

Digital primary care visits designed for different patient segments in the pre-pandemic era: A scoping review

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Abstract

Digital healthcare services have been implemented increasingly during and after the COVID-19 pandemic. They have been expected to improve access, reduce inefficiencies, improve the quality of care, lower the cost of healthcare, and provide more personalised care.

This study focuses on digital visits: digital health care services that replace a general practitioner (GP) appointment in primary care. The aim of this review is to assess the perspectives used in studying digital visits, and to describe the services studied in terms of modalities used and patient segments targeted. We aim to find how digital visits were studied prior to their becoming a necessity during the COVID-19 pandemic.

This is a scoping review of English language papers published between 1.1.2010-31.5.2020. The papers were eligible for the review if they focused on a digital primary care visit which replaced a face-to-face appointment with a GP. In total, 36 papers were included.

Ten of the studies described services tailored to the needs of a patient segment. The rest of the studies (26/36) did not differentiate between patient segments. The most often-used perspective was that of the clinician (16/36 studies). Fifteen studies were descriptive. The costs and outcomes were rarely utilised as a perspective: the costs were used in only one study and outcomes in six. Patient experience was the perspective chosen in 11 studies. Among all the interventions, the most common modality was by phone call (20), and the second most common was asynchronous messaging and video consultation (10 each).

Prior to the COVID-19 pandemic, digital visits had mostly been developed for the entire population instead of a particular segment of patients. We argue that developing them to fit the needs of a patient segment would help make them more acceptable and suitable for patients. More studies from the patient perspective are needed to develop these services to better fit the needs of patients. The situation is likely to have changed during the pandemic, as a large number of studies has been published since May 2020.

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Keywords: primary health care, telemedicine, remote consultations, health care system, patient segmentation

Introduction

According to the WHO [1], primary healthcare is ‘a whole-of-society approach that includes health promotion, disease prevention, treatment, rehabilitation and palliative care’. Primary healthcare answers to the unsorted demand that arises from a diverse population. In order to serve this population in an effective manner, the demand must be segmented into more internally homogeneous groups, to which tailored service offerings can be developed.

A recent approach has been the development of digital services, through which patients can access primary care remotely. Digital services may increase productivity [2,3], thus making it easier to match the rising demand. Remote services have often been seen as especially helpful in areas with a low population density and long distances needed to travel to reach medical services [4]. However, the COVID-19 pandemic led many patients to avoid face-to-face contact, leading to a surge in the use of digital visits [5].

Healthcare performance requires assessment of several dimensions [6]. As single articles often have limited setting or performance assessment, it is essential to increase the knowledge of effects of digitalization on various aims of healthcare.

Patient segmentation

Patient segmentation and providing health services on a patient-focused basis have been used in developed countries to lessen healthcare costs and deliver better health services [7]. In particular, patient-centredness has become an important goal, particularly in the care of the chronically ill [8]. To

start solving problems in a patient-centred way, solutions must be tailored to each patient. However, no two patients are alike, and completely individualised solutions at the population level are impossible [9]. The solution is patient segmentation—a grouping of healthcare users into smaller, more homogeneous subgroups [7].

One goal of patient segmentation is to better match healthcare services to the needs of patients [10]. If the needs of the patients are not met, worse health outcomes will follow, potentially increasing the utilisation of health services [11]. However, exceeding the needs will lead to increased costs but not improved outcomes [12]. Therefore, it is important to plan healthcare services to match the needs of the targeted patients.

In recent years, different ways of doing patient segmentation have been the focus of research [7]. Introduced in 2010 by Lillrank et al. [13], the DSO (Demand and Supply-based Operating modes) framework segments patients according to the demand type, such as the urgency, severity, and finiteness of the service needs of the patient.

In 2013, Porter amended the concept of value-based healthcare to better encompass primary care [14]. His argument was that in primary care, patients should be segmented based on their needs—not diagnoses, as is often done in secondary care—and services should then be designed to meet the needs of the segments [14].

The methods of industrial management utilised in the DSO model are also the starting point for Brommels [15], who suggests seven patient segments corresponding to the DSO modes. From the point of

view of primary care, some of the segments only pass through (such as persons needing elective operations), some pass by (emergency patients) - what remains in primary care are the healthy persons with occasional needs, and the persons with chronic and/or multiple ailments. A wealth of evidence supports the existence of the latter patient segment, characterized by long-term healthcare needs and extensive resource utilization [16-19]. What remains are the healthy persons with occasional needs - a much less studied segment. From the point of view of cost minimization, the patients with long-term needs are key. However, it is also important to consider the less costly patient group and to design interventions for them: timely services are key in preventing their transition from primary care to more intensive specialised services [13].

