was reported to be associated with the types of challenges mentioned above and others including: most clients opting to have face-to-face sessions even if required to travel long distances."* [Bassilios, 2014] "*Participants explained that phone consultations are quicker to deliver, enable a higher number of consultations, and yield greater financial benefits compared with videoconference consultations: 'I don't do video, [because] it takes time. I do telephone.' 'I think that clinicians have figured out that it's quick to phone, and fewer patient problems are raised, making the length of consultation shorter, and the Medicare rebate is the same for those two services. So, they're tending to vote with what is more financially appealing.'"* [de Guzman, 2022]
	• Enablers • Clinicians must be able to see a benefit for patients and the health system when providing virtual care solutions. • Positive patient feedback supports the need to continue using virtual care solutions. • The benefits need to outweigh the costs associated with delivering virtual care solutions. • Virtual care solutions that allow for audio and visual interactions; facilitate access to more comprehensive patient information; and enhance the efficiency of care are favored among clinicians.	"*They believed that telemonitoring will provide better patient care and reduce patients' hospitalization rates.*" [Bassilios, 2014] *"Practices viewed telephone consultations as a useful adjunct service to support scripts, referrals, reviews and team meetings, . . .for chronic reviews. Where the patient is isolated, or repeat scripts or for following up results rather than getting someone in to discuss their issue, and you can organise the physio without them having to come in.*" [O'Sullivan, 2022] "*They also valued the support and the time saved (e.g., thank you for support and advice, telepsychiatry has meant a greatly reduced waiting time for this consult)."* [Dham, 2018] "*In correlation with the program risk of costs and strategies for resourcing, the participants recognized that the program was now part of the integrated care service delivery. Despite it being potentially a costly process (reported by Participant 5), the consensus amongst the participants was that the telemonitoring program was a positive program and that it provided a better patient care.*" [Chow, 2019] *"Practice: Benefits to general practices were described, including the ability to triage high-risk patients, while still allowing those patients requiring physical examination or further diagnostic tests to have face-to-face consultations following a telehealth. GPs revealed that informal telehealth had actually sometimes been done previously prior to MBS subsidies, therefore, the new telehealth item numbers allowed GPs to be paid for these consultations."* [Hardie, 2022] "*GPs further believed that videoconference would provide higher quality of care compared with telephone because it enables visual assessment of patients: 'The visual interaction, you can see the gestures, you can see the facial expressions, and its nicer to see someone. I mean if were having this by phone, we couldn't get the same information. You're nodding and I'm nodding, and I'm using my hands, there's more of a conversation that's occurring."* [de Guzman, 2022]

Table 4: (*Continued*)

CFIR domain / Construct	Influencing factor statement	Exemplar quotes
Inner Setting / Information Technology Infrastructure	Barriers • Functional IT infrastructure, including reliable access to the internet and mobile reception, are needed to support the provision of virtual care. • Technology should be fit for purpose and contemporary (e.g., use of fax is not acceptable anymore). • Support to access data remotely should be provided to streamline processes and ensure continuity of care.	*"The main issues reported in regards to the technology used were related to internet connectivity. Taking into consideration the characteristics of the local area where this program had been running, some of the rural areas were not covered by the telecommunications companies and despite the provision of SIM cards and USB data units, the internet connectivity was not a reliable resource, causing connectivity issues for transmission of results between devices and requiring the patients to enter measured results manually."* [Chow, 2019] *"In addition, although faxing is still the typical mode of communication for most GPs, many participants expressed dissatisfaction with it for receiving information requiring timely attention: "Electronically downloading to, you know, report to us, I think, would be the most effective way."* [Chow, 2021] *"Other factors included the preferred mode of consult for both patients and RACF staff, as well as the need to have notes transferred from the GP to the RACFs software, which may not be accessible by GPs offsite. I've got a lot in aged care that are very competent to do that, but it still does then involve a follow-up call to the facility. So, whatever we do still needs to be interpreted and passed on and certainly, the notes need to be written in the facility's software, so that sort of takes longer because there's all these sort of multiple steps. A lot of it is phone; certainly, when I'm speaking to residents because that's their preferred way. And then, if there is something I need to see I'll often then get the nurse to take a device to the room."* [Hanna, 2013]
	Enablers • Functional IT infrastructure, including reliable access to the internet and mobile reception, are needed to support the provision of virtual care. • Increased levels of baseline familiarity with technology supporting the delivery of virtual care enhances uptake.	"*Practices that dealt with patients from a broad geographical area or a rural population were identified as appropriate for telehealth, with the critical caveat that adequate internet and mobile coverage for both patients and clinicians was essential."* [Smyth, 2022] *"There was a diversity of preparedness among participants for the rapid implementation of telehealth. Preparedness was conceptualised in terms of both the available equipment and staff capacity in providing a telehealth service. Those who already used telehealth in their practice and had adequate resources found it easy to pivot to increasing telehealth use."* [Indraratna, 2021]
Individual / Capability	Barriers • Capability of both patients and staff needs to be supported with appropriate education and training to enable engagement with virtual care. • Clinicians need to be sure that patients are capable of providing accurate data and meaningfully participating in virtual care. • Virtual care should be delivered in a way that considers the capability and cognitive awareness of patients.	*"Four mental health professionals made suggestions for further support and training, including: putting forms for mental health professionals and consumers online, offering a review training session to professionals after they have conducted some sessions, and providing an opportunity to link up with other [mental health professionals] across Australia to discuss patients."* [Bassilios, 2014] *"Some participants had concerns that TM did not produce the same clinical data obtainable via face-to-face consultations. Although many participants recognised that TM data could supplement face-to-face assessment, others doubted the accuracy and validity of self-measurements, or felt numerical data and patient self-report, in the absence of direct GP observation, was inappropriate for clinical decisions."* [Chow, 2021] *"Negative themes mentioned difficulties due to patient-related issues such as disabilities and poor engagement (e.g., advanced dementia precluded the assessment but it was still helpful, patient was not engaging and so the assessment was difficult) or technical aspects like audio-visual difficulties, noise, cold and privacy issues (e.g., visual not clear, too cold in the room, uncomfortable, there was a lot of background noise at the far end)."* [Dham, 2018]
	Enablers • Virtual care solutions that help improve patients' ability to self-manage are viewed favorably by clinicians. • Capability of both patients and staff needs to be supported with appropriate education and training to enable engagement with virtual care. • Increased levels of baseline familiarity with technology supporting the delivery of virtual care enhances uptake.	*"The participants also commented that the telemonitoring intervention has contributed in providing social care in self-management capability for the patients, as they had ownership of their health and confidence in managing their own level of care."* [Chow, 2019] *"Eight of the 10 interviewed mental health professionals said that the mandatory Australian Psychological Society webinar training had been helpful."* [Bassilios, 2014] *"Health professional facilitators: Interestingly, all participants commented that they felt that they had a high level of digital literacy and competency in their role and were ready for change."* [LaMonica, 2020]

