

BMJ Open Patients' online access to their electronic health records and linked online services: a systematic interpretative review

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ABSTRACT

Objectives: To investigate the effect of providing patients online access to their electronic health record (EHR) and linked transactional services on the provision, quality and safety of healthcare. The objectives are also to identify and understand: barriers and facilitators for providing online access to their records and services for primary care workers; and their association with organisational/IT system issues.

Setting: Primary care.

Participants: A total of 143 studies were included. 17 were experimental in design and subject to risk of bias assessment, which is reported in a separate paper. Detailed inclusion and exclusion criteria have also been published elsewhere in the protocol.

Primary and secondary outcome measures: Our primary outcome measure was change in quality or safety as a result of implementation or utilisation of online records/transactional services.

Results: No studies reported changes in health outcomes; though eight detected medication errors and seven reported improved uptake of preventative care. Professional concerns over privacy were reported in 14 studies. 18 studies reported concern over potential increased workload; with some showing an increase workload in email or online messaging; telephone contact remaining unchanged, and face-to-face contact staying the same or falling. Owing to heterogeneity in reporting overall workload change was hard to predict. 10 studies reported how online access offered convenience, primarily for more advantaged patients, who were largely highly satisfied with the process when clinician responses were prompt.

Conclusions: Patient online access and services offer increased convenience and satisfaction. However, professionals were concerned about impact on workload and risk to privacy. Studies correcting medication errors may improve patient safety. There may need to be a redesign of the business process to engage health professionals in online access and of the EHR to make it friendlier and provide equity of access to a wider group of patients.

Strengths and limitations of this study

- There was a dearth of evidence from high-quality studies about the impact of online access, although the evidence around online services issues was more comprehensive.
- Many of the studies in this review originate from the USA, from large health plan-based programmes; a minority of studies originate from Europe.
- Owing to the inclusive nature of the review, we recruited a team of expert reviewers from a broad range of professional backgrounds (health, academia and policy) who volunteered to help with the RCGP initiative about online access. This group provided a rich resource in order to extract relevant data and share information, through regular teleconferences. However, this inclusivity may have resulted in some inconsistencies.
- Like all systematic reviews, evidence has been gathered from various resources from a specific time period. As such, there may be new papers recently published that have not been included in this review.

A1. Systematic review registration number:
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INTRODUCTION

Online services and applications are increasingly part of normal life. Personal computers are ubiquitous in the workplace, and many people have 24 h access through smartphones and a range of other devices.

Providing patient online record access has been described as fundamental to patient empowerment, but UK progress to date has

been limited in part by professional resistance and concerns about security and privacy,¹⁻³ legal constraints⁴ and low uptake of previous schemes to provide online resources for patients. These medicolegal concerns have been echoed in other international studies.⁵ The tensions between the growing consumer demand to access data and a healthcare system not yet ready to meet these demands have increased in recent years.⁶⁻⁷ The promise of linking personal records from multiple sources into a readily digestible single online record has not yet been realised.⁸⁻⁹ Plans to provide patients online access¹⁰ have been successfully piloted,¹¹ but not widely adopted. Patients were concerned about the relative brevity of the record and that any mistakes, though few, could be clinically significant.¹² Hybrid access involving an adult or a carer for children and young people complicates arrangements further.¹³

There have been some notable international successes in the provision of online services. Kaiser Permanente has had two-thirds of its 3.4 million members sign up for online appointment booking, test result collection and email.¹⁴ The USA Veterans Administration has also registered large numbers online with over 600 000 users making over 20 million 'visits' over the internet by 2008, the most popular service being online repeat prescription requests.¹⁵ The UK government announced in its health strategy that all patients in the English National Health Service (NHS) are to have access to their own health record by 2015.¹⁶ However, the guidance developed by pioneers of patient record access and published by the RCGP in 2010 has not been widely adopted¹⁷ and has now been superseded by updated guidance.¹⁸

Provision of online services for patients can be largely grouped into two areas.

- ▶ Patient online access to their medical record. The ability to view, and sometimes edit or comment, on their electronic health record (EHR).
- ▶ There are also other online services linked to EHR provision. These can be grouped into those that involve a human interaction to generate a personal response to a question, largely communication with your practice, doctor or other healthcare worker by email or through a web portal, and those where the transaction is purely digital, for example booking an appointment or receiving notification of a test result.

We carried out this study to inform this important new national policy directive by identifying how access might impact on the provision, quality and safety of healthcare.

METHODS

We identified four key research questions developed from an approach used in a recent systematic review (box 1).¹⁹ This paper is an evidence synthesis that should be read in conjunction with our systematic review of 17 experimental studies; these studies were reported separately on the basis that we could assess their risk of bias.²⁰ This paper aims to bring together this research

Box 1 Aim, Objectives and Research Questions

Aim:

To assess the factors which may affect the provision of online patient access to their EHR and transactional services and the impact of such access on the quality and safety of healthcare.

Objectives

1. Identify and understand the barriers and facilitators to providing online access to records and transactional services in ambulatory care.
2. Assess the benefits and harms of online access to records and transactional services in ambulatory care and how they affect the quality and safety of healthcare.

Key research questions:

Research Question 1 (RQ1): What is the association between online patient access to their EHR and:

- ▶ Utilisation of healthcare;
- ▶ Health outcomes including patient safety;
- ▶ Patient experience and satisfaction;
- ▶ Adherence,
- ▶ Equity and
- ▶ Efficiency;

and wherever possible to identify the impact of online patient access to their EHR.

Research Question 2 (RQ2): What is the association between online patient access to transactional services provided as part of their ambulatory care EHR and:

- ▶ Utilisation of healthcare;
- ▶ Health outcomes including patient safety;
- ▶ Patient experience and satisfaction;
- ▶ Adherence,
- ▶ Equity and
- ▶ Efficiency;

and wherever possible to identify the impact of online patient access to transactional services.

Research Question 3 (RQ3): What is the association between practitioner and healthcare team being provided with:

- ▶ Education and staff training;
 - ▶ Making workload and workflow changes,
 - ▶ Achieving regulatory compliance and
 - ▶ Business process changes for ambulatory care;
- and patient uptake of online access and transactional services as part of their ambulatory care.

Research Question 4 (RQ4): What is the association between:

- ▶ IT developments which provide records access,
 - ▶ Systems to enhance privacy and security,
 - ▶ Usability and accessibility of transactional services, and
 - ▶ Business process for technical development of EHR systems, including lead time in their development;
- and patient uptake of online access and transactional services as part of their ambulatory care.

and highlights the breadth and detail of evidence emerging from each of our original research questions.

We used an established methodology, following Cochrane guidance for the review process²¹ and the Preferred Reporting Items for Systematic review and Meta Analysis (PRISMA) framework.²² The protocol for this review has already been published, including details of the key research questions and inclusion and exclusion criteria.²³⁻²⁴ The study aims were structured in a

systematic way, using the elements of a clinical research question (population, intervention, comparator and outcome/PICO).^{20 25}

Search strategies were developed and run on 10 bibliographic databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane database, Cochrane Effective Practice and Organisation of Care Group (EPOC), Database of Abstracts of Reviews of Effects (DARE), Embase, King's Fund, Medline, Nuffield Health and PsycINFO. Search for unpublished material was conducted using the database OpenGrey. Search strings were tailored to each database according to each source using Medical Subject Heading (MeSH) and index terms. The total number of papers identified was 9877. An example Medline search string can be viewed in our previous publication.²⁰

Screening against the inclusion criteria was carried out by SdeL, FM & MC to identify relevant papers using a framework of the types of relevant interventions and a detailed inclusion–exclusion guide.²⁰ Full text papers were sourced at this stage and apportioned to group members for review. The group members were volunteers who had expressed interest in joining Working Group 7 (and evaluation of the evidence) of a larger Royal College of General Practitioners (RCGP) exercise to define a Road Map for providing patients online access to their medical records. We recruited a purposeful sample of academics, practitioners and patient representatives with the relevant expertise. This group was given autonomy to review the evidence and has reported separately from the Road Map report.¹⁸ Evidence was subject to dual data extraction (group member and FM).

Refining the data collection forms and training the assessors

Two pilot paper-based exercises were conducted to refine the data collection tools, ensure consistency in the reviews and to inform design of online data capture forms. We also developed a data extraction form (DEF) which was used to extract the salient points from each paper. DEF training was provided to our group members in order to facilitate their review of evidence. The DEF also included a risk of bias (RoB) form for each paper, which aimed to look at limitations in study design.²⁰ The RoB form was included with the intention of applying the Grading of Recommendations Assessment, Development and Evaluation (GRADE) tool to assess the strength of evidence as a collective for each research question.^{26–28} The RoB form was grouped into six domains: sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting and other bias. Although all papers were subject to a RoB assessment, only a small number ($n=17$) were experimental in design; and these had a wide variation in their RoB. A detailed summary of these trials and RoB analysis can be seen in our previous publication.²⁰

The review forms were returned via the website ([http://www.clininf.eu/projects/patient-access/paper-](http://www.clininf.eu/projects/patient-access/paper-review-form.html)

[review-form.html](http://www.clininf.eu/projects/patient-access/paper-review-form.html)) or directly to individual team members.

Where reviewers disagreed about ratings we reached a final rating by consensus. A meta-analysis could not be undertaken, as included studies were not sufficiently homogeneous in terms of primary outcome measures to provide a meaningful summary. As such, we chose to adopt an established qualitative method to guide this synthesis.²⁹ We extracted data relating to the study setting and context, the experience and attitudes of online users and non-users, clinicians and other healthcare staff, the technologies used and the impact and context of these on the organisation of primary and ambulatory care. Specific data extracted included the study aims/objectives, study design, setting, intervention and key findings. The initial analysis was undertaken by the two principal authors with input and comments from the group members/coauthors. The final synthesis of the data was undertaken at a meeting where data were presented and discussed at a group level.

Applicability

Most of the included studies were undertaken in the USA and Europe; the reviewers included those they considered applicable to countries with comprehensive primary care services.

RESULTS

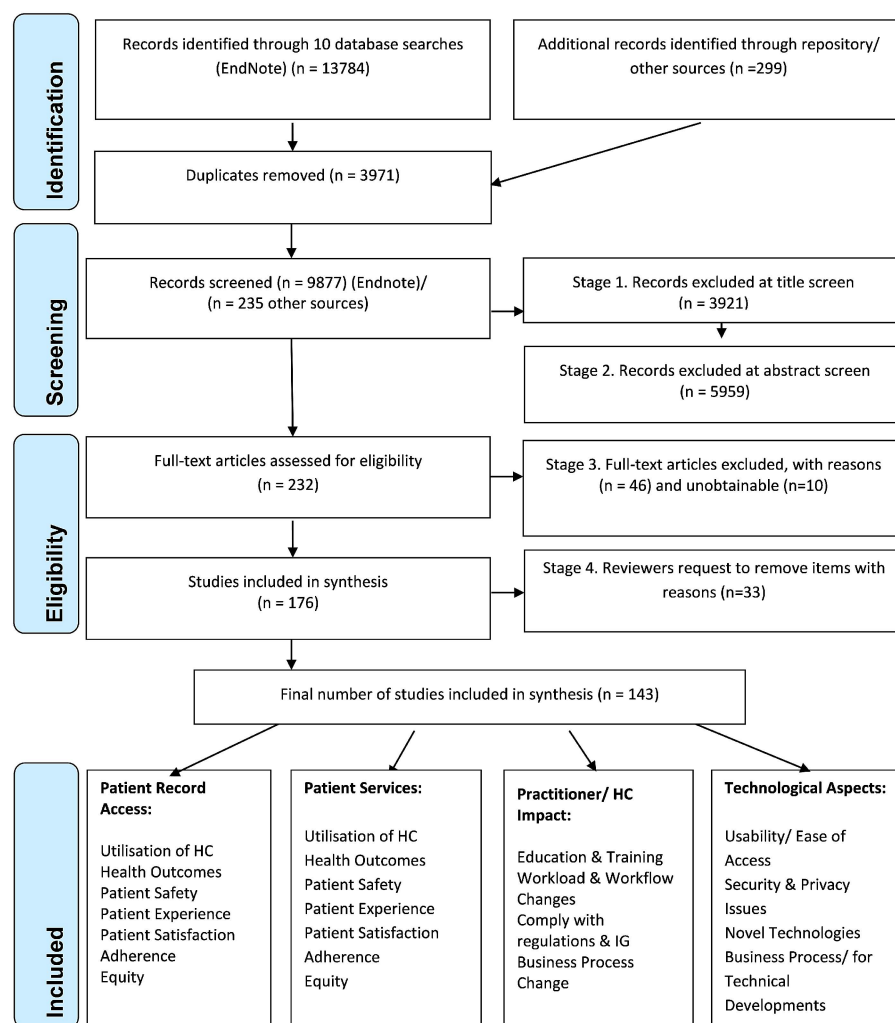
Excluded papers

The papers selected by the search process, but rejected by the reviewers largely comprised of studies not considered relevant to the review (see online supplementary table S1—Excluded Studies). Portals, websites, email or other online access for single conditions or diseases, such as diabetes, were excluded. The search and exclusion process is summarised in the PRISMA flowchart (figure 1). Results from these searches were stored using Endnote, and where copyright allowed, in an online repository. There were 3971 duplicate articles. After this initial filter process, 6191 papers remained.

Research Question 1: what is the association between providing patients online access to their own ambulatory care medical record and utilisation of healthcare and outcomes, including patient safety, patient experience and satisfaction, adherence, equity and efficiency?

Patient online access has a low uptake, and the effect on face-to-face utilisation of healthcare was equivocal. Female adults were the largest group of online access and online service users according to 11 papers^{30–40} (see online supplementary table S2—Research Question 1 Results). Six studies report that some were disadvantaged by lack of access to the internet.^{41–46} while others reported no such barrier.^{47 48} Seven papers stated that patients want to be able to appoint a proxy, share records with family or another healthcare professional or be able to print out segments of their records.^{30 41 49–53}

Figure 1 PRISMA Flowchart.



Two papers described the elderly's willingness to accept assistance in accessing their records^{53 54} and two further studies reported that children's advocates suggest that their guardians should have access to their records up to age 16 years.^{55 56} However, others have expressed concerns about unauthorised access,⁵⁷ as misuse or 'snooping'.⁵⁸

While online access allows patients to reflect on their records and prepare for the next consultation,^{59 60} there was no evidence of improved health outcomes.^{61 62} However, evidence from eight studies indicated that there may be an improvement in patient safety primarily through identifying errors in medication lists and adverse drug reactions.^{38 49 59 63–67} In one study about the potential to access and identify medication errors, there was significant difference between the number of discrepancies in medication with potential for severe harm in the intervention group compared with controls (0.03 intervention vs 0.08 control per patient, adjusted RR 0.31, 95% CI 0.10 to 0.92, $p=0.04$).⁵⁹ There was no evidence of harm to patients from the provision of patient online access, though there were concerns among health professionals that access to unexplained reports may cause anxiety or stress for patients. In eight

studies, health professionals were concerned that viewing notes could potentially be offensive to patients or could cause an adverse reactions and this could impact negatively on the doctor–patient relationship.^{30 41 49 68–72} Patient experience and satisfaction appears to be improved through enabling better self-care (n=13 studies)^{11 2 30 49 57 60 61 66 72–76} and patients being empowered to communicate more effectively with clinicians (n=13 studies).^{49 50 51 57 60 68 72 73 77–82}

Research Question 2: What is the association between providing patients access to online services as part of their ambulatory care and utilisation of healthcare and outcomes including patient safety, patient experience and satisfaction, adherence, equity and efficiency?

Patients' access to online services offered greater convenience particularly in time-saving when compared with other methods of interaction with their health provider.^{30 83–90} Both healthcare professionals and patients reported time-saving in terms of avoiding an in-person clinic visit^{85 86} and better efficiency in managing patient care⁹¹ (see online supplementary table S3—Research Question 2 Results).

Many disadvantaged and vulnerable people were non-users, including non-Caucasian ethnicities^{46 92} and those of lower socioeconomic status,^{44 93 94} while adult females were the most active adopters of this technology.^{32 34–40} Several studies also report disadvantages with access to online technology for other groups, such as those in poorer health and vulnerable groups.^{38 42 45 95} Evidence from four studies reported that patients wanted direct communication with their clinician^{96–98} while evidence from three studies suggested that clinicians preferred support staff to filter messages.^{70 90 99} Patients' satisfaction also improved if clinicians responded in a timely manner to their requests (10 studies).^{37 65 71 82 92 96 100–103}

The EHR linked services most utilised by patients were: prescriptions, viewing the test results, messaging with their clinician, arranging referrals and rescheduling appointments.^{14 30 35 52 87 89 90 96 104–109} Generally, email contacts from patients were brief, well structured and about non-urgent minor problems.^{75 82 87 89 100 110–112} Seven studies reported that patient access to online services facilitated uptake of preventative care services^{83 95 113–116} and four studies reported small improvements in adherence with medication and clinical attendance.^{30 36 49 59} Patients also felt more able to express ideas and concerns,^{82 86 89 95 112 117–119} and 16 studies reported how patient experience and satisfaction was high.^{37 59 62 75 80 81 85 89 96 97 103 106 112 116 120 121} While patients were positive about online services, a substantial minority (all from studies in the USA) would not be willing to pay for the service, and those that did put a relatively low financial value on the transaction.^{42 45 92 122 123}

Research Question 3: what is the association between patient adoption of online access and online services as part of their ambulatory care and the practitioner and healthcare team being provided with staff training, making workload and workflow changes, achieving regulatory compliance and business process changes?

Most studies identified reported levels of patient adoption of online access and services without clear reference to the impact of training (see online supplementary table S4—Research Question 3 Results). These are reported here to describe the extent of the existing evidence base. There are more reports about the effect on workload and workflow, though largely on the interrelationship between providing online access to records, email (or messaging via a portal), telephone use and face-to-face consulting.

Five studies commented on the clinicians' use of email to communicate with their patients, with only a small number of clinicians, between 3% and 17%, being regular users.^{43 109 120 124 125} Four papers described patient requests for clinical advice online^{37 39 82 110}; and many more described other EHR linked services, such as repeat prescribing and administering bookings.^{65 88 89 100 105 107 115 126} However, some clinicians

preferred sharing their mobile phone number to providing their email address.¹²⁴

Simple self-limiting problems were readily manageable by email^{36 37 45 82 83 88 100 106 108 110} but more complex problems were not.^{87 96} Overall use was judged by clinicians to be appropriate with a minority of e-consultations resulting in a subsequent face-to-face encounter (n=3 studies).^{34 85 110} After an early peak in email volume there is some evidence that the level falls back.¹²⁷ Only two papers reported that healthcare professionals felt that they lacked the skills to use these technologies^{121 128} and wanted more training.^{120 129–133} Some were concerned about the effect of providing online access and services on workload^{134–136}; there seems to be a complex interdependency between face-to-face, online messaging or email and telephone utilisation. Seven studies reported an increase in workload^{33 43 49 97 108 132 126}; two reported a large but temporary increase that plateaued,^{71 106} and eight reported a decline.^{57 62 71 72 85 102 108 137}

Online access and services has an inconsistent effect on face-to-face consultations across studies, with some reporting a decline^{62 102 108 111 137} (n=5), an increase^{33 49 106} (n=3) or no change (n=3).^{57 101 102} Generally, email and web-messaging created new and increased volumes of contacts,^{62 81 105 106 108 126 132 137} though four studies reported no change.^{88 94 120 138} Telephone contact appeared to rise and fall back when new services were offered,^{71 106} though six studies reported no change in telephone volume,^{88 94 97 101 102 126} and three reported a rise.^{33 108 136}

Online services were perceived as fundamentally changing the business process. There was a perception that there needed to be a reorganisation of working practices.^{71 76 90 139} Clinicians felt they needed to change the way that they wrote their medical records as they were now shared with their patients rather than using them as largely private professional aide memoire.⁷² The nature of communication was felt to change in that email communication was led to a greater extent by the patient than happened in face-to-face contact; possibly, online access facilitates a subtle shift in the balance of power in the clinical consultation.^{70 98 116 127}

Research Question 4: What is the association between IT developments, and the business process for developing modified systems and patient adoption and utilisation of online access and online services provided as part of the patient's ambulatory care computerised medical record?

Eight studies reported formalised systems to ensure governance and compliance with other relevant regulations,^{53 90 100 106 115 120 124 126 140} but there was a lack of knowledge about what made an appropriate framework^{76 140–142}; and other studies reported a need for future guideline development^{58 72 90 96 143–145} (see online supplementary table S5—Research Question 4 Results).

Several studies (n=16) also highlighted clinicians' concerns about privacy and confidentiality.^{43 51 58 67 77 82–84 98 105 111 121 138 146–148}

Patients in one study expressed willingness to trade-off security for ease of access.¹¹⁵ Clinicians reported in three papers that they preferred controlled access via a portal, authenticating users and ensuring privacy.^{67 130 142} Incorporating a fee for service appears to be highly effective in promoting clinician uptake of online services; some organisations have experimented with incorporating a fee, but this practice is not widespread, especially among large organisations having the most experience (such as Kaiser, VHA and most health systems in the USA and in Europe).^{86 149}

Seven studies outlined a number of novel technologies that had been introduced including providing links to X-ray and scan images^{34 70 98}; automated test result tracking;⁸⁰ text messaging question and answer service¹²⁵; portals that use a code number or pictures of medications to avoid medication names being displayed⁴¹; and web-based triage.³⁶ Many of the portals were carefully designed to deliver full or partial online access^{87 96} and some required complex technical development linking different systems, for example to provide access to pathology results and X-ray reports or images.^{70 98} Despite the level of technical innovation, 10 studies report often lower than anticipated levels of patient uptake.^{35 36 53 74 99 105 109 114 150 151}

DISCUSSION

Statement of principal findings

Patients generally report benefits of greater access; however, there was a lack of evidence of improvement in health outcomes. However, clinicians in several studies (n=8) feared access to records, or reports without a clinician available to interpret them may cause patients worry. Further research is needed to report whether any harm or privacy breaches occur as a consequence of online access.

Providing online access generally lowers the threshold for patient–clinician contact and can change the nature of their interaction. The medical record changes from being an aide memoire for clinicians to an opportunity for patients to learn about their condition and reflect on the questions they might wish to ask at their next consultation. This creates opportunities for preventive care and for patients to take the lead in clinical consultations, though this is limited by much of the record being written in a way that is inaccessible to patients.

Technical and contractual developments of business processes are needed to facilitate patient online access; they are important and necessary for success. The technical developments include the development of portals, which provide privacy, and allow monitoring and thereby ensure that messages and responses are recorded and not lost; they also measure workload to facilitate billing or other forms of reimbursement. Contractual processes include ensuring that there is the

necessary training and other mechanisms in place to ensure that the service is provided and to a defined standard.

Comparison with the literature

Berwick *et al*¹⁵² described the triple aims of health systems: how to improve the experience of healthcare, reduce per capita cost and improve the health of populations. Online access may improve the experience of healthcare and improve patient satisfaction; it may also be more cost effective if cheap online contacts substituted for more expensive ones, but the change in thresholds of access makes this hard to determine. We do not know the impact on business processes and costs in primary care. Other than correcting medication errors it is yet to be demonstrated how it improves health outcomes and that of the population.