As Lynn et al. [9] point out, the number of patient segments needs to be limited for practicality reasons. Therefore, in our paper we divide patients into two distinct groups: patients with long-term needs and patients with occasional needs.

Digital health care services

According to Ronquillo et al. [20], “*digital health refers to the use of information and communications technologies in medicine and other health professions to manage illnesses and health risks and to promote wellness*”. It “*--includes the use of wearable devices, mobile health and applications, telehealth, health information technology, and telemedicine*”. Digital health includes the use of different health technologies to manage healthcare services to improve patients’ health [21]. Digital healthcare has been expected to improve access to healthcare, reduce system inefficiencies, improve the quality of care, lower the costs, and provide more personalised services [20]. In our review, we focus on digital visits: digital health care services

that include a personal but remote contact between a patient and a professional, without which a face-to-face visit to a healthcare unit would have been needed.

Digital health services have been greatly developed in recent years to both treat specific diseases and facilitate access to services [22]. However, primary care users are a heterogeneous group. Therefore, the development and implementation of digital health services that are suitable for the primary healthcare population can be challenging.

Several studies and systematic literature reviews have been conducted on interventions developed to treat specific diseases [23-25] or conducted in secondary or tertiary care [26], but only a few of the reviews [27] have focused on digital health services that are suitable for primary care. There is also little information on whether digital services for primary healthcare have been targeted at specific patient groups.

The COVID-19 pandemic brought a surge of interest in digital healthcare services [28]. We study the pre-pandemic era in order to find what sort of studies had been conducted when digital visits were not yet a necessity. As the pandemic hit, there was probably a need to implement digital visit services quickly, based on the scientific evidence existent at the time. We set out to study how sound that evidence base was and what perspectives it included.

Objectives

As outlined above, it is necessary to design healthcare services (digital and otherwise) to match the needs of the patients. In order to do that, healthcare demand must be segmented. Thus we focus on the intersection of digital services in primary healthcare and patient segmentation.

The research questions for the present study are as follows:

1. From which perspectives have primary care digital visits been studied?
2. Which modalities do these visits employ?
3. What are the targeted patient segments?

Material and methods

A scoping review maps the existing literature, synthesises and analyses research and non-research material in order to provide a comprehensive understanding of a particular topic [29,30]. Scoping reviews are useful especially when the area is complex or it has not been reviewed broadly before [31]. They are also conducted in order to assess research gaps or determine whether it is reasonable to conduct a full systematic review. Our aim is to provide an overview of the evidence of this topic and answer a rather wide research question; therefore we chose a scoping review as our method.

Inclusion and exclusion criteria

This scoping review included studies published in English from January 2010 to May 2020. We limited our search to the previous 10 years because technology is evolving at a rapid pace and we thus found that over decade-old solutions would likely be outdated by now [32].

Papers were eligible for the review if they focused on digital visits used in a primary healthcare setting. In the context of the current study, digital visits refer to those digital services that include a personal but remote contact between the patient and GP and that happens instead of a face-to-face visit to a healthcare unit.

Visits with a professional other than a GP (e.g., nurse, physiotherapist, specialized physician) were

excluded. We therefore excluded interventions such as chatbots, which tend to only provide general advice to patients; consultations between professionals (e.g., primary care physicians and specialists); non-outpatient settings, such as a specialised clinic or a hospital. We only included original studies; thus, literature reviews and study protocols were excluded. The inclusion and exclusion criteria are also presented as a table, see Appendix 1.

Data sources and search strategy

We searched for papers in the electronic databases of PubMed, Scopus, and CINAHL. A structured search strategy was developed with the help of an information specialist, and it included terms relating to digital healthcare services at the primary healthcare level. The results of each database search were stored in the reference manager software Mendeley. Duplicates were removed. The search strategy, search terms, and variations for each database can be found in Appendix 2.

Study selection

Two reviewers screened the selected studies, first by title, then by abstract, and last by full text. After each step, the reviewers discussed possible disagreements and reconciled them by consensus with the help of a third reviewer when necessary.

