Telehealth for primary healthcare delivery in rural and remote contexts in high-income countries—a scoping review

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Background: Telehealth is an important tool for improving access to health care in underserved areas. This scoping review explores the evidence for implementing telehealth as a mode for delivering primary health care (PHC) consultations by general practitioners (GPs) to rural and remote patients in high income countries.

Methods: Peer reviewed publications were sourced from CINAHL, PubMed, and the Web of Science. The Joanna Briggs Institute's (JBI) methodology for scoping reviews was followed. Data from each paper were coded deductively to five themes: (I) telehealth structures and processes; (II) patient and provider preferences for telehealth; (III) positive and negative outcomes of telehealth; (IV) characteristics of providers, practices and patients affecting telehealth adoption; and (V) barriers and enablers to the use of telehealth.

Results: Sixty papers were included. Rural and remote populations accept telehealth because of profound impacts on their otherwise long travel times, high travel costs, logistical difficulties and overcoming the generally lower availability of GPs in these locations. Providing face-to-face GP care to isolated small populations is also resource intensive and limited by GP availability, with provider travel time, travel costs and accommodation costs adding to the overall costs of service provision. The main concerns about telehealth were reduced ability to conduct physical examinations, privacy and data security, heavier clinic workloads and poorer relationships. Telehealth was most acceptable for after-hours and follow-up consultations. Effective telehealth required adequate connectivity and digital infrastructure and training of staff to support the patient and PHC provider, which was especially important if there were cultural differences or communication difficulties. Few studies focussed on the experience of telehealth for First Nations people or use of telehealth for PHC service delivery in remote locations.

Conclusions: Telehealth can be used as a supplementary mode for delivering PHC services to improve access and continuity of care in rural and remote locations, especially when there is a pre-existing relationship between the PHC provider and the patient. We recommend identifying contextual indicators and putting in place adequate monitoring and evaluation frameworks if introducing telehealth in rural and remote contexts and in the context of First Nations peoples.

Keywords: Video consultation; marginalised; teleconsultation; primary health care (PHC)

Introduction

Background

Ensuring equitable access to health care services for rural and remote populations is a challenge faced by governments and policy makers around the world (1). Multiple factors affect health care access in rural and remote locations including socioeconomic deprivation, geographical barriers, large distances from urban centres, lack of transport or telecommunications, low acceptability of services provided, and the costs of accessing and providing services (1). Telehealth has the potential to improve health care access for rural and remote populations (2), including during infectious disease outbreaks (3) and extreme weather events (4). The uptake of telehealth has burgeoned globally with many high-income countries substantially increasing investment in and use of telehealth in response to the coronavirus disease 2019 (COVID-19) pandemic (5). However, even prior to 2020, telehealth consultations were in use to improve health care access for populations living in rural and remote areas, including for First Nations people (6-8). Specialist telehealth consultations with patients co-located with their general practitioner (GP), nurse or Aboriginal health worker are increasingly common (9). There has been far less evidence related to telehealth as a consultation mode between GPs and patients in rural and remote contexts, where face-to-face consultation is considered to be the gold standard (10).

Rationale and knowledge gap

An international review with no clear focus on rurality found that while patients were generally satisfied with telehealth for primary health care (PHC) consultations due to the reduced waiting times and travel costs, face-to-face consultations were preferred (11). Another review found that telephone consultations were preferred as it reduced practice workload, however the rurality/remoteness focus of the studies was unclear (12). A review of Australian First Nations peoples' use of telehealth highlighted social and emotional benefits of receiving treatment within their community where they have access to family support (13). A review focussed on marginalised groups in the UK found that telehealth could overcome access issues, previous negative experiences with staff, stigmatising reactions from staff and other patients, offer anonymity and support the use of an interpreter (14). However, none of the included groups in the review were specifically rural or remote populations. Likewise, a review of e-visits which identified improvements in efficiency, continuity of care, quality of care, and access to care as advantages of telehealth use between patients and PHC providers, lacked a rural or remote focus (15). Mold *et al.*'s review of e-consultations found high acceptability and ease of use among patients from remote locations, although their conclusion was mainly derived from papers involving a GP-patient consulting with a specialist, rather than a patient consulting a GP (16).

For people living in rural and remote locations, there are often stark inequities in health outcomes and poorer access to PHC services may be exacerbating these inequities (17-19). Access to GP services is increasingly likely to be provided as intermittent services via outreach models as population dispersion and isolation increase (20). It is

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Highlight box

Key findings
- Key drivers of telehealth acceptability and uptake in rural and remote settings include large distance of patients from general practitioners (GPs), long travel times, high travel costs, intermittent availability of face-to-face GP services, and improved affordability as a result of coronavirus disease (COVID)-related changes to funding for GP telehealth.
- Telehealth appointment management processes vary according to who, if anyone, screened, triaged and decided about appropriateness of telehealth, how the GP-patient linkage occurred, who was present with the patient, whether a patient was present and whether digital equipment was used to support examination.
- Telehealth was preferred for after-hours care and follow-up appointments (e.g., test results, referrals, repeat prescriptions or chronic disease management) when there was a pre-existing doctor-patient relationship, and it was used as an adjunct to face-to-face consultations in a hybrid model of care.

What is known and what is new?
- We know that telehealth has great potential to improve health care access for rural and remote populations.
- Telehealth roll out in rural and remote locations should consider contextual factors to make it more effective and acceptable.

What is the implication, and what should change now?
- Rural and remote health services offering intermittent outreach GP services should explore opportunities to offer hybrid care models to increase access to regular GP care and support interpersonal continuity of care.
- GP telehealth models for culturally and linguistically diverse rural and remote populations will need to be adequately resourced to enable the use of additional support staff as cultural advisors or interpreters.

Table 1 Inclusion and exclusion criteria

Element	Inclusion criteria	Exclusion criteria
Telehealth	Pertains to the provision of a consultation where the provider and the patient are not in the same physical location and includes using any type of technology	Tele-monitoring (unless involves a remote consultation)
		Patient self-management programs where there is no consultation with a general practitioner
Telehealth provider	The telehealth consultation is provided by a primary health care medical practitioner (i.e., general practitioner, family physician or equivalent) who is providing first contact or an un-referred service—with or without an intermediary at the patient end or with an intermediary (e.g., remote area nurse) on behalf of the patient	Medical practitioner is not a primary health care medical practitioner (i.e., not a general practitioner, family physician or equivalent)
	Includes a telehealth consultation between a primary health care medical practitioner and a nurse/other health practitioner such as an Aboriginal Health Worker on behalf of a patient where the patient may or not be present	Other primary health providers including all allied health providers
		Consultations that include a specialist and a General Practitioner are excluded with or without referrals
Language	English	Languages other than English
Timeframe	No limitation	No limitation
Context	High income countries as per World Bank definition at the time of searching (https://data.worldbank.org/country/XD)	Low and middle-income countries at the time of searching
Level of geographical remoteness	Location of some of the study patients classified geographically as rural or remote as per terminology used in the paper	Urban location of all of the patients
Methods	Empirical research	Reviews, literature reviews, editorials, comments unless they have a data analysis component
	Qualitative and/or quantitative	

therefore important to specifically synthesise the literature around GP-patient teleconsultations in rural and remote contexts, to ensure that any efforts to improve access to PHC services in rural and remote areas using telehealth are informed by the strongest possible evidence base. A scoping review is best suited to understand the extent lines 1–4 of available evidence and identify any gaps.

Objective

This systematic scoping review focuses on telehealth consultations between GPs and patients (or the patient's proxy) in rural and remote locations in high-income countries and aims to synthesise current information on:

(I) The range of telehealth modalities used in rural and remote locations and appointment processes followed;

(II) Patient and provider preferences for the provision and delivery of telehealth;

(III) Telehealth outcomes, both positive and negative;

(IV) Specific characteristics of providers, practices and patients that affect telehealth adoption;

(V) Barriers and enablers to telehealth adoption.

We present this article in accordance with the PRISMA-ScR reporting checklist (available at https://mhealth.amegroups.com/article/view/10.21037/mhealth-24-75/rc).

Methods

A review protocol was not registered, but the scoping review was informed by the Joanna Briggs Institute's (JBI) methodology for conducting scoping reviews (21). The inclusion and exclusion criteria are provided in *Table 1*. Telehealth can encompass a range of functions and modalities including store and forward technologies, tele-monitoring and tele-consultation (22). For the purposes of this paper, telehealth consultations were defined as any form of remote consultation involving a GP and a patient

Table 2 Search terms

Database	Search terms	No. of records
PubMed	(((((((((((((((telemedicine[Title/Abstract]) OR (Tele-medicine[Title/Abstract])) OR (Telehealth[Title/Abstract])) OR (Tele-health[Title/Abstract])) OR (video consult*[Title/Abstract])) OR (video consultation[Title/Abstract])) OR (videoconsult*[Title/Abstract])) OR (remote consult*[Title/Abstract])) OR (telephone consult*[Title/Abstract])) OR (*phone consult*[Title/Abstract])) OR (video-consultation[Title/Abstract])) OR (video consultation[Title/Abstract])) OR (Tele?consult*[Title/Abstract])) OR (tele-consult*[Title/Abstract])) OR ("Remote Consultation"[Mesh])) AND (((((("primary health care"[Title/Abstract]) OR (primary health care[MeSH Terms])) OR ("General Practi*"[Title/Abstract])) OR ("family practi*"[Title/Abstract])) OR ("Physicians, Family"[Mesh])) OR ("family physician*"[Title/Abstract]))) AND (((((Rural Health service[MeSH Terms]) OR (Rural[Title/Abstract])) OR (remote[Title/Abstract])) OR (regional[Title/Abstract])) OR (non?metropolitan[Title/Abstract]))	1,048
CINAHL	S1 = AB telemedicine OR AB Tele-medicine OR AB telehealth OR AB tele-health OR AB "video consult*" OR AB video consultation OR AB videoconsult* OR AB "remote consult*" OR AB "telephone consult*" OR AB "phone consult*" OR AB "video-consultation" OR AB "tele consult*" OR AB "remote consultation" OR MJ telemedicine S2 = AB "primary health care" OR AB "general practi*" OR AB "family practi*" OR AB "family physician*" OR MM "primary health care" S3 = MM "Rural health services" OR AB Rural OR AB remote OR AB regional OR AB non?metropolitan S1 AND S2 AND S3	221
Web of Science	TI=(((((((((((((("telemedicine" OR "Tele-medicine") OR "Telehealth") OR "Tele-health") OR "video consult*") OR "video consultation") OR "videoconsult*") OR "remote consult*") OR "telephone consult*") OR "phone consult*") OR "video-consultation") OR "video-consultation") OR "tele consult*") OR "tele consult*") OR "Remote Consultation"[MeSH Terms]) AND ((((("primary health care"OR "primary health care"[MeSH Terms]) OR "general practi*") OR "family practi*") OR "physicians, family"[MeSH Terms]) OR "family physician*")) AND ((((("rural health services"[MeSH Terms] OR "Rural") OR "remote") OR "regional") OR "non metropolitan" OR "northern Health" OR "frontier health")) OR AB=(((((((((((((("telemedicine" OR "Tele-medicine") OR "Telehealth") OR "Tele-health") OR "video consult*") OR "video consultation") OR "videoconsult*") OR "remote consult*") OR "telephone consult*") OR "phone consult*") OR "video-consultation") OR "video-consultation") OR "tele consult*") OR "tele consult*") OR "Remote Consultation"[MeSH Terms]) AND ((((("primary health care"OR "primary health care"[MeSH Terms]) OR "general practi*") OR "family practi*") OR "physicians, family"[MeSH Terms]) OR "family physician*")) AND ((((("rural health services"[MeSH Terms] OR "Rural") OR "remote") OR "regional") OR "non metropolitan" OR "northern Health" OR "frontier health"))	300

or a health care professional such as a nurse on behalf of a patient.

