

E-consultation in primary care: a systematic review

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Abstract

Background: Governments and healthcare providers are keen to find innovative ways to more efficiently deliver care. Interest in e-consultation has grown, but evidence of benefit is uncertain.

Objectives: To assess the evidence of delivering e-consultation using secure email/messaging or video links in primary care.

Methods: A systematic review was conducted focusing on the use and application of e-consultations in primary care. A systematic review of seven international databases was searched (Medline, Embase, CINAHL, Cochrane Library, PsycINFO, Econlit and Web of Science) (1999-2017), identifying 52 relevant studies. The screening was conducted against a detailed inclusion and exclusion criteria. Independent dual data extraction was conducted and assessed for quality. The resulting evidence was synthesised using thematic analysis.

Results: This review included fifty-seven (n=57) studies from a range of countries, mainly the USA (n=30) and the UK (n=13). Patient responses to e-consultation are mixed. Patients report satisfaction with services, and improved self-care, communication and engagement with clinicians. Evidence for the acceptability and ease of use was strong, especially for those with long-term conditions and patients located in remote regions. However, patients were concerned about the privacy and security of their data. For primary healthcare staff, e-consultation delivers challenges around time-management, having the correct technological infrastructure, whether it offers a comparable standard of clinical quality, and whether it impacts on health outcomes.

Conclusions: E-consultations may improve aspects of care delivery, but the small, pilot nature of many of the studies and low adoption rates result in unanswered questions about usage, quality, cost and sustainability. The review findings have drawn attention to the need to improve future e-consultation implementation, and research to develop innovations which support equitable primary care access and delivery across user groups.

1. INTRODUCTION

The growth and ageing of the global population combined with increased expectations place enormous pressures on health care. Greater use of technology is seen as a partial solution to the complex challenges of delivering healthcare to an increasing and ageing population with more chronic disease. This is reflected in health policy in the UK, USA and elsewhere [1]. Technology-supported consultations provide more flexible, though different, style of the clinician-patient relationship. However, adoption has been a challenge [2] and there is limited evidence of benefit [3-4].

The UK has taken a strong interest in remote care [5] due to the increased cost of emergency administrations. Between 2012-3 there were 5.3 million emergency admissions to UK hospitals, at a cost of approximately £12.5 billion representing a 47% increase over the previous 15 years [6]. These increases have led to growing interest as to whether remote care reduces what is considered unnecessary doctor's appointments or avoidable hospital admissions. However, to be commissioned and mainstreamed into everyday practice an innovation must show it can provide significant system-level advantages effectively providing 'more for less'. For example, a "whole system" telemedicine demonstrator project saw improvement in patients' quality of life [7-8]. This was one of the worlds' largest remote care trials [9]. Telemedicine has also shown benefits in terms of health outcomes, hospital admission, and in terms of cost-effectiveness [10-12].

In this study, we focus on e-consultations situated within primary care. Whilst remote care comes in many forms, including telephone, video, text messaging, email consultations, online portals for prescription orders, appointment booking and patient access to online health records, or some combinations of all these [13], research into these different forms is heterogeneous [14]. We have elected for this review to exclude telemedicine and telemonitoring as they are generally specialist based and focus on the long term management of chronic conditions.

E-consultations are feasible, and reliable and convenient [15]; though in common with other digital innovation challenging to implement [16]. With the growing use of computerised medical records (CMR) [17-18], it should be more straight forward to incorporate e-consultations [19-20].

Nevertheless, trials show little or no significant difference between usual care and intervention groups in terms of clinical outcomes [21].

The aim of this review is to assess the evidence of delivering e-consultations using secure email/messaging or video links in primary care. The objectives are to:

- (1) Understand how e-consultations affect patients' access to services; their frequency of use and satisfaction and any impact on health outcomes.
- (2) Investigate professional/workforce issues, including potential changes in workload/flow (actual and perceived) and barriers to use.
- (3) Identify possible organisational/ technology barriers and solutions to implementation.