The initial database search identified 680 documents in total across all the databases. After duplicates were removed, the number of documents was 656. These papers were screened by assessment, first of the title and then of the abstract. After this, 594 papers were excluded, and 62 full-text articles were reviewed, of which 36 were accepted. Figure 1 depicts the PRISMA flow chart.

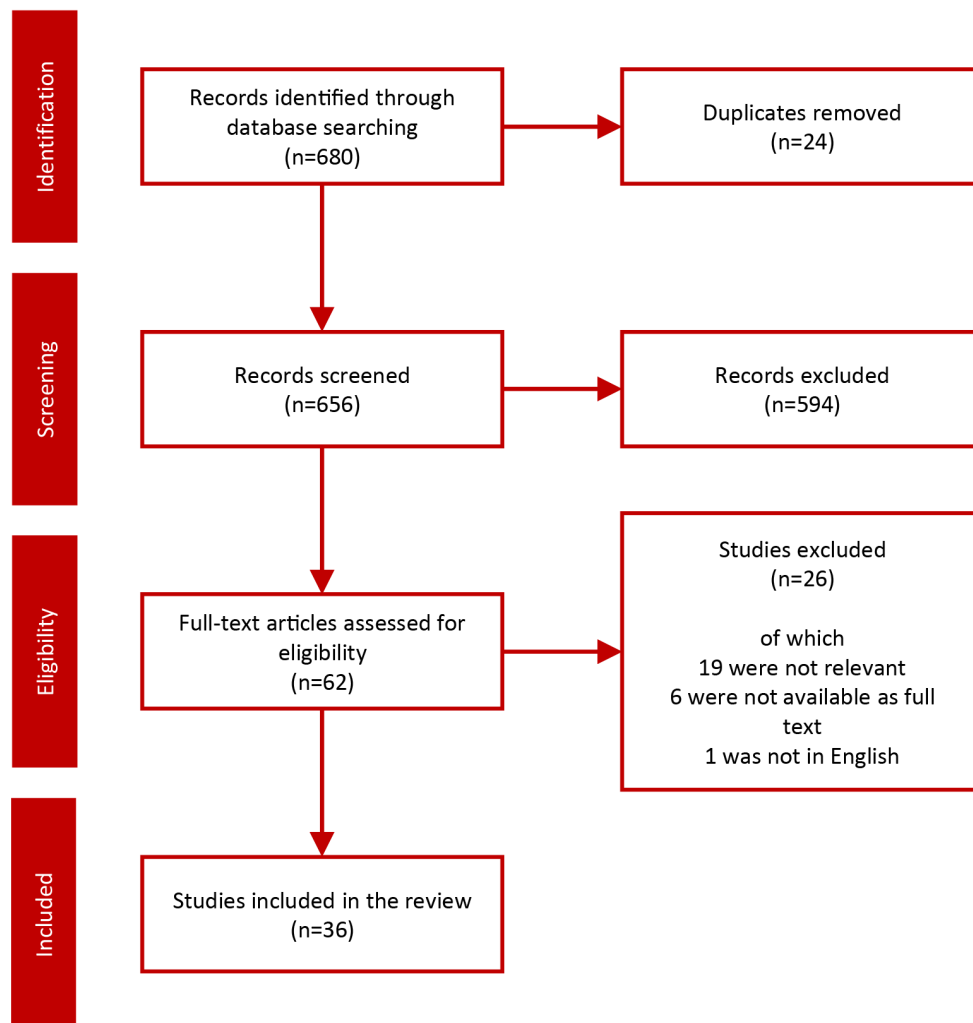


Figure 1. The PRISMA flow chart.

Data extraction, synthesis and analysis

A data extraction sheet was developed by the research team to ensure that the approach was consistent with the research questions. Extracted data included study details, methodology used (quantitative, qualitative or mixed methods), study perspective, details of the digital visits, study results and the targeted patient segment.

As actual segmentation should be done based on population characteristics and data, we employed a crude level of segmentation for the purposes of this study: we defined the segments as 1) a health care

user with long-term needs, or 2) a health care user with occasional needs, as described in Introduction.

The services were classified according to the modalities used (video, text, voice, image) and whether the communication between the patient and professional was synchronous or asynchronous. Both reviewers performed the extraction process independently. Any disagreements were addressed through conversation and reconciled by consensus.

Regarding the study perspective, we utilised the quadruple aim [6] framework. We found that some of the studies did not fit into any of the categories,

but were descriptive in aim—that is, studies aiming to describe, for example, the demographics of the patients using digital visits. Thus we added a fifth category (“Descriptive”) to accommodate these studies.