The sociotechnical school describes the implementation of a technology as a journey of mutual transformation of that technology and its users.^{153 154} The mutual transformation required may have three intertwined themes. First, providing patients with easier online access needs to be done in such a way that it improves convenience, but does not result in multiple interactions about self-limiting conditions (unless getting patients to engage in this way is seen as a goal of the health system). It is plausible that online access might not actually improve health, but reduce efficiency. Second, the nature of the medical record needs to change so that it informs the patient, possibly linked to relevant educational material that might provide greater self-management support. Third, there may be a subtle shift in the balance of authority in the clinical consultation; patients and the technology itself (through reminders and links to information) may increasingly take the lead in the clinical consultation, reinforcing the trend away from clinician-led consultations.¹⁵⁵

The chronic care model suggests that a range of components including creating activated patients who improved their self-management support might have better health outcomes¹⁵⁶; though there is a suggestion that the most effect is seen in complex cases.¹⁵⁷ Implementing self-management support has demonstrated improved health outcomes in specific diseases, for example diabetes¹⁵⁸; and computerised self-management support, has also shown benefits.¹⁵⁹ Such computerised support might be readily linked to EHRs. However, there is currently no evidence of improved health outcomes from implementing generic self-management support processes^{160–162}; though further trials of self-management support are currently underway.

Implications for research, policy and practice

Quality in healthcare includes improving convenience, satisfaction and patient safety^{163 164}; and online access can contribute to these. However, there is a risk that highly qualified clinicians become less efficient through

answering multiple emails and electronic contacts about minor and self-limiting conditions. The business requirements of systems where users pay may be different from the ones where the state or social insurance wants to focus on improved population health outcomes.

There were no reports of harm caused by breaches of privacy; however, there were concerns and calls for further guideline development. The policy of the English NHS to provide online access via computerised medical record systems vendors seems appropriate. However, there may be scope for development of a common specification that might be more usable by patients with more similar functionality provided across the different brands of computer systems.

Call for further research

Research, including well-designed trials, is needed to determine whether and how online services might improve health outcomes. In particular, how the medical record might be redesigned to guide and teach patients in a way that promotes self-management and ultimately improves health. There is also a need for further research concentrating on the impact of online access by patients with specific long-term conditions, such as diabetes, where it is potentially easier to define health outcomes.

Health services need to learn if it is possible to provide ready access without being overwhelmed by requests and questions about potentially self-limiting conditions. Studies are needed to explore whether patient online access to reports and traditional medical records induces anxiety and fosters dependence or reassures, and if so, what needs to be done to mitigate this.

Trials comparing the potential impact of patient online access in more complex cases compared with lower risk cases, possibly including tools to improve self-management support, might provide some insight into where patient access and technology might add most value.

CONCLUSIONS

Online access offers patients more convenience, a vehicle for engaging with their healthcare information, and *may* improve patient safety. These services are currently not widely taken up by patients, nor met with widespread enthusiasm by healthcare professionals, and there is no evidence-base that they improve health outcomes. This review suggests that online access and services are perceived as fundamentally changing the business process of primary care, and with careful development, may be successfully incorporated into clinical workflows. Patient online access is to stay and set to grow, albeit slowly. Health systems may find that, in the short-term, online access reduces efficiency. Record systems may need to change to become more patient-friendly; in the long term this may enable patients to

more effectively self-manage and take the lead in consultations about their healthcare.

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Data sharing statement Online supplementary table S1, detailing excluded studies, is available on request by emailing Freda.mold@surrey.ac.uk.

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 162. Kennedy A, Bower P, Reeves D, *et al.* Salford National Institute for Health Research Gastrointestinal programme Grant Research Group. Implementation of self management support for long term conditions in routine primary care settings: cluster randomised controlled trial. *BMJ* 2013;346:f2882.
 163. Department of Health High Quality Care for All. NHS Next Stage Review Final Report. London, June 2008;47. http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_085828.pdf
 164. Department of Health. *The NHS outcomes framework 2012/13*. London: Department of Health, 2011:5. http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_131723.pdf

Supplementary Documentation File

Patients' online access to their electronic health records and linked online services: a systematic interpretative review

Main/ Embedded Tables, Figures & Boxes

Box 1: Aim, Objectives, and Research Questions

Figure 1: PRISMA flowchart (see separate file)

Table 1: Research Question 1 (RQ1) Results

Table 2: Research Question 2 (RQ2) Results

Table 3: Research Question 3 (RQ3) Results

Table 4: Research Question 4 (RQ4) Results

Supplementary Tables Figures and Boxes:

Supplemetnary Table 1: Excluded studies (available on request only)

Supplementary Table 1:

Excluded studies (available on request only)

No	Article Citation	Reason code
1	Adams, A. E., R. Adams, et al. (2007). Barriers to the use of e-health technology in nurse practitioner-patient consultations. <i>Informatics in Primary Care</i> 15(2): 103-109.	8
2	Ahmed, S., S. J. Bartlett, et al. (2011). Effect of a web-based chronic disease management system on asthma control and health-related quality of life: study protocol for a randomized controlled trial. <i>Trials</i> 12: 260-260.	9, 5
3	Angstman, K. B., J. E. Rohrer, et al. (2009). Impact of e-consults on return visits of primary care patients. <i>The health care manager</i> 28(3): 253-257.	8
4	Ariza, A. J., H. J. Binns, et al. (2004). Evaluating computer capabilities in a primary care practice-based research network. <i>Annals of Family Medicine</i> 2(5): 418-420.	3
5	Bartlett, C., K. Simpson, et al. (2012). Patient access to complex chronic disease records on the Internet <i>BMC Medical Informatics and Decision Making</i> 12:87.	4, 5
6	Beattie, A., A. Shaw, et al. (2009). Primary-care patients' expectations and experiences of online cognitive behavioural therapy for depression: A qualitative study. <i>Health Expectations</i> 12(1): 45-59.	9, 5
7	Bennett GG, Herring SJ, Puleo E, Stein EK, Emmons KM, Gillman MW. (2010) Web-based weight loss in primary care: a randomized controlled trial. <i>Obesity (Silver Spring, Md)</i> .18(2):308-13	1
8	Car, J., C. Ng, et al. (2008). SMS text message healthcare appointment reminders in England. <i>The Journal Of Ambulatory Care Management</i> 31(3): 216-219.	6
9	Chadwick, D. W. (2000) Using the Internet to access confidential patient records: a case study. <i>BMJ</i> 321:612-4.	8
10	Crowell et al Audiology Telepractice in a Clinical Environment: A Communication Perspective <i>Annals of Otology, Rhinology & Laryngology</i> 120(7):441-447.	2
11	Delpierre, C., L. Cuzin, et al. (2004). A systematic review of computer-based patient record systems and quality of care... <i>International Journal for Quality in Health Care</i> 16(5): 407-416	8
12	Fisher, B. (2011). "Patient record access: Making it work for you and the NHS." <i>London Journal of Primary Care</i> (1): 44-49.	7
13	Grant, R. W., et al. (2008). Practice-linked online personal health records for type 2 diabetes mellitus: a randomized controlled trial. <i>Archives of Internal Medicine</i> 168(16): 1776-1782	9
14	Guy, R., J. Hocking, et al. (2012). How effective are short message service reminders at increasing clinic attendance? A meta-analysis and systematic review. <i>Health Services Research</i> 47(2): 614-632.	2, 3, 4
15	Harris, L. T., S. J. Haneuse, et al. (2009). Diabetes quality of care and outpatient utilization associated with electronic patient-provider messaging: A cross-sectional analysis. <i>Diabetes Care</i> 32(7): 1182-1187	9
16	Hassey, A. (2005). The National Programme for IT in the NHS. <i>British Journal of General Practice</i> 55(510): 58.	7
17	Hawn, C. (2009). Take two aspirin and tweet me in the morning: how Twitter, Facebook, and other social media are reshaping health care. <i>Health Affairs</i> 28(2): 361-368	1
18	Heidt, E. L. (2006). Health information technology and physician-patient interactions: impact of computers on communication during outpatient primary care visits. <i>Journal Of The American Medical Informatics Association: JAMIA</i> 13(2): 236. (No abstract) Hsu (2006) author reply Health information technology and physician-patient interactions: impact of computers on communication during outpatient primary care visits. <i>Journal Of The American Medical Informatics Association: JAMIA</i> 13(2): 237 (Letter)	1

19	Hellström, L., K. Waern, et al. (2009). "Physicians' attitudes towards ePrescribing--evaluation of a Swedish full-scale implementation." <i>BMC Medical Informatics And Decision Making</i> 9: 37-37	3, 7
20	Kittler, A. F., L. Pizziferri, et al. (2004). Primary care physician attitudes towards using a secure web-based portal designed to facilitate electronic communication with patients. <i>Informatics in Primary Care</i> 12(3): 129-138.	5
21	Leong, K. C., W. S. Chen, et al. (2006). The use of text messaging to improve attendance in primary care: a randomized controlled trial. <i>Family practice</i> 23(6): 699-705.	3
22	Longo DR, Shari LS, Wright MA, LeMaster, J, Williams CD. Clore JN. (2010) Health information seeking, receipt, and use in Diabetes self-management. <i>Annual of Family Medicine</i> . 8(4):334-340.	5
23	Lussier, M. T. and C. Richard (2010). Effects of the Internet on patient consultations." <i>Canadian Family Physician</i> 56(1): e4-5.	1, 2
24	Lyles, C. R., L. T. Harris, et al. (2012). Patient race/ethnicity and shared medical record use among diabetes patients. <i>Medical Care</i> 50(5): 434-440.	9
25	Martinez I, Del Valle P, Munoz P, Trigo JD, Escayola J, Martínez-Espronedá M et.al. (2010) Interoperable and standard e-Health solution over Bluetooth. <i>IEEE Engineering In Medicine And Biology Society Conference</i> , 2192-5.	5
26	Morris, L., J. Dumville, et al. (2003). A survey of computer use in Scottish primary care: General practitioners are no longer technophobic but other primary care staff need better computer access. <i>Informatics in Primary Care</i> 11(1): 5-11.	6
27	Parmar et al The online outpatient booking system 'Choose and Book' improves attendance rates at an audiology clinic: a comparative audit. <i>Informatics in Primary Care</i> 2009;17:183-6	7, 8
28	Pinnock,H, G Hoskins et al (2005) "Triage and Remote Consultations: Moving beyond the rhetoric of access and choice" <i>British Journal of General Practice</i> 55(521) 910-911	7
29	Rotich JK, Hannan TJ, Smith FE, BII J et.al. (2003) Installing and implementing a computer-based patient record System in Sub-Saharan Africa: the Mosoriot Medical Record System. <i>Journal of the American Medical Informatics Association</i> .10(4):295-303	5
30	Sands, D. Z. (2004). Help for physicians contemplating use of e-mail with patients. <i>Journal of the American Medical Informatics Association</i> 11(4): 268-269. (No abstract)	6
31	Stiles, R. A., S. A. Deppen, et al. (2007). Behind-the-scenes of patient-centered care. Content analysis of electronic messaging among primary care clinic providers and staff. <i>Medical Care</i> 45(12): 1205-1209.	8
32	Tang, P. C. and T. H. Lee (2009). Your Doctor's office or the internet? Two paths to personal health records. <i>New England Journal of Medicine</i> 360(13): 1276-1278.	7
33	Williams, D. (2011). "Patients to see GP records online." <i>The Health service journal</i> 121(6285): 11.	7

Reasons

1. Online / e-Health health promotion tools including social media and health promotion technology
2. Telehealth / Telemonitoring of chronic and other conditions.
3. Admin tools which do not form part of an online access or a transaction about the administration of direct patient care. For example invitations to participate in research projects or computer capabilities in a primary care practice-based research network to understand how receptive the practices were to new ideas for automation of practice activities and research.
4. Systems and services based in social, community, secondary, or tertiary care.
5. Pilot – possible non-inclusions for reviewer training purposes.
6. Does not address any of the research questions.
7. Other. For example poor quality, not original/update paper only
8. No patient access. For example contact between professional groups only, and does not involve direct online patient contact.
9. Disease specific

Potentially relevant studies:

A further 17 papers were rejected after the review process as they were judged to be relevant, and open to review, but then excluded based on lack of empirical evidence and generalisability to the primary care setting. These were:

1. The Government Response to the Health Committee Report on the Electronic Patient Record (Cm7264). Presented to Parliament by the Secretary of State for Health by Command of Her Majesty. 2007
2. Department of Health. Guidance for access to health records requests. London, DH. 2010a http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/documents/digitalasset/dh_113206.pdf
3. Department of Health. The power of information. Putting all of us in control of the health and care information we need – *Impact assessment* Department of Health. 2012b. DH
4. Department of Health. Good practice guidelines for general practice electronic patient records: guidance for GPs. London :DH. 2011 Online only for full version and supplements: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_125310
5. Department of Health. The power of information: putting all of us in control of the health and care information we need. Department of Health. 2012a May 21.
6. Department of Health. *Equity Analysis*. The power of information: putting all of us in control of the health and care information we need. – May 2012b. Department of Health. DH
7. Dixon, R. F. Enhancing primary care through online communication. *Health Affairs*, 2010, 29(7): 1364-1369.
8. Feeley TW, Shine KI. Access to the medical record for patients and involved providers: Transparency through electronic tools. *Annals of Internal Medicine* 2011, 155(12):853-854.
9. Fisher B, Fitton R, Poirier C, Stables D. Patient record access--the time has come! *The British Journal Of General Practice: The Journal Of The Royal College Of General Practitioners* 2007, 57(539):507-511.
10. Greiver, M. Practice tips. E-mailing patients. *Canadian Family Physician Médecin De Famille Canadien*, 2006, 52(9): 1074-1074
11. Haslam D, Taylor J. Information: a report from the NHS Future Forum. London, Department of Health. 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216424/dh_132086.pdf
12. Katz SJ; Moyer CA. The emerging role of online communication between patients and their providers. *Journal Of General Internal Medicine*. 2004 Sep; 19 (9): 978-983
13. Hannan, A. Building a record of trust. Allowing patients access to their own records has become easier thanks to the internet. It's obviously empowering for the patient but what are the pros and cons of opening the online door to clinical files? *Health Serv J*. 2011;121(6250):28-9.
14. The Royal College of General Practitioners. Enabling patients to access electronic health records: guidance for health professionals. 2010, RCGP.
15. Spicer, J. Getting patients off hold and online. *Family Practice Management*, 1999,6(1): 34-38.
16. Spielberg, A. R. Online without a net: Physician-patient communication by electronic mail. *American Journal of Law and Medicine*, 1999, 25(2-3): 267-295.
17. Stone, JH. Communication between physicians and patients in the era of E-medicine. *New England Journal of Medicine*, 2007, 356: 2451-2454

1. Department of Health (2007) (UK)	Command paper (The Government Response to the Health Committee Report on the Electronic Patient Record); n/a; 2007	Setting= n/a; Population= n/a; Practice No= n/a; Practice size= n/a; Scale= national	This command paper sets out the government's response to the Health select committees sixth report of the session 2006/2007 on the electronic patient record.	No/No
Many recommendations were offered; make clear to pts & drs that data will only be added to summary care records (SCR) with patient consent; acknowledge 'sealed envelopes', where mechanisms are in place to protect data; further trials of HealthSpace & independent evaluation; review/ consider existing European models (French), for the SCR in England; that planned security systems are subject to independent evaluation and are adequately maintained & operated; clarify as to what information the IT system will be recorded and shared, including the range of organisations that will share this data; and ensuring compliance with technical and clinical standards.				
No/ No dates/ Practitioner and healthcare provider, Future research, Technological aspects./ Key messages = The central vision of the National Programme is to make essential pt data available at the point of need, through the NHS Care Records Service. The Summary Care Record (SCR) has been designed in consultation with clinicians working in urgent care settings. There is a single standardised front screen to display key health information which is vital for emergency care. This will be with consent from patients. The Government welcomes support for HealthSpace, a secure online personal health organizer. The report talks extensively about security measures needed, future research and computer needs.				

2. Department of Health (2010a) (UK)	Guidance document; Adults - Carers/representatives; 02/2010	Setting= mixed (DH guidance for General Practices within the UK); Population= n/a; Practice No= n/a; Practice size= n/a; Scale= national	This guidance aims to assist NHS organisations, specifically general practices in England (UK), through the stages of organising records access requests in accordance with relevant legislation and any subsequent considerations. The relevant legislation includes the Data Protection Act 1998; Access to Health records Act 1990; Freedom of Information Act 2000; and Access to Medical Reports Act 1988; which is pertinent to accessing health records.	No/No
Equivocal (neither good nor bad)/ Factual document containing guidance and protocol to follow when patients request to access their health records. Does not offer opinions re: benefits / disbenefits				
No/ No dates/ Practitioner and healthcare provider/ Key messages = Individuals have a right to apply for access to health information held about them and, in some cases, information held about other people. NHS organisations should ensure they have adequate procedures in place to enable patients to exercise this right.				

3. Department of Health (2010b) (UK)	Health economic impact assessment; All ages; Evaluation between 2012/13-2021/22	Setting= Mixed NHS; Population= n/a; Practice No= n/a; Practice size= n/a; Scale= national	To determine how patients used record access in real life, and the benefits and drawbacks of using it from the patients' perspective. The impact assessment focuses specifically on providing service users easier access to information, including on-line portal and on-line access to their records which they can share with others.	No; (access, pt-dr interaction, quality)/ Yes; not providing service users easier access to information
Benefit/ Three areas of benefit were reported: participation in care; quality of care; enhancing self-care. Several core themes emerged 1. Access to information to help service users to participate in <i>no decision about me without me</i> . 2. Linking and sharing person based electronic records; comprising of: standards; ensuring availability of person based information along care pathways at the point of care; and information derived from person based records. 3. Capturing person based information at the point of care to enable effective and appropriate sharing of clinical and management information leading to real or virtual connectivity across different setting. Assessment reports that GP Practices gain efficiency benefits from contacts per patient. Patients gain time savings from reduced GP contacts and QALY gains from benefits such as earlier diagnosis and reduced medical errors. Health and social care providers will realise cost savings from reductions in the paper transfer of information. The centre will benefit from the reduction in the duplication of online information and website provision. The study suggests that record access improves shared management, with patients using their records to improve interactions with healthcare providers, make decisions about their health and improve the quality of the care they receive. These findings also suggest a possible long-term potential for record access to improve health outcomes.				
No/ No dates/ Patient/carer/representative, Practitioner and healthcare provider, Future research./ Key messages = Online access to records will help primary care practices gain efficiency benefits from contacts per patient. Patients gain time savings from reduced dr contacts and QALY gains from benefits such as earlier diagnosis and reduced medical errors. Health and social care providers will realise cost savings from reductions in the paper transfer of information. The centre will benefit from the reduction in the duplication of online information and website provision.				

4. Department of Health (2011) (UK)	Guidelines; Adults - Carers/representatives; 2011	Setting= n/a; Population= n/a; Practice No= n/a; Practice size= Other (n/a) ; Scale= national	Department of Health reference source/guidelines intended to support and encourage general practices (and all those involved in developing, deploying and using GP IT systems) as they continue the move toward becoming paperless.	No/ No
Benefit/ Computerisation of health records offer the prospect of rapid sharing of information in ways that are not possible with paper records. Potential benefits of this emerge in terms of pt safety, and efficiency and flexibility of healthcare provision. Good clinical and information governance practice is essential for the safe use of EPR systems. Health organisations, drs and allied health professionals need to be familiar with relevant legislation, common law, acceptable ethical practice and relevant government policy and standards.				
No/ No dates/ Practitioner and healthcare provider./ Key messages = Professional regulatory bodies and representative organisations produce useful guidance for their members, but there are areas where guidance is unclear or incomplete and will require interpretation. There is a need to develop new guidance in areas such as high quality clinical records and data quality to facilitate records sharing, operability between contributors/ systems and communication.				

5. Department of Health (2012a) (UK)	Strategy Document	n/a; Scale= national	Strategy document setting out a ten year framework for transforming information for health and care, including the benefits and roles of practitioners, patients, carers, government organisations.	No/ No
Benefit/ The ambitions of this document include; a drive to integrate information across care settings; information that benefits everyone; change in organisation and mind-set to embrace quality record contents; interoperability between system and the security of data flow; reduction of bureaucratic data collection and measurement of quality; embrace a culture of transparency; better use of modern technology to facilitate access and efficiency; and use of innovations that support national standards. Being able to access and share our own records can help us take part in decisions about our own care in a genuine partnership with professionals. This will include access to letters, test results, personal care plans and needs assessments. We will be able to interact with health and care services online. Provide the ability to share records with our other health and care professionals and/or carers, therefore improving the experience and continuity of care				
No/ No dates/ Patient/carer/representative, Practitioner and healthcare provider, Technological aspects, Future research./ Key messages = All NHS pts will have secure online access to their personal GP records by 2015. Different people will want and need to access information in different ways and, as such essential that information is not just be web based. Language and literacy levels will affect ability to access and understand online and other forms of information. NHS number will be used to connect our records across the whole system as we move between services. Sharing of information can support culture of 'no decision without me'. Healthcare professionals will be able to access relevant records online simply, securely and in one place. Several benefits are outlined in the document. However it also acknowledges the potential risks for vulnerable people, and potential for abuse. Safeguarding will be reviewed, and confidentiality is a concern for many.				

6. Department of Health (2012b) (UK)	Equity analysis/ report; Provision for vulnerable groups - those with disability, different genders, ethnic groups, age groups, sexual orientation, religion/ belief, pregnancy, carers and those from transient communities; 05/2012	Setting= mixed; Population= 800 consultation responses and 13 stakeholder groups; Practice No= n/a ; Practice size= n/a; Scale= national	The analysis considers the impact on different protected equality characteristics of the information strategy, specifically; the need to eliminate unlawful discrimination, harassment and victimisation; and advance equality of opportunity between people who share a protected characteristic and people who do not. Ensuring that individuals are supported in navigating and understand information, and that information benefits all and aims to reduce inequalities and not to increase them.	No/ No
Benefit/ The overall impact of this strategy should be a positive one. The analysis identified a number of opportunities to advance equality of opportunity. This includes 1. making clear that information is available in other formats (and may include face-to-face support); encourage the NHS/ Government to do more to support those with needs to understand information 2. have RCGP safeguards in place to review its guidance on access to records 3. making the NHS number as standard as person identifier 4. encourage greater collection of data regarding Equity Duty and current governance to ensure balance between protection of confidentiality and identifiable data. However, as identified in this analysis, there are some groups who have expressed concern about potential negative impacts (for example, victims of domestic abuse and Gypsies and Travellers), but the actions planned or currently being taken to mitigate against these are detailed below.				
No/ No dates/ Patient/carer/representative, Technological aspects, Other (specify below) = Many recommendations are offered on what needs to happen to support equity./ Key messages = The area of most concern was around digital exclusion. Different people will want and need to access information in different ways and that it is therefore essential that information is not just be web based. Language and literacy levels will affect ability to access and understand online and other forms of information. Access to online records raises safeguarding risks for vulnerable individuals. Confidentiality is a concern for many.				