2. METHODS

2.1 Design

This systematic review follows 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [22] guidelines, (Figure 1). The study aims were structured using PICO such as population, intervention, comparator and outcome format [23]. The study *population* were defined as users/non-users of e-consultation services, including both patients/carers and clinicians/support staff in primary care. The *intervention* related to synchronous or asynchronous e-consultation service used in primary care. Any *comparison* was used, including usual care. Finally, several *outcomes* were identified. These included:

- Patient(s): changes to service use including access to services (by specific patient groups/disorder or attributes of the user, frequency of attendance and satisfaction); and impact on health outcomes.
- Professional/ workforce: workload and barrier to e-consultation implementation; impact on professional identity; consultation/revisit rates; and finally (if the information is available) quality and safety (i.e. complaint numbers/ rates).

The protocol was registered on PROSPERO, the international database of systematic reviews [registration number CRD42015019152].

2.2 Information Sources & Searches

Advanced searches were performed across a range of international electronic databases, including, the Cochrane Library, general medical bibliographic databases (Medline, Embase, Cinahl, via EBSCO platform) PsycInfo, Econlit and Web of Science. A search was performed in the database OpenGrey for unpublished material.

Search strings were developed according to the index terms/ MeSH of each database together with keywords within the title and/or abstract using boolean searches (AND, OR) with truncation and wildcard functions used [see Online Supplementary Table S1].

This is an emergent and developing area, so recently published research was of key interest. We searched the literature from 1st January 1999 to 1st March 2017. No limits were placed on the evidence type (type of document i.e. systematic review) country of origin or language of literature. Search results were exported into Endnote (v7.2.1). The search yielded 14,016 references, of which 1,610 were duplicates and 12,406 were screened.

2.3 Setting & Participants

The systematic review focuses on primary care and ambulatory care settings. Our principal participants in this study are patients and their family, caregivers (users and non-users of e-consultations) and healthcare professionals (clinicians, allied health professionals, practice support staff and managers). The technology is also relevant and is included in this review, focusing on current implementation, design and the IT infrastructure underpinning e-consultations.

2.4 Eligibility Criteria

Search results were checked against the pre-defined inclusion/exclusion criterion [see Online Supplementary Table S2 — for Excluded Studies]. The inclusion criteria were based on:

- A range of healthcare conditions, including any long-term chronic conditions managed in primary care (diabetes, hypertension) or routine conditions (skin conditions, sleep issues).
- Any asynchronous and synchronous/ emails and visual/ video technologies (e.g. Skype™) used by both patients/ carers and health care professionals in the e-consultations.

- No limitations were placed on the type of study (RCTs, qualitative, quantitative, economic impact) however study protocols were excluded as they do not contain original outcome data or review evidence.

Exclusions were studies focusing on telephone use alone (without the use of email/video or messaging) any experimental studies which fail to provide specific outcomes measures, or reported quality measures for service evaluation purposes only (e.g. NHS Information Centre Quality and Outcomes Framework (QOF) summary data). Finally, studies were excluded if they reported use of medical records/email or telephone to recruit participants to research projects. This review only includes studies that performed e-consultations with primary care staff, with services performed in other settings (the community, secondary or tertiary care) being excluded. Other studies were excluded on the basis they focused on health promotion/ education tools, which was not the primary focus of this review. Specifically, we were interested in e-consultations impact on access/health outcomes related to an illness event, rather than on long-term preventative strategies. Budgetary constraints excluded the authors from including studies that needed to be translated. Finally, in order to avoid possible bias and over-reporting, studies were excluded if their results were already reported on in included review article [24].

2.5 Data Selection

Evidence was sourced and retrieved by members of the research team (FM, YL). Results from searches were stored electronically. An initial screening of titles/abstracts was independently conducted by two team members (YL and FM). Inclusion queries were resolved through discussion at team meetings. Inclusion decisions were recorded using EndNote (v7.2.1). Further exclusions occurred once full texts were retrieved, and when papers failed to meet the inclusion criteria or on the basis of poor fit.

2.6 Data Extraction

Independent dual data extraction was undertaken by two researchers using a pre-designed data extraction form (DEF) reflecting the core objectives of the study, including aims/objectives, study design, setting, type of e-consultation, outcome measures, comparator groups and key findings. Data extracted also focused on a range of clinical outcomes (such as haemoglobin HbA1c, blood pressure) behavioural outcomes (patient-clinician interaction, perceptions, acceptance and system

use) and organisational issues (such as functionality, usability, cost, and workflow). The DEF aimed to assist the authors to consistently retrieve the core contents of each study and aid in the organisation of material prior to analysis.