Searches of the peer-reviewed literature were undertaken in April 2023. Sources searched include CINAHL, PubMed, and Web of Science databases (see *Table 2* for search terms). Two reviewers independently reviewed each title and abstract. Any disagreements were resolved by re-reading the abstract or including the paper for full text review. Where there was disagreement between reviewers on full texts, the papers were re-read and discussed until a consensus was reached or a third reviewer was involved. Detailed data extraction, including the location of the study, data used, main findings, and telehealth modality or structure used, was then undertaken.

Key findings from each paper were coded deductively (23)

across five themes that aligned with the research questions: telehealth structures and processes; patient and provider preferences for telehealth delivery; positive and negative outcomes of telehealth; and characteristics of providers, practices and patients affecting telehealth adoption; and barriers and enablers to the use of telehealth. Nvivo 12 software was used for the coding process. Consistent with the strengths and methods for conducting scoping reviews, the purpose was to identify what is known and has been studied and did not include any critical analysis or quality assessment of the individual papers.

Results

As shown in the PRISMA flow diagram (*Figure 1*), 1,569
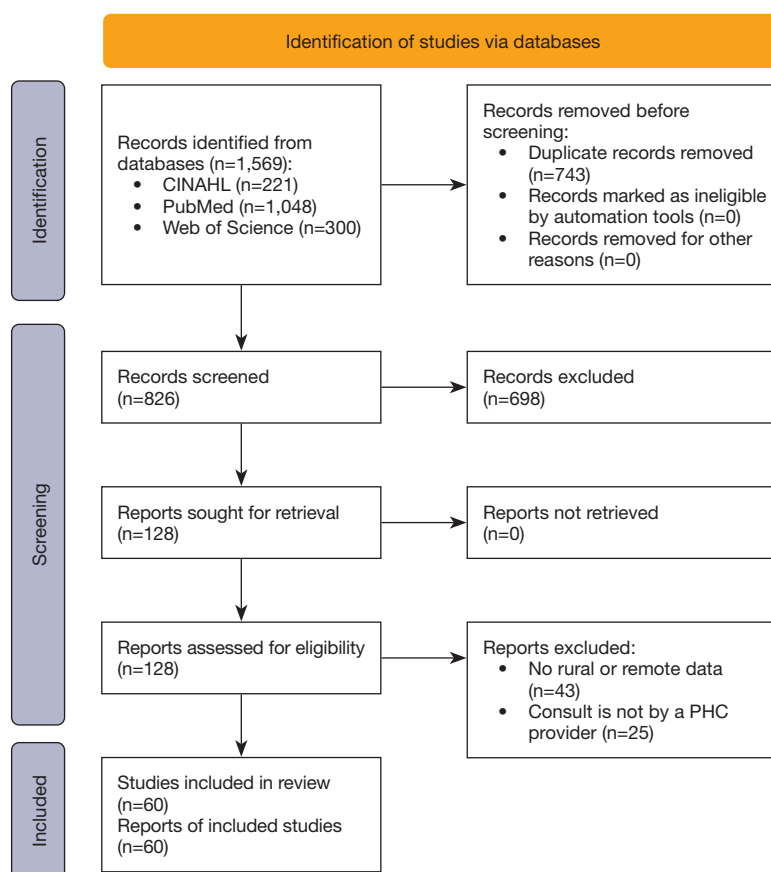
Figure 1 PRISMA flow diagram. PHC, primary health care.

papers were identified through database searching and 128 papers were included for full text review. Full text review resulted in exclusion of further papers (for reasons including GP-patient consultation was with a specialist or there were no patients or health professionals from rural/remote locations). Sixty papers satisfied the inclusion and exclusion criteria and have been included in this review. The key data extracted from each included paper are summarised in *Table 3*.

Telehealth structures and processes

Telehealth modalities

The modalities of telehealth investigated in the studies included video-consultation (consultation using video and audio) (24,38,53,58,61,63,68,71,76,78,83); telephone-consultation (audio only) (25,57,66,72,84); asynchronous email and messaging (no synchronous audio or video) (49,55,56,79,81); or various combinations of these (10,26,28-30,32-34,36,40,42,45-48,51,62,64,65,67,71,73,74,80).

Uscher-Pines *et al.* described Teladoc, which comprised telehealth audio consultations via phone with live video via Webcam or smartphone applications (79).

E-consultations, also termed asynchronous messaging, comprised exchange of data via a shared electronic health portal or a web-based platform (10,49,55,56,67,73,79,81). For example, UK's free online e-Consult platform provides a symptom checker, pharmacy advice, and a link to UK's National Health Service information page, with the ability to perform administrative functions and for a patient to submit a request for an e-consultation (49). A GP then allocated requests to an appropriate consultation method (face-to face, telephone, other). Another asynchronous e-consultation service was Spain's e-Consulta portal which was an adjunct to face-to-face care (55,56,81). The e-Consulta portal keeps records of consultations and patients can submit queries and attach files. It was intended to replace low value-added face-to-face GP consultations such as consultations for receiving results of laboratory

Table 3 Characteristics of included papers

Reference	Data used	Location	Objective of the study	Results	Description of telehealth used
Berry et al., 2022 (24)	Interviews with patients from a low-income background (n=18)	New York State, USA (rural, urban and suburban)	To explore patients' experiences of telehealth during the COVID-19 pandemic, including perceptions on quality of care and advantages and challenges associated with different modalities	Patients perceived the quality of telehealth visits to be similar to in-person visits, but this was dependent on the type of services. Telehealth consultations were perceived to be unsuitable for appointments that required visual or physical diagnosis. The benefits of telehealth included ease of use, convenience, and comfort. Barriers to use, particularly for older adults, included a lack of connectivity and devices (e.g., limited broadband, cell coverage, and equipment) and discomfort or unfamiliarity with technology. Patients also had concerns about privacy, particularly for video visits. Patients highlighted the importance of training for patients who had limited technological experience and suggested integrating scheduling systems with telemedicine platforms. Most patients planned to return to in-person visits following the pandemic, although supportive of telehealth remaining an option to reduce access barriers faced by some individuals	Video and telephone consultations between patients and GPs
Budrevičiūtė et al., 2022 (25)	Questionnaire with family physicians (n=191)	Lithuania (11.5% rural)	To establish the frequency of use of telemedicine during the COVID-19 pandemic and understand its relationship with sociodemographic characteristics	Frequent telephone (79.6%) or in-person (63.9%) consultations were reported by most family physician respondents. 57% reported never consulting patients over the Internet. During the pandemic, family physicians who never or rarely had in-person consultations (i.e., mostly used telehealth) were significantly older and significantly more experienced than those who frequently or always consulted in-person	Phone consultations, over the internet, or in-person consultations
Toll et al., 2022 (26)	Focus groups with diverse consumer groups, including those from low socio-economic areas, Aboriginal and Torres Strait Islander communities and non-English speaking community members (n=90)	Australia, all jurisdictions except Northern Territory and Tasmania (cities, rural, remote and regional areas)	To explore consumer experiences of telehealth during the COVID-19 pandemic	Telehealth was perceived to be acceptable for simple, routine, or non-acute situations and when seeing a previously known provider, but not for complex or sensitive issues or where physical exams were needed. Participants wanted the option to choose between telehealth modalities, and 24/7 availability. Barriers to using telehealth included access issues (e.g., language barriers, digital literacy, occasional longer wait times, and lack of efficient systems and processes), establishing trust with new providers, poor communication, poor technical quality and privacy concerns. For rural and remote locations, increasing reliability of technology and increasing connectivity were important for improving telehealth consultations. Perceived benefits included convenience, access, and reduced cost, though value for money was perceived to be less for telehealth. Strategies to enhance accessibility, such as interpreter services, were suggested	Video and telephone consultations between patients and GPs
Hanna et al., 2022 (27)	Interviews with primary health care administrators, providers, advanced practice providers and residents (n=42)	10 States, USA (45.2% rural practices)	To identify barriers and facilitators to cancer screening during the COVID-19 pandemic and explore recommendations to support cancer screening	Most participants felt that telehealth provided an opportunity to discuss cancer screening at a time when in-person visits were not available. Some participants perceived telehealth visits to be more efficient than in-person, making it easier to discuss cancer screening. Several mentioned reimbursements as enablers for phone visits, particularly for engaging patients with limited internet access or digital literacy. A lack of staff made it difficult to implement telehealth and rural clinics had more difficulty with telehealth implementation due to a lack of infrastructure (e.g., lack of Wi-Fi throughout the practice)	Telehealth definition not reported
Burton et al., 2022 (28)	Focus groups (n=3) with providers and clinic managers (n=4) and patients (n=8)	British Columbia, Canada	To explore opportunities and barriers to sustainable patient-centered virtual care delivered by a rural micropractice	The study found patients' and providers' experiences clustered around four themes: learning and evolving the micropractice model, communicating meaningfully, partnering in care, and transitioning seamlessly to an increased virtual care model during the pandemic. There was a learning curve for both providers and patients to operate in a technology-enabled virtual care model that occurred through trial and error in using different systems, to find the optimal fit over time. Patients and providers reported ease of communication and high satisfaction, and patients reported being highly engaged, feeling empowered, safe and cared for, but noted limited care coordination with specialists. Providers were concerned about missing diagnoses, and impact of virtual care on work-life balance	Virtual care options were integrated with the micropractice's electronic medical records, including a patient portal for video-conferencing visits, secure messaging, appointment booking and reminders, and broadcast messaging and information sharing; with email as a last resort. Patient communication was supported and triaged by the medical office manager and addressed by the physician when needed
Eggleton et al., 2022 (29)	Survey with nurses, GPs and practice managers (n=1,516)	New Zealand, Australia, USA, Canada (including 20% rural practices)	To assess effects of the COVID-19 pandemic on strain experienced by practices and differences between urban and rural practices	Rural practices reported more face-to-face consultations and less video or telephone consultations than urban practices. Reimbursement of telehealth consultations, or use of other forms of telehealth e.g., portals, did not differ between rural and urban practices	Video and telephone consultations between patients and GPs, and patient portals
Ivancic et al., 2023 (30)	Survey with consumers ≥45 years of age (n=45,071)	New South Wales, Australia (major cities, inner regional, outer regional to remote)	To examine how COVID-19 impacted access to healthcare services and use of telehealth, and ongoing acceptability and usefulness of telehealth services	Forty-eight percent of participants reported using telehealth services since January 2020, with most using phone (96.0%) and some using video (9.0%). Higher users of telehealth included those who received treatment in the last month for cancer, mental health, heart disease and asthma, and those with a disability/illness and females. Lower usage was found for males, those aged 45–64 years, from non-English-speaking backgrounds and residing in outer regional and remote areas. Telehealth services were reported to be 'as good or better than in-person healthcare services' by 59.7% of participants, although 30.2% reported it to be worse	Video and telehealth consultations
Muehlensiepen et al., 2022 (31)	Survey of German GPs (n=437) and rheumatologists (n=48)	Germany (including rural providers)	To identify factors associated with GPs and rheumatologists' telemedicine use and willingness	Of 83 variables, 13 determinant factors were associated with telehealth use and 17 with telehealth willingness. Being female, having very poor knowledge of telemedicine, treating fewer patients per quarter, perceptions that telemedicine was not at all important for current work and not being willing to use telemedicine, were negatively associated with telehealth use. Being aged 51 to 60 years, being located in a rural area, not using telemedicine, thinking that it was not suitable or important for future work were negatively associated with willingness. Factors that were positively associated with telemedicine willingness included owning a smart device and working in an urban area	Not described