7. Dixon (2010) (USA)	Descriptive	Setting= not specified (general healthcare in the USA); Population= n/a; Practice No= n/a; Practice size= n/a; Scale= national	To discuss and outline the potential benefits of online communication (videoconferencing, electronic messaging and remote monitoring) in the healthcare industry, focusing on barriers to uptake and suggests solutions to support its implementation and growth.	No; barriers to technology adoption; characteristics of technology enabled practices/ No
Benefit/ Technology-enabled practices have the potential to lead to significant advancements in patient satisfaction, improved practice efficiency, and improved health outcomes. Such technology would consist of patient portals, asynchronous (email) consultation, virtual visits using video technology, and remote monitoring of chronic conditions. However, several barriers exist to the implementation of these strategies, including lack of integrated tools and lack of financial incentive / fears of not being reimbursed for work done online. These barriers need to be addressed for online communication to be more widely adopted throughout the healthcare industry.				
No/ No dates/ Practitioner and healthcare provider = Providing institutional and financial support for these new technologies may make providers more rapid in adopting them and make healthcare delivery more efficient./ Key messages = Less effort has focused on IT to providing channels for the delivery of health care. Videoconferencing, electronic messaging and remote monitoring to augment communication between primary care and a pt provide an opportunity to improve information flow in both directions. This has the potential to improve health outcomes and increase the efficiency of primary care delivery systems. Although privacy concerns and cultural resistance have stalled the adoptions of new technologies.				

8. Feeley & Shine (2011) (USA)	Editorial	n/a; Scale= other (editorial)	Editorial to discuss patients' access to their medical records and how technology may improve transparency in health care.	No/ No
Benefit/ Despite demographics and medical conditions, patients were interested in viewing their consultation notes to see what was written about the encounter. Some pts expressed an interest in being able to share their notes with other health care providers and caregivers. Drs were not as keen to participate as they thought that these notes would lead to extended visits and more demands. The drs that did participate felt satisfied and thought that communication had improved, whilst others thought it lead to pts being confused. In the VA system, most pts wanted to be able to share certain health records elements with providers and caregivers outside of the system. Current systems, allow pts to be able to view their own record and offer permissions to others in other locations. This sharing was thought to improve communication, engage pts, and enable pts to prepare for consults in advance.				
No/ No dates/ Patient/carer/representative, Practitioner and healthcare provider./ Key messages = Electronic health records can improve pts and drs relationships and empower pts and increase their engagement in their health care. It can be used to improve communication, decrease repeat testing, and enhance delivery of care, depending on how records are used and who has access to them. Doctors may view this as a barrier to their care, depending on the times it may take to use the system and consult with their pts. Future studies could look at the impact of the improvement of implementation of electronic medical records and secure internet portals.				

9. Fisher, Fritton, Poirier et al (2007) (UK)	Descriptive/ perspective; All ages	Setting= n/a; Population=n/a ; Practice No=n/a ; Practice size= n/a; Scale= national	An essay to outline the current process of introducing online patient record access to the UK, why it is important, possible benefits and risks and impact of record access.	No; descriptive/ No
Benefit/ Record access is increasingly being adopted around the world by clinicians and patients. Substantial benefits have been reported from online access to medical records. Patients describe improved trust and confidence in their drs and feel more informed and in control of their condition and its management. Despite scepticism from drs, evidence suggests that record access seems to help pts focus their medical agenda, saving time and fostering compliance. Potential risks do exist however, which include confidentiality and authentication concerns.				
No/ No dates/ Practitioner and healthcare provider = This editorial strongly advocates the implementation of patient record access in the UK, and recommends that this happens soon to improve patient care./ Key messages = Despite the risks and potential pitfalls, record access could significantly improve shared care through improved mutual trust and respect between pts and drs. Enabling access may also improve patient safety, as pts could include their own recorded values and view care management records. Access appears safe when used with simple precautions.				

10. Greiver (2006) (Canada)	Personal account/ experience	Setting= not specified (Individual family physician working in Ontario, Canada); Population= not specified ; Practice No= 1 ; Practice size= not specified; Scale= individual experience	Individual account of personal experience discussing how email communication with patients has aided patient care and impacted on workload.	No/ No
Benefit/ The number of email messages has been low (between 3-5 per month), so this mode of communication has not significantly impacted on existing workload. Patient queries have mainly involved health concerns, medication side effects and follow-up of medical problems. Emails have been particularly useful for communicating complex problems to elderly patients / those with chronic disease and, with permissions, emailed brief explanations to relatives. Patients largely kept to guidelines regarding not using it for urgent messages. Some pts would be willing to pay for email communication with their doctor.				

No/ No dates/ Practitioner and healthcare provider, Technological aspects, Future research = Expert help needed with computer security, confidentiality and administration to make more acceptable to physicians./ Key messages= Email communication with pts can be helpful at times, especially for older pts with chronic conditions that might be difficult to explain. Contrary to expectation, email has not been very time-consuming and does not significantly impact upon workload. Email communication also provides a window for further education, for example links to websites.

11. Haslam, Taylor, Brearley et al (2012) (UK)	Government/ Policy Report	Setting= UK Government; Scale= national	To develop an information strategy via a multi-professional work stream/ NHS Future Forum focusing on six key areas, information for patients, patient ownership of data, data sharing, information governance, drive to quality and transparency.	No/ No
Benefit/ Report claims benefits from better use of IT but no empirical data presented to support this. The report offers multiple area to consider, including supporting pts to make sense of information; ownership of data ('no decision about me without me'); acknowledging GPs concerns regarding workload implications, governance and potential negative impact on the pt-dr relationship; safe data sharing (to promote high quality and integrated care); interoperability (capacities for different computer system to communicate with each other) and technical interoperability standards; cultural and behavioural 'blockers'; review of information governance rules; and finally, the development of clear strategies to monitor progress of quality and outcome measures.				
No/ No dates/ Patient/carer/representative, Practitioner and healthcare provider, Technological aspects. / Key messages= 1. Information is an integral part of the service to pts and the Government need to clearly set out the responsibilities of commissioners and providers in affirming this principle. 2. Service providers must ensure that information integrates around the needs of the individual, and commissioners must ensure that this is done. The NHS Commissioning Board must lead by example in its direct commissioning and also ensure that the levers and enablers it uses for improving quality align with this requirement.				

12. Katz & Moyer (2004) (USA)	Descriptive/ perspective; All ages	Setting= mixed ; Population= n/a ; Practice No= n/a ; Practice size= n/a; Scale= n/a	To describe the barriers and challenges providers/ organizations must address in developing and using email and web-based communication tools, and outlining the lessons learnt from early experiences of deploying these tools in clinical settings.	No/ No
Benefit/ Describes three types of barriers to instituting an online service including; organisational (reimbursement issues, technical/ operational complexity, privacy, medico legal issues); provider (concerns about being overwhelmed with messages, relevance of messages); and patient (experience of using online tools, focus - those most 'in need' may be least likely to be online). It describes possible benefits such as reduced workload for drs, more efficient service delivery, better and less time consuming communication for pts. Setting up services is time consuming and expensive, relying on on-going support which would be very expensive for small practices. Solutions are offered to help facilitate online communication, including; tailoring communications to users' needs (intuitive navigating); adjusting organisational expectations; preparing staff for changes, target potential 'late adopters' in early stages; assessing pt and dr needs across specialities and across time.				
No/ No dates/ Practitioner and healthcare provider, Technological aspects, Future research./ Key messages = The paper suggests that a web-based approach would be easier to implement in terms of security and audit. It provides a roadmap of potential problems and barriers with solutions. It also suggests patient education and expectation management to limit inappropriate messages.				

13. Hannan, A (2011) (UK)	Short discussion paper	Setting= mixed; Scale= national	Short discussion paper arguing for online access to medical records using specific examples.	No; descriptive/ No
Benefit/ This paper discusses 2 main examples of successful online access to records and how they overcame difficulties; renal patient view and a GP surgery (previously owned by Dr Shipman). It describes how patients are well informed, and on average only check records once. In the GPs opinion, trust has been improved since implementing online record access.				
No/ No dates/ Practitioner and healthcare provider, Technological aspects./ Key messages = Very few places offer online access to medical records. The benefits include the building of trust and better informed patients. Need to inform patients prior to performing tests. Although there are many perceived barriers, these can be overcome.				

14. The Royal College of General Practitioners (2010) (UK)	Guidance document with literature review; Adults - Carers/representatives (health care professionals); 09/2010	Setting= other (n/a); Population= n/a; Practice No= n/a; Practice size= n/a; Scale= national	To facilitate the implementation of Record Access in a variety of settings, offering good practice guidance to aid health professionals enable Record Access and support patients who wish to access their records. The guidance aims to address safety and legal concerns, maximise the benefits, minimise risks and demonstrate how to deal with some of the limitations.	No/No
The intention of this document was to make it easier for healthcare organisations and health professionals to provide contemporaneous electronic Record Access to pts and to highlight some of the benefits of enabling this interaction, as well as some of the risks and concerns about sharing. Potential benefits include improved care, safety and record keeping/ record accuracy, but further studies are needed as record access becomes more widespread. Currently there is no plans to translate records into other languages, although it would be good practice to offer a translator where possible. There are two key exceptions for access; where the data is likely to cause serious harm; and where data may relate to a third person who could be identified. Other areas are in need of consideration including, security, registration and authentication of access; informing pts of the implications of access; and the need for on-going professional development to ensure good information management. Access for children was also detailed as parents normally have an automatic right to access their children's records; however competence to exercise these rights might be reached at different ages, but health professionals can consider competency from the age of 12 years.				
No/ No dates/ Practitioner and healthcare provider, Future research = Further research is needed to explore the potential risks and benefits of online pt access in more detail, and where implemented research into pt experiences./ Key messages = The emerging evidence is that health records can be safely shared with pts for the improvement of their care. Sharing records with pts has significant potential benefits for professionals and pts: for relationships, for understanding, for health outcomes and for safety. Uncertainties are understandably widespread amongst health professionals and there is a need to learn from good practice.				

15. Spicer (1999) (USA)	Editorial; Health Professionals	Setting= mixed (points of view from family physicians from a mixture of settings across the USA); Population= n/a ; Practice No= n/a ; Practice size= n/a; Scale= national	Editorial piece which summarise the benefits of using email communication with patients in primary care, and provide practical advice on how to set up a practice website.	No/ No
Benefit/ Timely communication, increased efficiency of clinic appointments and a strengthened bond between dr and pt are all cited as potential benefits to using electronic, asynchronous communication. Other benefits include email and websites as relatively inexpensive methods to connect with pts, and guidelines that are available to help health care providers effectively manage email use, thereby potentially reducing any medio-legal risks (i.e. American Medical Informatics Association white paper 1998). There are, however, potential challenges include concerns about security				

and confidentiality, and promoting the service so that patients sign up and use it.
No/ No dates/ Practitioner and healthcare provider = This article strongly advocates the use of email and practice websites in primary care, and recommends that they should be used sooner rather than later./ Key messages = Timeliness is one of the greatest advantages of online communication with pts. Email and websites are relatively inexpensive ways to connect with pts and direct them to relevant information. Guidelines are available to assist in the use of email and may reduce any medico-legal risks.

16. Spielberg (1999) (USA)	Discussion paper	Setting= mixed; Scale= national	To discuss the rights and expectations of pts and dr when communicating via email.	No; No
Equivocal (neither good nor bad)/ There are multiple areas that needs to be considered when using electronic communications with pts. Policy or legislative initiatives should consider privacy and health information security issues, which offers patient autonomy. Policymakers need to ensure that drs inform pts of any privacy implications and potential risks of email, preferably as part of an informed consent process, and this consent process is completed using a signed written agreement form. Finally, policymakers, pts and drs need to acknowledge that the email dialogue may become part of patients' medical records, and that these discussions are covered by the privacy and confidentiality protections afforded to the original medical records.				
No/ No dates/ Practitioner and healthcare provider, Patients/ carers/ representatives./ Key messages= It is necessary to know that health care professionals must not be allowed to circumvent any the legal and ethical guidelines. Regardless of communication method, it is imperative that enforcing the same standards throughout medical care, can assure pts privacy, confidentiality and facilitate informed decision making. Furthermore it is also important to acknowledge that all stakeholders in health care, policymakers, drs and pts, should recognize that transcripts of electronic medical communications become part of pts' medical records, and will need the same protections, such as privacy and confidentiality, that is afforded to all medical records. Without these assurances, online medical practice would be exempt from the pt safeguards				

17. Stone (2007) (USA)	Descriptive/ perspective account by one GP; All ages	Setting= not specified (clinic); Population= not specified ; Practice No= 1 ; Practice size= not specified; Scale=single practice, hospital or clinic	To outline the benefits and opportunities of electronic communication between physicians and patients, looking at four types of services; online appointment booking; prescription refills; general messaging capacities and remote visits.	No; descriptive (account by one GP)/ No
Benefit/ Use of electronic communication for routine tasks can improve practice efficiency, and give staff members more time to serve pts with urgent needs. E-medicine can also enable hospitals to improve transition of care for pts and communication with GPs. Many drs appreciate the asynchronous nature of email communication, as they can respond to pt queries at their convenience, thereby potentially leading to further efficiencies. However, the issue of dr reimbursement is central to e-medicine, as despite the advantages of e-medicine, there could be increasing demands on drs time and workload.				
No/ No dates/ Practitioner and healthcare provider = The issue of reimbursement needs to be addressed for emedicine to be widely adopted./ Key messages = E-medicine has many potential advantages, including time savings, improved workflow through its asynchronous nature, and improved communication with patients. If drs are fairly compensated for this work drs may build into web messaging times into their work schedules.				

Table 1: Research Question 1 – Evidence Tables (RQ1)

Research Question 1				
Author, Year, Country	Author, Year, Country	Author, Year, Country	Author, Year, Country	Author, Year, Country
Findings / Implications				
Hannan (2010) (UK)	Descriptive (strategies to enrol patients to sign up for record access);	Setting= semi-rural; Population= 12, 164; Practice No= 1; Practice size= large; Scale= single practice, hospital or clinic	A narrative description of the experiences of setting up online access to patients in a semi-rural practice	No; descriptive
6% of pts (n=730) have access to their e-health record via an explicit consent process. The greatest amount of sign up were amongst 45-74 years of age. Records are reviewed either by office staff or by dr prior to release to pt. There have been over 100 000 viewings of the practice web portal, which holds specific information including practice related material and links to national health information. Clinicians and nurses regularly encourage pts to view their records . No problems occurred as a result of providing access. Further developments include developing a new process for pts unable to provide consent in nursing homes. / The case report of one practice indicated that pts had embraced access to their EHRs. a number of concerns were raised regarding potential risks, but these were not realised in this project. The study suggests if pts can get a better understanding of their health, diagnosis and treatments, then their compliance and concordance may also improve.				
Pyper, Amery, Watson et al (2004a) (UK)	Postal survey & focus groups; N=100 questionnaire; N=7 focus groups; Adults - Patients; no dates	Setting= Urban; Population= 10,300 ; Practice No= 1 ; Practice size= medium; Scale= single practice, hospital or clinic	To explore pts' views, concerns and to understand their needs when given access to their on-line electronic records for the first time.	No; usability; security; expectations; pt experiences when accessing records
Almost all pts found their session useful and could navigate around their health record easily. The majority found it easy to understand, although nearly half required clarification via a glossary. The advantages perceived by pts include: being better informed about their own health care and medication; being able to identify and correct errors and omissions; being reminded of appointments and screening; that life wills, next of kin, and donor wishes could be added; that access to EPRs will assist NHS professionals caring for patients outside their own health centre. / Patients were able to navigate and understand their records, on average taking an hour, and perceive many advantages. 2. Patient concerns can be alleviated by effective communication of the advantages and by demonstration of technology. 3. Frequent users of health care were the most interested. 4. Before receiving abnormal results or bad news electronically, most pts would prefer to be told by a health professional first. 5. Provided pts are confident about security, two thirds of pts would like to be able to access their record via the internet. 5. Patients wish to be able to give consent as to who can access their electronic patient record.				

Silvestre, Sue & Allen (2009) (USA)	Contents analysis of website traffic data and email survey; N=1,702 (survey); Adults - Patients (KP's online registration database); 2004-2008	Setting= mixed; Population= 10,000 (member who use KP website); Scale= regional	To examine website usage and survey data from Kaiser Permanente to investigate: issues contributing to consumers' acceptance of online health services; and services used.	No
The age range of users was from 13 to 95 years, with a mean age of 48, (median 47). Use of KP's member website has increased steadily. Viewing test results, prescription refill, online appointment transactions, facility directory, and health encyclopaedia visits consistently ranked among the most-visited features. The issues that may determine consumers' acceptance and intention to adopt online health service included perceived usefulness and ease of use. Registration for and use of KPs member Web site is not limited to the wealthy and educated. / Members valued the e-connectivity with their health care team, view key components of their medical records and conduct clinical transactions online and; provides them with information so that they can make knowledgeable decisions about their health. Perceived usefulness and quality were positive and significant predictors of actual usage, whereas perceived ease of use was not. Large health care organizations could serve an important function by connecting policymakers with pts, clinical staff, and drs who can illustrate how online tools can affect health and health care delivery.				
Bhavnani, Fisher, Winfield & Seed (2010) (UK)	Postal survey; N=213; Adults - Patients;	Setting= city; Practice No= 3; Scale= national	To explore how pts make use of their ability to access EHRs and the affect that this may have on health behaviours.	Yes; access; health behaviours/ No
Frequent users of record access were aged between 45 and 65 years, with 58% (n=124) being female and 91% defining themselves as White. Patients reported that record access had a positive impact on taking medicine (42% 95% CI; 34-51%) and following lifestyle change/ advice (64%; 95% CI; 53-74%). A quarter of the sample expressed concern over the possibility of unauthorized access to records. / Most pts reported a positive experience using record access. The sample in general felt more involved in their health care, understood better what had been communicated to them during prior consultations and felt more confident in GPs as a result of record access. Those with poorer health tended to use record access more frequently than healthier people, however a minority did report difficulties in understanding content of their records.				
Goel, Brown, Williams et al (2011a) (USA)	Observational; N=7,088; Adults - Patients; 05/2008-10/2009	Setting= city; Scale= single practice, hospital or clinic	To examine enrolment in an electronic patient portal in patients from various ethnic, gender and age groups, the aim of which was to examine the subsequent use, or non-use, of the system.	Yes; enrolment in pt portal; use of advice after pt enrolment; refill request post enrolment
In total 69% of 7,008 pts enrolled in the pt portal. There were significant disparities in the rates of enrolment by ethnicity, but not by age or gender. White patients were significantly more likely to enrol than black, Latino, and Asian patients. Older pts were less likely to enrol than those younger. Overall use of the patient portal to request medication refills was 22%. There were no differences by race/ethnicity in bivariate analyses, but female patients and those 35 years and older were significantly more likely to seek provider advice and request medication refills. / There were large differences in enrolment by ethnicity, with only one quarter of white pts failing to enrol compared to almost half of black pts. However, post-enrolment use of the portal was similar across race and ethnicity. White and non-white pts were equally likely to use the portal to communicate with their providers and request repeat prescriptions, suggesting that overcoming barriers to enrolment in the portal was the most crucial next step to minimizing disparities in use of portal technology.				
Hassol, Walker, Kidder	Mixed methods; online survey, focus	Setting= mixed (Geisinger health	To evaluate pts' experiences and	No; use; pts

et al (2004) (USA)	groups and interviews; N=1,421 (survey - patients) N=25 (focus groups - patients) N=10 (interviews - clinicians); Adults - Patients; 2001-2003	care/Health Maintenance Organization (HMO); Population=4282 ; Practice No=52 ; Scale= regional	attitudes towards internet based communication with their health care provider and their electronic access to health care records.	attitudes & satisfaction; accuracy
The majority of users indicated the system was easy to use (mean scores ranged from 78 to 85) and that their record information was complete, accurate, and understandable (mean scores ranged from 65 to 85). Patients preferred e-mail communication for some interactions, and face to face communication for others. Telephone or written communication was never their preferred communication channel. In contrast, physicians were more likely to prefer telephone communication and less likely to prefer e-mail communication. / Pts attitudes about the use of web messaging and online access to their EHR were mostly positive, and they were satisfied about the completeness and accuracy of medical information. Clinicians were less positive about using electronic communication with their pts. More research is needed into web messaging and pt record access to determine the impact of these technologies on outcomes, such as safety, effectiveness, efficiency, satisfaction, and overall quality of care?				
Palen, Ross, Powers et al (2012) (USA)	Cohort with match controls; N=87,206 (with access) N=71, 664 (without access); Adults - Patients; 03/2005-06/2010;	Setting= other ; Population= over 500,000; Scale= local	To assess health care utilisation of users and non-users of an online system, enabling access to EHRs, focusing on association between pt online access, use of clinical services, and before and after the introduction of this system.	Yes; use (rates of office visits, telephone encounters, after-hours clinic visits, emergency department visits, and hospitalizations) measured/ Compared for pts with and without online access
Comparing the use of clinical services before and after the index date between MHM users and nonusers, there was a significant increase in the per-member rates of office visits (0.7 per member per year; 95% CI, 0.6-0.7; p<.001) and telephone encounters (0.3 per member per year; 95% CI, 0.2-0.3; p<.001) in the group enrolled in the online system. There was also a significant increase in per-1000-member rates of after-hours clinic visits, emergency department encounters and hospitalizations for MHM users compared with nonusers. Online access steadily grew from about 25% to 53.8%. Enrolees tended to be slightly older (t-test, p<.001) and more likely to be female (x2, p=.002). There was greater variability in rates of utilisation for users with chronic illnesses. / Findings suggest the relationship between online access and utilization is more complex than the simple substitution of online for in-person care suggested by earlier studies. If these findings are present in other systems, health care delivery planners and administrators will need to consider how to allocate resources to deal with increased use of clinical services.				
Ralston, Rutter, Carrell et al (2009) (USA)	Cross-sectional cohort study; N=175,909 ; Adults - Patients; 01/2004-03/2005	Setting= mixed ; Population= over 300,000 group members; Practice No= 20 ; Practice size= large; Scale= regional	To evaluate characteristics of patients using secure electronic messaging with their health care provider within a shared medical record.	Yes; use by demographics and health characteristics; number of secure message threads between pt and provider (analysed by number of variables)/ Comparisons of pt characteristics of those registered for the website using SM and those not registered/ using messaging
Among eligible enrolees, 14% (25,075/ 175,909) exchanged one or more secure messages with a primary or specialty care provider. Compared to others registered for the pt web site, messaging users were more likely to be female (OR, 1.15; 95% CI, 1.10-1.19) and have greater overall morbidity, comparing high or very high to very low overall morbidity. Results also show that compared to other patients, messaging users were more likely to be between 50-65 years and less likely to be insured by Medicaid. Patients less likely to use secure messaging was associated with enrolees age over 65 years (OR, 0.65; CI, 0.59-0.71) and Medicaid insurance vs. commercial insurance (OR, 0.81; 95%, CI, 0.68-0.96). / The study identified significant variability between pts. Patients with greater overall morbidity were the most active users of SM. Those over 65 years were less likely to use SM. Patients in low SES neighbourhoods were also less likely to use SM. This may be due to differences in resources available.				