2.7 Data Analysis and Quality Assessment

The analysis was executed in several stages. Firstly, the identification of the themes arising from the literature. The themes were developed over a series of meetings when the researchers clustered the results into higher-order categories that seem to have coherence when summarised together. The aim of the clustering was to devolve a large and varied number of results into a smaller number of more easily understood, salient issues. The analysis was supported using a three-stage thematic analysis process previously used [25-26] and guided by the Mayring framework [27]. Secondly, the assessment of evidence quality. Finally, themes were grouped against each of the research objectives, in order to build up a comprehensive overview of the evidence. The analysis was undertaken by FM and JH with periodic input from the wider team.

2.8 Critical Appraisal

Studies based on qualitative, quantitative and mixed methods designs were subject to critical appraisal, using the Mixed Methods Appraisal Tool [2011 version] (MMAT) [28-29]. The MMAT tool uses criteria scored from 0% to 25%, with the overall score being 100. The inter-rater reliability of the MMAT was 0.94 [28]. No quality threshold was imposed but caution was used in order to not over-emphasise the contribution of evidence which had a low score (50% and less) (n=7 papers, 25%). In reporting findings, greater emphasis has been placed on literature with a higher MMAT score (>50% and above) (n=41). In order for this work to be transparent, we have reported the MMAT score table. [See Online Supplementary Table S3 – MMAT].

3. RESULTS

Study Characteristics

Fifty-seven studies were included in the review (n=57) including evidence from a range of countries, the USA (n=30) and the UK (n=13), with the remaining from Australian (n=3), Sweden

(n=3), Finland (n=3), (Canada n=3), Denmark (n=1) and Italy (n=1) enabling greater ability for the finding to be generalizable. [See Online Supplementary Table S4 - Evidence Tables].

A variety of study designs were used, though the majority employed quantitative methods including descriptive designs such as surveys, and analysis of service frequency data (n=22) [30-51] quasi-experimental, cohort or cross-sectional designs (n=10) [52-61] or RCTs (n=2) [62-63]. There was also a range of qualitative study designs using case studies, interviews and focus groups (n=13) [64-76]. Only six studies had a mixed-method design [77-82]. Four review findings were included [21, 83-85].

Five overarching themes were identified across the literature, patient access, patient outcomes, workforce issues, governance and safety, and factors that impact on willingness to adopt and sustainability.

3.1 Patient Access

Age and gender

The socio-demographics of patients using e-consultations was mixed. Users of e-consultations [30, 39,82,83] and secure messaging [41,56] were primarily women [30,39,41,42,44,56,82,83] who used these services during working hours [30], presumably due to issues of convenience [42] in terms of organising care/treatments for dependents (young children/older relatives) [31]. However, the evidence is far from conclusive, as one study found no statistical difference between genders [59] and another study found more men (n=59/87) than women used the service (n=28/87) [55]. The mean age of e-consultation users also varies. Some studies report prevalent users as being younger (45.9 vs 50.3 years, $P<.01$) [59] some as being 31-49 years (n=63/87, 77%) [55,83] middle-aged (between 50-65 years) [56] or over 60 years of age [44].

A study comparing patient characteristics receiving face-to-face or e-consultation in primary care (sinusitis/UTI) found older people (≥ 65 years) to be less likely to use e-consultations (sinusitis, n=28/475, 6%; UTI, n=9/99, 9%, $P<.001$) [39]. In a similar study, age (over >65) was also associated with being less likely to use secure messaging (OR, 0.65, CI, 0.59-0.71) [56]. Early evaluation of e-consultations in one clinic suggested older patients found the concept of e-consultations confusing

[82]. In contrast, a systematic review in 2014 suggests concerns about older patients being confused by them may be unjustified; and benefit could be gained if offered the right support [83].