Table 4: (*Continued*)

CFIR domain / Construct	Influencing factor statement	Exemplar quotes
Innovation / Accessibility	Barriers • Functional IT infrastructure, including reliable access to the internet and mobile reception, are needed to support the provision of virtual care. • Virtual care solutions should have options to cater for people with disabilities, age-related concerns (e.g., poor hearing or vision) or mental health conditions (e.g., social anxiety). • Booking portals should allow for attendance modality selection options. • Virtual care solutions must be fit for purpose (e.g., facilitate video-conferencing).	*"I think rural was just because of distance you could actually do more with public hospitals; they were a nightmare to do, the technology never worked and, and I think I did about a maximum of five and so we travelled to the aged care facility and sat there with the patient and then connected with the specialist so it was good in the point that you know very frail people didn't have to go and have a face-to-face appointment about a skin lesion first before we could book them directly into have an excision so it did assist with that, but it was a very clunky so there was no telehealth that we could do without actually being there with the patient and physically being there during the consult."* [Hardie, 2022] *"Some clinicians expressed concerns regarding the information required for the referral (e.g., the referral process took a while as I had to wait for the GP and then had to include the other assessment tools and audio-visual issues, visual not working, I had not anticipated the hearing problem for the client. Repeating the questions was awkward and made the consultation difficult for both parties)."* [de Guzman, 2022] *"Some practices don't actually offer video telehealth at all particulary if you're doing an online appointment; there's no selection for it, it says telehealth but it ends up just being telephone. And so, one of the barriers to video, I think, is the fact that it's actually not being offered in some sense through the online."* [Hardie, 2022] *"The use of phone-based telehealth magnified the perception of risk of missing something, through the loss of all visual cues and challenges communicating with those who might be hearing impaired or speak English as an additional language."* [Smyth, 2022]
	Enablers • Improved access of care for patients (particularly those who are immunocompromised, live in rural or remote areas, or have a chronic condition or disabilities that make travelling hard) is seen as a major advantage of virtual care solutions.	"*It was also mentioned that patients were possibly better able to attend telehealth appointments, without fear of needing to ask for time off work. Older people, immunocompromised, people who are concerned about walking out the door, a lot of people with significant mental health issues including you know, high anxiety and distress find it easier to do, rather than trying to come out and be seen. (P1)* *"It suits an absolute wide range of my patients - probably 95% of my patients and I'm working in a rural area where people have to travel. A lot of my patients have to travel 45 minutes, 60 minutes to come into town so it helps them a lot you know, telephoning them. It's so much more convenient for them, and even the cost of petrol a lot of them complain about the costs associated with travel, not only the time as well. So it's really useful in a rural setting."* [Hardie, 2022]

Table 4: (*Continued*)