Haggstrom, Saleem, Russ et al (2011) (USA)	Observational videos; usability testing of a PHR system; Provision for vulnerable groups (veterans & 6 with disabilities)	Setting= primary care clinics; Population= 24; Practice No= 3; Scale= local	To identify usability barriers to the personal health records (PHR) adoption to ensure that the MyHealthVault system was sustainable.	No; usability testing; efficiency measures; potential design solutions
Four PHR scenarios were observed/ tested: registration and log-in, prescription refill, tracking health, and searching for health information. Four usability issues were identified: older pts experienced registration difficulty; a few pts had privacy concerns; pts want to share information with their health care professionals; pts may opt for others ways of searching for health information. Areas of potential design solutions; allowing longer passwords/ no special characters; greater on-screen confidentiality via prescription numbers/ picture of pills; enable information to be printed/ downloaded; health care organisations may highlight advantages of high quality health contents./ The most common function of MHV was associated with greater usability. Recommendations include; the registration process should be simple and secure; and information that is presented needs to be understandable. Patients want to share information at the time of their visit with the healthcare team.				
Kruse R et al (2012) (USA)	Cross-sectional survey; N=638; Adults - Patients; 02/2008-03/2008	Setting= mixed ; Population= 713 (outpatients in the waiting room) ; Practice No= 5; Scale= local	To better understand potential audience for one academic medical centres implementation of a patient web portal, by examining how primary care pts' use the Internet, and their characteristics.	No; portal use; pts characteristics
Internet users (78%) and non-users (22%) differed on several demographic characteristics. Users were more likely to be younger pts, and Internet use declined with age. Use also increased with educational level and income and differed by self-reported health status. One out of six (16.6%) non-users reported that they could not see well enough to use a computer. Barriers to internet use were lack of computer access, lack of email, and computer literacy. / A high number of primary care pts use the internet, and this number is expected to rise. Internet use was seen to increase with education and income, and decreases with age. Findings suggest that improving internet access of older adults is necessary if these people they are to benefit from internet based health support/ management. Older adults, pts with chronic illnesses and new computer users may benefit from computer interfaces that are simpler and easier to navigate.				
Fashner & Drye (2011) (USA)	Survey; N=258; Adults - Patients; 09/2008-02/2009	Setting= suburban; Practice No= 1; Scale= local	To explore pts' access to the internet and whether they would be interested in using the internet to communicate with doctors about their care.	No; pt internet access
Of the 258 returned surveys, 80.6% pts reported having some form of internet access. 48.45% had internet access at home. Pt interest in receiving medical information defined by marking 'yes' was 46.5%. Of possible services available online, pts chose appointment reminders by e-mail most often, (44.6%, n=115) followed by getting answers to simple questions (41.9%, n=108) and making appointments online (41.5%, n=107). / Pt access to the internet is high in this population despite being from a low income background, showing there is less likely to be financial inequalities. This suggests there are no financial barriers to internet access. Patient interest in using the internet for services in numerous ways, many of which are not yet currently realised. There is a need, however, to undertake a larger survey to confirm the results of this study, including demographic details so the sample is representative.				
Goel, Brown, Williams et al (2011b) (USA)	Telephone survey; N=159; Adults - Patients; 01/2009-03/2010	Setting= city; Scale= single practice, hospital or clinic	To identify pts who declined to enrol in a patient portal, despite being directly offered this service	Yes; reasons for non-enrolment; perceived benefits of a pt portal; pt characteristics (ethnicity, age, sex,

			by their providers.	education)
<p>Participants who were explicitly invited to enrol in a pt portal by their dr report positive attitudes toward the benefits of portal use. However, there appears to be no statistical significance in any of the outcomes, though some insight is offered into factors which influence pt enrolment. Most respondents (63%) did not enrol because of lack of information or motivation and others reported negative attitudes toward the portal or computer related obstacles. There was no significant race difference in access as the primary barrier to enrolment; however, access was only a small factor. / Most participants felt that the portal would not be useful to them and they may not have understood the portal features being offered to them. The disconnection between this negative attitude and the overall perceived importance of many features of the portal highlights the importance of communicating the portals features and potential benefits.</p>				
Delbanco, Walker, Bell et al (2012) (USA)	Quasi-experimental trial and survey; N=105 physicians and N=13,564 patients (trial); 41% of 13,564 (completed survey) N=5,561; Adults - Patients; 2011-no end date	Setting= mixed; Population= 22,703 Practice No= 3; Scale= regional	To evaluate effect of facilitating pts access to their visit notes through a secure internet portal, and impact of this on drs work lives.	No; access; pts & dr experience; workload
<p>Of pts who opened at least 1 note and completed the survey, 77% - 87% reported open visit notes assisted them feel more in control of their care; 60%-78% reported better medication adherence; 26%-36% expressed privacy concerns; 1%-8% stated that the notes caused confusion, worry, or felt offended; and 20%-42% reported sharing their notes with family members/ relatives. Drs response to questions about open notes found that they felt the system strengthened relationships with some pts; participation in care was easier than expected as open notes did not make an impact on their working lives. At the end of the experimental period, 99% of pts wanted open notes to continue and no doctor asked to stop. / Patients were enthusiastic about open access and of these who completed the survey recommended continued use of the system.</p>				
Pyper, Amery, Watson, et al (2004b) (UK)	Survey; N=577; Adults - Patients; no dates	Setting= mixed (general practice ; Population= 1050; Practice No= 1 ; Practice size= medium; Scale= single practice, hospital or clinic	To explore pts' views of online access to EHRs and health information in primary care, focusing on rights of access; security issues; confidentiality and use of smart cards.	Yes; pt views; pt access; confidentiality and security; accuracy of records
<p>Patients were largely positive about accessing records, with nearly 60% stating they would like to see their records if they were available on a computer, and 35% would like to see them as a printout. Although overall pts feel the advantages of EPRs outweigh the disadvantages, pts remain concerned about security and confidentiality. Other themes raised was whether parents/guardians should view their children's records; with 95% reporting that they should be able to view children's records up to aged 93% up to aged 12 and 71% up to the age of 16. Many pts agreed having access to records could improve their relationship with health professionals and their understanding of health care. / 1. Patients know they have a right to see their records and most want to see them. 2. Patients have concerns over security and confidentiality, and over the accuracy of their record. 3. The majority felt parents, guardians and carers should have access to dependents records. Offering pt access to their records has the potential to improve pt involvement in their own care, improve the professional-pt relationship and improve the way pts access the NHS services. However there are major implications for primary care when pt access is implemented locally and nationally including explanations of records; correcting misunderstandings; and reassurance about confidential.</p>				
Walker, Leveille, Ngo et al (2011) (USA)	Survey; N=173 (physicians); N=37, 856 (patients); Adults - Patients; 2010-2011	Setting= mixed (3 primary care practices Population= 213,000; Practice No= 3 ; Scale= local	To explore attitudes of pts and primary care physicians towards potential benefit or harm, if patients could access and read consultation notes.	No; pts & drs attitudes; beliefs; risks & benefits

<p>The majority of participating PCPs across sites (69%-81%) and (92%-97%) their pts thought open visit notes were a good idea. Participating drs were more supportive of pts being able to access their consultation notes, and their pts were enthusiastic. Pts enthusiasm extended across age, education, and health status, and 93% anticipated sharing visit notes with others. Overall, pts of both participating and non-participating drs expected overall benefits more than harm. / There were substantial differences in attitudes between pts and drs in those who did / did not participate in OpenNotes. Non participants were more concerned about potential effects, security concerns. Among PCPs, opinions about open visit notes varied in terms of predicting the impact on their practices and benefits for pts. Sharing visit notes has broad implications for quality of care, privacy, and shared accountability.</p>				
Zulman, Nazi, Turvey et al (2011) (USA)	Web-based survey; N= 18, 471; Adults - Patients; 07/2010-10/2010	Setting= mixed; Population= 18,471; Scale= national	To explore users views and preferences about sharing electronic health information.	No; interest in shared PHR access; preferences about who would receive access; type of information that would be shared; activities that users would delegate.
<p>79% of respondents wanted someone outside of the health system have access to at least some of their notes. Approximately 39% reported having poor or fair health status. Preferences about degree of access varied on the basis of the type of information being shared, the type of activity being performed, and the respondents' relationship with the selected person. Respondents were more interested in sharing access to medication lists, appointment information and test results. / 79% of existing users of the VA PHR system were interested in sharing access to their electronic health information with caregivers (including relatives) and non-VA providers.</p>				
Lober, Zierler, Herbaugh et al (2006) (USA)	Survey study; N=35; Provision for vulnerable groups - Low-income elderly and disabled population; 08/2005-3/2006	Setting=; Population No= 170; Practice No= 1; Scale= single practice, hospital or clinic	To evaluate barriers faced by a low income, elderly and disabled patients in creating and using a PHR.	No; descriptive
<p>Elderly and disabled residents were able to create and use a PHR system with the help of nursing staff, and found it useful to bring printed copied of their records with them to drs appointments. 76% of residents required assistance with setting up and updating the online healthcare system. Several barriers were identified in being able to independently use the system, including: computer illiteracy and computer anxiety, health literacy issues, and cognitive and physical problems. / To explore whether there are other groups who will not be able to create or maintain a PHR. This raises questions about who would be responsible for the PHR, and the infrastructure to support it?/ Elderly and disabled residents were able to create and maintain a PHR, although the majority could not do so independently. Registered nurses were able to help residents to create their PHRs, and they were able to use this time to enhance their health literacy.</p>				
National Children's Bureau (2012a) (UK)	Focus groups; N=21 young people views; Provision for vulnerable groups - Children aged between 10 and 17; 2011	Setting= other; Population= children and young people; Scale= national	To summarise views and recommendations of children and young people on how they would go about getting health information and advice, how health information could be made more accessible, and how to ensure that HealthWatch can engage them.	No; descriptive (young person's views; access)

<p>Young people were largely positive about the use of digital technology in healthcare but also highly valued face-to-face advice and guidance from someone they know, over anything available online. They thought they should be able to access their medical records if they wanted to, but did not want it to be their responsibility to hold information and pass it to new medical professionals. They would also value having accessible follow-up information to take from consultations to help them understand any diagnosis, treatment or advice given. / Government, local and national HealthWatch and the NHS should work with children and young people and organisations that work with them to ensure that development of health apps, online information and advice and other health resources as part of the information revolution caters for children and young people's needs.</p>				
National Children's Bureau (2012b) (UK)	Consultation events/ focus groups; n=79 children and young people; Provision for vulnerable groups (10-17 year olds); 3 year period	Setting= study set in UK; Population= 79; Scale= national	To build on the previous consultation event (ref. 12.14) by considering what information they might need/ like to accessing health services and information.	No; currently available information; use of health technology; potential improvements
<p>Accessing reliable and quality sources of information was sometimes problematic, and young people found it hard to identify trustworthy and reliable resources. Suggestions for improvement included tailoring resources such as the NHS choices website, with specific sections for young people to access. Members of the group wanted access to their medical records. They felt it was important that individuals know what is contained in their records and have access to them in the case of an emergency. They felt that young people should be considered responsible enough to access their health records at the age of 10. / It is important for health information to be seen as a trustworthy and credible NHS resource. There should be a central point for finding out information about health, making appointments and feeding back about services in order to reduce the number of websites visited. Young people should also be included in developing new health resources.</p>				
Pagliari, Shand, Fisher (2012) (UK)	Survey; N=42 Adults - Patients; no dates	Primary care centres within NHS England, UK Practice No= 16	To examine how primary care practices had integrated record access during the course of a one year pilot, describing its impact on service quality and workload for patients and professionals	perceptions of access; quality; workload
<p>There were positive perceptions of online systems from practice managers, drs and their pts. 80% of clinicians believed that record access was well received by patients, and just over half (53.3%) thought it had facilitated shared decision making and trust during consultations. Almost half (46.6%) of clinicians thought the new system had integrated well into their workflow. / Findings reflect common findings from the literature, that access systems are well liked by pts and accepted by most professionals. Access to electronic patient records may also be easily accommodated within existing services. Finally, online record access can increase efficiencies by changing the way in which patients seek professional interaction, such as via telephone rather than in-person consultations</p>				
Schnipper, Gandi, Wald et al (2008) (USA)	Descriptive; Adults - Patients; 09/2005 - 03/2007	Setting= not specified (primary care network in US; Practice No= 4 ; Practice size= large; Scale= local	Development and implementation of a patient medication portal.	Yes; usability; pts attitudes/ experience; accuracy of clinical information
<p>35 680 pts across 30 primary care practices were using the patient gateway/ portal. Of the pts who responded to a brief survey about their journal experience (n=466) 70% found the module easy to use, 53% felt that it led to their providers having more accurate information about them and 56% enabled them to feel more prepared for their forthcoming visits. /The integration of an interactive medication module into a pt portal is a way to reduce adverse drug effects and medication discrepancies. The effects of this intervention on a variety of outcomes are currently being tested. Expanding its use to a broader population will be a major focus for the future. On-going education of both drs and pts regarding the prevalence and seriousness of medication discrepancies and ADEs and the importance of communication about these issues will also be</p>				

needed to produce the culture change necessary to improve medication safety				
Fisher, Bhavani & Winfield (2009) (UK)	Focus groups and interviews; N=43; Adults - Patients; 2003 - 2005	Setting= city Practice No= 1; Scale= single practice, hospital or clinic	To explore how pts use access to full health records and benefits and problems/ disadvantages of using it from the patients' perspective.	No; use; quality of care; self-care
Three areas were reported: participation in care; quality of care; enhancing self-care. Record access appeared to improve shared management between dr and pt by improving pt understanding, empowering pt monitoring of their conditions, and communication improvement. Pts also used record access to reduce care fragmentation, and improve quality and speed of care delivery. Record access had a small beneficial effect on health behaviour. Negative comments about record access mainly concerned difficulties in access, and pt attitude that the record did not belong to them. / Record access improves shared management, with pts using records to improve interactions, make health decisions and improve the quality of the care received. Record access may have beneficial effects on health outcomes and increased shared decision-making. Future studies need to focus on the measurement of these outcomes, once electronic access becomes well-established.				
Saparova (2012) (USA)	Scoping review; n= 22 articles; 1999 -2012	147 articles retrieved Scale= international	Review of 22 articles demonstrating the ways PHRs could deliver persuasive tools to see if messages motivate, influence and improves patients health behaviours	Whether existing systems can function as useful tools to providing tailored health information
Qualitative studies revealed the usefulness of PHRs, however RCTs provided evidence that PHRs did not have a significant impact on patients' health behaviours or increase in patients' self-efficacy. When PHRs are interoperable with other systems or devices they become powerful, when standalone they become limited in value. Some studies revealed patients' self-efficacy and motivation in managing health conditions improved. / A key limitation was the lack of non-control group quantitative studies addressing personal health records efficiency; the limited application of the theoretical framework (capology) which may not have been specific enough; and idea that efficiency of PHRs is dependent on their level of operability.				
Staroselsky, Volk, Tsurikova et al (2008) (USA)	Survey; n=163; Adults - Patients; 11/2003-02/2004	Setting= primary care practice based in a suburban area of Boston; Scale= single practice, hospital or clinic	To evaluate efficacy of a secure online patient portal in producing more accurate medication lists within an EHR. Secondary aim to see whether sending physicians a message updating them on the information will prompt physicians to update the health records medication list.	Yes; medication list accuracy by pts portal users and non-users/ Yes; users and non-users of a Patient Gateway system
Patients reported 43% of medication listed in the EHR as inaccurate, including 29% having been stopped and 14% having been changed. pt-reported rates of medication list accuracy were generally similar whether pts had ever used the pt portal or not. On average, users of the portal took significantly more medications than non-users, perhaps making maintaining accuracy more challenging. Providing pts the ability to view their EHR medication lists through a portal was not by itself associated with greater medication accuracy. / A better solution is needed to support pts review of their medication information and integration into a dr workflow/ workload to facilitate accurate maintenance of this vital data. More research is needed to identify when a discrepancy between medication list and patient-report is important and when to appropriately notify someone, so as not to create a burden of unnecessary activity.				

Schnipper, Gandhi, Wald, et al (2012) (USA)	Sub-study within a cluster-randomized trial; n=541; Adults - Patients; 09/2005-03/2007	Setting= mixed (regional health care delivery network; Population= 121,046; Practice No= 11; Scale= regional	To determine effect of electronic medication module.	Yes; assessment of adverse drug events; dr-pt communication/ Yes; pts in active control arm invited to review and update family history & view health maintenance reminders.
In the intervention arm, 78% of pts invited to submit a medication ejournal opened it and 72% returned it completed. Patients using eJournals had greater concordance between documented and patient reported medication regimens, fewer unexplained discrepancies with potential for harm. Unexplained discrepancies include missing medication; differences in dose and frequency and additional medications. / Ejournal encouraged pts to discuss medications with their provider. There was greater concordance between what had been prescribed and pt reported regimens. It reduced discrepancies with potential for severe harm.				
Honeyman, Cox & Fisher (2005) (UK)	Semi-structured interviews; N=109; Adults - Patients & Health Professionals; 2003	Setting= not specified (group practice in South London, UK); Population= 8300; Practice No= 1; Scale= single practice, hospital or clinic	To investigate attitude of pts with access to their EHRs, their interests and expectations; impact on the drs-pt relationship, and pts' interest in adding to records.	No; access; attitudes; dr-pt relationship; expectations
Over half of responders were female (65%). 71/ 106 (67%) reported that they had been offered access to their paper records in the past. Of this group 53 (out of 62) had taken up the opportunity to view their records. On being asked how interested they would be in viewing their records electronically a mean score of 8.05 was found (paired t-test, p=0.018). Patients were also asked about the security of viewing their electronic records and 78 out of 101 were either 'not' or 'a little' concerned and over 75% though there records was either 'fairly' or 'completely' accurate. / Patients were more interested in seeing an electronic record than paper records, although there were more concerns with security with electronic records. Patients felt it would break down any dr-pt barriers and help them understand their disease more.				
Ross, Todd, Moore, Beaty et al (2005) (USA)	Survey; N= 601; Adults - Patients (n= 601) & Carer/ representatives (drs n= 564); 09-2003- 04/2004	Setting= Primary care; Practice number=6; Practice size= other; Scale= Local	To compare attitudes of pt and drs toward shared outpatient medical records, focusing on socioeconomically disadvantaged patients in community health centres; insured patients in primary care offices, and range of drs in outpatient practices.	No; dr & pt attitudes
Academic medical centre pts and community health centre pts were similar in their endorsement of shared medical records (94% vs 96%) and Internet-accessible records (54% vs 57%). Community health centre pts were more likely than others to anticipate the benefits of shared medical records (mean number of expected benefits = 7.9 vs 7.1, P < .001), and these pts were also more likely to anticipate problems with shared records. Drs were more likely than pts to anticipate that access to records would cause problems; and were less likely than pts to anticipate benefits (mean number of expected benefits = 4.2 vs 7.5, P < .001). / Nearly all pts valued having access to medical records. While most pts endorsed internet-accessible records, a substantial minority did not endorse this practice, and many have strong feelings about it. This suggests that, if access to medical records is to be more widely adopted, their concerns will need to be addressed. Drs remain more sceptical of the potential benefits of pts access to medical records and more concerned about the potential risks.				

Steinschaden, Petersson, Astrand (2009) (Sweden)	Web based survey; N= 2251; Adults - carers/ representatives (health care professionals); 11/2007-12/2007	Setting= Primary care n=97 (and other disciplines n=106); Population= 203; Practice size= Other; Scale= regional	To compare attitudes of Austrian and Swedish physicians around the implementation of e-prescribing and to identify potential success factors for implementation.	No; dr attitudes; good & bad experiences
Findings illustrate a relationship between the residence of drs and their attitudes towards eprescribing (p<0.001) for all received responses. Swedish drs regarded eprescribing as time saving (69.8%, 88/126); 88.1% (111/126) as being safer and 96% (121/126) offering a better service for patients. The attitudes of Austrian drs were similar, as they were also mainly positive, but less strongly supportive. / Austrian drs relying on paper prescribing and Swedish drs thought e-prescribing was a good service, but had concerns around errors and system breakdown. There is a need for international exchange of experience for enhancing implementation of e-prescribing.				
Wagner, Howard, Bentley et al (2010) (USA)	Interviews; N=16; Provision for vulnerable groups - Patients with hypertension; no dates	Setting= other(ambulatory clinic in an academic medical centre); Practice No= 1; Scale= single practice, hospital or clinic	Pt views of EHR use and functionality to inform an existing PHR development.	Yes; to improve the ePHR; pts perceptions; usability; whether pts suggestions were implemented
Patient suggestions were grouped into three categories; user themes; system acceptance issues; and technology themes. Such tracking can increase the patient's role in managing illness and improve health outcomes. Patients anticipate the ePHR has the potential to support a patient centred approach by 1. facilitating a partnership with doctor 2. helping self-management and communication and 3. personalised health promotion. / Pts with little or no experience with ePHRs highlighted potential benefits of an ePHR such as motivation, partnership with physicians, improved communication, and ease of access. Incorporating patient suggestions may increase utilization and acceptance of technology which could improve health outcomes and encourage pt motivation.				
London Connect (2013) (UK)	Online and paper survey; N=318; 12/2012-01/2013	Setting= City; Population=318; Scale= regional	A online and paper based survey focussing on people's opinions in London about online access to their health and social records, looking specifically at the benefits and potential barriers.	No; descriptive (benefits & potential barriers)
Of those completing the survey 86% said they would look at their records if available online, and were positive about the potential for accessing their health and social care records online. Probable benefits were; being more aware of health issues (54%); feeling more involved in their care (57%); feeling more in control (52%) and being able to make better decisions about their health (56%). There were also some views that relationships with health care professionals could improve, and half mentioned greater trust in their health care professional. Differences however were perceived between opinions according to age and ethnicity. These people were least likely to be positive about accessing their records. / Survey responders were generally positive about potential for accessing their health and social records. However, older people and ethnic minorities least likely to be positive about accessing their records online. Responders were worried about privacy, utility support and wanted encouragement on how to use online records.				
Hannan & Weber (2007) (USA)	Review; Other (not based on specific pt group)	Setting= n/a (examples taken from primary care in England (UK) Scale= Other	To provide numerous examples of how, by enabling pts access to their medical records, may led to the development of a 'Partnership of Trust' whereby pts and their clinicians develop a shared understanding of their health and the mutually beneficial outcomes that may emerge.	No

<p>Examples provided of where the relationship of trust, and greater access to information and records for the patient, is likely to improve the process, experience and outcomes of care. This includes; the important role of drs and allied health professionals play in delivering good quality care whereby pts and professionals feel they play an equal role in the relationship and are more likely to share ideas, concerns and expectations. / It is hoped that facilitating pts to access their medical records will lead to an improvement in the health outcomes of individuals, and that a Partnership of Trust will support a transparent process whereby pts and drs to feel comfortable with sharing all information that is available.</p>				
Herbert (2007) (UK)	Conference report/ descriptive; 12/2006	Setting= meeting of the Clinical Computing Special Interest Group (CLICSIG) of the Primary Health Care Specialist Group of the British Computer society; Scale= national	Outlines the background, and lists issues relating to pts' access to medical records.	No
<p>Following a practice in Tameside allowing pt access to medical records, pts reported improvements in the dr-pt relationship and generally provided positive feedback. However issues were raised including; mental health pts/ children/ foreign language speakers could benefit least / disenfranchised; increased demand on a stretched service, system glitches/ internet not always reliable, pts seeing results / letters prior to GP; children and record access rights issues ; third party information issues; means of storing data, rights of patients about what data has been recorded about them. / A local stakeholder group was developed to address the issues surrounding access to medical records. Security was an issue, especially surrounding children, contraception, sensitive data, and it was decided email was not a safe method of communication. These and several other issues need addressing before access to data can be rolled out nationally.</p>				
Fairhurst & Sheikh (2008) (Scotland, UK)	RCT; N= 173; Adults - Patients; 08/2004-02/2005	Setting=city; Population= 5200, N=189 randomised to the intervention group, N= 226 to the control group; Practice size= small/ single handed; Scale= single practice, hospital or clinic	To assess effectiveness of texting appointment reminders to patients who repeatedly fail to attend their appointments in a small inner-city general practice	Yes; non-attendance rates. Yes; patients randomised to an intervention group, who received a text message reminder of appointments, and the control group who, received no reminder.
<p>Equivocal (neither good nor bad)/ 22 appointments (12%) were not attended in the intervention group compared with 39 (17%) in the control group. A chi-square analysis gave a non-significant difference of 5% (95% CI of difference -1.1 to 12.3%, p = 0.13). Multilevel analysis applied to the binary outcome data on non-attendance gave an odds ratio for non-attendance in the intervention group compared with the control group of 0.63 (95% CI 0.36 to 1.1, p = 0.11). Results did not reach statistical significance but would suggest some improvement in attendance rate related to text message appointment reminder. / Texting appointment reminders to pts who repeatedly fail to attend may not significantly reduce non-attendance rates.</p>				