Patients Socioeconomic Status

Direct measures of socioeconomic status or failure to have health insurance, which we took as an indirect measure of socioeconomic status, were associated with limited affordability and access to emerging technologies [72]. Socioeconomically disadvantaged patients or those with poorer self-reported health were less likely to express an interest in communicating about their care using email, or the internet [36]. In addition, patients who used email to communicate with their clinician were significantly associated with a higher annual family income ($P=0.007$, \geq US\$ 70,000) [35,44]. This group was reported to communicate with their clinician twice as much as those on lower incomes (\leq US\$10,000-29.999) [35]. Moreover, a study investigating the characteristics of e-consultation patients found a high number of employed patients (for conditions such as sinusitis, $n=355/475$, 75%; or UTI, $n=59/99$, 60%, $P<.001$) suggesting out-of-office access is important for those in work [39].

In contrast, one study suggests the lack of medical insurance increased the odds of using 2-way visual/audible contact with health providers (OR=0.83, 95%CI, 0.72-0.97) [42]. The cost of e-consultations for patients (email via a portal) varies between \$35 [30] and \$39 US dollars [40]. Earlier work found there may be a cost threshold, with 60.1% ($n=149/248$) of patients willing to pay up to \$10 US dollars or more per year. Only 31% ($n=77/248$) of patients were willing to pay up more - up to \$50 US dollars or more per year for secure email contact [32]. Willingness to pay did not differ by age ($P=.06$) [32].

Perceived seriousness of the condition, convenience and patient satisfaction

Patients reported using e-consultations when they did not perceive that a face-to-face consultation as warranted, even if conditions were a chronic and long-term (diabetes and hypertension) [30,58,80] or in cases where symptoms were routine or non-urgent, such as skin conditions, low-level pain, sleep issues, haemorrhoids, coughs or sinusitis [30,49,80,82,84]. Unlike other studies, email contents analysis in one study suggests emails are useful when patients want to request information (symptom updates) or simple provider action (referrals, medications,

treatments or test result information) [64]. This suggests e-consultation [68,84], and online primary care visits [30] offers a convenient means through which to manage low risk, non-urgent health concerns.

Differences also emerged when using technology to receive test results. While many patients were willing to use email to obtain test results for cholesterol (85%, n=1045/1229) less were willing to use this mode of contact for more serious conditions such as receiving a brain CT scan test result (59%, n=725/1229) [35]. Perceived seriousness also impacted on the mode of communication with patients' reported favourable attitudes towards email but not text message or a webpage for the delivery of blood test results [45].

Convenience was the primary reported reason for choosing an e-consultation by patients across multiple studies [36,39,42,46,49,68,80,84]. Patient satisfaction [33,52,60,67,71] with immediate care received was increased [82] in the short term at 6 months [53]. Studies exploring the possible long-term impact of e-consultations over face-to-face encounters reported similar findings [41,53]. One study found no significant difference in the 30-day adjusted visit frequency at follow-up (2.35 visits per year before and 2.35 after portal messaging, $P=0.93$) [41]. The subgroup analysis at 1 year of follow-up found an adjusted nonsignificant decrease of 0.1 visits per year (2.44 visits per year before the first message) and 2.34 after (p 0.14) [41].

Timeliness of responses was important to patients using email [34,75,82] and was associated with satisfaction [85]. Patients had high expectations regarding the timeliness of responses for various online services. Almost all patients in one study (89%, n= 2011 /2260) expected a reply from email messages from clinicians within 24-hours; and 68% (n=1536/2260) expected responses or access to test/laboratory results within a 24-hour period [35]. More than 50% of patients expected a reply within 8-hours [35] and preferably the same day [75].

A range of studies found specific advantages to using e-consultations including improved access to care [67,71,84] both in the delivery of care outside of standard working hours [74] and care delivery to remote areas; time saved [33,37,46,74] and cost-saving including lost wages [74]. One evaluation study, of joint teleconsultations between general practitioners, specialists and patients,

found cost-saving for patients with between €1,000.06 and €2700.50 by patients avoiding travel to emergency departments and for in-clinic visits/diagnostic examinations [51]. Lastly, video and email consultations provide both patients' and clinicians' with opportunities to learn about health conditions and their management, through information and image sharing [66,75] offering the potential for more active patient engagement in the care process [53,64,83].