CFIR domain / Construct	Influencing factor statement	Exemplar quotes
Innovation / Suitability	Barriers • Patient selection criteria are needed to ensure that the standard of care is appropriate when using virtual solutions. • Virtual care solutions must facilitate a standard of care that is the same or enhanced. • Virtual care solutions must provide information in a timely and accessible manner to ensure it can be used to provide quality care at the right time.	*"I think that wasn't to [the patients] benefit, because [the patient] over-exaggerated the readings, even if they [were] normal [the patient] was still worrying about it. This particular patient probably wasn't the best candidate for telemonitoring."* [Chow, 2021] *"From doctors' factors point of view, I've got three: the first one is an obvious one, particularly when it comes to acute care and I personally see a lot of patients on the day with acute issues: examinations going to change management; if they have right-sided abdominal pain, it could be appendix, it could be something else I need to examine them. If they come in with ankle injury, I need to examine them, apply certain rules to find out whether they need an x-ray and do x-ray appropriately; otherwise I'll be wasting resources."* [Hardie, 2022] *"Most often, the patient comes before the information has travelled and the patients tell me 'Oh, you've had a message from. . . and, no, not yet. . .' lif I have the information 2 days later, it's kind of lost the benefit from it."* [Chow, 2021]
	Enablers • Virtual care is viewed as suitable when offered to patients who meet pre-determined clinical criteria. • Patient characteristics (including limitations) should be considered when determining whether virtual care is suitable. • Virtual care solutions which allow for audio and visual interactions, facilitate access to more comprehensive patient information, and enhance the efficiency of care are favored among clinicians.	*"In further meeting patient needs, GPs described clinical presentations where telephone may be most effective (for example, repeat script requests, provision of results, follow-up consultations, and discreet care for patients experiencing domestic violence). They mentioned videoconference is more effective than telephone for scenarios that require visual assessment, such as skin or throat issues. They emphasised the importance of considering clinical needs when choosing consultation mode: 'Yeah, and then sometimes you might say, I want you to come back, I want to reassess you clinically.'"* [de Guzman, 2022] *"Many contemplated this innovation around patient limitations, patient characteristics, their health care needs and the doctor's satisfaction with the quality of care that could be provided, I like video. . .works well, once they have the hang of it, it is great especially as they live further away."* [O'Sullivan, 2022] *"GPs spoke about their experiences with building patient rapport through telehealth. Most felt that telehealth may be more appropriate for existing rather than new patient relationships. However, they emphasised that videoconference could help foster more patient rapport compared with telephone because of the visual experience. They described the importance of visual cues to help develop rapport and therapeutic relationships, which are important aspects in providing high quality care: 'Just from a relationship point of view, I think, having the video would be better than just speaking on the phone.' 'I think that you're going to find out more patients are going to trust you more, so your advice will be more likely to be understood and acted upon, that's quality of care.'"* [de Guzman, 2022]

implementation (such as the ones included in this study), no paper referred to, or included such frameworks into the method of the study. This is surprising, as a recent scoping review which sought to understand the use of implementation theories, models, and frameworks across digital health interventions found 156 studies published between 2000 and 2022 that used them for either data collection, data analysis, or identification of factors influencing implementation.[10] Further, another scoping review that analyzed the use of CFIR in telehealth implementation located 64 studies.[28] The narrow context of this review (Australian primary care) potentially contributed to this finding. It is encouraging that more broadly, implementation science is being used to evaluate virtual care interventions, but evidently, further uptake of implementation science methods needs to be encouraged in Australian primary care settings to enable the sharing of collective learnings using a common language, and to maximize the chance of virtual care innovation uptake.

In addition to a lack of implementation theory use, there was a distinct lack of perspectives from patients, with only 2 of 14 included studies reporting such perspectives within general primary care and chronic kidney disease contexts.[18,24] While it was the study goal to only include clinician perspectives, it did not exclude these based on including patient feedback. Patient perspectives, in addition to clinician perspectives, are important to ensure a holistic understanding of the factors influencing the uptake of virtual care innovations. The absence of patient perspectives could be due to difficulties with patient recruitment, specifically in a primary care setting, which have been lamented by numerous studies.[29–31] Several factors are believed to influence the difficulties with recruiting patients, including a lack of awareness of the study, lack of interest in research (in general), perceived burden for the patient (time), interference with usual care (recruitment during appointments), and practice characteristics.[30] Other concerns center around a reliance on the general practitioner to recruit and the factors that influence their motivation (attitude to research in general, incentives, relationships with academics) and capability (lack of time and resources).[29] One study that iteratively modified recruitment strategies to determine the most effective methods found that strategies that removed reliance on practice level involvement had the greatest impact on improving recruitment of patients.[31] In future, studies should seek to include patient perspectives and when recruiting, adopt a holistic approach (one that includes strategies at individual, outer setting, and inner setting levels) to ensure adequate representation.

While the study revealed a cluster of common factors influencing implementation of virtual care in primary care contexts, we found it was necessary to develop additional constructs to capture the most salient themes emerging from the data. This problem is not unique to our study, and others have developed additional constructs to meet their unique context, such as one that proposed specific constructs for low- and middle-income countries.[11] In their latest paper, the authors of CFIR encourage users to develop and use additional constructs as needed.[7] The new constructs in this paper are undergoing further testing, first, in another theoretical context, and second, applied in a real-world health care setting. Following further validation, a formal extension may be proposed.

Including original CFIR constructs, and new ones, the study found a cluster of common factors (mentioned in over 50% of papers) influencing implementation of virtual care innovations. These included Innovation Relative Advantage, Information Technology Infrastructure, Capability, Accessibility, and Suitability. Innovation Relative Advantage was an influencing factor in 14 papers and is defined as "the innovation is better than other available innovations or current practice."[7] The advantages of virtual care solutions over usual systems of care in primary care, and how these are perceived and experienced by patients and clinicians, are an important factor to successful virtual care implementation. Clinicians' perceived virtual care advantages often described improvement to patient care and their workflow, such as increased efficiency of care,-[18,19,23] access to a comprehensive suite of patient information,[17,21] and accessibility for disadvantaged patient groups,[17,22,26,27] which facilitated implementation. This is in line with international literature, where reduced transmission of contagious diseases and continuous monitoring of patients have been cited as advantages.[32–34] However, such perceived advantages are constrained by clinician's concerns surrounding clinical liability, and the validity and quality of care administered and received using virtual care.[16,19] Such issues could be addressed through the provision of data demonstrating positive patient outcomes and satisfaction to clinicians when attempting to implement virtual care.[35] Patients must also see the

advantages of virtual care over traditional modalities to encourage engagement. Such advantages include the convenience, no transport costs, and no lost time off work.[20,27] Despite the clear benefits, they are not always enough to convince patients that virtual care is the same or superior to face-to-face consultations.[36] Efforts to ensure that advantages are clearly communicated to both clinicians and patients when introducing virtual care should be made, while also making allowances for those who prefer face-to-face consultations.[37]