Table 3 (continued)

Table 3 (*continued*)

Reference	Data used	Location	Objective of the study	Results	Description of telehealth used
Eggleton *et al.*, 2022 (32)	Survey with GPs (n=1,516), 20% from rural practices	New Zealand (urban and rural primary care clinics)	To explore how COVID-19 and subsequent new models of care impacted rural and urban clinic staff	GPs were positive about telehealth but were concerned about the increased difficulty in establishing therapeutic relationships over the phone and the transactional nature of consultations. Telehealth was seen to be beneficial for some population groups and for some medical consultations but raised challenges for others such as patients with complex issues, new consults, children or older patients, those with poor IT literacy, and patients with English as a second language or hearing impairments. Rural patients were seen to benefit more from remote consultations, however poor mobile phone coverage was a challenge in rural areas. GPs observed reluctance by patients to pay as telephone consultations were perceived to have lower value than face-to-face interactions. Changes such as training receptionists in telephone triage led to more appropriate use of GPs' time	Not described
Chen *et al.*, 2022 (33)	Interviews with primary care physicians (n=15) and geriatricians (n=18)	USA (metro, suburban, and 2 rural physicians included)	To explore physician experiences in providing telehealth to older adults during the COVID-19 pandemic and identify strategies used to overcome barriers	Prior to the pandemic, 58% used some mode of telehealth. Challenges included access to smart phones and/or access to data or sufficient call-minutes on their phone plan and privacy and safety concerns. Strategies to increase telehealth acceptance and use included being flexible with mode of telehealth used, providing accommodations and enhanced communication for those with a disability or older patients, enhanced reassurance and support for the first visit, utilising clinical staff and students to assess readiness and educate patients on technology use, and involving family members and caregivers	Phone and video consultations
Dai *et al.*, 2024 (34)	Telehealth consultation data (n=27,980 residents of aged care facilities)	Victoria and New South Wales, Australia (1,300 general practices, including in rural areas)	To understand the relationship between telehealth utilisation and sociodemographic characteristics of residents in residential aged care facilities	Over 90% of telehealth consultations were conducted by telephone. Aged care facility residents in rural areas were 72% more likely to use telehealth, although 59% less likely to use video than telephone consultations compared to residents in urban areas.	Phone and video consultations
Sutarsa *et al.*, 2022 (35)	Interviews with patients (n=10) and GPs (n=3)	Rural New South Wales, Australia	To understand patient and GP experiences of using telehealth services in rural and remote settings	Telehealth was perceived to improve accessibility and availability and save time and money where specialist care was limited or absent, but the importance of having GPs facilitate consultations was stressed. Participants felt telehealth did not allow for a deeper caring relationship and perceived it to be superficial or fragmented in nature, lacking personal touch and understanding of social circumstances, affecting trust and confidence in the care relationship. Concerns about inequitable access and outcomes, particularly among elderly patients, those with limited access to internet and without sufficient digital literacy skills, were raised. The study highlighted that telehealth must support but not substitute care delivered by rural clinicians, and that face-to-face must be retained in acute and life-threatening situations. Being able to consult emergency and critical care specialists through telehealth platforms was seen as beneficial to help confirm diagnosis and treatment	Model not specifically described, but telehealth was referred to the use of information and communication technologies to deliver health services
Smart *et al.* 2023 (36)	Interviews (n=13) with primary care staff including GPs and administrative staff	South West England (includes rural and urban sites)	To explore primary care staff experiences on the use of online consultation and synthesise staff recommendations to improve service delivery	Respondents, particularly administrative staff talked about less meaningful relationships with patients due to reduced face-to-face contact. Administrative staff also highlighted that their workload was shifted (e.g., from front desk staff) and was often 'unseen' as people were directed to online resources and decisions were made via the online technologies available. GPs highlighted the increased workload control through online consultation	Online consultation included several digital forms of interaction between a practice and a patient (e.g., webchat, online forms, text messaging, emailing and video consultations)
Kruse-Diehr *et al.* 2022 (37)	Interviews (n=7) with primary care staff predominantly nurses	Rural Appalachian Kentucky, USA	To explore barriers to colorectal cancer screening during the COVID-19 period by primary health care providers	The study found increased use of digital educational tools and telehealth consultations for annual wellness visits during the COVID period	Not described
Greenhalgh *et al.* 2022 (38)	Interviews and focus groups (n=121: 33 patients, 55 GPs, 11 other clinicians, nine managers, four support staff, four national policymakers and five from the technology industry)	United Kingdom (rural and urban)	To explore the reasons for limited use of video consultations in general practice	The study found that patients consulted via video often required face-to-face follow-up, which meant there wasn't much reduction in GP workloads. Some patients found video consultations convenient, appropriate, and reassuring while others felt a therapeutic presence was achieved only in person. Video consultations were perceived as beneficial for out of hours consultations, nursing home consultations, statutory functions (for example, death certification) and emergency assessments (during COVID-19 period). Specifically, rural residents pointed out benefits of less travel for both patients and health care professionals. Increasing reliance on video consultation services (often accessed through smartphone applications) was discussed as a matter of concern as many rural locations had poor access to digital infrastructure	Video consultation
Marshall *et al.* 2023 (39)	A state-wide survey (n=53) and interviews (n=20). with of doctors, nurse practitioners, physician assistants and staff	Rural Arkansas, USA	To explore factors affecting the provision of affirming-care best practices for transgender individuals by primary care providers	All participants recognized the need for education/training in providing transgender care and existing providers' knowledge gaps about transgender specific treatments which hindered their ability to provide affirming-care best practice for transgender patients. The study concluded that enabling telehealth consultations between patients and transgender-care experts was the most desired strategy to improve access to affirming care for this minority population	Not described

Table 3 (*continued*)

Table 3 (*continued*)