Results

Table 1 categorises the included studies by methodology and perspective used. Each study may include more than one perspective.

Table 1. Included studies by methodology and perspective.

| Methodology | Study | Patient experience | Clinician experience | Costs | Outcomes | Descriptive |
|--------------------------|-------------------------|--------------------|----------------------|----------|----------|-------------|
| Quantitative (n = 16) | Hertzog et al. 2019 | | | | x | |
| | Mehrotra et al. 2012 | | | | | x |
| | Cingi et al. 2015 | | | | x | |
| | Grubbs et al. 2017 | | | | | x |
| | Porath et al. 2017 | | | x | x | |
| | Caralis 2010 | | | | | x |
| | Chudner et al. 2019 | x | x | | | |
| | Edgerton 2017 | | | | | x |
| | Gonzalez et al. 2018 | | | | | x |
| | Hammersley et al. 2019 | x | | | | x |
| | Huygens et al. 2018 | | | | | x |
| | Manabe et al. 2019 | x | | | | |
| | McConnochie et al. 2016 | | | | x | x |
| | Miller et al. 2019 | | | | | x |
| | Moth et al. 2014 | | | | | x |
| Raknes et al. 2014 | | | | | x | |
| | total | 3 | 1 | 1 | 4 | 11 |
| Mixed methods (n = 8) | Alam et al. 2019 | x | x | | | |
| | Gammon et al. 2017 | | x | | | |
| | Casey et al. 2017 | x | x | | | x |
| | Cowie et al. 2018 | | | | | x |
| | Eccles et al. 2019 | x | x | | | |
| | Flarup et al. 2014 | x | | | | |
| | McKinstry et al. 2011 | x | x | | | |
| | Seto et al. 2019 | x | | | | |
| | total | 6 | 5 | 0 | 0 | 2 |
| Qualitative (n = 12) | Ball et al. 2018 | | | | x | |
| | Shi et al. 2018 | | x | | | |
| | Egerton et al. 2017 | | x | | | |
| | Banks et al. 2018 | | x | | | |
| | Bishop et al. 2013 | | | | | x |
| | Brant et al. 2016 | x | x | | | |
| | Donaghy et al. 2019 | | x | | | |
| | Hanna et al. 2011 | | x | | | |
| | Hanna et al. 2011 | | x | | | |
| | Hanna et al. 2013 | | x | | | |
| | Newbould et al. 2019 | | x | | | |
| | Randhawa et al. 2018 | | | | | x |

| Methodology | Study | Patient experience | Clinician experience | Costs | Outcomes | Descriptive |
|-------------|-------|--------------------|----------------------|-------|----------|-------------|
| | total | 1 | 9 | 0 | 2 | 1 |
| sum total | | 10 | 15 | 1 | 6 | 14 |

Of the five perspectives, the clinician experience was the most common (15/36 studies). Fourteen studies were descriptive. Costs were reviewed in one study and outcomes in six. Patient experience was the perspective chosen in 10 out of 36 studies.

The studies that had a patient experience perspective presented mixed results. Chudner et al. [33] and Donaghy et al. [34] found that face-to-face visits were preferred, while Alam et al. [35], Cowie et al. [36], and Seto et al. [37] reported generally positive experiences from digital visits. Hammersley et al. [38] and Ball et al. [39] found that digital visits may be suitable for some patients or ailments.

Similarly, the studies utilising a clinician experience perspective (n=15) showed mixed results. It must be noted that these studies tended to overlap with other perspectives, most notably with the patient perspective (6/16) - thus, many of the findings are the same as in the preceding chapter: Chudner et al. [33] and Donaghy et al. [34] found that face-to-face visits were preferred, while Alam et al. [35], Cowie et al. [36], and Seto et al. [37] reported generally positive experiences from digital visits. The nine studies that focused solely on the clinician's point of view had similarly mixed results: many found that digital visits were met with both doubt and enthusiasm. Among the concerns raised by clinicians were medico-legal and remuneration issues [40], patient IT literacy and availability of technology [40,41], and the potential for confusion [42]. An overarching theme was the lack of standard processes in using digital visits [40,41,43], which translated into an added workload for the clinicians. The

main potential benefit recognised by clinicians was improved access [40,41,42].