Evidently, communicating and demonstrating how virtual care interventions provide benefit to patient care and clinicians' workflow is important to support successful implementation and engagement among clinicians. However, it is essential that this perceived relative advantage can be actualized by the virtual care solution in practice without flaws/mistakes/inconveniences, lest it fail to be accepted as an appropriate addition or replacement to existing systems of care.[34] IT infrastructure was an influencing factor in 12 papers and is defined as "[t]echnological systems for tele-communication, electronic documentation, and data storage, management, reporting, and analysis support functional performance of the Inner Setting." Functional IT infrastructure for patients and health care professionals has been readily identified in the literature as a key factor to successful implementation of virtual care interventions.[38–40] However, this remains a prominent barrier to virtual care implementation in Australian primary care settings, with issues concerning internet connectivity and coverage,[14,15,23] lack of appropriate technological infrastructure,[17,20] and audio and visual technical difficulties[17,18] being frequently reported. In contrast, sufficient infrastructure, equipment, and regular network updates, bolstered virtual care implementation, particularly in rural and remote areas.[15,22,27] Further, virtual care innovations' inability to allow clinicians and patients to access data remotely was a barrier to implementation, as this hindered efficiency and continuity of care.[19] Pre-implementation, it is essential that organizations work to ensure that there is working and appropriate infrastructure in place to support the use of virtual care modalities.[41] Thorough testing of equipment and maintenance of internet access infrastructure will help ensure a smooth transition. In addition, ensuring selection of virtual care products that are preferably interoperable with a wide range of practice management suites (including mHealth apps, videoconferencing) that are user friendly and fit for purpose should also support successful implementation.[42]

In addition to ensuring there is adequate and functional IT, clinicians and patients need the requisite skills to engage with virtual care. Capability was an influencing factor in 12 papers and is defined as "the individual (s) has interpersonal competence, knowledge, and skills to fulfill the role." The review found that clinicians' prior experience with various modes of virtual care supported successful implementation due to increased confidence and the ability to problem-solve.[22,23,25,27] Such findings mirror the international literature, where the capability and self-efficacy CFIR constructs are consistently identified as factors influencing virtual care implementation, as health care professionals' positive self-beliefs regarding their capability to use virtual care solutions with their relevant clinical population facilitates implementation.[32–34] Patients' digital competency and certain demographics' capability of engaging with virtual care interventions was also perceived as a barrier to virtual care implementation.[15,19,20] Hardie *et al.* identified that patient age and language were determining factors of patients' telehealth capability, in line with international findings that identify geriatric and culturally and linguistically diverse (CALD) populations as often requiring additional assistance and education to engage with virtual care.[20,43] When mandatory training for a mental-health focused intervention was provided, mental health clinicians found it helpful in delivering the service.[14] However, it was recognized across several settings that further training was needed to educate both clinicians and patients on the use and clinical utility of virtual care innovations to facilitate proper implementation.[14,15,23] A literature review by Edirippulige and Armfield concluded that as the introduction of telehealth necessitates a change in clinical practice, this must be supplemented with appropriate education and training within the workforce.[44] ECHO COVID, a Canadian COVID-19 specific telehealth education program improved clinician telehealth self-efficacy when implemented in a primary care setting, demonstrating that education and training may be a method of increasing adoption.[45] Training can be operationalized through the use of existing frameworks that support competency development and provide a structure to ensure comprehensive education is provided such as the one posed by Hilty and colleagues.[46] The type of training received also affects telehealth adoption among patients, and endeavors should be made to accommodate their

varying cognitive capabilities; failure to do so may result in decreased engagement.[18,47] A holistic approach to training program development that includes both face-to-face and hybrid modalities should be used to ensure maximum benefit for those patients regularly involved with using telehealth (e.g., those in rural areas and limited access).

As mentioned earlier, in addition to the above CFIR influencing factors, there were issues that emerged that were not adequately covered by existing constructs, requiring the development of additional ones. These constructs were not prominently mentioned but may be of importance over time. Of the eight, two of these introduced constructs—accessibility and suitability—were identified as key influencing factors. Accessibility, a new sub-construct introduced in the review, was an influencing factor in 11 papers and is defined as "the degree to which an innovation as designed can be accessed by everyone." Accessibility is viewed here as a sub-construct of equity within the innovation domain, which emphasizes the importance of access for all. Historically, accessibility has been a core tenet of virtual care, as such innovations have been used as a pathway to care for individuals for whom physical and geographical factors affect their ability to access appropriate health care.[48] The ability to provide improved access to care for patients, such as those who are immunocompromised, live in rural or remote areas, or have a chronic condition or disability, was seen by many clinicians as a major advantage of virtual care.[14,16–18,20,22,25,27] Accessibility remains a prevalent facilitator of virtual care implementation in Australian primary health care contexts. A recent study by Clay-Williams *et al*. including 49 care providers found that Sydney-based clinicians considered patient accessibility a key strength of virtual care.[49] However, the extent of access that virtual care can provide is limited to the extent of the surrounding technological conditions in which the virtual care innovation is implemented. Clinicians cited poor internet connection or mobile reception in rural areas as a barrier that undermined the value of virtual care.[14,15] In a Canadian qualitative survey study, rural clinicians were more likely to cite access to Wi-Fi as a barrier to virtual care use than urban clinicians, suggesting that there is a greater need to support the establishment of appropriate technological infrastructure in rural primary health care services.[39]