Table 2: Research Question 2 (RQ2) Results

Research Question 2				
Author, Year, Country	Study Design, Sample No and Study Dates	Setting	Study/ Intervention Aim	Outcome Measures / Comparator Groups
Findings / Implications				
Adamson & Bachman (2010) (USA)	Pilot study, online evisits; N= 2531 online visits, N=1159 billed pts; 11/2007-10/2009	Setting= City; Population= 4282 registered pts ; Practice No= 4; Practice size= Other; Scale= Local	To learn about potential for online visits in preparation for construction of an online pt portal.	No; descriptive
<p>The study found that evisits were submitted primarily by women during working hours and involved 294 different conditions. Of the 2531 evisits, 62 (2%) included uploaded photographs, and 411 (16%) replaced nonbillable telephone protocols with billable encounters. The evisits made in person visits unnecessary in 1012 cases (40%); in 324 cases (13%), the pt was asked to schedule an appointment for a direct encounter. / Online visits are feasible, and were managed with a minimum of message exchange. Patients were able to upload and digital images and refill prescriptions online. Evisits were generally conducted during office hours. The extent of conditions possible for treatment by online care is far ranging. Processes previously provided for free, such as nurse triage were documented and billed.</p>				
Fung, Ortiz, Huang et al (2006) (USA)	Service trial; N=3,331,539; 1999-2002	Setting= integrated healthcare delivery system in Northern California, USA; Population= 3.3 million patients ; Practice size= large; Scale= local	To examine variations in the specific types of transactional service use and the characteristics of e-users. Services available were transactional and care-related. Patients could not email their doctors directly or access electronic medical records.	Yes; measure use of e-health services for each service type (care-related & transactional); frequency of use; pt characteristics/
<p>Registered e-health users increased from 20,617 (0.7% of all members) in 1999 to 270,987 (8.6%) in 2002. In 2002, 42,845 members (1.3%) used the drug refill service and 55,901 (1.7%) used the appointment scheduling service compared with 10,756 members (0.3%) who used the medical advice service and 3069 (0.1%) who used the medication advice service. / Pts may be inclined to use these services more if they provide a more efficient or effective means of conducting health-related transactions. There is a need to better understand what types of patients are most likely to use e-health services, and by exploring this area we may be able to assess what services they value, and develop better tools that may lead to quality and efficiency gains.</p>				
Nijland, Cranen, Boer et al (2010) (The Netherlands)	Service trial (web-based triage system) & online survey; N=3812 (service) N=192 (survey); Adults - Patients; 15 months (no dates)	Population= 13,133 (general public); Scale= regional	To explore use of a web-based triage system in primary care, focusing on the compliance with the medical advice it offers. This web-based triage system (http://www.dokterdokter.nl), is accessible to the general public and provides diagnoses and advice to pts in primary care.	No; medical advice compliance

The most common complaint reported was common cold symptoms (22%), itch problems (13%), urinary issues (12%), diarrhoea (10%), headache (8%) and back pain (8%). The most frequent system generated advice was to contact a doctor (85%) and in 15% of the cases the system provided fully automated, problem-tailored, self-care advice. Attitude towards the advice was shaped by the perceived effectiveness of the delivered advice and trust in the triage system. / Web-based triage system has the potential to reduce costs and to promote self-care. However, there were two main problems: the high dropout rates and invariability of the generated advice. In most cases the system generated the advice to visit a doctor (85%). However, a web-based triage can promote self-management of minor ailments, especially among pts with a positive attitude towards the computer-generated advice. This positive attitude leads to intentions to follow up the advice and to actual follow-up. Web-based triage could be used in preparation for a GP visit.

Padman, Shevchik et al (2010) (USA)	Description of eVisit service; N=152; with patient N=28 and physician N=11 survey; and N= 6 staff interviews; 2008	Setting= 1 primary care outpatient practice associated with a major medical centre; Population=8,000; Practice No=1 large healthcare group; Practice size=large; Scale= local	To evaluate eVisits in a primary care clinic, covering 7 simple health conditions at three locations over a three month period.	Yes; use of eVisit system; patient demographics; consultation themes and conditions; pt & dr satisfaction
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Monthly eVisit use increased from 4% to start with, to 14%, 18% and 25% respectively, indicating adoption of eVisits. Women used eVisits 3X more than men. Out of 152 visits logged in the study, 82% were completed by drs within 2 responses, suggesting eVisits are fairly straightforward. In general, pts found the service easy to use and were satisfied with the quality of care received. 95% valued online access to drs and would use eVisits again. Pts were concerned about privacy and confidentiality, and some older patients found the concept confusing. Drs were concerned about ease of use, but acknowledged that eVisits were increasingly important./ Pts appeared to see value in the new service, as illustrated by raising usage numbers. The quality of the service was good, with fast response times and low numbers of messages exchanged before resolving an issue. However, some healthcare providers had concerns about the functionality and value of the service. With further development of the portal strategy, the health centre may be able to provide a greater service to pts and improved value and competitive advantage for the organisation.

Umefjord, Sandsrom, Malaker and Petersson (2008) (Sweden)	Descriptive analysis; N=16,306/38,217 inquiries; All ages; 10/1998-09/2002	Setting= mixed; Population= 16,306; Scale= national	Descriptive study to describe users and usages patterns of the freely provided Swedish Ask the Doctor service, a text-based medical consultation with a family dr on the internet. This service is supported on a public health web portal (infomedica).	No (demographics of users and contents of remote consultation)
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For those that were aware of the service availability, it was mostly used for inquiries on symptoms and troubles of medical issues. People were able to ask drs health and disease related inquiries anonymously at any time from any location with access. A considerable number of inquiries were submitted to the service (38,217). Three-fourths of the inquires originated from women, and the typical user was a woman aged between 21-60 years. Almost half of the inquiries were submitted during the evenings and at night. / Professionals believe asynchronous online communication is predicted to increase and replace office visits. This type of communication will grow once security and encryption is properly regulated, medical records integrated, and reimbursement issues resolved. Because this service was anonymous in its medical inquiries, it appealed to many people especially young and middle aged women. Online communications between dr and pt will continue to increase in the future and could possibly even use web cameras.

Wakefield, Kruse, Wakefield, Koopman et al (2012) (USA)	Surveys (x3); N= 499/713 (WRS) n=79/369 (E&FS); Adults - Patients (current internet users only); 3x surveys conducted between 02/2008-06/2009	Setting= Mixed; Population= total not stated; Practice No= 3	The study explored differences in hypothetical interest in potential portal functions among primary care pts' vs the interests and experiences of patients who chose to enrol and those who used the portal.	Yes/ Across surveys: frequency and usage, perceptions; working more closely with dr; active role in health management; communication with dr; meeting health needs).
Compared with pre-intervention survey of internet users (WRS), participants who enrolled and follow-up participants (E&FS) were older, female, (62.2% & 71.4% vs. 70.6%) had higher household income (52.8% & 50% vs. 44.5% > \$60,000 household income), and chronic illness (57.7% & 64.9% vs. 39.1% in WRS). Substantial differences were shown in the WRS (expectations) vs. enrolment (actual) response groups who reported being interested in; emailing their dr (48% vs. 73%), prescription refill (37% vs. 52%), and viewing test results (54% vs. 75%). Follow-up survey indicated at best modest use. The most common responses were neutral/no opinion in relation to whether the portal helped them take a more active role in managing health. / Greater attention should be paid to understanding differences between hypothetical and actual use by pts of online portals to optimise portal design and implementation. Potential of pt portals cannot be realised if these portals are not used routinely as part of pt care.				
Adler (2006) (USA)	Survey; N=329/346; Adults - Patients; 04/2006-05/2006	Setting= city ; Population= 2380 (with high numbers of geriatric patients); Practice No= 1 ; Practice size= Small/single handed; Scale= single practice, hospital or clinic	To determine the true level of demand for online services in a family medicine practice, looking at pts most and least interested in these services; their Internet connectivity; willingness to pay for these services; and what services patients would most value?	No; demographics of pts; internet access; willingness to pay; amount willing to pay; most desired service
The survey asked patients opinion on services currently not being offered by the practice. Services included viewing of medical records and two way email service with doctor (and how much they would be willing to pay for this email service). Most patients surveyed (74.6%) would be willing to pay a small annual fee (median amount \$20 per year) for one or more online services but most (60% with internet access) would be willing to pay at least \$10. Of those who were disabled 29% were willing to pay \$10 or more. The most important services to patients with internet access were email contact with their physician (34%), viewing their record online (22%) and repeat prescriptions (11%) (p< .001). Possible suggestion that vulnerable and higher need population, the disabled had relatively low access to internet (42%) compared to overall access (75.4%) and less willing to pay \$10 or more (29%). / Most patients surveyed would be willing to pay a small annual fee for one or more online services. The disabled had relatively low internet access, and even of those who has access they were less willing to pay for online services, with financial constraints being a likely reason.				
Hobbs, Wald, Jagannath et al (2003) (USA)	Paper based survey; N=94 (drs); Adults - carers/ representatives (health care professionals); 01/2002-03/2002	Setting= city ; Population= 71 (drs returned questionnaire); Practice No= 10; Practice size= Other ; Scale=regional	To explore how email is currently used by physicians and identify developments that might increase email use.	No; use of system between dr & pts; developments needed; comparison of drs use/ non-use of system; demographic details

The majority of drs already use email in their daily routine, the majority do so with only 1-5% of those patients. There was no statistical significance difference between age / gender for those using / not using email. Drs estimated median time devoted to email daily was 10 minutes, with far more time devoted to phone calls, much of it wasted. 48% of drs thought it was quicker and more efficient to respond to emails rather than phone messages. However, the majority of physicians felt if email was encouraged, workload would increase. The main reported barriers to physician-patient e-mail related to workload, security and payment; also digital divide between patients with / without internet access. / Adequate pre-screening and triage process for email and compensation for an email service may make drs more amenable to opening up their service to email use, and this may result in better quality care.

Virji, Yarnall, Krause et al (2006) (USA)	Survey & feasibility study (a randomized, controlled pilot study); N= 16 (study) N-390 (survey); Adults - Patients; Study 1. 11/2002 - 03/2003. Study 2. 11/2001 - 05/2002	Setting= other; Population= not specified but practice averages 35,000 visits per year; Practice No= 1; Scale= local	To assess pt views, use and receptiveness to communicating with their health care provider via email and to determine feasibility of providing preventative counselling and screening to pts, via email.	Yes; eligibility (access to email) and agreement to be emailed; proportion of pts email use; level of preventative screening/ counselling/ Yes; intervention group received tailored emails; control group received routine preventative/ screening appointments without prior email.
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68% of pts used email, and 80% of these were interested in communicating with the clinic via email. Less than half (42%) were willing to pay a fee to have email access to their drs. When evaluating email initiated by the clinic, 26% of otherwise eligible patients could not participate because they did not have email access; those people were more likely to be black and insured through Medicaid. All pts who received the intervention emails said they would like to receive health education emails in the future. / Patient are interested in email as a method of communication, however, access to email is likely to be limited in certain disadvantaged groups. There are technical issues associated with this form of communication. Findings limited by the small number of pts involved in the study and single site. Finally there are ethical and legal ramifications of email communication that need to be addressed.

Weingarta, Hamrick, Tutkus et al (2008) (USA)	Service trial; N=267; Adults - Patients; 04/2001-06/2002	Setting= mixed; i.e urban clinic in a working class area) ; Population= over 500,000 patients; Practice No= 3; Practice size= large; Scale= local	To test whether electronic safety messages sent directly to pts could facilitate communication with physicians about medication problems and identify adverse drug events.	Yes; use; pt-dr communication; pts characteristics; medication accuracy & messaging (response rates and time)
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Patients opened 79% of MedCheck messages sent via portal and 12% of these patients responded to the message (reporting medicine related problems); 77% responded within 1 day. Patients often identified problems filling their prescriptions (48%), with drug effectiveness (12%), and medication symptoms (10%). Clinicians responded to 68% of patients messages; 93% answered within 1 week. The portal facilitated pt-dr communication about medication problems and identified ADEs. / The MedCheck messages served to supplement the clinical encounter, enabling drs to follow up automatically on pts care. For this type of system to be effective, pts must review their messages in a timely way, and then provide information for drs to review and act upon.

Kummervold, Trondsen Andreassen et al (2004) (Norway)	RCT and Interviews ; 3 group by age; N=200; Adults - Patients; 2002-2003 (2yrs)	Setting= city; Population= 7500 ; Practice No= 1 plus 2 outreach clinics 1/day per week ; Practice size= medium; Scale= local	To describe the PatientLink study, use of electronic communication with pts, and pts and drs experience of using this system.	Yes; frequency of use; type/ purpose of use; replacement of or in additional to existing services; dr experience/ Yes; intervention group had access to messaging system, and control group had access to usual care.
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<p>The study observes a number of benefits and disbenefits from the pts and drs point of view, for example: Drs experience: benefits: 1. Simple, flexible alternative, 2. Better than telephone 3. Can be time saving 4. Threshold for initiating contact is lower 5. Doctor can manage own time better Drs experience: disbenefits: 1. Not suitable for complex problems 2. Lacks dimension from face-face e.g. body language 3. Can be duplication - need face to face after e-contact 4. A few instances of inappropriate use. Patients experience: 1. I can use patient link outside normal surgery hours 2. It saves me time 3. I save a trip to the dr 4. I save the waiting time on the phone 5. It is cheap. / Whether messaging actually reduces the number of face to face or telephone consultations is not conclusive, though the study showed a 10% reduction. The study findings suggest that time spent in answering emails, and the potential economic benefits which ensue, are largely linked to drs keyboard skills and experience with this type of communication. This provokes interesting questions for further research, such as how much other types of enquiries to a drs surgery can email communication replace?</p>				
Tang, Black, Young (2006) (USA)	Contents analysis/ evaluation; N=65000; Adults - Patients; 01/2005-06/2005	Setting= analysis of records not specified; Population= 117 responses; Scale=regional	Feasibility study to understand applicability of the proposed eVisit coding criteria, and reimbursement opportunities.	No (email contents, frequency of messaging)
<p>Drs applied the proposed eVisit criteria to 120 randomly selected electronic messages sent by 112 pts to 69 drs through a personal health record system. In sum, all of the messages analysed in the sample met the level 2 eVisit Evaluation & Management (E&M) criteria, and thus would be eligible for reimbursement. The authors state that bigger samples would be needed to confirm these results. / A fair method of compensating doctors time for rendering care online is needed. By basing the coding criteria for eVisits on established office visit E&M coding criteria, the reimbursability of dr-pt electronic encounters meeting the criteria is justified.</p>				
Swartz, Cowan, & Batista (2004) (USA)	Examination of patient claims data; N=982/9781; 01/1999-05/2000	Population= 982/9781 all pts that had claimed at the study clinic in study period/ all pts with demographic details ; Practice No= 1; Practice size= medium; Scale= Single practice, hospital or clinic	To study administrative information to characterise pts that communicate with a medical practice via internet, and to identify how these pts differ from pts who do not use online information system.	No; pt demographics, frequency of visits, acute/chronic diagnosis, use of online communication
<p>Pts with higher outpatient utilization have a stronger preference for online practice-based communication. While pts registered within each age cohort, a significantly higher proportion of those were aged 50 to 69 were users (16.5%), compared to those younger than 18 years (6.4%), aged 18 to 39 (10.9%), and aged 70 or older (5.9%). Similar proportions were found between male and female users. Both Medicaid and Medicare beneficiaries seen in person at the clinic were less likely to use the internet service than other insured pts, suggesting difference in service use for those with a lower income and/or older. / Only 10% of pts used the practice website. Findings suggest that pts with higher outpatient utilization have a stronger preference for online practice-based communication, and may not just be "worried well."</p>				
Miller & West (2009) (USA)	National telephone survey; N=928/ 1428; Adults only, patients, family, carers / representatives; 11/2005-11/2005 (5 day period)	Setting= N/A (sample sourced from commercial sampling firm); Population= 1,428 ; Scale= National	To examine the degree to which health care consumers seek health information through conventional, face-to-face consultation, telemedicine, or digital technology, while comparing demographic factors and health care perceptions.	Yes; health communication. Frequency of visits, calls or email contact with a health care professional, frequency of website use including ordering prescriptions/ medical equipment online in the past year.

No significant associations were found with using any type of health communication with education, income, residence, and conventional communication behaviour. Participants with better education and higher incomes in urban or suburban areas were more likely to report using online health communication than less educated people with lower incomes in rural areas. Women were more likely to make in person visits, make telephone calls, or visit health websites. People with increasing poor health were more likely to use email and communication conventionally, while those with higher health literacy would most likely use health websites. / Programs that facilitate health IT use need to be targeted at both users and providers. This will help encourage use of these technologies and help pts use digital technologies. The results show that participants that used one form of digital communication behaviour were more likely to use other forms, which is why health-related internet use should be promoted in one area to hopefully have a positive effect in utilization of other areas.

Lin, Wittevrongel, Moore et al 2005) (USA)	RCT; N=606; Adults - Patients; 03/2003-08/2003	Setting= academic internal medical centre ; Population= 8,000, No of practices= 1; Practice Size= large; Scale= local	To assess the impact of a pt portal enabling patients to send secure messages directly to their physician, request appointments and refill prescriptions; and to assess patients' satisfaction with this access on their clinical care.	Yes; use; pts satisfaction/ intervention pts could send clinical messages direct to dr; whilst control group received access to general health advice via website.
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Portal group pts reported improved communication with the clinic (portal: 77/174 [44%] “a little better” or “a lot better;” control: 18/146 [12%]; $\chi^2 = 38.8$, df = 1, P < .001) and higher satisfaction with overall care (portal: 103/174 [59%] “very good” or “excellent;” control: 78/162 [48%]; $\chi^2 = 4.1$, df = 1, P = .04). Portal group pts were also more satisfied with clinic services (measured by frequency of portal use, satisfaction with dr messaging). Drs received 1 portal message per day for every 250 portal pts. Total telephone call volume was not affected. Patients were more likely to send FYI (informational) and psychosocial messages via portal than by phone. In all, 48% were willing to pay for online messaging with their dr, with a median cost reported was US \$2 per message (mean \$4.10). / Portal pts demonstrated increased satisfaction with communication and overall care. These pts valued the portals convenience, thought it reduced communication barriers, and offered direct physician responses. Online messages from pts contained information and psychosocial content, compared to that of telephone calls, which may enhance the patient-physician relationship.

Smith, Merchen et al (2009) (USA)	Survey; N=1700; All ages; Patients ; 11/2007-03/2008	Setting= practice-based research network in Oklahoma including 223 clinicians in 107 practices located in a diverse mix of areas; mixed; Population=1700; Practice No=107; mixed; Scale= regional	To determine what proportion of pts had access to computers and email, and explore if changes had occurred since last carrying out the study ten years ago.	Yes; level of pt access to computer and email use
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Of all pts surveyed, 66% had a computer at home, 45% used a computer at work, and 72% had a computer either at home or work. Overall, 64% had access to email, and 91% said they would like to use it to communicate with their doctor. In 2008, the proportion of pts with access to computers and email had equalized across all locations. / A majority of pts express a desire to use email to communicate with their drs. A greater number of network members plan to make greater use of practice websites, and document pts email addresses. These practices could act as pro-active ways to communicate with their pts in the future, for example for flu vaccine availability, instructions for home care, tips for healthy lifestyle, and remote electronic visits.

Katz, Nissan, & Moyer (2004) (USA)	RCT & pt survey; N=65 intervention & N=67 control (drs) n=531/850 pt survey; Adults only - patients & carers/ representatives (health care professionals); 09/2001-06/2002	Setting= Mixed ; Population= 132 drs/ 531 pts; Practice No= 4; Scale= Regional	To address pt and health professionals concerns about use of online communication tools.	Yes; email volume, number of telephone calls; attitudes and preferences for communication method/ Pts of intervention drs were encouraged to use a web based tool to communicate with staff. Drs did not have access to the web tool, but staff acted as intermediaries. Control group had access to email and telephone but not to web systems.
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There was no significant difference between email and telephone use between control and intervention groups. However, intervention drs were significantly more likely to perceive benefits of the web communication than the control group (mean Web benefits scale score, 4.0 vs 1.1; $P = .008$). Pts and drs reported differential preferences for the use of online communication, as drs favoured use of triage staff to mediate communications whilst pts preferred a 'direct connect' to their dr. / Uptake was poorer than expected. Dr preference was to use triage staff to mediate communications; pts preferred "direct connect". The web based tool increased online communication volume modestly and did not offset telephone or email communication. The intervention positively influenced drs' attitudes towards online communication. There is a "digital divide" between pts and drs with regard to appropriate content of messaging.

Caffery & Smith (2010) (Australia)	Literature review; N=185 articles; Adults only, patients, carers / representatives	Setting= Other; Scale= International (databases searched - MEDLINE)	To assess peer-reviewed literature about email use in delivery of health services. The wider aim was to build knowledge about email-based health care and to look at the benefit and barriers that effect delivery of email telemedicine services.	No
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Email has been found to have many uses in both primary and secondary care from consultations to telediagnosis through pictures. Several recurring themes emerged including: diagnostic accuracy; privacy and security issues; potential challenges to traditional dr-pt interaction; high satisfaction with email use, but only if emails were responded to in a timely manner. Although benefits have been found for the use of email, the literature lacks conclusive results in regards to positive patient outcomes./ Email-based health care has the potential to be used in primary care and patient consultations as well as secondary care. Different medical specialities can make use of this including an application in primary consultation, secondary opinions, telediagnosis, and administrative roles.