Reference	Data used	Location	Objective of the study	Results	Description of telehealth used
Smyth *et al.* 2023 (40)	Interviews (n=39) with primary (public and private, n=11) and specialist clinician staff	Australian Capital Territory and surrounding regional New South Wales, Australia (rural also included)	To explore the suitability of telehealth for ongoing primary and specialist practice	The study found that the suitability of telehealth depended on patient population attributes (e.g., digital literacy, access to devices, age, issues with communication such as language spoken, speech, hearing or cognitive deficits, and mobility issues such as patient frailty) and attributes relating to attitudes (e.g., patient engagement, comfort with using telephone or video, willingness, established rapport with GP), contextual attributes (e.g., satisfactory internet and mobile connectivity for both patient and GP, geographical footprint of practice, whether it was a follow-up or initial consultation, requirement for physical examination) and the risk attributes [e.g., risk of misdiagnosis because of missing physical examination information, lack of visual cues (phone consultations), inadequate patient rapport, limited patient disclosure, or patients not taking the consultation as seriously as a face-to-face consultation] and benefits of a telehealth approach (e.g., patient convenience—reduced travel, safety of immunocompromised patients, comfort of the environment, ease of having multi-disciplinary consultations or recording of consultations)	Video and telephone consultations
Carrier *et al.* 2022 (41)	Questionnaire (n=233, 144 in rural) sent to GPs	France (rural included)	To describe the recent practices of telehealth consultations and the breaches of best practice guidelines	The study found that the proportion of GPs with a good level of telehealth best practice was low (25%). The study also found that (I) urban practice environments, (II) patient initiation in telehealth consultation, and (III) frequent teleconsultations (e.g., >5 per week) were factors associated with a significantly higher level of best practice in telehealth	Not described
Knörr *et al.* 2022 (42)	Online survey (n=1,521) with GPs, cardiologists, gastroenterologists, paediatricians, gynaecologist, ear, nose, and throat specialists	Germany (rural practice included)	To explore the use of telehealth during the COVID-19 pandemic	The study found that telehealth use increased during the pandemic. GPs rated the usefulness of telehealth higher than gynaecology and Ear Nose and Throat specialist staff. Physicians in group practices rated the benefits of telehealth significantly higher than physicians in solo practice. Urban physicians showed a higher association with the use and positive assessment of telephone consultations than rural physicians. Female physicians reported higher use of telephone consultations. The lack of equivalency of telehealth was reported as a barrier	Telephone and video consultation
Beatty *et al.* 2023 (43)	Survey and interviews	Alabama and South Carolina, USA (Rural and urban federally qualified health centers)	To investigate telehealth, use for contraceptive service provision during the initial months of the COVID-19 pandemic	Telehealth for contraceptive care increased during the early months of the pandemic. A smaller proportion of rural clinics than urban clinics provided telehealth for contraceptive counselling, emergency contraception, and sexually transmitted infection care. Key facilitators of telehealth were reimbursement policy, electronic infrastructure and technology, and funding for technology. Barriers included challenges with funding for telehealth, limited electronic infrastructure, and reduced staffing capacity	Not described
Kursīte *et al.* 2022 (44)	Analysis of consultation data and interviews with GPs and specialists (n=34)	Latvia (includes rural areas)	To analyse consultations provided to patients with non-communicable diseases and explore clinicians' experiences of providing remote consultations during the first wave of the COVID-19 pandemic	During the first wave of the COVID-19 pandemic, a large proportion of consultations were via telehealth. When the COVID-19 related restrictions were at their peak, one third of cancer related consultations and almost half of the GP consultations for other non-communicable diseases were via telehealth. Clinicians raised concerns about remote consultations with patients who had low health literacy (e.g., misuse of prescribed medications and their inability to describe their symptoms) and who were not regular patients. Patient data protection and privacy issues were also highlighted (e.g., clinician separation of private lives from work; use of various information channels such as WhatsApp, Facebook, and email to exchange patient information)	Remote consultations—ehealth also mentioned
Petrazzuoli *et al.* 2022 (45)	Questionnaires (n=406) from rural primary care providers from 16 European countries	Rural Europe	To understand the effects of the pandemic on changes in patient consultations in European rural primary care	Remote teleconsultation was valued by both healthcare professionals and patients. The most common telehealth modality was by telephone. Senior primary health care providers were less likely to adopt video consultation	Telephone and video consultations
Imai *et al.* 2022 (46)	Electronic patient data from approximately 800 general practices in Victoria and New South Wales (NSW), Australia	Victoria and New South Wales, Australia	To evaluate the uptake of telehealth consultations and associated patient characteristics in Australian general practice	Over 80% of patients (n=57,916) had telehealth consultations during the pandemic. Telehealth consultations were positively associated with patients with type 2 diabetes mellitus, chronic kidney disease, older age, female, prescribed medications for diabetes, and lived in remote areas. In terms of health outcomes, the study did not find any significant difference in 6-monthly HbA1c levels between telehealth and face-to-face consultations	Telephone and video consultations
Green *et al.* 2023 (47)	Pre (n=103) and post (n=175) model evaluation survey	Central Australia, Australia	To evaluate changes in clinicians' perceptions of efficiency and timeliness of the new medical retrieval and consultation centre and remote outreach consultation centre model in Central Australia	The availability of separate telehealth support for emergency and primary health consultations were perceived to provide timely and efficient care for remote community members (who were predominantly First Nations people) rather than having a single telehealth support for both emergency and primary health care	Telephone and video consultations provided by doctors with advanced critical care skills for emergencies 24/7 and afterhours primary care advice while GPs provide primary care telehealth (telephone) advice in business hours
Mathew *et al* 2023 (48)	Interviews (n=248) with staff working in several Aboriginal community-controlled health services across Northern Australia	Northern Australia	To explore health care staff perceptions on the main factors that enable or limit the use of telehealth for Aboriginal and Torres Strait Islander patients living in remote and very remote communities of Australia	The paper highlighted the need for a pre-established relationship between patients (predominantly First Nations patients) and the primary health care provider for effective telehealth consultation. Telehealth was perceived to work well for patients with good health literacy, who spoke English and had access to and familiarity with digital technology. Telehealth was thought to be resource intensive, particularly increasing the workload on the primary health care staff working in remote parts of Australia. Hybrid models of delivery, which include both telehealth and face-to-face-to-face consultations, were considered appropriate for residents of remote Australia	Telehealth was defined as use of telephone or video calls for primary care or specialist medical consultations

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Reference	Data used	Location	Objective of the study	Results	Description of telehealth used
Banks *et al.* 2018 (49)	Interviews (n=23) with clinical, administrative, and management staff from 6 practices	West of England (one rural practice included)	Evaluate whether an e-consultation system improves the ability of practice staff to manage workload and access	The study found that in most cases, GPs needed to follow up after the e-consultations either by phone or face-to-face, adding to their workload. Patients often used the e-consultation system as a route to obtain a quick face-to-face or telephone appointment rather than as a way of obtaining health information. GPs also felt most e-consultations did not contain sufficient information to inform clinical decision making. The asynchronous nature of the assessment meant additional information could not be requested. E-consultations were preferred by GPs for patients who required small changes to their medications for an ongoing issue (e.g., changes in blood pressure tablets)	eConsult, an online platform gives patients access to advice and care via their GP practice website
Brant *et al.* 2018 (50)	Interviews with patients (n=39) and staff including GPs, practice mangers, practice co-ordinators, nurses, receptionists, rural health workers, patient service manager and information technology staff (n=45)	England and Scotland (city, semi-rural and rural practice)	To understand the role of receptionists on the implementation of new approaches such as telehealth for primary care delivery	The high workload and lack of training meant that receptionists had to use their own intuition or perception about when and how to offer different consultation modalities. Telephone consultations were often considered to be a secondary option in cases where face-to-face appointment slots were unavailable. This makes it crucial to involve reception staff in the planning and implementation of new models of service delivery	In the rural practice, there were telephone slots, about six a day, and the receptionist would add more at the end of the day if needed. Video consultation was aimed for people living remotely but was rarely used
Grindlay and Grossman 2017 (51)	Interviews (n=8) with clinic staff (physicians, managers, medical assistants)	Planned Parenthood of the Great Northwest and the Hawaiian Island clinics in Alaska, USA	To explore providers experiences of telehealth for medical abortion	Impact of telehealth on women included increased availability of appointment times and decrease in travel requirements. From a provider perspective, there was minimal impact on clinic flow or patient-provider interaction. It also improved clinic efficiency (e.g., Fewer clinicians were needed to provide a medical abortion versus surgical abortion, physicians were scheduled only as needed which improved their ability to see patients in multiple clinics in one day). Suggestions for improvement included changes to video display to avoid patient self-viewing; wider angle video displays so that both patient and provider are aware of who else is in the room; and a software system that would enable better navigation between medical charts and patient video	Model of care where women seeking abortion first meet face-to-face with clinic staff for initial investigations and information and to provide consent. The physician will electronically review the patient's history and ultrasound images and finally have the telehealth session with the patient. A similar system was trialled at Iowa. One of the differences was that the Alaskan service did not use a remote tele-pharmacy system to dispense the medications to the patient
St Clair and Murtagh 2019 (52)	National survey (n=283) and interviews (with rural, regional or remote residents) to develop case studies and interviews	Australia wide, more participants from the Northern Territory (83% were rural/remote, 17% urban)	Explore consumer perceptions on the barriers and drivers to telehealth uptake	In this pre-COVID study, most of the survey respondents thought telehealth consultation should be funded under Medicare. While 74% of the respondents knew about telehealth, only 64% knew they could access it and only 25% used telehealth. The benefits of telehealth included savings related to patient and clinician travel time and improvements to diagnostic capabilities. Barriers to accessing telehealth included inadequate internet connections and data allowances, consultations that were not billable to Medicare, some specialist consultations that were not available via telehealth, training needed to deliver telehealth, lack of funding/resourcing for patient end-support and quality of telecommunication service (e.g., reliability of services in rural, regional and remote areas was affected by poor internet). Suggestions for improvement included: (I) options for video calls in emergency situations, (II) a telehealth app for homeless people with medical conditions, and (III) priority access to patients with special needs and increased/unmetered data allowance for telehealth services	Not described
Jiwa and Meng 2013 (53)	Survey with GPs (n=47)	Australia (rural and remote Australia included)	Explore attitudes of GPs toward video consultation by using a range of patient scenarios presenting different clinical problems through 6 video vignettes	Experienced GPs and GP Registrars working in remote practice, and those from larger group practices were more supportive of video consultations. Most participants agreed on the diagnosis in all video scenarios. Around one-third of participants were positive about video consultation. The majority were against video consultations for consulting patients experiencing life-threatening conditions (e.g., chest pain) due to the inability to interact physically with the patient. GPs were most likely to conduct video consultations with patients seeking a repeat prescription (e.g., for diabetes or hypertension treatment). Respondents also highlighted the importance of follow-up consultations	Not described
Ross *et al.* 2016 (54)	Survey with patients (n=28) and stakeholders (n=14 which included receptionists and community health workers, decision-makers, physicians, nurses) and analysis of patient telehealth consultation records (n=60, all records were of members of the First Nations communities)	Peerless Lake and Trout Lake, Canada (two First Nations communities in northern Alberta)	Evaluation of a pilot telehealth project to determine its feasibility and sustainability	There was a higher (17%) no-show rate than regular face-to-face clinic no-show rates (4.8–6.6%). More female and younger patients were seen. 29 patients booked for video consultation, and 21 were walk-ins. The common reasons for presentations were rashes, refill prescriptions for scripts for contraception or anti-hypertensive medication. Five of the patients required face-to-face supplementary appointments. Patients perceived waiting time to be acceptable and appointments to be easy to book. All users reported that they could understand the provider and they would use the service again. Stakeholder participants thought telehealth met the needs of the community and was sustainable as it decreased the requirement to travel, improved access, and provided education programs to increase community awareness. The study excluded ten non-English-speaking patients who were seen through telehealth, so issues linked to language barriers are unclear for the study	Nurses (support staff) screened patients to make sure their problem was suitable for telehealth. Patients were then taken to a private consultation space with support staff and a digital stethoscope. Diagnostics were faxed for visiting nurse practitioner to perform any treatment, prescriptions were faxed to pharmacy and medications were transported to the health centre