Joint e-consultations between general practitioners, specialists and patients resulted in significantly higher levels of patient satisfaction (mean difference 0.33 scale points [95% CI 0.23-0.43], $P < .0001$) [63]. Satisfaction was also associated with a reduction of distance travelled [39] (average decrease of 170kms) [33] or 1-way distance saved per patient (average 65 miles) [37]. Not surprisingly, greater e-consultation use was associated with the winter months [39] especially for patients (and families) using video consultations in rural/remote communities [74].

3.2 Patient Outcomes

There is a lack of good quality evidence demonstrating positive patient outcomes from e-consultations due to the heterogeneity of existing evidence making an accurate assessment of benefits difficult [21]. In addition, there are limitations as to the longevity of follow-up data in trial material again, limiting the generalisability of any findings [21]. There were, however, several areas of potential benefit highlighted. Survey evidence suggests how telemedicine was as good or even better than face-to-face consultation concerning the explanation of care to patients [33]. Email consultations were also shown to be clinically feasible in terms of diagnostic accuracy [85].

E-consultations may also play a role in the management of symptoms [52,58]. A study focusing on the management of hypertension in rural areas, using videoconferencing, found that the intervention group had a higher proportion of patients with blood pressure within treatment goals (systolic blood pressure, 140 mmHg, diastolic blood pressure, 90 mmHg) both at baseline and at follow-up, compared to a comparison group [58]. The intervention group was shown to have a higher probability of meeting their target blood pressure goal (OR 2.7, 95% CI 1.4–5.2) over the comparison group [58]. The quality of physical examinations in e-consultations was significantly worse regarding effectiveness (2.3 versus 4.9 for the face-to-face visit, $P < .0001$), but history taking and therapeutic effectiveness were not significantly different [60].

3.3 Workforce

Several studies report clinicians' reluctance to use email with their patients because of increased workload concerns [38,41,47,85]. Clinicians' reported improved efficiencies as email or secure messaging was described as taking little additional time [71] and encouraged care access [80]. However, as time is cumulative, even small additions for example between 2 to 6 minutes per email consultation [85], may lengthen the working day [71,77]. A quasi-experimental study reported how offering access to visit notes or email contact to patients was actually easier than expected and resulted in no change in the volume of messaging from patients [52]. Indeed, few clinicians reported longer visits (0%-5%) or more time answering patients' questions outside of face-to-face visits (0%-8%) [52]. Practice size has little effect on the overall workload [52]. Similarly, an evaluation of an email service found email services did not have any adverse time implications [67]. As such practice partners were satisfied that the service worked effectively and did not negatively impact their day-to-day workload [67].

A retrospective cohort study of patients (n=2,357) using electronic messaging (both secure messages and e-consultations) via a portal found, after the first message surge, no significant visit frequency differences (mean, 2.35 annual visits per patient both before and after the first message ($P=.93$) [41]. Subgroup analysis indicated no significant change in the frequency of visits between high messaging users, or for those who had used messaging for longer. In other studies, e-consultations were found not to reduce telephone consultations [80], or number of office visits [71]. Evidence focusing on return visits to primary care found no significant differences in rates of early return visits for the same reason (e-consultations 20.2%, n=46/228; face-to-face 19.6%, n=98/500, $P=.86$ face-to-face 19.6%, $P=0.86$) [59]. Similarly, a pilot study found less than <10% of patients who had an e-consultation ("similar to email") required a follow-up face-to-face appointment [79]. Only the presence of moderate or more co-morbidities was a significant predictor (OR 1.95, CI 1.20-3.17, $P<.01$) relating to return visits for the same reason [59]. A small questionnaire to determine the feasibility of conducting follow-up visits using video conferencing compared to face-to-face visits reported no significant difference in either group at 6 months [53]. Overall, findings from multiple studies suggest the use of e-consultations may complement in-

person delivery (or could be a useful adjunct) to routine care [69,80,85], but this is reliant on the seriousness or risks associated with specific health conditions [59,69,80].