Couchman, Forjuoh, Rascoe (2001) (USA)	In person survey; N=950; Adults - Patients; No dates	Setting= mixed ; Population= approx. 1000; Practice No= 6; Practice size= large; Scale= regional	To determine the proportion of pts with email access, assessment of willingness to use emails to communication with health care providers, and examination of pts' expectations of response times.	No; proportion of use; willingness to use technology; expectations of response time
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In total 54.3% of pts reported having email access, with significant differences between the clinics (33%-75%). Most pts indicated they would use it to request prescription refills (90%), for non-urgent consultations (87%), and to obtain routine laboratory results or test reports (84%). Regardless of gender or ethnicity, pts had high expectations that these tasks could be completed within a short time. Patients had different expectations about the timeliness of responses to their email queries, depending on the clinical service. / Most pts have email access and indicate they would use it for specific services. Regardless of gender or ethnicity, pts expect tasks to be completed within a relatively short time.				
Couchman (2005) (USA)	Cross sectional survey; N= 2260; Adults - Patients;	Setting= mixed; Population= 2260/186,000; Practice No=19; Practice size= large; Scale= local	To assess pts' willingness to access test results, prescription requests and other services and assess their expectations regarding timeliness of use. Demographic trends will also be identified.	No; proportion of pts with current email access, willingness to use it for clinical services and to obtain test results; and expectations of response times
53.8% of pts had e-mail access, much lower than in the UK (84.1%). Only 5.8% had used email to communicate with their dr. Pts were only willing to use email for specific types of communication, such as obtain blood glucose tests results (84%; mean 3.86), but less willing to obtain more serious results such as CT scan results (59%; mean 3.05). Expectations of timeliness were high, and there were significant differences of willingness and expectations found by age, education an income group. In general pts with more education were more willing to use email, and those from the highest income level were more willing to use email. / Data showed that pts were consistently interested and willing to use email for a wide variety of general clinical services, however, they had high expectations regarding timeliness of provider responses.				
Walters, Barnard et al (2006) (USA)	Descriptive; Adults - Patients; 12/2005-01/2006	Setting= mixed; Scale= regional	To describe the experiences of one health care system with their Patient Portal, which enables patients to review their medical records and add information, and E-visits.	No; descriptive
The pt portal was most frequently used for sending messages, followed by medication review, making appointments and updating demographic details. Rescheduling appointments and referrals were used less. E-visits were being developed. Ultimately portals have the opportunity to enhance the pt-dr interaction and to supplement the face-to-face relationship. In turn this may enable patients to become better informed and more active in the management of their own health care. / Portals increase the interaction between pt and providers and offer potential to supplement in-person relations, and enable pts to be better informed and engaged in their own health care. However there are no data on costs related to e-visit or use of e-visits.				
Flynn, Gregory, Makki et al (2009) (UK)	Case study; N= 90 (interviews- patients) N=900 (survey - patients) N= 28 (interviews - practice staff); Adults - Patients & Provision for vulnerable groups - Homeless patients; 2002-2004	Setting= mixed city & suburban; Population= 26500 (students, elderly, working age patients) ; Practice No= 3; Practice size= medium; Scale= national	To assess attitudes of pts and staff on a ehealth system that enabled online services, focusing on barriers around uptake of the service and recommendations made for future work around implementation.	Yes; usability; security; pts & staff perceptions; quality of pts interaction; clarity of information

<p>The Access service worked well for pts interested in online appointments booking and found it to be useful. A popular function was prescription ordering. Staff and pts thought that a more active promotion of the service would result in greater uptake. Low usage did not result in a negative assessment of the service by most staff. / For primary care eHealth services, take-up may be lower than expected, and intention to use may not be a predictor of actual use. Although some pts perceive advantages (choice of appointment times and GP, easier communication with the practice, independence from receptionists), others see disadvantages (lack of human contact, preference for conventional use, lack of IT or Internet experience and registration problems). Pts and GPs differ markedly in their preferences for several future eHealth services e.g. medical record access without explicit patient consent.</p>				
Moyer, Stern, Dobias et al (2002) (USA)	Cross sectional baseline survey; Adults - Patients; 08/1999-10/1999	Setting= city; Population= 476 ; Practice No= 2; Practice size=large ; Scale= regional	To analyse baseline survey data from pts, physicians, and staff who participated in a randomized control trial of e-mail used in a primary care clinical setting.	No (dr and pt) characteristics & attitudes, characteristics of non-users, barriers to email use
<p>52.1% of pts were email users, but only 10.5% of those had used email to communicate with their dr. 70% of patients surveyed said they would be willing to communicate with their drs via email. Drs and staff were more optimistic than pts about the potential for e-mail to enhance the re-pt relationship. Amongst drs 61.1% agree that email was a useful method to reach pts and 60% mentioned that email was good way to manage pts administrative concerns. 51.6% mentioned they would not mind if pts emailed them. / Both pts and drs use email / internet, but barriers exist to using it to communicate with each other. Differences between pt and provider expectations about the role of email in clinical practice suggest that messaging will need to be actively promoted in a way that educates both parties about appropriate use.</p>				
Grover, Wu, Bladford et al (2002) (USA)	Survey; N=227; Adults - Patients; 07/2000-11/2000	Setting= mixed ; Population= not specified but 600 surveys distributed; Practice No= 4 ; Practice size= mixed; Scale= local	To determine computer-using pts' interests and needs when using a Web based clinic service, and to explore their needs which go beyond informational services alone.	Yes; preference for transactional services
<p>Pts who use computers and the internet showed significant interest in using web based services to contact their family dr. The ability to send a message was ranked highly. These pts were especially interested in using the internet for services such as real time appointment booking and e-mail appointment reminders; services traditionally provided over busy telephone lines. Services related to providing information were also of less interest. / Pts who use computers and the web, showed a significant interest in using web based services. Computer-using pts desire web-based services to augment their care. Practice websites should be designed to go beyond information alone and incorporate services such as online appointments. Doctors may consider providing 'virtual visits' to assist with disease management.</p>				
Umefjord, Hamberg, Malkerb et al (2006) (Sweden)	Survey; N=1223; All ages; 11/2001 - 01/2002	Setting= other (all enquirers to internet based 'ask the doctor' service); Scale= national	To investigate how an ' <i>ask the doctor</i> ' <i>internet based</i> service (online asynchronous communication advice service) was used and evaluated by internet users.	No; descriptive (email contents)

<p>The survey was completed by 1223 participants, mainly female (74%). 77% of participants wrote their question at home, whilst 19% enquired at work. 80% asked on their own behalf. 45% of the enquiries concerned a medical matter that had not been evaluated by a dr before. After reading the answer, 43% of participants indicated they would not pursue further having received sufficient information in the answer. Participants appreciated the service for its convenience and flexibility, but also for reasons around the mode of communication such as ability to reflect on the written answer without having to hurry and to read it more than once. / Internet-based consultation may complement regular health care. Future studies should evaluate, the cost-effectiveness, patient security, responsibilities of the Internet doctor and the role of 'Ask the Doctor' services compared with regular health care.</p>				
Nagykaldi, Aspy et al (2012) (USA)	Cluster RCT; N=560; Patients; All ages (adults 40-75 and children less than 6 years); 12-month period but no specific dates	Setting=mixed; Practice No= 8; Practice size= mixed; Scale= regional	To determine the impact of a Wellness Portal on delivery of pts' preventative care by examining the experiences of pts and clinicians..	Yes; use; pt experience; perceived patient-centeredness; pt empowerment/ activation; users receiving preventative services; total number of clinic visits/ comparison of portal and non-portal users
<p>Patient surveys showed 90% found the portal easy to use, 83% found it a valuable resource, and 80% said it facilitated participation in their own care. Adult intervention group participants received 84.4% of all recommended preventive services, contrasting with 67.6% in the control arm. Children in the intervention group received 95.5% of suggested immunizations compared with 87.2% in the control arm. / Need to develop more understanding of pt attitudes toward preventive care and varying ability of practices to redesign pt-centred technology. Results suggest a comprehensive and prevention-oriented portal integrated into regular process of care delivery can improve pt-centeredness of care, pt activation, significantly enhance the delivery of both age and personal risk factor-dependent preventive services, and promote the utilization of web-based PHRs.</p>				
Szilagyi & Adams (2012) (USA)	Editorial/ presentation of RCT findings; Specific socio-economic groups (low-income families) and provision for vulnerable groups (children and adolescents); N=7574/9213;	Setting= city; Population= 9,213; Practice No= 4 ; Practice size=other; Scale= Local	To present findings from a randomized controlled trial of influenza vaccine reminders to low-income families using text messages.	No; vaccination rates/ Yes; children and adolescents received a single automated telephone reminder call about influenza vaccine.
<p>The practices are part of a common EHR network that has customized text messages and links the immunization registry with the EHR. Children and adolescents received a set of text message reminders about the influenza vaccination. Parents were first informed through three text messages about influenza and vaccine safety and effectiveness. Uptake was not as high as expected, but there was an increase of vaccinations of 4 percentage points. Compared to a larger target group or a national population that could result in a larger number of people. / This study showed how health information technology was growing and can be designed to improve pt and dr communication and areas of public health such as vaccination.</p>				
Wright, Poon, Wald et al (2011) (USA)	RCT (reminders via EHRs); N=3,979; Adults - Patients; 2005-2007	Setting= mixed; Population= 21,533; Practice No= 11; Scale= regional	To determine whether electronic reminders provided via a secure PHR system improves adherence to health maintenance guidelines by engaging patients in care, promoting pt-dr communication and offering decision-support tools to patients.	Yes; pt adherence rates to guideline based care recommendations/ intervention pts received reminder via an eJournal that allowed them to input/ review family history information. Pts compared to active control arm who were also due for the same item.

Benefit/ Patients in the intervention arm who received healthcare maintenance reminders were significantly more likely to receive influenza vaccines (22.0% vs 14.0% p=0.018) and have mammography (48.6% vs 29.5%, p=0.006). Although Pap smear completion rates were higher in the intervention group (41.0% vs 10.4%, p<0.001), this result did not reach significance. No significant improvement was noted in uptake rates of other screening tests. / There is a need to expand pt enrolment and address demographic disparities in groups less likely to use online tools. Providing pts with health maintenance reminders via an electronic PHR may be effective in improving some elements of preventive care. Pts who receive reminders via online eJournals were more likely to receive mammography and influenza vaccine. More research is needed to evaluate and improve upon the efficacy of this intervention and to engage more pts in the use of online health records.				
Andreassen, Trondsen, Kummervold et al (2006) (Norway)	Case series, interviews; N=12 patients N=6 GPs; Adults - Patients; 12 month period, no dates	Setting= not specified ; Population= 200 (patients) 6 (general practitioner); Practice No= 1; Scale= local	To explore patients' perspectives on e-mediated communications with their doctor, focusing on what changes in the their interaction.	No; pts perspectives
Several themes: 1. Trust in dr-pt relationship. 2. Time and space: opportunity to contact doctor outside hours and away from premises. Mental health problems. may hinder pts leaving home 3. Lowered threshold: Pts feel they can ask the dr questions they would not have asked in person . 4. Transferring responsibility: For some pts their problem is transferred with the email. 5. Personal language: informality was a welcome surprise for some pts. 6. New zone of reflection: for some pts communication is easier in writing, made people think about what to write and why. / E-mediated communication has the potential to strengthen pt-dr trust. Pts' use of technology might affect their participation. The possibility of communicating with the doctor at anytime from anywhere represents a desired increase in freedom of choice, but also brings an increase in responsibility to make these choices.				
Neville, Marsden, McCowan et al (2004a) (Scotland, UK)	Service trial & electronic survey ; N=150 (pts), N=62 GPs; Adults - Patients; 04/2002-12/2002	Setting= city; Population= 7000 ; Practice No= 1; Practice size= medium; Scale= single practice, hospital or clinic	To evaluate an email communication and consultation facility for pts in a general practice, focusing on repeat prescriptions, appointment booking and clinical enquiries.	No; pt satisfaction; workload
Reception staff adopted email into their daily routine without adverse time implications. Concerns about additional work did not materialise and all the partners were satisfied that the service worked effectively and did not negatively impact on workload. Patients specifically commended the practice for setting up a facility to allow communication outside standard working hours and for the ease of ordering repeat prescriptions. / Use of an email consultation facility worked well, with pts being very satisfied with the services, and resulted in no apparent increase in GP workload. Results suggest that there may be an unmet need amongst pts for clinical email services, and that such services may have positive outcomes for pts and general practice. The main barrier to practices setting up an email facility is likely to be attitudinal, rather than technical or logistical.				
Rutland, Marie & Rutland (2004) (Australia)	Service trial & survey; N=500 registered patients , N=120/66 doctors/GPs; N=Adults - Patients; late 2003 - no end date	Setting= mixed; Population= not specified (1200 patients, 1500 doctors); Scale= national (five Australian states)	To assess pt and dr attitudes to a new paid remote consultation/ email service, and analyse how systems were adopted and used.	No; pts & dr attitudes; analysis for reasons for calls, methods (email/telephone) & call length

Two hundred and fifty consultations were selected randomly for analysis, 84% by telephone and 16% by email. 61% of pts reported they were interested in a service allowing them telephone access to their dr. Of these, pts 71% were prepared to pay for such a service (43% of total sample), with interest highest in women, those with children and people outside capital cities. Almost all of drs 90% surveyed felt a service such as TeleConsult had some relevance to their practice. Results showed a greater interest in telephone consultations (80%) rather than email (40%). / Patients were interested in a system which would allow them telephone access to their dr, and that they would pay for it. Although respondents from the dr survey were poor, most drs thought it would have some relevance in their practice, and preferred use of telephone over email. It is anticipated that the use of telephone and email consultations has the potential for improved health-care delivery, as well as savings in both cost and time.

Table 3: Research Question 3 (RQ3) Results

Research Question 3				
Author, Year, Country	Study Design, Sample No and Study Dates	Setting	Study/ Intervention Aim	Outcome Measures / Comparator Groups
Findings / Implications				
LaVela, Schectman et al (2012) (USA)	Structured patient interviews; N=448, Patients; Provision for vulnerable groups - Veterans (fair to poor health); 2010	Setting= nationally dispersed primary care clinics located in urban, suburban and rural areas; Population=448 ; Practice No=14 ; Scale= national	To examine veterans' preferences of health communication methods to meet a variety of primary care needs; and to assess impact of computer and internet use frequency on pt preferences.	Yes; communication preferences (telephone vs. in-person, vs. email/internet portal)
Only 54% of the cohort indicated being regular computer users. On average, a greater proportion of infrequent computer users were older, male, and in fair/poor health compared to regular users. Among regular computer users, 1/3 preferred electronic methods for preventive reminders (37%), test results (34%) and refills (32%). / Veteran primary care pts preferred telephone communication. In-person communication was preferred when exam or visual instructions was required. Regular computer users were more likely to prefer electronic communication methods for a range of reasons. These should be considered when planning patient-centred care strategies and it may be considered important to regularly assess patient's access to, willingness to use, and preferences for using health technology.				
Baer (2011) (USA)	Descriptive (KP experience)	Setting= mixed (KP members in northern California, USA); Population= 3.6 million (signed up for online access); Scale= national	To report on KP experiences of implementing an secure messaging system.	Yes; satisfaction; quality

<p>Uptake of a password-protected email system allowing dr and pt communication increased rapidly. By 2010, 64% of the 3.6 million KP members in northern California had registered for online access. The software used allows for easy use for drs .Using previous studies on this topic this paper advocates that secure messaging has been associated with a decrease in office visits, an increase in measurable quality outcomes and improved patient satisfaction. / The website was popular with members and health professionals gradually using it. The use of secure messaging reduced office visits; pts were satisfied with secure messaging; a pilot phase was necessary to support practitioners; messages should be incorporated within the EPR and be returned to pts with health related information links. However, there were financial advantages to KP members in using the website since office visits incur a greater cost.</p>				
Neinstein (2000) (USA)	Survey; N= 89 health centres; Adults - Patients	Setting= mixed; Population= mean campus size N=16,264; Practice No= 89/99; Practice size= Other (mixed - sample was representative of different sized universities/centres); Scale= Regional	To explore utilisation and potential uses and problems with using electronic communication with pts.	No; email service utilisation; service problems
<p>63.6% of responding centres use some form of electronic communication with pts. Centres expressed concern about confidentiality and security, but only five had an electronic communication policy. Positive comments about electronic communication included; ease of communication; time saving; efficient way to communicate about non-urgent matters; ability to print messages. Negative comments included; concerns over confidentiality; lack of opportunity for feedback; lack of real time response; potential for miscommunication; lack of computer access; multiple messages resulting in greater workload; potential for erroneous email addresses; and risks to pts expectations regarding response times. / Whilst electronic communication with pts was common, offering medical advice via this means was less common. There is a need to focus attention on determining the types of contact that is acceptable to staff and pts; the level of security that is needed to support electronic communications; education of staff about confidentiality and security issues and finally; the need to establish a robust and comprehensive policy and procedures regarding use of email.</p>				
Bergmo, Kummervold, Gammon & Bredrup Dahl (2005) (Norway)	RCT; N=199; 3 group by age; Adults - Patients; 2002-2003 (2yrs)	Setting= not specified (general practice clinic in Norway); Population= 335; Practice No= 1; Practice size= medium; Scale= single practice, hospital or clinic	To explore whether an electronic messaging system, that is secure and merged with patient records, can substitute other modes of communication, and whether such a system can reduce the number of office visits and telephone consultations.	Yes; use/ Yes; intervention group had access to messaging system, and control group had access to usual care.
<p>A total of 147 messages were sent to 6 drs over a 12 month period. Over this time there was a greater reduction in office visits for the intervention. However, there was no statistical difference in telephone consultations between the two groups. The total number of interactions actually reduced, though this was not reported as significantly different from the control group. There was a reduction in office visits over time was greater for the intervention group. / Secure messaging system can lead to reduced office consultations. Less than half the intervention group used the messaging system. Costs of introducing messaging system or costs and time related to use of system not calculated. Future research needed to perform cost effective analyses and measure health outcomes.</p>				
Houston, Sands et al (2003) (USA)	Survey; N=204 physicians; Adults - Carers/representatives (primary care physicians (35%), medical subspecialists, paediatricians, surgeons, psychiatrists, obstetricians and	Setting= mixed; Population= 1329; Scale= national	To explore experiences of physicians who already communicate with patients by e-mail, focusing on physicians' motivation, and understand how e-mail is used in the context of current clinical practice.	No; dr experience

	neurologists); 2000 - no end date			
<p>The most common topics dealt with via email were non-urgent new symptoms, questions about lab results and advice on chronic medical problems, requiring brief responses and may enhance the efficiency of communication handling. When asked for most applicable reason for use: 49% patient request; 27% it is time saving; 24% it helps me deliver better care; 25% were not satisfied with using email with pts. The most common concerns among dissatisfied drs were medico-legal risks 69% and 63% time demands. 80% reported using email because of pt request. / The majority of drs would recommend that colleagues begin using e-mail and many felt that it was time saving, reducing the amount of telephone medicine. However 1/4th of respondents would not recommend using e-mail to a colleague. The implication is there is a mismatch between pt desire and dr willingness to use email, and some suggestions that time demands may form part explanation. Email may not be appropriate in all clinical situations.</p>				

Patt, Houston, Jenckes et al (2003) (USA)	Survey & telephone Interviews; N=45; Health Professionals; 11/2000-04/2001	Setting= mixed; Population= members of 'Physicians Online' a US-wide internet portal for doctors; Scale= national	To understand and develop hypotheses regarding possible benefits and limitations of email communication with pts, and explore how technology may be successfully used in future.	No; use (contents, access, clinical management); workload; pt-dr relationship
<p>Most drs opinions regarding electronic pt-dr communication were positive. Doctors did see a benefit to using e-mail in specific situations with specific pts. Doctors reported better and more-consistent communication with pts who have chronic diseases and require frequent, small changes in management. Several barriers were noted including: uncertainty of involving office staff; potential increase on dr time; difficulty incorporating e-mail into daily office workflow; generating timely responses; inappropriate or urgent content in messages; confidentiality issues; and lack of reimbursement for this service. / Doctors did perceive benefits to using email with a select group of pts. This study identified several areas of future research including: developing criteria for selected pts to use email; increasing dissemination of formal guidelines regarding email use; improving incorporation into office flow; use of office personnel to manage e-mail; clarifying medicolegal consequences; and mechanisms for reimbursing online medical care/communication. These issues need to be addressed before email is more widely used in clinical practice.</p>				
Byrne, Elliott, et al (2009) (USA)	Retrospective study; case report (service trial) and survey; N=200 emails analysed; N=33 (survey); Health professionals; 2007	Setting= mixed; Population=35000 ; Practice No=5 ; Scale= regional	To address the known concerns of clinicians, by analysing messages usage and volume and evaluating the barriers to acceptance.	No; descriptive (use, volume, workload, dr communication preferences)
<p>Pts sent a mean of 54 messages per 100 users. Email messages per month averaged 190 and grew to a peak of 425 per month in the first year, before plateauing at 250 per month. Registered drs communicated in a mean of 1.71 message threads and 3.35 messages/wk. Clinicians agreed that message content was appropriate and followed the set guidelines. The most frequent content of pt e-mail was requests for medication renewal (33%). Reasons for not using the system were unawareness and limited time to use another form of communication. / The survey showed users of the portamail found it efficient and user friendly, and reduced telephone communication. The nonusers thought portamail would add to workload and be unmanageable. However, it is important to note that drs selected pts who could use portamail to communicate.</p>				

Gaster, Knight DeWitt (2003) (USA)	Mail survey; N= 249/283; Health professionals; 11/2000-03-2001	Setting= mixed ; Population= not specified (all physicians caring for patients in these locations, including underserved populations); Scale= regional	To assess frequency of use of email communication with pts by physicians and to assess physicians clinical practices and attitudes related to its use.	Yes; pt & dr attitudes; frequency of email use and when used
72% of drs reported using email with pts. There was no significant difference in patients email use by dr gender or age. Most drs were satisfied with their email communication with pts, most communication being related to appointment scheduling. Most drs agreed email was an inappropriate way to assess new symptoms or medical problems. / Most drs used email, however overall the number was not large. Most drs admitted to not recording email communication in the medical notes. Attitudes toward email communication were generally positive if used for simple tasks.				
White, Moyer, Stern & Katz (2004) (USA)	Contents analysis of email communication (part of larger RCT); N=3,007 pr-dr email messages from N=50 intervention & N=48 control group drs; 08/2000-06/2001	Setting= City; Population= N=98 drs in internal and family medicine; Practice No= 2; Practice size= Large; Scale= Regional	Content analysis of a 10% sample of e-mail messages that pts sent to their health care providers as part of an RCT of a triage-based e-mail system. Research Questions include: 1. For what purposes did pts most frequently use e-mail to communicate with their providers? 2. Were the content and tone of messaging appropriate? 3. Did pts follow specific guidelines, developed by the study team, to facilitate email use?	Yes; message type, number of requests per e-mail, inclusion of sensitive content/ Users would have access to a pt-provider electronic communication tool. Control arm pts would communicate via standard channels (telephone).
Most messages followed guidelines stated by the primary care centre; 82.8% addressed a single issue, most did were not related to very sensitive issues (5.1%), but 94.5% related to medical issues. All messages were deemed non urgent. Most messages were related to; information update for the doctor (41.4%), and prescription requests (24.2%), health questions (13.2%), questions about test results (10.9%), referrals (8.8%). Overall, messages were concise, formal, and medically relevant. Less than half (43.2%) required a dr to respond. / Findings suggest that drs' concerns about using e-mail in clinical practice may be unwarranted. It demonstrate that a triage-based e-mail system combined with pt education results in pt-dr messaging that is appropriate and relevant. Email addresses unmet need for some pts who might not otherwise communicate with their dr to resolve new or recurring issues. Results have three specific implications, 1. using email may be a low cost strategy, combined with pt education about appropriate contents and managing pts expectations about response times. 2. offers reassurance to providers who have concerns about lengthy, unfocused or inappropriate emails. 3. pt respond well to simple email rules 'do's' and 'don't' and this can be reinforced via autoreplies and staff input.				
Zhou, Gerrido & Homer et al (2007) (USA)	Retrospective cohort and matched-control study; N=4686 (cohort); N= 3201 (matched-control); Adults - Patients; 09/2002-08/2005	Setting= mixed; Population= 487,000; Practice size= large; Scale= regional	To investigate the relationship between patient-physician secure messaging and physician workload in terms of physician visits and telephone contacts.	Yes; rates of annual adult office visits; documented telephone contact rates in the pre- and post-period/ Yes; retrospective matched-control study included subjects who were also part of the cohort study

Annual adult primary care outpatient visit rates decreased by 6.7% to 9.7% for members using KP HealthConnect Online™. These members had a smaller increase in documented telephone contacts (16.2%) than the control group (29.9%). Online using among 1000 registered users found that more than 70% of sessions resulted in pt-dr messaging, indicating the importance and influence of this function. To confirm that secure messaging was used for non-urgent issues, a review of the level of service of 50 secure messaging threads showed that 2/3rds were coded as either 'brief' or lower. / Findings suggests several additional areas for further study; annual primary care office visit rates held steady for the region as a whole. However, visit rates were significantly lower in the post-period for both groups in the matched-control study. The authors suggest that, because subjects and controls were matched by primary care dr, these dr may have become more responsive to care efficiencies over the study period. Also; members with diabetes were disproportionately represented among online users, which raises important questions about electronic communications in relation to chronic illness.