In addition to the technological infrastructure, there also needs to be support through adequate policy that facilitates access to subsidized care. In Australia, the introduction of a Medicare Benefit Schedule claim number has greatly supported telehealth use.[4] Before the introduction of this claim number, practices were absorbing significant costs associated with telehealth, as there was no facility for reimbursement through the public health system.[4,50] Consequently, telehealth was a luxury of the few. Using a lens of equity, it is evident that support from the government is needed to ensure that those who really need access to virtual care can reliably do so, and software providers should make allowances to ensure that those with disabilities can also access virtual care services.

Suitability, a new construct introduced in the review, was an influencing factor in 11 papers, and is defined as "the degree to which an innovation is clinically appropriate or useful as delivered to target populations." Virtual care suitability influenced implementation through patient compatibility with the innovation,[17] and clinicians' perceptions concerning the role and utility of virtual care in primary health care in the context of providing appropriate clinical care.[16] Suitability posed a barrier to virtual care implementation when there was poor congruence between the patient's clinical needs and the innovation design.[17] Across several papers, telemonitoring patients with chronic conditions required more extensive in-person support than the innovation could provide and, in some case, resulted in patient populations developing disease passivity or anxiety when exposed to their monitoring data.[15,16] This suggests that the modality was not clinically suitable for certain patients. While determining patient suitability for different virtual care innovations is a complex process,[27,36,51] the refinement of guidelines for clinicians concerning patient suitability for various virtual care modalities may encourage proper implementation in primary health care while improving clinical outcomes and patient experience.[52] In a primary mental health care setting where clinicians considered the clinical appropriateness of patients for participation in a virtually administered mental health care program, clinical risk was averted and implementation facilitated.[14] This suggests that having a benchmark to ascertain patient compatibility with virtual care may be beneficial. Despite refinements needed in screening patient suitability for virtual care, the clinical benefits of virtual care for patient care through remote monitoring

and self-management is acknowledged by clinicians as a facilitator of implementation.[15,16]

In addition to the abovementioned constructs, the review also resulted in the development of new constructs, including privacy, governance, unintended consequences, preference, choice, and trust. Privacy is defined as "the degree to which the innovation can be delivered in a way that preserves the privacy of the innovation deliverers and recipients" and appeared in four papers. In the context of increasing data hacking and privacy breaches, this is likely to become a more prominent factor to consider in the development and implementation of virtual care.[53] However, it presented itself as an issue here when either the clinician or patient were engaging in consultations without sufficient privacy (e.g., while the patient was at the supermarket). Care should be taken that if the patient cannot speak in a private setting, another time is made to ensure the quality and confidentiality of the interaction with the clinician.

Governance was also an issue, appearing in four papers and defined as "the degree to which an innovation can or is being supported by local, inner setting policies and procedures." There were numerous instances, particularly in relation to the provision of devices to patients, where tracking the location of the devices and ensuring they were properly maintained and returned proved difficult.[14] To support judicious use and proper maintenance, it is recommended that all equipment used for telehealth be kept on an equipment register. Processes should be in place to ensure routinely scheduled maintenance and the safe return of devices from patients when they were no longer required, as well as those used in the clinic to support virtual care operation.[54]

Unintended consequences were mentioned in one paper and defined as "the degree to which the innovation results in unintended consequences (negative or positive) that could be relevant at patient, provider, or system levels." While this construct was not widely apparent, it is possible that it may emerge as a more prominent issue as virtual care matures. In the context of this review, it emerged as a problem when patients were misusing technology given to them, resulting in high internet usage costs to the practices, as well as difficulties with off-boarding patients, where they had grown an attachment to the equipment and saw returning it as a symbolic way of acknowledging disease progression.[15] Studies are beginning to report unintended consequences more widely, with one study identifying multidimensional issues created by telehealth. These included the disruptive nature of integrating telehealth, potential to fragment care, impact on power relations between patient and provider, impact on supply chains, and maladaptive government policy borne out of urgency.[55] A more comprehensive view is provided by Gogia and colleagues, who offer a raft of possible solutions to address the many unintended consequences of implementing virtual care.[56]

Preference was mentioned in six papers and defined as "the degree to which an innovation considers the preferences of innovation deliverers and recipients." Preference emerged as an issue when exploring the design and development of virtual models of care.[14,17,19,20,22,27] Choice appeared in three papers and was defined as "the degree to which an innovation facilitates the ability of the recipients/deliverers to choose." This was a conceptually similar descendant to preference, related more to the operational nature of virtual care solutions.[57] For example, allowing patients to choose whether they have a face-to-face appointment versus telehealth is different to the idea of ensuring that varied preferences are included in the development of an intervention (e.g., an appointment booking application that provides multiple options). Given the importance of clinician and patient acceptability of virtual care interventions, it is important that both constructs be considered when developing virtual models of care.