All six studies that used the effectiveness perspective [39,41,44-47] found digital visits to be as effective as traditional visits. Of these six, only one [33] measured health outcomes, while the rest estimated effectiveness based on the need for a follow-up visit.

Porath et al. [44] was one of those six studies, and it was the only study that used the point of view of costs. Porath et al. [44] studied the use of a telehealth service concept in elderly frail patients, finding that it was equally effective (in terms of follow-up visits needed) as traditional care, and that it provided cost savings.

Table 2 shows the modalities used and patient segments targeted for each paper included. In the included studies, the user groups were defined mostly by diagnosis, not by how constant the patient's need for the service was.

Three studies defined the targeted patient segment by something other than diagnosis. In the paper by Chudner et al. [33], the digital visit service was targeted at patients who had a follow-up visit in their primary healthcare unit; some of the patients had chronic diseases, though the majority did not. Donaghy et al. [34] studied a video consultation-based service intended for patients older than 16 who had a follow-up visit with their GP. In the paper authored by McConnochie et al. [47], the user group of the digital visits was paediatric patients.

Table 2. Studies, the modalities employed, and the patient segment targeted.

| Study | Type of intervention | Segment |
|-------------------------|---|--|
| Alam et al. 2019 | Phone call; Synchronous messaging | Users with occasional health service needs (n=5) |
| Ball et al. 2018 | Phone call | |
| Hertzog et al. 2019 | Asynchronous messaging | |
| Mehrotra et al. 2012 | Asynchronous messaging | |
| Shi et al. 2018 | Phone call; Video consultation | |
| Cingi et al. 2015 | Asynchronous messaging | Users with long-term health service needs (n=5) |
| Egerton et al. 2017 | Phone call | |
| Gammon et al. 2017 | Asynchronous messaging | |
| Grubbs et al. 2017 | Video consultation | |
| Porath et al. 2017 | Phone call | |
| Banks et al. 2018 | Asynchronous messaging | Any users (n=26) |
| Bishop et al. 2013 | Phone call; Asynchronous messaging | |
| Brant et al. 2016 | Phone call; Synchronous messaging | |
| Caralis 2010 | Phone call | |
| Casey et al. 2017 | Asynchronous messaging | |
| Chudner et al. 2019 | Video consultation | |
| Cowie et al. 2018 | Asynchronous messaging | |
| Donaghy et al. 2019 | Video consultation | |
| Eccles et al. 2019 | Asynchronous messaging | |
| Edgerton 2017 | Video consultation | |
| Flarup et al. 2014 | Synchronous messaging | |
| Gonzalez et al. 2018 | Phone call | |
| Hammersley et al. 2019 | Phone call; Video consultation | |
| Hanna et al. 2011 | Synchronous messaging; Phone call; Video consultation; Photos | |
| Hanna et al. 2011 | Synchronous messaging; Phone call; Video consultation; Photos | |
| Hanna et al. 2013 | Synchronous messaging; Phone call; Video consultation; Photos | |
| Huygens et al. 2018 | Asynchronous messaging | |
| Manabe et al. 2019 | Other | |
| McConnochie et al. 2016 | Video consultation; Phone call; Images; Other | |
| McKinstry et al. 2011 | Phone call | |
| Miller et al. 2019 | Phone call | |
| Moth et al. 2014 | Phone call | |
| Newbould et al. 2019 | Phone call | |
| Raknes et al. 2014 | Phone call | |
| Randhawa et al. 2018 | Video consultation | |
| Seto et al. 2019 | Phone call | |

The most common modality used in digital visits was phone call (20/36). The second most common modality was video consultation (11), followed by asynchronous messaging (10) (for example, email or communicating through a patient portal). Synchronous messaging was included in six interventions, and an interactive video was included in one service. In total, nine studies examined services that included many digital channels and/or modalities or combinations of them: the patient could use, for example, both email and video consultations.

Five studies described a service targeted at users with long-term health needs. The long-term health needs included asthma and rhinitis [46], osteoarthritis [42], mental health problems [46,47] and multiple chronic diseases [41]. Two of the services [48,49] for long-term users employed asynchronous messaging. Edgerton [42] examined a service that included a phone call between the patient and a multiprofessional team, and Porath et al. [44] studied a service that included a phone call (a telehealth centre for multimorbid patients). Grubbs et al. [48] examined video consultations as a part of the treatment of veterans with PTSD.