Goodyear-Smith, Wearn, Everts et al (2005) (New Zealand)	Interviews; N=80; Health Professionals;	Setting= mixed; Scale= regional	To assess the extent to which GPs communicate with pts by email, and explore possible benefits and disadvantages they identify with this communication mode.	No; descriptive; frequency; use; advantages & disadvantages
68% of drs surveyed had not used email with patients. Perceived advantages included convenience of consulting at a distance and useful for pts with specific conditions; time convenience to dr & pt; ease of giving out evidence-based information; and that records could be saved. However, many concerns about email communication included: security and confidentiality; loss of face-to-face communication; and workload and remuneration issues. / Email communication between GPs and pts is an inevitable development. Currently few drs use emails to communicate with their pts, however, they might if barriers are addressed. Attention is needed for guidelines to standardise its use and a criteria on appropriate circumstances with which to use it should be determined. Practices will also need to establish consent from patients; provide protocols of use; and use secure encrypted systems with automated replies and electronic authentication of recipients.				
Albert, Shevchik, Paone & Martich (2011) (USA)	Telephone survey & participants medical record review; N= 121/ 7,000 (e-visit users); Adults only - patients; 08/2009-11/2009	Setting= not specified but family medicine practice with multiple sites; Population= 7,000; Practice No= 1; Practice size= Large; Scale= Local	To explore internet based medical visits (e-visits) which allow patients to report symptoms, seek diagnosis and treatment without calling or visiting the practice.	No; diagnosis made and appropriate care, need to return to dr office; treatment suggested

The most common type of visit was for 'other' symptoms and concerns (37%), followed by cold symptoms, back pain, urinary symptoms and other minor issues. 61% of evisits were conducted with pts own dr and 57% of pts reported receipt of diagnosis without need for follow-up except a prescription. 75% of pts reported evisits were as good or better than in person, with a minority unsatisfied with how their concerns was addressed. In the review of medical records, 16.9% returned to the clinic for a in person visit within 7 days, mostly for the same symptoms as they previously emailed their dr about. / Findings suggest evisits are an appropriate and potentially cost saving service complimenting in-person delivery of care. Care delivered was largely for minor complaints, and over 90% of pts reported their health concern was addressed and most did not need to return for an in person visit. This suggests that the evisit was sufficient for alleviating minor health concerns. Evisits reduced the need for in person visits but it did not reduce telephone consultations. Use of evisits may benefits pts by offering access that is convenient and quick without increasing risks or the quality of care.

Roter, Larson , Sands et al (2013) (USA)	Email content analysis; case study of 8 individuals & their respective 8 doctors (N=74 e-mail messages exchanged); Adults - Patients & Health Professionals; 05/2001-10/2001	Setting= other; Population= 300; Scale= other (not specified - case studies from larger study of e-mail users)	To explore the extent email messaging exchanges between a small group of pts and physicians mimics communication dominance, content, and tone of traditional medical exchanges; whether exchanges contain the range of contents similar to face-to-face communications, and whether these dialogues address psychosocial issues.	No (range of contents, tone of messages & impact on psychological issues)
Drs emails to pts were shorter and more direct than those of pts, averaging half the number of statements and words. Content of communication were mainly task orientated with the exchange of information and routine tasks. The remaining contents were expressing and responding to emotions and acts of relationship building. There were also differences in emotional tone between traditional face-to-face encounters and email use. In face-to-face, the majority of the dialogue is directed and controlled by the dr; in email, the majority of the dialogue is shaped and controlled by pts. / Email use has potential to support the dr-pt relationship by providing a means through which pts can express worries and concerns and drs can be patient-centred in response. Comparisons between e-mail and face-to-face communication show many similarities in these tasks. Differences include a greater dominance of questions by the pt using email, whereas literature suggests greater use of questions by the dr in a face-face consultation.				
Anand, Feldman, Gellar et al (2005) (USA)	Email contents analysis with survey; N=54; Adults - Carers/ representatives; 10/2003-11/2003	Setting= suburban ; Population= 4700 (patients); Practice No= 1; Practice size= medium; Scale= single practice, hospital or clinic	To analyse content of email exchanges between primary care paediatricians and parents of their pts, to identify potential benefits for the provision of care, over a 6 week period.	No; descriptive (contents, volume) email contents; parent attitudes
86% of emails were answered in 1 exchange, and mostly related to medical questions and queries about medical updates, speciality evaluations, and administrative issues. Email was thought by parents to prevent phone calls and appointments and they were satisfied with the service. Benefits of email include: improved pt-dr communication; enhanced pt-centred care; reduced cost; and continuous monitoring of clinical status. 98% pts said their experience of using email was good or very good. Although 80% of parents thought that all paediatricians should use email, 63% said they would be unwilling to pay for this service. 39% of dr generated emails were sent during office hours so practitioner workload impact was minimal. / Email improved communication between parents and providers by allowing updates on conditions. The majority of emails were primarily medical-related, and regarded a single concern/ request, rather than administrative, and most only required 1 response. This was reassuring for the paediatrician because of concerns over workload. The finding of prevention of telephone calls demonstrated a positive impact on health care utilisation.				
Ye, Rust, Fly-Johnson & Strothers (2010) (USA)	Systematic review; N= 24 studies; 2000-2008	Setting= mixed; Population= 24 studies; Scale= national	To build on understanding of e-mail use between the pts-provider, focusing on content of e-mail exchanges; pts use of and attitudes toward messaging providers; and providers' use of and attitudes toward e-mail with pts.	No

<p>The majority of e-mail inquiries from pts were for non-acute issues and were usually brief, formal, and medically relevant. Benefits of using e-mail for communicating with providers included convenience, increased access to the provider, improved the quality of care, feeling more comfortable to ask questions, and the ability to save the message. While some providers were satisfied with using e-mails with pts they were also aware of a number of barriers to their use of e-mail communication. Barriers included workload and time demands, confidentiality and security, lack of reimbursement, and inappropriate use of e-mail by pts. / For some, email has been a primary means to build relationships and keep in touch with others, however, it is still new for the dr-pt communication. There is a need to rigorously explore the various pros and cons of electronic interaction in health care settings, the results of which may help make email communication a powerful, beneficial tool in health care settings.</p>				
Tufano, Ralston & Martin (2007) (USA)	Interviews; N=22 professionals; Other - representing 14 organisations ; 2000-2005	Setting= mixed; Population= not specified (providers from 14 medical specialties); Practice No= 7; Scale= regional	To describe and characterise effects of a 6 year pt improvement strategy, intended to promote pt-centered access, from the perspectives of the healthcare provider.	No; descriptive (views of access, job satisfaction, workload, pt satisfaction)
<p>Analysis showed nine themes, five of which are relevant for health-care organisations pursuing pt-centred access: 1. pt satisfaction improvements; 2. clinical quality of patient care improvements; 3. potential concerns that pursuit of the Access initiative could compromise ability to provide effective preventative and chronic care; 4. additional work for providers and inhibit work speed ; 5. decreased job satisfaction. / Providers expressed feelings of satisfaction with their ability to provide high quality pt care through improvements in access (due to the Access Initiative) and they thought that these changes were mostly good for their patients. However providers disliked the negative effects on their own quality of life especially in primary care. There is a need to address issues such as compensation methods and current models of care organisation if such initiatives are to be sustained.</p>				
Peleg, Avdalimov, Freud (2011) (Israel)	Survey; N=120; Adults - Carers/representatives (primary care physicians);	Setting= mixed ; Scale= regional	To assess attitudes of physicians to providing their telephone or email address to patients. Also to evaluate advantages/ disadvantages of email; to find if these can be used without negatively affecting service quality or physician lifestyle.	No; dr attitudes; service quality; dr demographic details regarding tele/email contact details
<p>37.5% of drs reported they gave their email address to a small number of pts, while 43.3% are not prepared to provide it, even when requested. Perceived benefits of giving email contacts to pts included providing pts with a sense of security, and reducing A&E and clinic visits. Disadvantages to email communication were also noted including: intrusion into physicians' privacy during off-work hours, interference during other patient's clinic visits, and the danger of miscommunication and medical error. / Dr preferred to answer calls during daily hours or a pre-determined times. In contrast, communication by email provided greater flexibility and this, together with telephone numbers, may offer pts a greater sense of security, even if they do not choose to use them. It is important to understand the significance of integrating these into clinical practice, and how this should be accomplished.</p>				
Bergmo & Wangberg (2007) (Norway)	RCT; N=199; N=100 control group, N=99 intervention group; Adults - Patients; 2002-2003	Setting= general practice in Norway; Practice No=1; Practice size= medium (6 gps); Scale= single practice, hospital or clinic	To investigate how patients value the opportunity to access their GP electronically; and study differences in willingness-to-pay (WTP) between intervention and control groups.	Yes; frequency of use; pt experience; pt characteristics; willingness to pay. Yes; intervention group provided with electronic access to the GP; control group through standard channels.

51% of study participants expressed a willingness to pay for electronic GP contact, and 21% expressed a zero willingness to pay. The groups of respondents who had the opportunity to communicate with their GP electronically for a year revealed a statistically significant lower willingness to pay than the group who did not have access to the communication system ($p=0.0028$). No difference in zero WTP and non-response between the two groups was found. Significant correlation was found between WTP and age ($p=0.247$, $P=0.019$). / Both the difference between the groups and the relative low WTP are somewhat counterintuitive. Three possible explanations to account for this arose; that the communication system was less user friendly than expected; that individuals valued new technology more highly before using it than they did after; and finally that pts simply preferred a face-to-face encounter with their GP.

Katz, Moyer, Cox et al (2003) (USA)	RCT; N=50 (intervention) N=48 (control); Adults - Patients; 08/2000-06/2001	Setting= city ; Population= 5,000 patients (who had visited a doctor 6 months prior to study period) ; Practice No= 2; Practice size= large; Scale= local	To evaluate whether a triage-based email communication tool increases electronic communication between pts and providers.	Yes; use; visit distribution over 10 months; pt-dr satisfaction; attitudes about communication; volume of emails & phone/ intervention pts's emails were passed to appropriate staff; whilst control group patients did not have access to the triage system
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The triage-based email system led to increased email volume for the intervention group (46 weekly e-mails per 100 scheduled visits vs 9 in the control group at the study midpoint; $p<.01$), but this surge was not sustained and email volume diminished after the initial promotion period. Increased email volume did not offset phone volume or visit no-show rates in the intervention group. Although intervention drs reported improved attitudes towards electronic communication over that of control drs, there were no differences in attitudes toward pt or staff communication in general. The rise of email in primary care may not improve the efficiency of clinical care. / E-mail generated through a triage-based system did not appear to substitute phone communication or to reduce visit no-shows in a primary care setting. Doctors attitudes toward electronic communication were improved, but drs' and pts' attitudes toward general communication did not change. Growth of e-mail communication in primary care may not improve the efficiency of clinical care.

Hart, Henwood & Wyatt (2004) (UK)	Interviews and observations of the pt-dr interaction; N=47 patients; Adults - Patients; 11/2001-11/2002	Setting= suburban; Population= 47 patients & 10 health professionals; Scale=local (women considering HRT for menopause and men Viagra for erectile dysfunction)	To explore pts and drs use of the internet, considering whether use is changing the relationship between pts and their health care practitioner.	No/ internet non-users compared to those who used the internet, relationship between pts and providers
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Both pts and providers were not very IT literate when sourcing information on the internet. A few clinicians expressed concern that the internet would encourage pts to challenge their medical knowledge/ authority, and worried about pts self-diagnosing. Use of the Internet can increase pts' knowledge about their health status. However, pts often felt too overwhelmed by the information available to make an informed decision. Pts have a great deal of trust in their health-care practitioners. / There were 3 key messages. 1. IT literacy was generally poor both in pts and practitioners. 2. Pts tended to trust and rely on health professionals to discuss health issues, rather than that of the internet. 3. The Internet was seen as potential resource for health information especially by health professionals.

Umfjord, Malker, Olofsson Hensjo & Petersson (2004)	Survey; N=21 GPs; Adults only - Carers/ representatives;	Setting= drs providing online consultation in a Swedish 'ask a doctor service', no previous relation to the enquirer; Population= total population not specified	To explore experiences of a group of GPs performing text based	No; challenges, worries and educational requirements for the task, computer/ internet experience, quality of incoming
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(Sweden)	03/2001 - no end date specified.	but from start of service n=18,500 enquiries have been received and answered; Scale= Other	consultations on the internet.	queries, information retrieval needed prior to answering
100% of drs found this work stimulating and educationally rewarding; 90% found it challenging; 38% found enquiries often or a bit difficult to answer and 62% found either often or most enquiries easy to answer. Main reasons for difficulties were too little information and hard to answer without physical examination. The ability to 'read between the lines' was emphasized. All drs were able to provide acceptable medical safety almost always/ often, if necessary referring pt to see their regular dr. All found they almost always or often obtained new medical knowledge, and all agreed this had some value. / Participants were stimulated and challenged by providing online consultations on the internet with previously unknown and sometimes anonymous enquiries, despite limitation of lack of personal meeting or physical examination. GPs were keen to improve performance by learning more about how to do internet consultations.				
Nijland, Gemert-Pijnen, Boer, Steehouder & Seydel (2009) (The Netherlands)	Online Survey; N=1066/1706; Adults only - patients; no dates but survey available for 11 wks	Setting= mixed (Dutch primary care pts); Population= n=1706 (pts recruited via 26 trusted pt organisations/websites); Scale= National	To identify factors that can increase the use of e-consultation among nonusers: patients with access to Internet, but with no prior e-consultation experience. These factors included barriers motivations and demands.	No; motivation for using econsultations; barrier to use, demands regarding econsultations
Findings indicate that non-use of econsultation was primarily due to lack of availability among GPs and to information deficits among pts, such as unawareness of the existence of the service and the possibilities of e-consultation. Proper education and instructions are necessary to increase the use of econsultation. Patient groups who were most motivated to use econsultation e.g., elderly pts, less-educated pts, chronic medication users and frequent GP-visitors, perceived the greatest barriers towards econsultations. Web-based triage systems may be promising, because this study indicates that pts are motivated to use such systems for primary evaluation of medical complaints and for self-care advice. / The findings of this study demonstrate that the use of econsultations will not increase through efforts to change the attitudes of pts or health care providers, since many nonusers liked the possibilities of econsultation and were thus motivated to use econsultation. Increase in use will rather occur through solving existing barriers among non-users and through addressing pts' demands, preferences and skills when developing econsultation systems.				
Wakefield, Mehr, Keplinger, et al (2010) (USA)	Literature Review/ Review;	Scale= other (not specified)	A brief overview of literature relating to the implementation and management of secure web based patients-provider electronic communications portal.	No
Authors offer framework to structure lessons learned from implementation process and the specific issues and questions healthcare organisations need to consider in implementing systems. Seven areas were raised: strategic fit & priority; selection process & implementation team; integration into communications and workflows; aligning organisational policies with health care requirements; systems implementation & training; marketing & enrolment; and finally, on-going performance monitoring. / Pts increasingly share the financial burden of health care, and as such it is important to develop new ways of meeting their expectations. Secure web-based systems can be used to enhance patient-provider communication, facilitate appointment booking, respond to medication repeat prescriptions, provide means for bill paying, and increase pt access to their health records.				

Leveille, Walker, Ralston et al (2012) (USA)	Mixed methods; n=114 (physicians - intervention) n= 22,000 (patients = intervention); Adults - Patients	Setting= mixed; Population= 339802 ; Practice No= 3 ; Practice size= other; Scale= national	To assess primary care physician and pts' attitudes and experiences with OpenNotes. A mixed methods approach was used.	Yes; attitudes & experiences; portal usage and health care utilization / Yes; user and non user groups
Rates of participation in OpenNotes varied widely across the three sites; drs who participated tended to be younger, male, and from small practices. None of these differences were statistically significant. Many drs voiced concerns in advance of the trial and even opposition to next steps about potential burden on their practice in explaining notes to patients. / This was a protocol report, which determined the impact of giving pts online access to their physician's visit notes. The evaluation indicated that many primary care drs were willing to participate in a new intervention despite their concerns about additional practice workloads.				
Wald, Middleton, Bloom, Walmsley et al (2004) (USA)	Challenges of aligning two technological systems (pt gateway and medical records); N=8700+(pt gateway) & 4000+ (medical record system); Adults only - patients;	Setting= Mixed; Practice No= 10; Practice size= Large ; Scale= Local	This report focuses on some key issues and challenges that resulted when the Patient Gateway "Journal" for patients was coupled with an electronic medical record (EMR) maintained by the patient's physician.	No/ Challenges associated with systems coupling
Certain practices have mixed feelings towards the Patient Gateway system. For example, a practice did not constantly encourage use of the system because they were afraid that they would receive too many messages from pts. Data was kept separate between the journal and the electronic health record to ensure that invalidated pt entries did not affect the information that drs and staff worked with. Feedback from pts reported the need to develop next steps for self-care and to find out information. / For a system such as Patient Gateway to work, it has to fulfil the needs of all participants and to accommodate their communication and workflow. The Gateway was found to be valuable to those that used it, but there is little evidence about whether it was of value. Concerns of the pts and practices would have to be looked at, especially if physicians fear numerous messages from pts that they may not be able to address. As the system grows, updates would need to be made in policies, standards, and design.				
Wald, Pedraza, Reilly et al (2001) (USA)	Focus group & staff interviews; N=10 (focus groups) N=6 (interviews) ; All ages; from 2001 - no end date	Setting= mixed ; Population= 44 physicians & 100 office staff; Practice No= 6 ; Practice size= medium; Scale= local	To create a web-based software enabling patients to connect electronically with their physician's offices with the potential to improve care efficiency and quality, focusing on requirements needed to support this system and adequate design.	No; efficiency; quality; workflow; technical design
Elicited requirements for Patient Computing System were broadly grouped: 1. giving pts access to health /disease information; 2. allowing pts to see certain parts of their medical record 3. easing pts communications with their health care provider. Addressing identified requirements include: providing pt feedback; limiting direct messages to drs; limiting staff interruptions; assisting the pt in using the system; personalisation of health information; display medications and allergies and; develop the system with multiple speciality, organisation and entities in mind. Concerns remain about limiting staff interruptions and workload increases. / Understanding of key issues and certain complex issues has grown rapidly, and should position well for extensions in functionality and scale. However, more resources are needed including skills in requirements development, prototyping, and broad design. There is also a need for on-going work to launch and evaluate the system and improve capacity to document what is discovered in requirements work.				

Chew-Graham, Alexander & Rogers (2006) (UK)	Interview study; n= 24 GPs; Adults - Carers/representatives; 2002-2003	Setting= mixed; Population= 24 GPs ; Practice size= other/ mixed; Scale= national	To examine GPs perspectives about the use of the Internet as an information resource, and to describe GPs views about benefits and limitations of using electronic communication for colleagues and pts.	No; dr & pt views; benefits & limitations of internet as information source
Whilst GPs appreciate the Internet could offer an exceptional quantity of information for use within consultations and which might improve pt management, they report many barriers to effective acquisition and use, such as time constraints, lack of self-efficacy, uncertainty of information quality, and security. Similarly, GPs reported limiting their Internet use to assist communication between them and pts, and were concerned about the Internet duplicating work. / There is a need to invest in equipment and education/ training of practitioners to improve confidence and competence in using the information available within the Internet and a need for an administrative infrastructure to be in place.				
Chen, Garrido, Chock et al (2009) (USA)	Retrospective observational study; N=225,000; 2004-2007	Setting= mixed; Population=22 5,000; Scale= regional	To examine impact of implementing an EHR system on several types of ambulatory care patient contacts, external referrals, scheduled telephone visits and email communication.	Yes; utilization of in-person visits; telephone consultations; secure messaging/ baseline data prior to intervention
There was a rise of messages send after the launch of MyHealthManager, the secure online dr-pt messaging function of the KP HealthConnect. The rise of emails sent over this time was statistically significant ($p<0.001$). Reduction in office visits both in primary care (2.24-1.67, -25%) and speciality (1.40-1.10, -21%), increased telephone visit rates (0.17-1.68), but overall increase in contacts, urgent care and emergency department visit. / EHR can lead to reduction in office (face to face) visits and increased telephone consultations and email messaging. Additional financial incentive for telephone consultations may have had an impact on this. Further research is needed to understand the total economic impact (patient and health service) of EHR, as well on quality, pt safety, costs of direct care, and administration efficiencies. Existence of an earlier electronic medical record will have impacted on the baseline data and subsequent use.				
Liederman, Lee, Baquero et al (2005) (USA)	Retrospective case control; N=6 case (Physicians) and N=9 control (physicians); Adults - Patients; Survey N=5,971 patients; N= 267 providers, N=16 staff in community primary care clinics; 2001-2002	Setting= mixed; Population= 34769; Practice No= 2 ; Practice size= medium; Scale= regional	Study examines how a commercial web messaging system may impact pt, provider, and staff satisfaction levels, and how volume of incoming patient messages would differ between study sites.	Yes; use; pt satisfaction; pt enrolment (message volume, type); pt demographics; physician telephone volume/ phone and web messaging volume was measured retrospectively, pre-intervention (at a primary care clinic which had not yet introduced web messaging), and used as the control.