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López Seguí *et al.* 2020 (55)	Review of eConsult data by 18 GPs	Central Catalonia, Spain (mainly rural area)	To explore GP perception of whether eConsulta reduced face-to-face consultations with GPs	The use of eConsulta in ~88% of e-consultations avoided the need for a face-to-face appointment. Telehealth was most frequently used for test results, medical enquiries, and repeat prescriptions. Longer messages in eConsulta were more likely to be satisfactorily concluded	eConsulta included an asynchronous teleconsultation via messages, with access to the electronic health record by the GP. In the model discussed, face-to-face consultations were also available if required
Fernández *et al.* 2020 (56)	Analysis of administrative data	Central Catalonia, Spain (mainly rural area)	To analyse the sociodemographic factors that affect the likelihood of doctors using eConsulta	Higher eConsulta use was observed among doctors in the age category 45–54 years, had a quality of care index above the 80th percentile, had a high degree of accessibility, were involved in teaching and/or worked in a high socioeconomic urban setting. The lower use of eConsulta observed in rural areas was linked to the wide availability of local GP surgeons in rural areas compared to other regions	eConsulta included asynchronous teleconsultation via messages, where GPs could also access patient electronic health
Olesen and Jolley 1994 (57)	Survey with patients and analysis of pre-post and post consultation data	Denmark (rural counties only)	To evaluate the out-of-hours care provided via telephone consultations	The new service was associated with reduced numbers of home visits and increased telephone advice. The majority of patients were satisfied with the services. Administrative costs were also less	Patients call a single phone number, 1–8 doctors are on duty to answer the calls at a coordination centre and either provide GP advice, or refer to emergency clinic or home visits. The coordination centre has patient's names addresses and insurance numbers. Doctors at coordination centre can provide electronic prescriptions, and send record of consultation to patients regular GPs
Timonen 2004 (58)	Randomised controlled trial including 508 patient visits treated remotely and 490 visits treated face-to-face	Finland (remote)	To identify the technical solutions what teleconsultation requires and to report on the implementation of the solutions and process of the teleconsultations	Patients were equally satisfied with both telehealth as well as face-to-face consultation, but telehealth was estimated to cost 30% more than traditional care. The transfer of information in telehealth was considered to be good enough to make reliable diagnoses	Patients visiting remote health centre were randomly assigned to receive usual care or telehealth consultations
Kuhn *et al.* 2017 (59)	Survey of local politicians [Mayors (n=292) and country administrators (n=31)]	Germany, lower Saxony (81% from a rural area)	To understand attitudes towards various supplementary healthcare models, including telehealth	Only 14% of the participants supported telehealth for rural areas. There were broad reservations about telehealth due to its impersonal treatment model and respondents were worried that it may not be suitable for the elderly. There were also concerns about lack of availability of technology and quality of care, lack of acceptance and trust among people	Model not specifically described, telehealth defined as the provision of medical care by a distance, allowing patients to be treated in their own homes
Schröder *et al.* 2018 (60)	Survey (n=277) and focus group discussions and interviews (n=20) with patients and stakeholder representatives affiliated with mobility in the district	Waldshut, Germany (rural)	To investigate the mobility behavior of a rural population in terms of medical consultations	The survey responses indicated that 60% expected to reach their GP within 15 minutes and 32% of patients could conceive of using telehealth. Interviews indicated that telehealth use could save travel time but, should be implemented with a face-to-face option if required. Respondents were concerned that telehealth could potentially weaken patient/physician relationships and could be difficult for elderly patients	Not described
Harvey, Peterkin and Wootton 2010 (61)	Patient telehealth usage data	Letham, Scotland (large rural village in NE Scotland)	To evaluate a telehealth model of care	A total number of 646 teleconsultations were conducted during the 11-year study period. Telehealth was used for a range of health issues including postnatal care, mental health problems, physical ailments, receiving test results and discussions with the doctor. Female patients seemed to use telehealth more than male patients. The median return rate was 55% i.e., those who returned for a further teleconsultation, type of consultation	The service included a nurse run clinic plus video consultation where appropriate with a GP
King, Richards and Godden 2007 (62)	Interviews with GPs and practice nurses	Scotland—26 of Scotland's most remote practices and 5 of the 7 most rural health boards	To explore attitudes of primary care providers (nurses and doctors) to the adoption of telemedicine	GPs were more positive about the use of computers and telehealth than nurses. Adoption of technology was easier for younger professionals. Respondents were more supportive of using telemedicine for education than consultation. Barriers were related to the quality of communication during videoconferencing and the need to embed it into organisational routines of practice	Model of care not discussed, but telehealth was defined as the transmission of laboratory results, X-rays or electrocardiograms, and audioconferencing or videoconferencing for education or clinical purposes
Torppa *et al.* 2006 (63)	Video analysis of 30 tele consultations	Northeast Finland (rural)	To analyse the interaction between patient-nurse-doctor teleconsultation in primary care	During the tele-consultation, the doctor was required to concentrate on several tasks, while the nurse supported the consultation through active listening, attention and empathy towards the patient. This often resulted in the doctor feeling like an outsider. Doctor-Nurse-patient interaction affected the primacy and privacy of the Doctor-patient relationship. Interpersonal dynamics between the nurse, patient and doctor in the joint consultations is important with both doctors and nurses requiring learning of new skills to effectively conduct such joint consultations	Teleconsultation with patient and nurse at one place and GP connected remotely

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Hanna, May, and Fairhurst 2011 (64)	Surveys (n=600) and interviews (n=20) with practice managers	Scotland (urban, rural and remote)	To understand practice managers' attitudes to non-face-to-face consultation/communication technologies and their role	Majority (96.8%) of the practice managers supported the use of telephone communication, 71.5% supported the use of email, 32.5% supported the use of text-messaging and 33.3% supported tele-consulting. Medico legal concerns (e.g., maintaining confidentiality) and potential lack of patient demand were raised as the most significant barriers to the use of newer information and communication technologies such as email, text messaging or tele-consulting. Certain local characteristics such as (I) practice list size (e.g., bigger practices having more positive attitudes towards the use of information and communication technologies, had a website, Information Technology Manager, a nurse for telephone triage and dedicated time for telephone consulting); (II) practice area deprivation (e.g., practices in deprived areas used less email for communication due to lack of patient demand) and (III) geographical location of practice (e.g., practice managers in more rural and remote areas considered information communication technologies to be unnecessary) affected practice managers attitudes towards non-face-to-face consultations. In terms of the role of practice managers, they were likely to influence decisions to use information and communication technology-mediated consultations/communication. Practice managers in more remote and rural locations thought telehealth were unnecessary for their practice populations and were less likely to have nurse telephone triage in their practices	A range of information and communication technologies such as email, SMS messages, telephone and tele-consulting has been mentioned. Model of care not specifically described, but the study mentioned that bigger practices relied on nurses for telephone triage
Richards et al. 2005 (65)	Survey (n=193) with GPs (n=134) and nurses (n=59)	Scotland (remote)	To understand use of eHealth and attitudes to eHealth	Survey results indicated that 95% of respondents had either used email or the internet. The use of eHealth was lower among nurses than GPs. Access to broadband, scanner, digital camera, and videoconferencing unit were key for telehealth. Clinical usefulness, functioning equipment and ease of use of equipment' affected the use of eHealth. Barriers to use included- lack of suitable training, high cost of buying telehealth equipment, and increase in clinician workload. In addition, respondents raised concerns about the impact of telehealth consultations on patient privacy and on the consultation itself	No specific model of care described, but eHealth was defined as the transmission of data (including obtaining laboratory results via internet, transmission of electrocardiograms, making outpatient appointments online, sending still images, sending X-rays) and communication (teleconference by phone, videoconference for education and for clinical purposes)
McKinstry et al. 2009 (66)	Focus group discussions (n=91) with patients, clinicians (GPs and nurses) and administrative staff	Scotland—urban (Lothian) and rural (Highland region)	To understand the impact of telephone consulting on patient confidentiality	The main concerns raised by the participants included – privacy concerns (e.g., return calls at work or public places or urgent calls taken by doctors during consultations which could result in overhearing of conversations), receptionist role in triage (e.g., too much responsibility on receptionist; confidentiality issues; useful to prioritise and allocate to face-to-face or tele-consultation), confidentiality issues (e.g., identity error and fraud; speculation in small communities, errors in identification, third party conversations (e.g., speaking to a family member about the results) and the use of answering machines (e.g., leaving messages on telephones which can result in confidentiality breach)	Telephone consulting including receptionists to triage and tele-consulting with doctors
Gonzalez et al. 2018 (67)	Retrospective longitudinal study using telephone consultation data of GP and patients	Galicia, North East Spain (urban and rural)	To analyse a model of care led through telephone consultations	9% of the total (28,472,852) requested consultations were telephone consultations. Elderly (both gender) and women in general used telehealth more. Telephone consultations were higher in urban than rural. 10% of the tele consultations required a further face-to-face appointment. Telephone consultations were highest during the week prior to Christmas and were lowest during the second week of January	Patient could request an appointment (face-to-face or tele-consultation) via a web-based platform or by calling the primary care centre. GP could access patient's medical record. Drug prescriptions could be made, and patients could collect the drugs from any pharmacy. If health issue couldn't be solved via telehealth the patient would be given a face-to-face appointment. Telephone consultation is not used to triage, but rather used as an alternative to face-to-face consultation
Nilsson et al. 2009 (68)	Case control trial of patients with primary hypertension and matched controls (n=91 intervention group; n=182 reference group)	Northern Sweden (rural)	To evaluate telehealth feasibility and quality of care for patients with hypertension	All health staff rated the treatment via telehealth to be feasible. Treatment of hypertension via telehealth was at least as effective as face-to-face consultations with a physician	Video consultation between physician and patient, or consultation with nurse who contacted the doctor via video consultation, a remote stethoscope was used. Preparatory work for consultation was conducted by the nurse
Atherton et al. 2018 (10)	Non participant observation, document review, informal conversations with staff, GP interviews (n=45), patient & carer interviews (n=39)	United Kingdom, includes both (urban and rural practices)	To understand benefits and challenges of using alternatives to face-to-face consultations in general practice	Rural locations used a combination of telephone and video as alternatives to face-to-face consultation. Practices described rationales for introducing non-face-to-face consultations as—desire to be a modern practice; only way of providing care to remote locations; recognition that reception and phone lines were busy and acknowledgement that previous systems were based on first come first serve and thus left some patients without the appointment they deserved. Ethnographic observations indicated that practice team staff were not always aware if other staff used any telehealth communications such as e-mailing their patients. It also revealed that patients rarely requested for such consultations and receptions offered it only as a last resort. Patient related benefits included convenience and improved access. Telehealth offers flexibility to both staff (e.g., GPs and reception staff can decide on what order to reply to messages) and patients. Telehealth consultations were perceived to be unsuitable if a new health problem was being presented, if the patient was older or confused, or if the patient was using a complex array of medicines. Barriers identified were related to difficulties in making patients aware of alternative options for consultations, lack of knowledge about when to use telehealth consultations, lack of training for reception staff and practice administrators	Telehealth consultations used as alternatives to face-to-face included- telephone consultations, e-consultations, email, video consultations