The patient-clinician relationship

E-consultation was reported to impact on the patient-clinician relationship. The quality and safety of communication between groups may be affected and the interpersonal relationship (both positively and negatively). Access to physician notes and electronic messaging impacted on who initiated the direction of contact [71] and quality of the clinician and patient communication (content, tone) [52,64,74,80,84,85]. The ability to immediately exchange information (in a timely manner either asynchronous or synchronously) was reported to potentially improve the therapeutic relationship [85]. Clinicians felt patients' access to visit-notes and electronic messaging strengthened their relationship with some patients because of a sense of enhanced trust, transparency, communication and shared decision-making [52,80]. Email exchange was also viewed as a useful tool to enable patients to express individual concerns and building a partnership which was supportive and patient-centred [64,84]. Video consultations in remote areas were also seen as an effective way to maximise home support, to bring comfort to users in their own homes and bring providers and families together from various regions [74].

In contrast, there were concerns about how e-consultations might negatively impact on the clinician-patient relationship [69]. These concerns include the need for professionals to communicate using non-technical language [70] and their need to manage multiple tasks simultaneously (such as recording information) which might impact on the perceived engagement/attentiveness of the clinician in the online interaction [76]. Indeed, in circumstances where nurses were present with clinicians in the e-consultation, clinicians themselves sometimes felt like outsiders, as the nurse and patient were better able to form a mutual bond via non-verbal communication and empathetic skills (such as maintaining eye contact) [76].

3.4 Governance and Safety

Within this review governance, quality and safety issues emerged in various forms, but not widely researched [40]. Only one study, a retrospective analysis of secure messaging and e-consultations was undertaken to assess the potential risk of time-sensitive symptoms, such as chest pain or

dyspnoea [40]. Only six hospitalisations were related to a previous secure message (0.09% of secure messages) and two hospitalisations related to a previous e-consultations (0.22% of e-consultations, n=2/892) [40]. Quality emerged in terms of the mode of care delivery either in terms of offering patients' information which impacts on their future service use, such as offering information which decreases the need for face-to-face encounters [61], enabling further opportunities to identify new problems during e-consultations [37], or raising perceptions of medicolegal liability [80].

Clinicians also raised concerns related to the lack of guidance about the 'rules of engagement' [68], such as if an email is left answered [80] or level of confidence about taking medical history via e-consultations rather than face-to-face [53]. In response to the lack of guidance, GPs and patients have introduced their own rules of contact. These rules were not comprehensive and did not cover all eventualities [68]. Lack of formal practices/ guidance was a recurring issue across the evidence [75,77,78,84]. A final concern is whether instructions through email can be adequately understood and correctly acted upon as intended by the sender [21,80] and whether some questions were appropriate for discussion via email [75].

3.5 Factors that Impact on Willingness to Adopt and Sustainability

Willingness to use technologies can be broadly divided into two related themes; the patient perspective and professional/ organisational. Low response rates amongst users were prevalent across studies [38,57,77] indicating differences in use depending on the level of experience between first users and those who are more experienced [37,47,77,82].

Patient enthusiasm was often dependent on their previous experience of using technology to manage their health [57]. In a longitudinal study comparing pre and post attitudinal changes to e-consultation found first-time users were more likely to have a positive view whilst experienced users were more negative ($P=0.025$) suggesting patient use may tail off over time[55]. Other factors impact on patients willingness to try e-consultations including perceived severity of the condition (minor complaints) [80], and the actual mode of communication (secure email or direct access to records/lab results) [45].

General practices willingness to adopt may also manifest in terms of the actual characteristics of the general practice, (size and location) [72], with smaller practices in more deprived areas being less likely to use email [78]. Clinicians working in group practices were reported to be more in favour of using video technology for consultations [50].

In terms of sustainability, e-consultation may have repercussions in respect of further work across settings. A pilot mixed-methods study found that specialist consultation requests made into primary care clinicians [79] resulted in GPs being asked to offer more patient advice, order diagnostic tests or commence a new course of treatment [79]. Other work has echoed this potential service 'push' to other healthcare providers with teleconsultations resulting in a small number of additional diagnostic examinations (n=8) and hospitalisations (n=6) [51]. Similarly, a RCT examining whether e-consultations (called virtual outreach in the study) (between GP's, specialists and patients) would reduce follow-up appointments found more e-consultations patients than the standard group being offered a follow-up appointment (52%, n=502/971 vs 41%, n=400/971; odds ratio 1.52 [95% CI 1.27-1.82] $P<.0001$) [63]. There was, however, variability associated with rates of follow-up according to speciality and site [63].