The final new construct was trust, mentioned in six papers and defined as "the degree to which innovation deliverers or recipients believe that the care provided will not be compromised when providing the innovation." Trust was an issue where clinicians felt as though the care they were providing would not be equivalent or superior to face-to-face care or when they had difficulties trusting data that were collected by the patient or provided to them by a system.[15,17,19,21,22,27] In the broader body of evidence, this extends to the patient, who may increase their levels of trust in clinicians through the enhanced availability of care.[58] In an umbrella review that included 79 studies, Ramachandran considers trust to be mediated by "patient-related, provider-related, technology-related and organisational factors, such as patient sociodemographic, provider communication skills, technology design and organisational technology implementation."[59] Thus, it is likely that trust is an

important factor in virtual care implementation, and strategies to improve trust at all levels should be deployed.

This study has provided an overview of the key factors to consider when implementing virtual care interventions in a primary health care setting. The study also identified additional constructs that may have continued importance once tested in varied contexts. A limitation of the study is that it was conducted using a set search strategy at a singular time point. Additionally, only eight studies reported detailed participant characteristics (e.g., gender, age, role), and there was an inconsistent attribution of gender versus sex, making generalizations about the clinicians' responses in regard to demographics challenging. Though every effort was made to include all key terms related to virtual care, there may have been relevant studies that did not contain such terms or were published after the search was conducted, and were therefore excluded from the review. As such, this study provides a review of the literature concerning virtual care in an Australian primary health care context as recent as December 2022. In addition to a lack of implementation theory use, there was a distinct lack of perspectives from patients, with most papers focused on influencing factors as experienced by clinicians. Finally, as this is a scoping review, there is a chance that some studies were missed, as gray literature was not searched for. Thus, we cannot be certain that all relevant literature was included.

CONCLUSION

Virtual care is increasingly being used within Australian primary health care settings, and often, implementation occurs without the use of an appropriate theory, model, or framework. The CFIR provided a multi-level lens from which to identify barriers and enablers, but it lacked constructs relevant to virtual care. The development of new constructs, which seem to also appear in the wider body of evidence, suggests that they may be of increasing importance. Further research is needed to confirm the influence of the new constructs in additional clinical contexts, including testing in empirical studies. This study has provided a starting point for those wishing to embark on a journey to implement virtual care that is informed by theory and available evidence, ensuring that virtual care is provided to the right patient, in the right context, at the right time.

AVAILABILITY OF DATA AND MATERIALS

Data is available upon reasonable request.

AUTHOR CONTRIBUTIONS

AD assisted with conceptualizing the study, writing the protocol, study selection, data analysis, data synthesis, and drafting the manuscript. EM assisted with study selection, data analysis, data synthesis, and drafting the manuscript. PW assisted with data analysis, conceptualization of the discussion, and review of the manuscript. RJ assisted with conceptualizing and refining the discussion as well as reviewing the manuscript. JP assisted with conceptualizing the study, writing the protocol, study selection, data analysis, data synthesis, and drafting the manuscript.

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REFERENCES

1. Wong A, Bhyat R, Srivastava S, Boissé Lomax L, Appireddy R. Patient care during the COVID-19 pandemic: use of virtual care. J Med Internet Res 2021;23(1):e20621.
2. Snoswell CL, Chelberg G, De Guzman KR, Haydon HH, Thomas EE, Caffery LJ, Smith AC. The clinical effectiveness of telehealth: a systematic review of meta-analyses from 2010 to 2019. J Telemed Telecare 2023;29(9):669–84.
3. Bajgain B, Rabi S, Ahmed S, Kiryanova V, Fairie P, Santana MJ. Patient-reported experiences and outcomes of virtual care during COVID-19: a systematic review. J Patient-Reported Outcomes 2023;7(1):126.
4. Butler DC, Joshy G, Douglas KA, Sayeed MSB, Welsh J, Douglas A, Korda RJ. ANU Telehealth in Primary Care Study team. Changes in general practice use and costs with COVID-19 and telehealth initiatives: analysis of Australian whole-population linked data. Br J Gen Pract 2023;73(730):e364–73.
5. Halcomb EJ, Ashley C, Dennis S, McInnes S, Morgan M, Zwar N, Williams A. Telehealth use in Australian primary