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Reference	Data used	Location	Objective of the study	Results	Description of telehealth used
Drake *et al.* 2019 (69)	Telehealth and broadband internet access mapping	USA (rural)	To identify whether Americans with inadequate access to primary care physicians and psychiatrists have sufficient broadband internet access to support video-based telehealth	The study found that broadband penetration rates and physician access decreased as counties became more rural. While telehealth was an alternative solution to physician shortages in rural areas, broadband access was considered to be the main barrier to telehealth adoption	Not described
Moore *et al.* 2017 (70)	Survey with family physicians (n=1,557)	USA (urban and rural)	To investigate the use of and barriers to using telehealth services	Among the 1,557 respondents, 15% reported using telehealth services. Telehealth users were more likely to - be in a rural setting; use electronic health records; work in a practice with ≥6 GPs. The users were also less likely to: work in a privately-owned practice and to provide general primary care to their patients. The most common barrier identified by both telehealth users and non-telehealth users were lack of training and medical reimbursement. Other barriers to telehealth use included physician's gender (e.g., female physicians identified training as a barrier), perceptions about legal liabilities (rural GPs and USA medical graduates were more likely to identify liability as a barrier compared to urban and international medical graduates respectively), years in practice (compared with GPs who had practiced for ≤10 years, GPs who had practiced longer were less likely to identify training as a barrier), care provided (e.g., GPs providing general primary care were significantly more likely to identify cost, training, and reimbursement as barriers to using telehealth), and ownership of practice (e.g., telehealth users were less likely to be working in a private practice). Over half of the telehealth users indicated they used telehealth for diagnosis and/or treatment purposes. Other common purposes included chronic disease management, follow-up, second opinion and emergency care	The model of care included a physician providing care for a patient (not necessarily a patient in their practice) using live interactive video. Telehealth in this paper also included consultation with specialist and store and forward of data with specialist which was not relevant for the review
Jetty *et al.* 2018 (71)	Survey (n=1,630) with family physicians	USA (urban and rural)	To examine GPs perception of telehealth usage and barriers to adoption	Rural GPs were twice as likely to use telehealth as urban GPs. They were also less likely to identify liability concerns as a barrier to using telehealth. Other barriers identified by the participants included time restraints, state regulations (e.g., regulations regarding licensing and where GPs can deliver their services), and organisational decisions. More than half of the rural GPs agreed that telehealth could improve access and continuity of care to their patients	Telehealth defined as medical information that was exchanged via electronic communication and included: primary care services between a physician and a patient using video, services between a primary care provider and a specialist using video, and store and forward modalities between primary care provider and specialist
Fisher, Margerison, and Jonker 2020 (72)	Review by independent GP of electronic management system data to check appropriateness of patient contacts (n=500)	UK (rural)	To create and test an audit tool called 7S tool to assist GPs evaluate if mode of patient contact was appropriate	Mode of patient contacts was reviewed for appropriateness. In one-third of cases, the choice of care mode was inappropriate and chronic disease cases contributed most to this. The tool had seven management options. One option was 'surgery' (GP face-to-face appointment). Another option was 'speak' (telephone appointment with GP)	Telephone appointment with a GP was one of the audited outcome items for the 7S tool
Mueller *et al.* 2020 (73)	Interviews with patients (n=20)	Siegen-Wittgenstein, Germany (rural)	To examine patient needs, perceptions, and experiences that facilitate the acceptance of video consultation technology and adoption behaviour	For patients who were already using video consultations, the perceived benefits of video consultations were much higher than for patients who hadn't yet had a video consultation. Actual users of video consultations also acknowledged their responsibility to use it appropriately. Patients who hadn't yet had a video consultation valued the opinions and expectations of their peers. Participants mentioned a range of benefits in using video consultations including saving travel time; less exposure to infections; and greater flexibility in getting a suitable appointment that fitted their schedule. All participants highlighted the importance of data security. The advantages of a video consultation outweighed the perceived risk of data interception by third parties. Users preferred to have medical data transferred (e.g., blood test results), better feedback mechanisms and an app to use instead of a website. All participants acknowledged that there were limitations to digital appointments and that such appointments needed to be an optional extension of already existing face-to-face primary care services. Participants indicated that personal contacts and trust in their physician was also important for video consultations	GP practices included video consultations in their regular office hours, patients could opt for either video consultations or a face-to-face consultation. Patients registered online via a website to get an appointment date and time of appointment is then confirmed
Ohligs *et al.* 2020 (74)	Questionnaire for GPs after each tele-consultation (n=56) and interviews with patients (n=19)	Rural German nursing home	To evaluate telehealth in nursing homes	56 routine and emergency telehealth consultations were conducted in a rural German nursing home. The study found that only one of the consultations required hospital admission	In this tele-doc system, a nursing home was equipped with a telemedical system where patients are tele-medically connected to a GP for both routine and emergency consultations. The role of nurse is to convey the treatment instructions. The model was aimed to be delivered in cases where there is a pre-existing doctor-patient relationship
Grindlay, Lane, and Grossman 2013 (75)	Analysis of abortion encounter data—2 years prior and after telemedicine introduction	Iowa, USA (places that are at varying distances to clinic offering medical abortion included)	To evaluate early medical abortion by a physician via telehealth	While abortion rates decreased from 46% to 54%, the odds of obtaining medical abortion before 13 weeks gestation increased after telehealth introduction. Women living at distances >50 miles (measure of rurality/remoteness) from the nearest clinic that offered surgical abortion were more likely to obtain an abortion after telehealth was introduced in the clinic	Women seeking abortion contacted a central call center to select the preferred type of appointment. The patients' medical documents were uploaded into a secure server for the physician to review. The physician physically present at the nearest clinic to the patient then discusses the treatment via videoconference

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Reference	Data used	Location	Objective of the study	Results	Description of telehealth used
Macduff, West, and Harvey 2001 (76)	Questionnaire and in-depth interviews with elderly patients (n=18 for questionnaire and n=16 for interviews), weekly satisfaction questionnaire sent to 2 GPs (n=18 questionnaires completed)	Hamlet (large village) in North East Scotland	To evaluate a nurse-led telehealth service linking the senior citizens of a rural village with a town-based general practice	All the respondents mentioned they would use the service again. The GPs and nurses involved in the model were positive about the service. GPs mentioned that it saved their time. Negative comments about the model were related to the technology used (e.g., video and sound quality)	The model included a nurse-led telehealth with a town-based GP for elderly rural patients. In this model, once an appointment is made for a telehealth consultation, the GP surgery is informed so that the patient's medical notes are available. The video equipment is set up and the nurse discusses any issues with the GP prior to the appointment. During the consultation with the patient, the nurse may stay or leave depending on the patient's requests. At the end of the consultation, the nurse carries out any treatment advice provided by the GP
Macduff, West, and Harvey 2001 (77)	Questionnaire and in depth interview with elderly patients (n=18 for questionnaire and n=16 for interviews), weekly satisfaction questionnaire sent to 2 GPs (n=18 questionnaires completed)	Hamlet (large village) in North East Scotland	To explore the role of nurses in teleconsultation	The nurse-led clinic made a significant contribution in terms of screening patients for video-link consultations. Nurses highlighted the need for further guidelines and protocols that would enhance their scope of practice. Patients mentioned that the service provided more time for discussion and explanation, unlike normal GP consultations. The value of the nursing role in interpreting the information and ensuring continuity was mentioned by patients	Model explained Macduff *et al.* part 1
Campbell, Harris, and Hodge 2001 (78)	Interviews with physicians, nurses and administrative personnel (n=57)	Rural Missouri, USA	To explore rural health care providers readiness to adopt telehealth	Rural health care providers (n=10) vary in their perceptions about telehealth and its use. Practices affiliated with a public tertiary centre had higher telehealth use compared to private practices. Factors that affected telehealth adoption included - perceptions such as that telehealth is a threat to the livelihood and/or professional autonomy of rural health care providers (e.g., allowing intrusion of urban tertiary care centres which will have economic ramifications to the local health care); efficacy of telehealth in terms of improving patient outcomes or in terms of its functional utility; apprehension among physicians and nurses about the use of new technology; social pressure and ownership in terms of how invested the participants were in the technology	Not described
Uscher-Pines *et al.* 2016 (79)	Analysis of HEIDS measures (set of performance measures that has been used to measure quality in managed care plans) of Teladoc users and non-users	California, USA (rural patients included)	To compare quality of care and access to care for Teladoc patients and patients consulting at physician offices	Comparisons indicated that for pharyngitis performance measure (ordering strep test) and bronchitis measure Teladoc performed worse than physician offices. For the back pain measure (not ordering imaging), Teladoc and physician offices had similar performance. Teladoc providers were less likely to order diagnostic testing and had poorer performance on appropriate antibiotic prescribing for bronchitis	Teladoc is a large Direct-to-consumer telemedicine company providing consumers around-the-clock access to care for common, nonemergency conditions through phone and live video via Webcam or smartphone applications. Direct-to-consumer telemedicine physicians diagnose, recommend treatment, and, if required, prescribe medications. In this, patients and physicians do not have an established relationship, nor do physicians have access to the patient's full electronic health record
Ranganathan and Balaji 2020 (80)	Survey staff of 1,285 clinics	Minnesota, USA (rural and urban)	Evaluate key predictors of telemedicine adoption by ambulatory clinics and assess salient differences between adopters and nonadopters	Fifty-five percent of the clinics adopted telehealth. Real-time consultations were adopted in over 26% clinics. Relative to urban clinics, rural clinics had 270% higher odds of telehealth adoption. To note—the dataset had 85% clinics from urban areas and the consultations included both primary health care and speciality telehealth consultations	Different types of telehealth consultations, including real-time provider to patient consultation
Solans *et al.* 2021 (81)	Patient eConsulta user profile and use data	Catalonia, Spain	To analyze the profile of the users of eConsulta tool and the reasons for their use	During the pandemic, the number of unique users of this teleconsultation services had almost tripled. Users predominantly included female, younger, more actively employed, and patients with less complex pathologies. There was also a relative decrease in the number of conversations initiated by higher-income urban users and an increase in conversations initiated by users in rural areas	eConsulta is part of the patient portal of the public health system in Spain (described before)
Holyk *et al.* 2017 (82)	Survey of First Nations patients (n=210)	North-central British Columbia, Canada	To explore the role of telehealth in improving continuity of care	The study found that continuity of care improved with the introduction of telehealth. The use of telehealth services did not have an impact on patients' levels of medical trust, and patients seemed to be more satisfied with telehealth if they had an appointment in their primary home clinic. Patients also rated the usability, effectiveness, and convenience of telehealth services higher when it was accessed through their primary home clinics	The model includes walk-in visits and booked appointments in clinics. When physicians are not physically in a community, a member of the physician team is available daily through telehealth. Physicians were able to access all patient medical records

COVID-19, coronavirus disease 2019; GP, general practitioner; HbA1c, glycosylated haemoglobin; IT, information technology; PHC, primary health care; SMS, short message service.

investigations, repeat prescriptions, and routine follow-up or for management of conditions not requiring physical examination (55,56,81).

Telehealth appointment management processes

Telehealth appointment management processes comprised a range of models, including having nurses (54,77) and receptionists (10,66) screen and triage calls and determine the mode of consultation; a physician conducting an initial consultation and deciding the mode of subsequent consultations (57,84); random assignment of patients to either face-to-face or telehealth consultation which was undertaken as a randomised controlled trial to compare patient satisfaction (58); and patients choosing the mode of consultation and directly booking appointments via a web-based platform (10,49,55,56,67,73).