With regard to implementation and sustainability, there is limited evidence available about the cost-effectiveness of e-consultations, but the high cost of buying telemedicine equipment [47] and expense of implementing this technology is a concern for healthcare professionals [62].

Costs of clinicians' time to support joint consultations were unlikely to be offset against subsequent savings to healthcare services in the short term [62]. The total use of UK healthcare (NHS) resources over 6 months suggest the overall mean cost per patient is significantly higher in the joint consultation group than the standard outpatient group by approximately £100 [62]. The significant reduction in tests and investigations in the joint consultation group resulted only in small cost reduction "downstream" [62]. Similarly, other studies recommend future long-term follow-up (over 6 months) to determine downstream outcomes and full evaluation of cost-effectiveness [63].

Delays in service delivery was also an additional concern with the provision of out-of-hours services. A small study assessing delayed response to patients' secure email messages (messages not opened after 12 hours or non-response after 36 hours) found both kinds of delays were higher on weekends ($P < .001$) (Friday-Sunday) [41]. Delay was more likely to be experienced by patients aged over 50 years (25.7% $n=605/2357$, delayed, $P=.013$) [41]. The study suggests these delays could be addressed by automatically rerouting messages to a 24 hour staffed support service, or another mechanism to manage this after-hour workflow [41]. Provision of logistical support for a range of e-consultation methods may, therefore, be significant to enable long-term and efficient implementing of systems in primary care [63]. In addition, in one study, facilities which offered user support for those wanting secure messaging were found to have higher rates of adoption (2.13%) over other providers (1.52%, $P=.0058$) [57].

Other notable barriers to implementation include commissioners' incentives (or direction of cost) for the introduction of remote services [66], the impact of size and location of practices [72], and organisational resistance [60,78]. From the provider perspective, a mixed-method study suggests email communication could be embedded into everyday practice, and be remunerated similarly to usual clinic time, thereby potentially offering a new structure of care [80]. The direction of cost is illustrated in one study exploring the experience of Greek healthcare providers and their patients with the introduction of an e-consultation service [66]. The study found there was no incentive for the healthcare system to introduce e-consultations as often patients incurred the cost of their own travel to the mainland for healthcare [66]. Implementation may also be influenced by whether e-consultations in practice were resource or reimbursement driven [38,72,82].

The final sustainability consideration is system-level fit. The extent that e-consultations can integrate into existing services and the scalability of implementing this technology.

Scottish research on the uptake of an electronic clinical communication system reported that although the current system was beneficial, issues around system reliability, incompatibility of systems and duplication of data hindered widespread uptake [46]. The main perceived barrier to adoption were views about the instability of computer networks across the region [46].

Technology design was also seen as critical in relation to ease of use and functionality for both patients' and healthcare professionals' [37,47,77,82] and can be directly linked to uptake/ or

adoption [77]. Functionality is also important to clinicians [47,82]. This emerged in reference to possible technical failure, level of previous and current training needs, experiences of technology use (both positive and negative) and the condition/state and age of the available technology [62].

MMAT Results

The overall MMAT study quality was moderate, with only n=11 studies identified as excellent (100%). However, use of the MMAT, aided both description and appraisal of studies, helping to highlight the need for robust and larger trials as well as to fully explore the level of risk, both real and perceived [59,80].

As previously mentioned generalisability of some studies was limited [47,56,79] in many cases by low participant numbers [38,53,69]; or single or low number of study sites [35,36,38,41,44,52,67]. Due to the heterogeneity of (OR / HR) measured outcomes across studies, the study team decided not to conduct a meta-analysis, as this may have resulted in a misrepresentation of the data.

4. DISCUSSION

The aim of this review was to identify the facilitators and barriers to e-consultation in primary care with a focus on patient access, workforce, organisational and technological factors. Five themes emerged which addressed the three review objectives.

In understanding how e-consultations affect patients' access to services; there is evidence to suggest e-consultations work well for some patient groups but not for others impacting on access; with the elderly and the poor less likely to use these services [37,40,57,73]. As such, there was a disparity between different users and under what circumstances patients are more willing to use e-consultations systems and why. There was also a lack of evidence of whether patient health outcomes improve with e-consultations [21]. Indeed a potential limitation to this study is the dearth of studies reporting health outcomes from e-consultations. As such, there is a need for further high-quality studies to fully evaluate the usefulness of e-consultations in primary care, especially on how patients' outcomes are affected and the impact of e-consultations, long-term on patient-clinician interactions.