Another five studies described a service targeted at users with infrequent healthcare service needs. These needs included minor infections, such as sinusitis, urinary tract infection, or lower respiratory tract infections [50,51], low-acuity illnesses [52], and pregnancy or recent childbirth [35]. The solution studied by Alam et al. [35] included synchronous communication, as well as the possibility of a phone call. Shi et al. [51] studied a service which included the possibility of both a phone call and a video consultation. Mehrotra et al. [50] and Hertzog et al. [45] examined e-visits, which included asynchronous messaging between the patient and professional. Ball et al. [39] studied a telephone-

first approach (speaking to the GP by telephone before a face-to-face appointment).

In the rest of the studies (26/36), the digital visit service studied was not targeted at any particular patient segment but rather was available to all patients in that particular primary care unit. In this group, phone calls were the most popular modality. Asynchronous messaging was studied in six studies and synchronous messaging in five. Video consultations were more common than in segment-specific services, as were the combinations of different services.

Discussion

According to the results of our review, digital visits in primary care have mostly been studied from the point of view of the clinician. Little research had been done on patients' views and experiences of using digital visits. Similarly, there was very little information on the impact of digital visits on health outcomes and costs. Previous research has suggested that digital services can improve access and quality, and personalise services [20], but the results of our study found little research on these aspects in the context of digital GP visits. In terms of both effectiveness and costs, results were albeit promising. Thus, the digital leap had to be made with very little scientific knowledge about the benefits of digital visits in improving population health. More research is needed on the costs and effectiveness of digital visits to find out whether they truly have the potential to improve productivity as expected [2,3] and to strengthen primary care, as WHO envisioned in 2018 [22].

The studies presented very few digital GP visit services targeted at a specific patient segment - before the pandemic, digital visits had mostly been designed to serve the entire heterogeneous population of primary health care. Although there was

already scientific evidence on the benefits of patient segmentation [10-12], the results of our review suggest that this was not yet reflected in the targeting of digital visits. However, the studies pointed out many problems that we think could be alleviated by using needs-based patient segmentation [14] as a starting point when designing the services. First, many studies [35,41,43,51] have concluded that digital visits needed improvement or that their implementation was incomplete. Second, some studies found that although digital visits showed promise, face-to-face visits were still preferred [33,34,38]. Third, in five studies [38,39,52-54], the clinicians concluded that digital visits are better suited for certain needs than others. All of this highlights the need for further development based on the patients' needs.

A small proportion of patients use the majority of health services (and thus incur the majority of healthcare costs) [19]. Although patients with chronic conditions often need a lot of services, none of the articles described segmentation based on the patients' needs. We argue that given the limited resources in primary care, it would be very important in the future to target both digital and face-to-face services based on patient needs, in order to reach the patients who place the greatest burden on the healthcare system. However, more research and understanding of the profile and needs of these patients is needed, especially for digital visits.

Before the pandemic, telephone calls were by far the most popular modality of digital visits studied. Although the WHO classifies telephone interventions as digital interventions [22], it could be argued that telephone calls are not fundamentally digital. However, it should be noted that the studies included in this review date prior to the COVID-19 pandemic, which promoted the use of digital visits, which may have increased the proportion of newer

technologies (e.g. chat, video call). Still, the digital leap was made in a context where newer modalities were neither widely used nor widely studied.

Three articles [33,34,38] compared digital visits to face-to-face visits, and all found that although the digital service was usable, face-to-face appointments were still perceived as superior. Further studies are needed to find out why this is and whether the possible superiority of face-to-face visits is great enough to justify their higher cost. When studying patient preferences, it would be useful to take a patient segmentation perspective: how do the preferences of patients in different segments differ? Furthermore, the pandemic may have had an impact on this preference as well.

Also, most of the services were developed to improve access. Our earlier point about implementing digital services properly is likely to be even more important after the pandemic; digital visits and face-to-face services should not form separate care paths but be used in an integrated manner.

Prior research has emphasized the significance of patients exhibiting high healthcare resource utilization [16-19], and this is often used as a starting point for patient segmentation: patients with long-term needs and patients with occasional needs. Both groups comprise diverse individuals and warrant further investigation and research regarding their specific needs. It is plausible that there exist noteworthy subsegments within these patient groups that necessitate careful consideration and attention.