Gonzalez *et al.* described an appointment management process whereby patients could choose and book a telehealth appointment with a GP who would call them at a pre-allocated time (67). The GP had access to their patient's electronic records, could prescribe electronically and could book a follow-up face-to-face appointment with the patient if deemed necessary. Mueller *et al.* described a process whereby the patient would click on a link at the allocated time to enter a conference room and the GP would be notified about this and would start the videoconference (73). Another telehealth appointment management process was used by Carrier Sekani Family Services (CSFS). Face-to-face GP services at CSFS were provided by intermittent outreach services, but patients could attend their PHC clinic in person (as walk-in visits or booked appointments) and have a video consultation with their GP if the GP was not physically in that community (82). This supported interpersonal continuity of care. Other studies similarly reported GP-patient telehealth consultations being facilitated by a nurse or community health worker who were with the patient (54,63,65). An alternative model involved a nurse providing face-to-face care to the patient, with a GP available via telehealth if needed (61,68). In some instances, there was the addition of tele-monitoring equipment such as the digital stethoscope at the patient end to assist the GP with examination findings (54,68). One model described the nurse seeing the patient face-to-face first, in order to minimise the time required with the doctor during a telehealth consult (68). Another model described senior PHC doctors consulting via video with junior doctors who were reviewing the patients at a geographically remote location (85). The telephone first model involved all appointment requests being followed by a telephone call from the GP to the patient to either resolve the issue by phone at that time or initiate a face-to-face appointment subsequently if required (84).

Patient and provider preferences for telehealth delivery

Included studies detailed both patient and provider preferences that made the provision and delivery of telehealth services more acceptable.

Patient preferences

Patients preferred telehealth for initial medical assessments as it was perceived to save travel time, but highlighted the need for regular face-to-face consultations (60). Other studies found telehealth to be more suitable for follow-up consultations, rather than initial diagnostic consultations (10,53). Telehealth with specialists was preferred than with GPs (60). An established relationship with their GPs was considered important for effective telehealth consultations (32,42,60,82).

Patients preferred telehealth to be an optional extension of face-to-face care by the GP, with the ability for them to choose between modalities according to their preferences (26,73). Some patients thought telehealth was suitable for all people, but its use was a matter of individual patient preference (51). For some groups of patients where their safety was an issue e.g., due to physical frailty or being immunocompromised, telehealth was considered more appropriate (40) than them having to travel and attend a clinic in person. This was also reflected in data showing higher use of telehealth by patients with more advanced diabetes during the pandemic (46).

Provider preferences

There were specific types of consultations where telehealth was more acceptable to physicians. These included management of test results, general medical enquiries, repeat prescriptions, and arranging referrals for further diagnosis and treatment, chronic disease management, follow-ups, second opinions and for GP support of emergency care in remote contexts (40,47,55,61,71,86,87). Other examples included nursing home consultations, and completing statutory functions (for example, death certificates) (38). One study reported that video consultations were perceived as being beneficial for after-hours consultations (38). In contrast, end of life care consultations was considered to be better done face-to-

face (88). A pre-existing relationship between the GP and patient, established via face to face consults was considered important by PHC staff (48).

Positive and negative outcomes of telehealth

Positive outcomes/benefits

Positive outcomes associated with telehealth use included decreased travel time for providers and patients (10,38,51,52,58,60,71,73,84,89); greater convenience (10,24,26,51,68,82); increased efficiency (10,27,51,58); more acceptable wait times (54,84); greater ease of booking appointments and of the overall process (24,54); greater patient comfort (24); greater flexibility (10,73), ability to show empathy to the patient (63) and better continuity of care (10,90). During the COVID-19 pandemic, telehealth helped to reduce the spread of infection (42,73,81).

In communities previously serviced by intermittent GP outreach visits, offering telehealth services in between the face-to-face visits enabled patients to see their GP more regularly and attend more appointments (82) GP telehealth to aged care facilities reduced calls to emergency services and unnecessary hospital admissions (74). Telehealth was associated with patients being reviewed earlier, resulting in better patient management (e.g., enabling medical abortion for women) (51,75,91). Telehealth use has also been associated with increased patient engagement, empowerment, and sense of feeling safe and cared for (28). Telehealth enabled clinicians to see patients from multiple clinic locations without having to travel, providing opportunity for same day appointments if required and overall had minimal impact on clinic flow or patient/provider interactions (51). Nurse facilitation of telehealth consultations also saved GP time and improved nurses' knowledge and skills while reducing their sense of professional isolation (65,76). Health staff rated telehealth as at least as good as routine face-to-face care (68) and measured outcomes were also at least as good as face-to-face consultation for the treatment of hypertension (68), diabetes (46) and tonsillitis (92).

Negative outcomes

Some GPs raised concerns about telehealth. They described the difficulty of having to decide between telehealth and face-to-face consultations and perceived that there was an increased possibility of missing crucial medical information during telehealth consultations resulting in a misdiagnosis (28,44). Concerns about providers work-life balance were also raised (28). Providers quoted difficulty separating professional and private lives as patients tried to contact doctors at any time (e.g., receiving and answering phone calls after hours and during weekends) using telehealth (44). Two papers measured the acceptability of telehealth for patients as less than 50% compared to face-to-face consultations (59,60).

Some studies found that telehealth consultations did not reduce GP workloads (38) and may even add to the workload of clinicians through the requirement for follow-up appointments and training for support staff (10,48,49,52,65). Additionally, telehealth was associated with a shift in administrative staff workloads that were often 'unseen' (36,50) and was found to cost 30% more than a regular consultation in a study (58).

Concerns were also raised about telehealth affecting the quality of providers and practice administrative staff relationships with patients (60). These concerns included that telehealth did not adequately support deeper caring relationships and the consultation experience was more likely to be superficial or fragmented, lack a personal touch and could negatively affect patients' trust and confidence in the care relationship (35,36). Telehealth was perceived to be more impersonal (59). Some patients held beliefs that a therapeutic presence was achieved only through in person care (38). Decreased quality of care was perceived with telehealth use (59).

Privacy concerns featured in some studies (24,44,66,73). One study found that during consultations involving a patient-nurse dyad with a GP, the patient-nurse interaction resulted in some negative effects by affecting the privacy and the primacy of the doctor-patient relationship (63). Maintaining patient confidentiality and data security were raised in several papers (10,64-66,73). Maintaining confidentiality and data security in relation to booking appointments; establishing the identity of patients securely; and the involvement of third-party consultations were negative considerations held by patients (66,73). Patients highlighted that uncertainty about the timing of the doctor's call and poor communication resulting in patients not receiving an appointment as other negative outcomes of telehealth (84).

Mixed or unclear impacts

There were mixed findings about the effect of telehealth services on PHC no-show rates. Higher no-show rates (17%) for telehealth appointments involving First Nation patients compared to regular face-to-face appointments (4.8–6.6%) were observed in Canada (54), while lower

no-show rates were observed (0.7% compared to 8.6%) in Spain (67). Telehealth was associated with changes in utilisation patterns, although whether the changes were beneficial (and if so, to whom) was unclear. Evidence from Spain suggested that telehealth reduced the need for face-to-face consultations, and that only around 10% of telehealth consultations required a follow-up face-to-face consultation (55,67). The introduction of an after-hours GP telephone service also resulted in a decrease in home visits (57).

Characteristics of providers, practices and patients affecting telehealth adoption

Specific characteristics of patients, providers and practices were found to affect the adoption of telehealth.

Provider characteristics

Higher telehealth use was observed among:
- ❖ Older providers compared to younger providers (25,56), which was attributed to more experience and higher confidence in clinical care;
- ❖ Providers with high quality of care index, who were more accessible or who were involved in teaching activities (56);
- ❖ Providers who had been practicing for longer periods as well as providers such as GP registrars who were only beginning their PHC career (53);
- ❖ GPs more than nurses (62);
- ❖ Providers with previous experience with telehealth technology (62,73);
- ❖ Providers with the ability to quickly establish rapport with patients (54); and
- ❖ Providers who were willing to be flexible with the mode of delivery to meet patients' individual needs (33).

Lower telehealth use was associated with:
- ❖ Seniority; in contrast to the papers cited above, the more senior a GP, the lower the use of video-consultations, considered to be due to senior GPs' lack of familiarity with the technology (45);
- ❖ Female GPs (31); and
- ❖ Providers with very poor knowledge of telemedicine, who have treated fewer patients or who held negative perceptions of the effectiveness of telehealth (31).

Practice characteristics

Practice characteristics associated with greater telehealth use included rural/remote practice location; practice location in a higher socioeconomic setting; larger group practices; non-private practices and those using an electronic health record (71,78). Lower telehealth use was reported in some rural/remote locations (42,56). Low use in rural/remote practices was attributed to the wide availability of local PHC providers (56) and implementation difficulties or lack of digital infrastructure (e.g., adequate Wi-Fi) compared to their urban counterparts (27,38). Rural/remote practice managers were less likely to consider teleconsulting necessary and those in deprived areas were less likely to use email or have a practice website (64).

Patient characteristics

Higher use was observed among:
- ❖ Rural/remote populations (34,46,81), but the modality used was more likely to be telephone than video (34);
- ❖ Elderly patients aged over 85 years (67);
- ❖ Younger patients (26,62), due to their higher levels of digital literacy;
- ❖ Minority groups (e.g., transgender individuals) who face significant prejudices and difficulties accessing health care (39);
- ❖ Female patients (46,54,61,67,81);
- ❖ Patients who were both employed and had fewer complex chronic conditions (81);
- ❖ Patients concerned about the risk of exposure to COVID-19 virus (73,81); and
- ❖ Practices scoring significantly higher for best practice in telehealth (41).

In contrast, lower use was observed among:
- ❖ Elderly patients, due to a correlation between older age and being averse to or unfamiliar with technology and the importance of physical contact (10,24,59,60,93); and
- ❖ Patients who were poorly engaged with the process, or who experienced discomfort with telephone- or video-based communication (40).

Barriers and enablers to the use of telehealth

The main barrier to telehealth uptake by practice staff was the lack of physical interaction with patients and inability to undertake clinical examinations (51,53,62,73,78,89). Health providers reported that the lack of equivalency of telehealth compared to in-person consultations was the biggest reason for not using telehealth, with low patient

demand also a frequent reason for not using telehealth (42). In one study, PHC providers stated it was hard to get to know their patients and build relationships through telehealth as it was affected by slow connections and poor image quality (10). The threat posed by telehealth to the livelihood and/or professional autonomy of rural health care providers through the intrusion of urban providers was also reported (78). Perceived threats relating to GP liabilities (71) and attitudes of patients, colleagues and funders towards conducting video consultations (53) were also barriers. The beliefs of receptionists and administration staff were raised as potential barriers (64) including that patients preferred to see a doctor face-to-face (10); and that telehealth was second best, or a last resort (10) and therefore not offered routinely. The increased workload for receptionists, need for additional training and receptionist discomfort with decision making about consultation modality were also barriers (70). Receptionists were considered to have an important role in promoting the use of telehealth and required adequate training and active involvement in service redesign processes (10,29,64).