healthcare during COVID-19: a cross-sectional descriptive survey. BMJ Open 2023;13(1):e065478.
6. Nilsen P. Making sense of implementation theories, models and frameworks. Implement Sci 2015;10(1):53.
7. Damschroder LJ, Reardon CM, Widerquist MAO, Lowery J. The updated Consolidated Framework for Implementation Research based on user feedback. Implement Sci 2022;17(1):75.
8. Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing Implementation Science. Implement Sci 2009;4(1):50.
9. CFIR Research Team-Center for Clinical Management Research. CFIR 2.0 Constructs. 2023. Available from: https://cfirguide.org
10. Rouleau G, Wu K, Ramamoorthi K, Boxall C, Liu RH, Maloney S, *et al*. Mapping Theories, models, and frameworks to evaluate digital health interventions: scoping review. J Med Internet Res 2024;26:e51098.
11. Means AR, Kemp CG, Gwayi-Chore M-C, Gimbel S, Soi C, Sherr K, *et al*. Evaluating and optimizing the consolidated framework for implementation research (CFIR) for use in low- and middle-income countries: a systematic review. Implement Sci 2020;15(1):17.
12. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med 2018;169(7):467–73.
13. Liberati A, Altman DG, Tetzlaff J. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. BMJ 2009;339:b2700.
14. Bassilios B, Pirkis J, King K, Fletcher J, Blashki G, Burgess P. Evaluation of an Australian primary care telephone cognitive behavioural therapy pilot. Aust J Prim Health 2014;20(1):62–73.
15. Chow JSF, Gonzalez-Arce VE. Learnings from implementing telemonitoring: the LITE study. J Integr Care 2019;27(4):346–56.
16. Chow JSF, Knight A, Disney A, Kohler F, Duggan J, Maurya N, Gonzalez-Arce V. Understanding the general practice of telemonitoring integrated care: a qualitative perspective. 2021;27(- 5):370.
17. de Guzman KR, Snoswell CL, Giles CM, Smith AC, Haydon HH. GP perceptions of telehealth services in Australia: a qualitative study. BJGP Open 2022;6(1):1–11.
18. Dham P, Gupta N, Alexander J, Black W, Rajji T, Skinner E. Community based telepsychiatry service for older adults residing in a rural and remote region- utilization pattern and satisfaction among stakeholders. BMC Psychiatry 2018;18(1):316.
19. Hanna L, Fairhurst K. Using information and communication technologies to consult with patients in Victorian primary care: the views of general practitioners. Aust J Prim Health 2013;19(2):166–70.
20. Hardie RA, Thomas J, Li J, Pearce C, Georgiou A. General practice perspective on the use of telehealth during the COVID-19 pandemic in Australia using an Action Research approach: a qualitative study. BMJ Open. 2022;12(10).
21. Indraratna P, Biswas U, Liu H, Redmond SJ, Yu J, Lovell NH, Ooi SY. Process Evaluation of a randomized controlled trial for teleclinical care, a smartphone-app based model of care. Front Med (Lausanne) 2021;8:780882.
22. James S, Ashley C, Williams A, Desborough J, McInnes S, Calma K, *et al.* Experiences of Australian primary health care nurses in using telehealth during COVID-19: a qualitative study. BMJ Open. 2021;11(8).
23. Jones A, Mitchell LJ, O'Connor R, Rollo ME, Slater K, Williams LT, Ball L. Investigating the perceptions of primary care dietitians on the potential for information technology in the workplace: qualitative study. J Med Internet Res. 2018;20(10).
24. Katz IJ, Pirabhahar S, Williamson P, Raghunath V, Brennan F, O'Sullivan A, *et al*. iConnect CKD - virtual medical consulting: a web-based chronic kidney disease, hypertension and diabetes integrated care program. Nephrol (Carlton) 2018;23(7):646–52.
25. LaMonica HM, Milton A, Braunstein K, Rowe SC, Ottavio A, Jackson T, *et al.* Technology-enabled solutions for Australian mental health services reform: impact evaluation. JMIR Form Res. 2020;4(11).
26. O'Sullivan B. Challenges and innovations in access to community-based rural primary care services during the COVID-19 pandemic in Australia. Int J Health Plan Manage 2022;37(Suppl 1):115–28.
27. Smyth L, Roushdy S, Jeyasingham J, Whitbread J, O'Brien P, Lloyd C, *et al*. Clinician perspectives on rapid transition to telehealth during COVID-19 in Australia - a qualitative study. Aust Health Rev 2023;47(1):92–9.
28. Rangachari P, Mushiana SS, Herbert K. A scoping review of applications of the Consolidated Framework for Implementation Research (CFIR) to telehealth service implementation initiatives. BMC Health Serv Res 2022;22(1):1450.
29. Bower P, Wallace P, Ward E, Graffy J, Miller J, Delaney B, Kinmonth AL. Improving recruitment to health research in primary care. Family Pract 2009;26(5):391–7.
30. van den Brink MJ, Hummel M, Lemstra M, Berger MY, Dekker JH, Blanker MH. Factors affecting patient recruitment to trials: qualitative research in general practice. BJGP Open 2020;4(3):bjgpopen20X101056.
31. Dyas JV, Apekey T, Tilling M, Siriwardena AN. Strategies for improving patient recruitment to focus groups in primary care: a case study reflective paper using an analytical framework. BMC Med Res Methodol 2009;9(1):65.
32. Pugmire J, Wilkes M, Wolfberg A, Zahradka N. Health care provider experiences of deploying a continuous remote patient monitoring pilot program during the COVID-19 pandemic: a structured qualitative analysis. Front Digit Health 2023;5:1157643.