Strengths and limitations

A strength of our study is that we addressed a previously understudied area; digital visits in the field of primary health care. This is the first review of digital GP visits that considered the patient segments

targeted. To increase the rigour of our review, we used transparent and comprehensive study methods throughout the entire process, as described in the Methods section of the paper.

This review presents some limitations. First, due to the methodological heterogeneity of included papers, systematic assessment of the study quality was not possible. However, systematic critical appraisal is not mandatory in scoping reviews. A manual search for the grey literature could have decreased the risk of publication bias. We included only papers written in English into our review, which might have increased the risk of selection bias.

The review spans 10 years, which is a strength in terms of coverage, but it could render the technology used in the oldest studies outdated. However, the prevalence of the telephone as the main technology was unchanged throughout the years covered.

Conclusion

This review spans the final decade of the pre-pandemic era. The COVID-19 pandemic marks a considerable rise in interest towards digital visits, which may have affected the perspectives used in

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studying them. Further research is needed to evaluate the perspectives employed in studying digital visits since the emergence of COVID-19.

Prior to the pandemic, there was little scientific knowledge about the effectiveness or benefits of digital visits in improving population health or reducing healthcare costs; the point of view of the patient; new technology, like chat or video call; or the needs of different patient segments. It is especially noteworthy that, overall, few papers aimed to study the effects or benefits of digital visits. This is a major gap as digital visits are becoming more and more prevalent. Although the results regarding the benefits of digital visits instead of face-to-face visits varied, none of the studies deemed digital visits completely unsuitable. Further studies to fill this knowledge gap are needed, and more information is needed on the effectiveness of digital services.

Conflict of interest

The authors have no conflict of interest.

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Appendix 1.

Table A1. Included studies.

| 1st author | Title | Year of publication | Country of origin |
|--------------------|--|---------------------|-------------------|
| Hertzog | Diagnostic Accuracy in Primary Care E-Visits: Evaluation of a Large Integrated Health Care Delivery System's Experience. | 2019 | US |
| Mehrotra | A comparison of care at e-visits and physician office visits for sinusitis and urinary tract infection. | 2012 | US |
| Cingi | The "physician on call patient engagement trial" (POPET): measuring the impact of a mobile patient engagement application on health outcomes and quality of life in allergic rhinitis and asthma patients. | 2015 | Turkey |
| Grubbs | Usual Care for Rural Veterans with Posttraumatic Stress Disorder. | 2017 | US |
| Porath | Maccabi proactive Telecare Center for chronic conditions - the care of frail elderly patients. | 2017 | Israel |
| Caralis | Teaching residents to communicate: the use of a telephone triage system in an academic ambulatory clinic | 2010 | USA |
| Chudner | Choosing Video Instead of In-Clinic Consultations in Primary Care in Israel: Discrete Choice Experiment Among Key Stakeholders-Patients, Primary Care Physicians, and Policy Makers. | 2019 | Israel |
| Edgerton | A Pilot Study Investigating Employee Utilization of Corporate Telehealth Services. | 2017 | US |
| Gonzalez | Telephone consultation in primary care: A retrospective two-year observational analysis of a public healthcare system | 2018 | Spain |
| Ham-mersley | Comparing the content and quality of video, telephone, and face-to-face consultations: a non-randomised, quasi-experimental, exploratory study in UK primary care. | 2019 | UK |
| Huygens | Understanding the use of email consultation in primary care using a retrospective observational study with data of Dutch electronic health records. | 2018 | Netherlands |
| Manabe | Perceptions of Residents among Rural Communities with Medical Group Practice in Japan. | 2019 | Japan |
| McConnochie | Care Offered by an Information-Rich Pediatric Acute Illness Connected Care Model. | 2016 | US |
| Miller | Impact of a telephone-first consultation system in general practice. | 2019 | UK |
| Moth | Drug prescription by telephone consultation in Danish out-of-hours primary care: a population-based study of frequency and associations with clinical severity and diagnosis. | 2014 | Denmark |
| Raknes | Travel distance and the utilisation of out-of-hours services | 2014 | Norway |
| Alam | Patients' and Doctors' Perceptions of a Mobile Phone-Based Consultation Service for Maternal, Neonatal, and Infant Health Care in Bangladesh: A Mixed-Methods Study. | 2019 | Bangladesh |
| Gammon | Shifting Practices Toward Recovery-Oriented Care Through an E-Recovery Portal in Community Mental Health Care: A Mixed-Methods Exploratory Study. | 2017 | Norway |
| Casey | Experiences with online consultation systems in primary care: case study of one early adopter site. | 2017 | UK |
| Cowie | Evaluation of a Digital Consultation and Self-Care Advice Tool in Primary Care: A Multi-Methods Study. | 2018 | UK |
| Eccles | Patient use of an online triage platform: a mixed-methods retrospective exploration in UK primary care. | 2019 | UK |