In investigating professional/workforce issues, evidence suggests that e-consultations may increase patient expectations of care delivery [35] and add to/complement existing in-person care [69,80,85]. There were, however, differences in perceived rise of work demand for clinicians and the actual manifestation of raised workloads reported in studies, with clinicians reporting little additional time [71] or volume of messaging from patients [52].

E-consultations may also impact on the patient-clinician relationship in terms of changing the quality of the communication [52,64,74,80,84,85]. Either as fostering an enhance sense of trust or transparency in communication [52,80] or highlighting communication deficiencies regarding the interpersonal skills needed to manage online interactions [70,76].

The review highlights the lack of evidence or guidance about any rules of engagement for technology consultations and the challenges this presents to patient safety [67,75,77-79,84,86].

An appropriate consultative discussion to clarify “terms and conditions” and guidance may enhance professionals’ confidence in using these systems and positively impact on implementation and sustainability of e-consultation.

Further research is also needed to explore what value and perceived benefit of care provision beyond core working hours (8 am to 6.30 pm Monday to Friday). Expectations of timeliness arising from this review may lead to pressures in other areas of the healthcare system, such as secondary care services (Accident and Emergency providers). Despite the challenges of providing comprehensive care coverage to meet changing demographics and healthcare demands, early research does suggest the need to manage and deliver care outside of traditional infrastructures [92]. Consideration also needs to be given to quality and safety concerns especially in relation to the accuracy of e-consultations diagnoses, or whether differences emerge in the quality and safety of prescribing (face-to-face vs e-consultation) including by whom – physician or advanced practitioner) [93,94].

Finally, identifying possible organisational or technological issues related to the implementation of e-consultations found little evidence of studies being sustainable in the longer-term (up to 1 year) [41,53]. So consideration needs to be given to whether these systems are only useful at specific time points in the patient journey, for example, newly diagnosed patients with specific conditions, or whether e-consultations could be more broadly applied across conditions. Indeed, studies into a

willingness to pay were also under-represented [62] and caution is reported in other studies suggesting the need to adequately fund organisations before establishing video consultation as routine in general practice [50]. This perhaps suggests a need for further research, to capture longer-term economic data related to e-consultation, an important consideration for any provider considering implementation [41,49,95]. Adopting e-consultations may also enable greater communication between clinicians [72] across from across specialist and primary care [74,79] and a broader range of geographical urban/rural areas [34,72,83].

4.1 Strengths and Limitations

In a fast-moving field, it is impossible for reviews to always include the latest developments and some of these may be commercialised without publication. Additionally, we faced the challenge of appraising if recent studies carried out in out-patients clinics are relevant to primary care [87-91]. Finally, in conducting this review we also appreciate there are some technology and infrastructure differences between the countries, including limitations in using e-mails to communicate with patients. This may also have limited the reporting of results, especially if some studies were not translatable into English.

4.2 Conclusion

E-consultations are intended to address the growing demand for care from general practice. Policies, and new funding opportunities, that support innovative ways of care delivery may encourage a cultural shift in how patients interact with professionals and manage their own care; whilst also shaping the way primary care professionals use/manage technology in their practice to provide safe and efficient care.

There are three key messages identified from this review which may be considered important in the future developments of e-consultations. First, the review provides some insight into who, why and when specific patient groups may be disproportionately disadvantaged or advantaged by using online systems. Second, patients' perceived seriousness of their conditions is one of the key factors to influence their willingness to use/ adoption of e-consultations.

Finally, issues impacting on professionals use of/perceptions of e-consultation may also be a limiting factor in terms of adoption. Fears of extra workload, expectations of quick response time, insufficient guides/ training about the “rules of online engagement” and effective communication strategies were all factors impacting on use.

Our review suggests that e-consultations may improve aspects of care delivery, but there remains a mixed view/opinion about e-consultation across user groups. The review findings have drawn attention to the developments needed to improve future e-consultation implementation, as well as the further work needed to develop innovations which support equitable primary care access and delivery.

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