The need for adequate infrastructure and equipment was frequently reported, including having access to appropriate digital infrastructure such as adequate internet bandwidth (10,24,40,43,52,69); having computers that were fast enough (10); equipment that worked (68); and access to appropriate technology (59,65) that was easy to use (51,62,68) and which allowed patients to understand the provider clearly (54). Well-resourced telehealth infrastructure at the patient end was important for the successful delivery and uptake of telehealth (52). The presence of a nurse and remote monitoring equipment at the patient end made the consult more acceptable (68).

Funding to provide patient-end support (43,52) and for appropriate technology were reported as important facilitators for telehealth uptake (43). Reimbursement for telehealth, including uncertainty about whether medical reimbursements covered the costs of telehealth was a barrier to telehealth use (70,71). Expansion of medical reimbursement mechanisms for telehealth consultations associated with health system responses to the COVID-19 pandemic enabled the provision of increased telehealth services for visit types newly eligible for reimbursement (43). Cost (equipment and internet costs, particularly in remote/ rural settings) was reported as a barrier (65,71,94). Reduced costs associated with home visits and after-hours visits were highlighted in other studies as enablers (52,57). From a patient perspective, reduced costs related to travel or time away from work or home were perceived as enabling, while instances, where the cost of the consult was not billable to Medicare, were a barrier (52).

The COVID-19 pandemic was reported as a catalyst for telehealth uptake in some studies (37,42,44,93,95,96). An increased number of PHC consultations via video were reported for people aged 50+ years presenting with features that indicated cancer or patients with an existing cancer diagnosis (30,97) and for end-of-life consultations (88) during the COVID-19 period.

Innovators had an important roles in getting telehealth systems off the ground (10). Studies raised the importance of consultation with patients, staff and general practice support systems and peers, prior to establishing new systems (64); assessing patients for their readiness to use digital technologies prior to using telehealth with them (33); and the need to educate patients about the usefulness of telehealth and addressing any privacy concerns they held (33). Two studies found that telehealth usage increased over time, with one study attributing this to increased acceptance of telehealth by patients over time (55,67).

Barriers to implementing telehealth included the need to adequately train GPs and other staff members (10,51,62,65,71,94) and provide regular technical support to manage and operate telehealth units (51,62,64,65,94). Lack of training and support often resulted in equipment being left unused in cupboards (62). Reduced staff capacity was also a barrier (43). One study explicitly reported that telehealth implementation was more difficult in rural than urban clinics due to staff shortages (27). One Scottish study described usage falling due to changes in staffing when a GP retired (61).

Other reported barriers included patients having limited access to Wi-Fi or other necessary digital infrastructure (40,93); child patients (32); patients with complex medication regimes (10,72,79) or other complex issues (32); patients with English as a second language or patients who experienced language barriers (26,30,32,51,93); hearing impaired patients (32,51); patients with other communication challenges such as speech or cognitive difficulties (40); patients with conditions necessitating a physical examination (24,40,53); life-threatening emergencies (35); and mental health issues (53). Additional barriers were reported for patients with lower health literacy (44); who lacked awareness that telehealth services were offered (52); who lacked trust (e.g., about treatment quality, provider not previously known to them), and who perceived telehealth as an impersonal treatment modality (26,59).

Discussion

Key findings

For rural and remote populations, long distances to PHC services and the difficulties associated with travelling to get to a GP were key drivers of telehealth acceptance. Telehealth had a lesser, though not insignificant role in overcoming barriers related to other key domains of access including affordability, adequacy, awareness and acceptability (98). Telehealth access has been improved through the affordability brought about by COVID-19 changes to PHC funding models for telehealth services, together with high service delivery costs for remote face-to-face services. Reduced travel related expenses and travel time for both clinicians and patients also make telehealth consultations more affordable. While there were many positive aspects of telehealth, important concerns include those relating to privacy and data security, impacts on the workloads of health service staff and on the quality of relationships with patients.

A range of different telehealth models was described which varied according to whether health service staff screened and triaged requests for consultations; who made the decision about whether an appointment was suitable for telehealth; whether health service staff were present with the patient to facilitate the telehealth consultation with a GP, whether digital examination equipment was used; and whether a patient was present in the telehealth consultation, or, there was a proxy (e.g., nurse) seeking advice from a GP on their behalf. The importance of adequately resourcing both patient and provider ends, as well as providing training support and telehealth skill development for staff, whether clinical or administrative, were highlighted in the review.

In terms of acceptability, telehealth was preferred for after-hours care and for follow-up appointments, especially when there was a pre-existing GP-patient relationship, and telehealth was an adjunct to face-to-face consultations. It was also preferred when a patient's minority status or a particular health condition was associated with societal prejudices or a more specific skillset was required [e.g., medical abortion in some communities, transgender PHC (99)]. Face-to-face consultations were preferred when physical examinations were required; for initial consultations: for patients with low digital literacy, or with communication issues, and for whom it was their personal preference. Adequacy and awareness factors included digital connectivity, patient access to digital devices, having staff trained to use telehealth equipment and facilitating consultations; and GPs' ability to develop rapport, were key to successful implementation.

Provider characteristics associated with telehealth uptake included age; years of experience; gender; skills; and individual attitudes and beliefs. Practice characteristics included practice size; use of electronic records; private ownership; rurality; and population demographic characteristics. Patient characteristics associated with telehealth use similarly included age and gender, but also the need to manage time due to employment and/or carer responsibilities.

Strengths and limitations

A strength of this scoping review was its conduct according to the JBI methodology for scoping reviews, which is valued for its transparency, detailed guidelines and development by methodological experts (100). The review is limited to studies from high-income countries, which could impact the generalizability and interpretation of the findings. As with any scoping review, a key limitation relates to the range, quality and number of studies included in the review. An illustrative example is that only a few included studies explored telehealth use amongst rural and remote First Nations people or non-English speaking participants, which is an important limitation of this synthesis. Most included studies also had a 'rural' rather than a 'remote' PHC focus. Findings from rural studies may not be immediately transferable to remote contexts, as the demographic, social, economic and cultural characteristics of 'remote' health differ from rural (101). The extent to which the geographical focus of included studies was on rural or remote populations also varied, with some studies including both rural and urban populations but not always reporting findings by rurality. A further limitation relates to searches being limited to three databases and excluding grey literature, due to resource constraints.

Comparison with similar research

A key finding in relation to the acceptability of telehealth for PHC in rural and remote areas being driven by gains in access (102), especially reduced travel time and travel costs is consistent with the findings of another recent systematic review (11). The included studies observed mixed results in terms of patient age and telehealth use. High telehealth use by elderly rural patients was reported in a systematic review (103). This high use was attributed to decreased mobility and transport access issues impacting elderly people's ability

to travel to see their GPs. The same review reported older rural patients preferred face-to-face consultations over telehealth because of poorer digital literacy, lack of technical support, and poorer cognitive and psychomotor skills. Young people's stronger preference for telehealth was associated with their greater technological proficiency and a need to balance work schedules with other commitments. Higher use of telehealth by females was also reported, which similarly could be a strategy to manage a range of family and other commitments. This review corroborates a previous review (104), concluding that better or similar health outcomes are achieved via telehealth consultations when compared to face-to-face consultations. As highlighted in other studies (14,102), this review also highlighted the importance of a pre-existing relationship between the patient and GP for effective telehealth consultations.

Explanations of findings

Rural and remote populations use telehealth because of its profound impact on otherwise long travel time, high travel costs, removing logistical difficulties and overcoming the generally lower availability of GPs in these locations. Providing face-to-face GP care to small, isolated populations is resource-intensive and limited by GP availability, travel time, and travel and accommodation costs. Given the high health needs in rural and remote locations, especially in countries such as Australia and Canada telehealth could substantially reduce the high opportunity costs of face-to-face consultations. Hybrid models of face-to-face care complemented by telehealth are likely to be increasingly adopted in such contexts. The potential for telehealth to support the on-going PHC needs of communities isolated by disasters such as floods, other climatic sequelae, or future pandemics cannot be underestimated (87,105).

Concerns regarding privacy and data security are increasing across health and other sectors, not only in relation to telehealth (102). And it is only appropriate that concerns exist and emerging threats are identified and effectively addressed. While not captured in this review, telehealth could also mitigate patients' privacy concerns related to visiting local clinics in small communities where they know most PHC staff personally (106).

Negative impacts on the workloads of health service staff, particularly nursing staff (48) are of particular concern in under-resourced settings., where staff burnout and turnover rates are high. Over time, it is likely that the user-friendliness of telehealth systems will improve, mitigating

adverse impact on workflows. Similarly, concerns about the negative impacts of telehealth on the quality of relationships with health service staff can be addressed by providing appropriate training in telehealth communication skills and by developing mature hybrid models of care.

Implications and actions needed

Rural and remote PHC workforce supply issues, including geographical maldistribution and the extraordinary high turnover of PHC providers, have long been a major health system concern in countries across the globe (107-109). This synthesis suggests that services could supplement intermittent GP outreach visits (infrequent face-to-face GP consultations) by offering telehealth consultations with the same GP. This would improve patients' overall access to care and continuity of care (82). We note that none of the included articles explored the extent to which telehealth could entirely replace face-to-face consultations. Until such time as new evidence emerges evaluating telehealth-only models of PHC for rural and remote populations, health services should explore opportunities to offer hybrid care models which support interpersonal continuity of care.

A further implication relates to the high cultural and linguistic diversity of migrant and especially First Nations populations in rural and remote areas of high-income countries (104). While our review revealed scant evidence about their use of telehealth, a review examining the cultural safety of telehealth consultations with First Nations peoples highlighted the critical importance of the telehealth provider's cultural and community knowledge, communication skills and pre-established relationships with patients for telehealth effectiveness (110). The implication is that telehealth delivery to culturally and linguistically diverse rural and remote populations will similarly need to consider the use of additional support staff as cultural advisors or interpreters. This has resource implications for health services so they can ensure appropriate support staff and resources are available (111).

Conclusions

Telehealth is not a 'quick fix' to workforce issues and the cost of delivering services to rural and remote areas, but it can be used as a supplementary model of PHC service delivery to improve access and continuity of care. It is important that models of telehealth are designed to support and not undermine the sustainability of rural

and remote health services. Telehealth is appropriate for treating specific chronic conditions and providing repeat prescriptions and test results, especially when there is a pre-existing relationship between the GP and the patient. Evidence on telehealth implementation in remote locations and for culturally and linguistically diverse populations, including First Nations peoples is scarce and requires more attention. We recommend identifying contextual indicators and putting in place adequate monitoring and evaluation frameworks when introducing telehealth in rural and remote contexts.

Acknowledgments

Footnote

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