| 1st author | Title | Year of publication | Country of origin |
|------------------|---|---------------------|-------------------|
| Flarup | A feasible method to study the Danish out-of-hours primary care service. | 2014 | Denmark |
| McKinstry | Comparison of the accuracy of patients' recall of the content of telephone and face-to-face consultations: an exploratory study. | 2011 | UK |
| Seto | Opportunities and challenges of telehealth in remote communities: Case study of the Yukon telehealth system | 2019 | Canada |
| Ball | Qualitative study of patient views on a 'telephone-first' approach in general practice in England: speaking to the GP by telephone before making face-to-face appointments. | 2018 | UK |
| Shi | Quality Of Care For Acute Respiratory Infections During Direct-To-Consumer Telemedicine Visits For Adults. | 2018 | US |
| Egerton | General practitioners' perspectives on a proposed new model of service delivery for primary care management of knee osteoarthritis: a qualitative study. | 2017 | Australia |
| Banks | Use of an electronic consultation system in primary care: a qualitative interview study. | 2018 | UK |
| Bishop | Electronic communication improves access, but barriers to its widespread adoption remain. | 2013 | USA |
| Brant | Using alternatives to face-to-face consultations: a survey of prevalence and attitudes in general practice. | 2016 | UK |
| Donaghy | Acceptability, benefits, and challenges of video consulting: a qualitative study in primary care. | 2019 | UK |
| Hanna | Non-face-to-face consultations and communications in primary care: the role and perspective of general practice managers in Scotland. | 2011 | Australia |
| Hanna | The place of information and communication technology-mediated consultations in primary care: GPs' perspectives. | 2011 | Australia |
| Hanna | Using information and communication technologies to consult with patients in Victorian primary care: the views of general practitioners. | 2013 | Australia |
| Newbould | GPs' and practice staff's views of a telephone first approach to demand management: a qualitative study in primary care. | 2019 | UK |
| Randhawa | An exploration of the attitudes and views of general practitioners on the use of video consultations in a primary healthcare setting: a qualitative pilot study. | 2018 | UK |

Appendix 2.

Search Strategy for scoping review

Ovid Medline

- 1 ehealth.mp. (3786)
- 2 e-health*.mp. (2890)
- 3 mhealth*.mp. (4592)
- 4 m-health*.mp. (577)
- 5 exp Telemedicine/ or telemedic*.mp. (32754)
- 6 digi* health*.mp. (1934)
- 7 1 or 2 or 3 or 4 or 5 or 6 (40394)
- 8 exp Primary Health Care/ or primary health*.mp. (177713)
- 9 exp General Practice/ or general practice*.mp. (98659)
- 10 exp Community Health Services/ or community health care*.mp. (302836)
- 11 8 or 9 or 10 (538310)
- 12 remote visit*.mp. (14)
- 13 televisit*.mp. (44)
- 14 exp Remote Consultation/ or remote consult*.mp. (5043)
- 15 12 or 13 or 14 (5091)
- 16 7 and 11 and 15 (1043)
- 17 8 or 9 (263476)
- 18 7 and 15 and 17 (619)

Scopus

(TITLE-ABS-KEY (ehealth* OR e-health* OR m-health* OR mhealth OR "digi* health*" OR telemedic*) AND TITLE-ABS-KEY ("primary care" OR "primary health care" OR "occupational health" OR "family medicine" OR "general practice*" OR "community health*") AND TITLE-ABS-KEY ("remote visit*" OR "teleconsult*" OR "remote consult*")) AND NOT INDEX (medline) AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012) OR LIMIT-TO (PUBYEAR , 2011))

CINAHL

(ehealth* OR e-health* OR mhealth* OR m-health* OR telemedic* OR digi* health* OR (MH "Telehealth+")) AND ((MH "Primary Health Care") OR primary care* OR General Practice* OR (MH "Community Health Services+") OR Community Health* OR (MH "Occupational Health+") OR (MH "Occupational Health Services+") OR occupational health* OR family medicine*) AND (remote consultat* OR remote visit* OR teleconsult*)