33. Chen W, Flanagan A, Nippak PMD, Nicin M, Sinha SK. Understanding the experience of geriatric care professionals in using telemedicine to care for older patients in response to the COVID-19 pandemic: mixed methods study. JMIR Aging 2022;5(3):e34952.
34. Husain A, Cohen E, Dubrowski R, Jamieson T, Kurahashi AM, Lokuge B, *et al*. A clinical communication tool (loop) for team-based care in pediatric and adult care settings: hybrid mixed methods implementation study. J Med Internet Res 2021;23(3):e25505.
35. Zanaboni P, Wootton R. Adoption of telemedicine: from pilot stage to routine delivery. BMC Med Inform Decision-Making 2012;12(1):1.
36. Cannedy S, Leung L, Wyte-Lake T, Balut MD, Dobalian A, Heyworth L, *et al*. Primary care team perspectives on the suitability of telehealth modality (phone vs video) at the Veterans Health Administration. J Prim Care Commun Health 2023;14:21501319231172897.
37. Wade VA, Eliott JA, Hiller JE. Clinician acceptance is the key factor for sustainable telehealth services. Qual Health Res 2014;24(5):682–94.
38. Lewinski AA, Sullivan C, Allen KD, Crowley MJ, Gierisch JM, Goldstein KM, *et al*. Accelerating implementation of virtual care in an integrated health care system: future research and operations priorities. J Gen Intern Med 2021;36(8):2434–42.
39. Mohammed HT, Hyseni L, Bui V, Gerritsen B, Fuller K, Sung J, Alarakhia M. Exploring the use and challenges of implementing virtual visits during COVID-19 in primary care and lessons for sustained use. PLoS One 2021;16(6):e0253665.
40. Li J, Varnfield M, Jayasena R, Celler B. Home telemonitoring for chronic disease management: perceptions of users and factors influencing adoption. Health Inform J 2021;27(1):1460458221997893.
41. Wang CJ, Liu TT, Car J, Zuckerman B. Design, adoption, implementation, scalability, and sustainability of telehealth programs. Pediatr Clin North Am 2020;67(4):675–82.
42. Zakerabasali S, Ayyoubzadeh SM, Baniasadi T, Yazdani A, Abhari S. Mobile health technology and health care providers: systemic barriers to adoption. Healthc Inform Res 2021;27(4):267–78.
43. Chuen VL, Dholakia S, Kalra S, Watt J, Wong C, Ho JM-W. Geriatric care physicians' perspectives on providing virtual care: a reflexive thematic synthesis of their online survey responses from Ontario, Canada. Age Ageing. 2024;53(1).
44. Edirippulige S, Armfield N. Education and training to support the use of clinical telehealth: a review of the literature. J Telemed Telecare 2017;23(2):273–82.
45. Zhao QJ, Rozenberg D, Nourouzpour S, Orchanian-Cheff A, Flannery J, Kaul R, *et al*. Positive impact of a telemedicine education program on practicing health care workers during the COVID-19 pandemic in Ontario, Canada: a mixed methods study of an Extension for Community Health care Outcomes (ECHO) program. J Telemed Telecare 2024;30(2):365–80.
46. Hilty DM, Chan S, Torous J, Luo J, Boland RJ. A telehealth framework for mobile health, smartphones, and apps: competencies, training, and faculty development. J Technol Behav Sci 2019;4(2):106–23.
47. Garber K, Gustin T. Telehealth education: impact on provider experience and adoption. Nurse Educ 2022;47(2):75–80.
48. Lum HD, Nearing K, Pimentel CB, Levy CR, Hung WW. Anywhere to anywhere: use of telehealth to increase health care access for older, rural veterans. Public Pol Aging Rep 2020;30(1):12–8.
49. Clay-Williams R, Hibbert P, Carrigan A, Roberts N, Austin E, Fajardo Pulido D, *et al*. The diversity of providers' and consumers' views of virtual versus inpatient care provision: a qualitative study. BMC Health Serv Res 2023;23(1):724.
50. Celler B, Varnfield M, Nepal S, Sparks R, Li J, Jayasena R. Impact of at-home telemonitoring on health services expenditure and hospital admissions in patients with chronic conditions: before and after control intervention analysis. JMIR Med Inform. 2017;5(3).
51. Gray C, Wray C, Tisdale R, Chaudary C, Slightam C, Zulman D. Factors influencing how providers assess the appropriateness of video visits: interview study with primary and specialty health care providers. J Med Internet Res 2022;24(8):e38826.
52. Brant H, Atherton H, Ziebland S, McKinstry B, Campbell J, Salisbury C. Using alternatives to face-to-face consultations: a survey of prevalence and attitudes in general practice. Br J Gen Pract 2016;66(648):e460.
53. Hardcastle L, Ogbogu U. Virtual care: enhancing access or harming care? Healthc Manag Forum 2020;33(6):288–92.
54. Arab-Zozani M, Imani A, Doshmangir L, Dalal K, Bahreini R. Assessment of medical equipment maintenance management: proposed checklist using Iranian experience. Biomed Eng Online 2021;20(1):49.
55. Alami H, Gagnon MP, Fortin JP. Some Multidimensional unintended consequences of telehealth utilization: a multiproject evaluation synthesis. Int J Health Policy Manag 2019;8(6):337–52.
56. Gogia SB, Maeder A, Mars M, Hartvigsen G, Basu A, Abbott P. Unintended consequences of tele health and their possible solutions. Contribution of the IMIA Working Group on Telehealth 2016;25(01):41–6.
57. Martin TL, Yu CT, Martin GL, Fazzio D. On choice, preference, and preference for choice. Behav Anal Today 2006;7(2):234–41.
58. Yee V, Bajaj SS, Stanford FC. Paradox of telemedicine: building or neglecting trust and equity. Lancet Digit Health 2022;4(7):e480–1.
59. Ramachandran M, Brinton C, Wiljer D, Upshur R, Gray CS. The impact of eHealth on relationships and trust in primary care: a review of reviews. BMC Prim Care 2023;24(1):228.