<p>Drs fears of being overwhelmed by electronic patient messages proved groundless; pattern of rapid growth in message volume was followed by a plateauing. Case total message volume declined substantially, suggesting that web messaging may have increased the efficiency of non-visit care. Providers using web messaging reported mostly positive satisfaction and ease of use than did patients. Of the pts receiving a message response right away (67.7%, 132/195) were very satisfied with the system, as were 55% (378/687) of pts receiving a response by the next working day ($r=0.557$; 95% CI, 0.505 to 0.608). / Secure web messaging is an improvement over e-mail. Patients and providers were satisfied with the system. Web messaging reduced telephone messaging, which could improve access to care for those communicating electronically. Total case message volume declined over time, suggesting web messaging may have increased quality of non visit care.</p>				
Delbanco, Walker, Darer et al (2010) (USA)	Descriptive/ perspective; All ages	Setting= mixed city x2 &rural x1; Population= 25,000; Practice No= 3 ; Scale= regional	This paper describes an intervention, OpenNotes, which aims to evaluate patients and care providers expectations and experiences of access to electronic doctors' notes.	No; descriptive (pts & providers experiences, access, advantages & disadvantages)
<p>Primary care providers worry about the impact of access to records on their time and workload, and are concerned about having to change the style of their notes / edit in order for lay pts to read. Drs worried about notes being offensive to pts or causing adverse reactions from reading notes. Advantages include clinical benefits and efficiencies; reading the notes potentially confirming what was discussed in the consultation; additional insight into medical condition, participation in care and treatment adherence; possible contribution to accuracy and completeness of record; and facilitation towards better pt-dr trust and preparation for visits./ The discussion raises multiple questions about future work that needs to be done in order to move forward with Open notes. These include: can a single note serve many audiences, including beyond primary care? Can patients contribute in preserving notes, perhaps advancing note accuracy and saving dr time? Do drs and pts need to sign agreements regarding notes contents/ accuracy or maintenance? Would there be annual quality checks with measurable outcomes to enhance care quality?</p>				
Hanna, May, Fairhurst (2011) (Scotland, UK)	Mixed methods; N=600 (survey) N=20 (interviews) Adults - Carers/representatives (practice managers);	Setting= mixed; Practice No= 1026 (practices); Practice size= other; Scale= national	To explore practice managers' views of remote consultations and communication technologies.	No; practice managers' perspectives & attitudes; barriers & facilitators to remote consultations; IT infrastructure & adoption issues (workload, training)
<p>Practice managers play a key role in service redesign and introduction of non-face-to-face consultation/ new communication technologies. Managers views vary about appropriateness of these for consultation/communication with pts, and can be influenced by a mix of contextual/practice characteristics such as locality, practice size, practice team ICT capacity and the nature of the practice population. Although they support the use of these technologies for daily/ routine duties to manage workload and maximise convenience for pts, they have a few reservations about its use, including medico-legal concerns and lack of perceived pt demand. Managers resist the imposition of these technologies without acknowledgement of individual practice circumstances and needs. / Practice managers are likely to play a critical role in influencing whether remote consultations/communications becomes normalised within general practice. Primary care policymakers should work closely with practice managers prior to and during any routine implementation of remote consultations to ensure local practice characteristics are acknowledged and that clear medico-legal guidance and IT support are provided to all staff. The study finding could offer underlying principles which may be comparable to primary care systems internationally.</p>				
Liederman & Morefield (2003) (USA)	Online survey; N=238/645; Adults - Patients; 11/1001-03-	Setting= city; Population= not specified (n=238); Practice No= 1 ; Scale= single	To evaluate the introduction and use of internet based messaging system by pts and staff of a community primary care network to determine	Yes; pt & staff satisfaction; ease of use; physician productivity before & after introduction of messaging

	2002	practice, hospital or clinic	pt satisfaction with using this mode of communication, and whether this has improved access to providers.	system (relative value unit reports, monthly average visits)analysis of dr
<p>Response rate to pt survey was 36.9%;. 49.6% reported having used the system once or twice. 66.4% (154) found the system 'very easy' to use and 22.4% found it 'easy to use'. 61.2% reported they were 'very satisfied' and 24.6% 'satisfied' with web messaging. All pts receiving a response right away were very satisfied. Most clinicians indicated they would continue web messaging after study completion, and 38% found the system easy to use. There was no change in number of non-urgent office visits by almost all staff, and no change in number of telephone calls received from pts. 50% of clinicians reported it was 'important' and 2 (25%) 'very important' to be reimbursed for time spent communicating online with pts. / General pt and physician satisfaction with secure web messaging system, less so for medical assistants (due to workload and computer speed). Patient satisfaction was dependant on response time.</p>				
Williams (2008) (Multiple)	Action research, interviews; N=6 general practices; Health professionals - & practice manager, In house IT professionals	Setting= mixed; Practice No= 6 ; Practice size= other; Scale= international	To examine obstacles which prevent good medical information security implementation, focusing on four distinct relationships to information security: demographics, actual practice, issues and barriers, and practitioner perception.	Yes; perceptions of security, demographics, issues and barriers; practitioner perception, user needs
<p>Key themes identified were poor implementation (of policy, access control, backup procedures, system/staff monitoring, availability planning), lack of relevant knowledge (of responsibilities, system/software function, protection, risk, legal requirements, technical expertise) and inconsistencies between principles and practices; and information security (including reliance/ trust in staff, software, technology, medical authorities). Themes that occurred less in interviews included capability (of staff, drs, risk assessment, software, process and training), cost (equipment and outside expertise), time issues (lack of time to devote to security) and attitudes (to meeting standards, to technology, lack of prioritization to security). / The study identified a range of factors which contribute to the reticence of security measure adoption in medical practices. Confusion over the responsibilities of information security was a key issues; including no clear delineation for security; lack of risk assessments; policy is usually ad hoc and not in written form; incorrect implementation of security measures (or poor monitoring/ measuring); lack of understanding by staff regarding security, need for education and procedures to be put in place. A culture of trust affects policy formulation, and creates confidence in staff to maintain confidentiality and privacy, and to implement security measures correctly without scrutiny. In the medical environment it is often this lack of policy and the reticence of practices to enforce policy that creates an insecure environment.</p>				
The Conference Board of Canada (2012) (Canada)	Analysis of household survey data; N= 3,200; Adults - patients; 03/2012- no end date	Setting= Canadian households/ patient perspective ; Population= 3,200 households; Scale= National	To analyse household survey data to evaluate the potential economic impact of the time saved by pts from adopting consumer health solutions in the Canadian health care system.	No

Survey asked households 60 health-related questions. Overall, adult pts (18s and over) would have saved nearly 47 million in person visits in 2001, if they have been offered a choice with providers regarding having access to their test results or having prescriptions renewed electronically. For pts this would have saved 69.8 million hours and estimate that pts could have worked an extra 18.8 million hours in 2011, saving over 400 million Canadian dollars and representing a GDP gain of roughly 0.03 per cent. People aged between 35-54 would have saved the largest number of working hours, followed by those aged between 18-43 years. / The survey captures potential time savings from a user perspective, i.e. how much extra time could be devoted to work. Benefits may include time saved for pts, but also might increase wider productivity if systems were in place. However, there is a costs underpinning this investment in technology, and trials and other related costs may be incurred. Hint that further research could focus on time saved from the adoption of system, including time spent in accessing and using portals, if these solutions were adopted.

Brooks & Menachemi (2006) (USA)	Cross-sectional survey; N= 4203/ 14,921; Adults only - carers/ representatives (primary care drs); 03-2005-05/2005	Setting= Mixed; Population= 14,921; Practice No= All primary care dr working in Florida; Practice size= Other; Scale= Regional	To examine issues associated with dr-pt email communication and report on drs' adherence to communication guidelines.	No; dr email use characteristics; adherence to guidelines
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Of the 4203 drs completed questionnaires, 16.6% had used email to communicate with pts, however only 2.9% used email frequently with pts. Email use correlated with dr age, ethnicity, medical training, practice size, and geographic location. Only practice size greater than 50 and Asian-American ethnicity were related to email use. Only 46 drs (6.7%) adhered to at least half of the 13 selected guidelines for email communication. / The survey showed only modest advances in the adoption of email communication, and little adherence to recognized guidelines for email correspondence. Further efforts are required to educate both drs and pts on the benefits and limitations of email communication, and there is a need to remove fiscal and legal barriers to its adoption.

Allaert, Teuffb, Quantin & Barber (2004) (Canada)	Narrative/ descriptive; no dates	Scale= international	Narrative focusing on pts' access to medical records, pts' online access to medical records, use of digital signatures and smart card solutions to access medical records, and this technology in relation to ethics and law: the liability limits	No; descriptive
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No results; discourse about pts access to online medical records (pts would need to be provided with an intuitive, fool proof access facility); use of digital signatures and smart card solutions to access records ; technology and ethical and legal limitations. / For pt access to their records, it is preferable to seek solutions that provide safety for both pts and the medical record systems and which allows valuable development in areas of personal freedoms and human rights. Ideally development of an individual pt chip card having the cryptographic algorithms of an electronic signature. However, this will take time and expense before it becomes standard. Use of digital signatures and smart card solutions to access records might be a solution as these can be emailed out to pts providing facilities have been established. The medical record transmitted to the pts must also be electronically signed by the practitioner to guarantee that he has given his agreement as well.

Table 4: Research Question 4 (RQ4) Results

Research Question 4				
Author, Year, Country	Study Design, Sample No and Study Dates	Setting	Study/ Intervention Aim	Outcome Measures / Comparator Groups
Findings / Implications				
Collins, Vawdrey, Kukafka et al (2011) (USA)	Telephone structured survey/ interview; N=17 health care organisations; Other 12/2010-01/2011	Setting=mixed mixed; Practice No= 17 ; Practice size= large; Scale= national	To summarise capabilities of existing PHRs, looking at: general use and functionality; types of data available to pts; timeframe for data release; governance issues for decision making about PHR policies.	No; descriptive (type of data available, timing of data release, functionality); governance
All study sites provided secure messaging communication between pt and provider. The majority of sites allowed for online prescription renewal and appointment scheduling. However there was great variability in pts use of personal records among organisations and differences between practices in terms of online services availability and in the times the data is made available. Half the organizations had clear governance in the form of a written policy. Almost 90% of organisations offered a proxy, such as a relative, to have access to pts data. / Study results highlight the gap between current practices of organisations that support PHRs and the set of 'best practice' standards for making data available to pts. This includes data release policies which need to go beyond technical requirements, as questions arise about who owns the data? Non-tethered PHRs must also have a model that adheres to data release policies of the organisation from which they receive data, and make these policies known to their users.				
Weitzman, Kaci & Mandl (2009) (USA)	Focus groups & interview; N=20 staff; N= 52 community members; N= 250 subjects; Adults - Carers/representatives; 05/2006-04/2008	Setting= city: Scale= local	To learn more about acceptability of Personally Controlled Health Record (PCHRs) by describing assumptions about the technology, as well as barriers and facilitators to its adoption.	Yes; beliefs, attitudes, & preferences related to the PCHR
Participants demonstrated low levels of awareness about PHR technologies. No age differences were evident regarding awareness. Evaluation about acceptability of a PCHR in a community setting indicated several areas of concern: privacy, autonomy, and accessibility of technology. Barriers and facilitators were identified at institutional, interpersonal, and individual levels. Facilitating issues include clear operational guidelines, governance systems, and administrative support. / There is a need for a clear, accessible systems and education and training in how to use them./ Prior to full implementation it is necessary to further understand the potential barriers to adoption and use. Use of Indivo, the original PCHR, have identified societal, interpersonal, and individual level barriers and facilitators to address, including system redesign and revised social marketing of the technology.				

Lehnbom, McLachlan & Brien (2012) (Australia)	Semi-structured interviews; N=48; Other(consumers and healthcare providers); 10/2009-08/2010	Setting= Other (different geographic locations and work settings); Population= N= 48; Scale= National	To assess in Australia the knowledge, understanding and views of healthcare providers and consumers about the personally controlled EHR.	No; demographic characteristics; knowledge & view about EHRs; anticipated benefits and drawbacks
Some participants favoured personally controlled electronic health record (RCEHR) while others did not. A large concern regarding the PCEHR was privacy and authorized access. The records need to be complete and accurate to prevent problems such as misdiagnosis. / Patients and providers are aware of the PCEHR, but are not as willing to uptake the system due to concerns such as completeness, accuracy, privacy, and authorized access. If a system is designed to cater to the needs of the pts and providers, they are more likely to implement it and opt-in to usage.				
Johnson, Frankel, Williams et al (2010) (USA)	Focus groups; N=15 participants in 2 focus groups; Adults - Health Professionals	Setting= focus groups held at institutional facility/ details not specified; Population=15; Scale=regional	To explore drs views and preferences about current and new approaches to sharing radiology test results with patients, including the use the internet to communicate rapid online imaging results directly to patients.	No; dr preferences; dr perceptions of online result concerns
Current reporting systems were viewed as dissatisfactory. Referring drs and radiologists suggested 2 potential benefits, ability to offer hyperlinks to high quality educational materials; this would help to mitigate poor quality information found online by patients. Secondly, increased patient satisfactions, due to perceived greater transparency in information from drs. Widespread concerns were reported about pts ability to understand reports. The consequences of access could be greater pts anxiety, if not able to promptly access a doctor. Both professional groups preferred a system that incorporated a time delay and be tested for effect before implementation. Radiologists were also concerned about losing control of the doctor-patient relationship. / Clinicians agree that pts should have access to records and take personal responsibility for their health. However they fear causing further anxiety and effect the dr-pt relationship. Most participants agree that direct online access to records should be approved by the dr, on a case by case basis.				
Greenhalgh, Hinder & Stramer et al (2010) (UK)	Multilevel case study; N=56 pts/ carers & N=160 staff & study of 3000 pages of documentation; Adults - Patients & Carer/ representatives; 2007-10/2010	Setting= National Health Service (England); Population= Individuals registration into HealthSpace website N=2913 (activated accounts); Scale= National	To evaluate policy making process, implementation, and patients'/carers' experiences of the introduction of an internet accessible personal EHR called HealthSpace.	Yes; National statistics on invitations sent; HealthSpace accounts created; ethnographic observation of patients and carers.

Adoption of personal EHRs by pts in England in 2007-10 was low (0.13% of those invited to use HealthSpace), and benefits expected by policy makers not realised over the study period. This raises questions about policy decisions, the technology design process and implementation in the public sector context. Overall, pts viewed HealthSpace as neither useful nor easy to use and it functioned poorly against expectations and self-management practices. Those who did use the email-style messaging were positive about its benefits, but enthusiasm beyond three early adopter clinicians was low, and fewer than 100 of 30,000 pts expressed interest. / A suggestions that future research take a different approach to the design of PHRs, based on lessons learnt, need to align PHR closely with peoples' attitudes and self-management practices and records should be dynamic, rather than static as HealthSpace was. Utilising user-centred design, future efforts may be better received and may lead to better overall adoption. The findings raise questions about how eHealth programmes in England are developed and approved at policy level.

Matheny, Gandhi, Orav et al (2007) (USA)	A prospective, cluster RCT; N= 570/768 patient; 12/2002-04/2005	Setting= mixed; Population= 1586; Practice No= 26; Practice size= large; Scale= local	To trial use and impact of an automated test result notification system (Results Manager (RM)), embedded within EHRs, on pt satisfaction regarding communication of test results.	Yes; pt satisfaction with: automated test result system; treatment information; physicians listening skills/ Yes; intervention drs trained and given access to test result tool. Control arm drs tracked status of their orders and results manually.
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Use of the intervention increased pts' satisfaction with test results communication. Trends of satisfaction over time did not change in the control arm and improved patient satisfaction in the intervention arm. Patients in the intervention arm were also more satisfied with the information given to them about their treatment and condition. Trends of satisfaction over time did not change in the control arm and improved in the intervention arm. Pts' satisfaction with their care providers' general communication skills and listening skills did not significantly improve with the intervention. / Overall, an automated management system providing centralized test result tracking and facilitating contact with pts improved overall satisfaction with the communication of test results. Pt satisfaction with receipt of information regarding conditions and treatments related to the tests, suggests that this factor had a direct effect on overall pt satisfaction with test results communication.

Wallwiener, Wallwiener, Kansy et al (2009) (Germany)	Literature review/review; searches up to 2008	Setting= international; Scale= international	A literature review focusing on the impact of secure pt internet messaging on the pt-physician interaction.	No
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Medline search resulted in 1065 publications. Of these, 71 articles were independently reviewed twice. Currently available messaging systems allow for asynchronous communication, dr reimbursement and automated supporting functions such as triaging of pt messages and integration of messaging into medical records. Findings show that pts are satisfied with the use of secure dr messaging systems and find these services to be convenient, time-saving and useful. Drs do not report adverse effects from their use, but were concerned with legal issues and compliance with privacy standards. / These systems are more likely to be taken up if secure, integrated into reimbursement systems and are a larger organisation. There is a need for further trial evidence and for a better / integrated international standard for data protection and information monitoring, as well as quality control and accreditation of system suppliers.

Wald (2010) (USA)	Case report; N=48, 007; 2002-2009	Setting=diverse group of practices ; Population= 48,007; Practice No=4; Practice size= diverse mix ; Scale= regional	A case report to identify factors that may facilitate or slow the adoption of a patient portal in four primary care practices, and how implementation of a pt portal may influence enrolment and use.	Yes; rate of pt enrolment in portal, rate of use (measured as new per 1000 patients per year)
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Adoption of the portal was lowest in practices with higher proportions of ethnic minority pts, and those without health insurance. Marketing practices appeared to heavily influence portal uptake, with practices that employed automated telephone promotion of the system seeing the highest rates of registration/enrolment. Staff/dr knowledge and enthusiasm seemed important for pt adoption regardless of the practice. A number of staff reported having their own portal account helped improve understanding of the tool and its potential value to pts. / In order to drive enrolment in online health record systems the process needs engaged, enthusiastic staff who can successfully market the idea to their pt groups. Variations were also observed which could account for differences in adoption and use among pts, providers, and their staff: pt characteristics, practice leadership focus, staff engagement, feature activation, marketing practices, and incentives.				
Car & Sheikh (2004a) (UK)	Literature review/scope/ Evidence summary; 1980-2003; pt1	Setting= mixed; Scale= international	This article explores the potential use for email consultations for preventive health care, health education, and managing non-urgent conditions.	No
About 60% of the UK population now has access to email; email consultations have the potential to play an important role in delivery of preventive healthcare and in facilitating self-management of chronic disorders. There is little evidence yet from controlled clinical trials that this potential benefit can be translated into routine clinical care. Successful communication by email depends on a clear and shared understanding by pts and healthcare professionals of its role, advantages, and limitations. / Healthcare systems are evolving throughout the world and are now embracing the concepts of pt - dr partnership and pt self-management. In this context, email consultations provide exciting possibilities to augment and facilitate healthcare delivery.				
Tjora, Trans, Faxvaag (2005) (Norway)	Interviews with MedAxess users; N= 15/70; Adults - Patients; 10/2002 - 05/2004	Setting= Primary care ; Population= 15; Practice No= 1 ; Practice size= other; Scale= local	To study the experiences of pts who use a secure electronic communication system, focusing on users' privacy versus the usability of the system.	No; perceptions & experiences; usability; benefits & concerns about using new system
Six themes emerged from the data: 1. pts thought access to their GP was easier via MedAxess, 2. pts were better able to manage minor health problems using MedAxess. 3. pts were able to elaborate on complex health problems, 4. pts were not overly concerned about confidentiality issues, as MedXess adheres to the strict health information security regulations in in force in Norway and other European states. 5. pts were hindered by 'security obstacles' in place in MedAxess compared to email. 6. some pts preferred ordinary email. / The challenge for secure web based communication systems is to develop processes that enable users to log-in easily and effectively, and the study shows that usability of the log-in procedure impacts on pts' actual use of the system				
Neville, Marsden, McCowen et al (2004b) (Scotland, UK)	Electronic survey; N=62; Health professionals (general practitioners)	Setting= mixed ; Population= 122 ; Practice No= 62; Scale= local	To explore the attitudes to, and experiences of e-mail within a group of GPs	Yes; usage; dr attitudes; actual experience

All GPs reported they had computers on a practice network and internet access. The majority used email to communicate with other GPs within the practice (82%); with GPs in other practices (79%); and with their administration staff (89%). The majority of GPs were concerned about the security of emails as a means of talking to pts. of email within health care was thought to be hampered by concerns about privacy, technical barriers, perceived fear of change and increased workload. 37% already experienced receiving emails from patients. Repeat prescriptions and appointment requests were the most frequent request. / Many general practitioners in this study perceived a need to provide an email service for clinical enquiries and repeat prescription requests, but felt constrained by a lack of acceptable systems and concerns over workload. The findings suggest that there is a need for good leadership, training and technical support to resolve issues and facilitate drs cope with potential demands for an email service. Guidelines for primary care organisations should also reflect the reality of actual clinical practice.

Hayes (2010) (UK)	Focus groups/ (iterative debate process); numbers not specified; Adults - Health informatics & health care professionals; no dates	Setting= not specified; Population= number not specified (range of experts incl health informatics personnel, clinicians & other stakeholders); Practice No= n/a; Practice size= n/a; Scale= national	This process aimed to establish how clinical, public and management needs can be effectively met by information technology; establish a vision for IT for the future NHS, health and social care; develop a strategy to achieve this vision.	No
<p>theme areas which emerged were: 1. the central importance of the record to serving individual patient care, 2. and that this should be top priority development of systems and 3. these should be carried out as close as possible to the front-line clinicians who use them. The review also highlights how standards and frameworks are useful, and serves a centralised functions; whereas imposing detailed technical solutions across large geographical areas is unlikely to succeed and should be abandoned. The findings may be useful to help make changes to what already exists and what can be implemented to decrease criticism. / Several issues were raised. 1 Patient must be at the centre of all information systems 2. Subject to any applicable constraints, halt and renegotiate the Local Service Provider (LSP) contracts to save further inefficiencies with regard to cost and delivery. 3. Redefine the systems required for a national infrastructure, ensuring that all functions that are amenable to localisation are decentralised. Health data will then be stored closer to the point of patient care. 4. Provide interoperable information systems. 5. Devolve all else to local trusts, including choice of system. 6. Allow local trusts to purchase from the central catalogue the system that is most appropriate for their patients and staff. 7. Enable local health communities to join together and use integrators to manage the move from existing legacy systems to new systems.</p>				
Car & Sheikh (2004b) (UK)	Literature review/scope/ Evidence summary; 1980-2003; pt2	Setting= mixed; Scale= international	To summarise evidence describing how acceptable email consulting is to the public and health care professionals, considering how to ensure quality and its safe use in daily clinical care.	No
<p>A national US surveys showed that pts increasingly want to be able to communicate with healthcare professionals by email, and 37% would be willing to pay for dr email access. Few drs (between 1-10%) currently provide email access. Professional concerns centre on quality of consultations, confidentiality, liability, and the challenge of recovering fees. Pts and drs need education in how to use email for consultations safely and effectively. Pt satisfaction has been shown to be preferred over telephone call for non-urgent problems. / Using email for pt-dr communication increases pt choice in the way health care is received. To date, email use has largely been pt led, with healthcare organisations slow to adopt it. Making email more accepted and more integrated with routine practice should be a key objective of the UK NHS information technology strategy. Widespread adoption is dependent on coordinated action of health organisations, pt representative groups, policy developers, and the IT industry.</p>				

Nijland, Van Gemert-Pijnen, Boer, Steehouder et al. (2008) (The Netherlands)	Scenario based test with in-depth interviews; Adults only - patients & other (mixture of GPs, physicians and psychologists)	Setting= Primary care providers recruited by the systems' providers; Population= eligible pts/care providers (N= 14 each); Practice No= other (no details); Practice size= other (not specified); Scale= National	To determine user centred criteria for the successful applications (x3) of internet based technology (including digital triage functions, symptom self-tests, health information and secure email between pt and provider) to supporting self-care.	No; usability/ user-friendliness of application; quality of care of application; implementation of application in practice
There were several problems with the user-friendliness of the application, including inadequate navigation structures; search options and lack of feedback features. Retrieval of information needs to be as easy as possible for pts and among caregivers, the lack of feedback and documentation possibilities caused inconvenience. The applications did not offer an adequate feedback feature. The quality of applications were hindered by; insufficient tailoring of information to pts'; the lack of personalized advice, and language (semantics) obstacles. Implementation problems arose for care providers because of unclear policies about email consultations and lack of training for email consultations. / User experience did not match expectations with pts finding difficulty in navigating and searching for information but also interpreting any automated self-care advice. Care providers expressed concerns around potential medico-legal problems and technical difficulties such as inability to store medical data in the patients' records already in use. The adoption of applications depends on an adequate infrastructure to support systems, and adoption of such new technologies they should be interoperable with health records.				
Huba & Zhang (2012) (USA)	Semi-structured interviews; Adults - Carers/representatives (medical professionals)	Setting= suburban ; Population= 21 (clinical professionals from 10 different disciplines); Practice size= large; Scale= local	To explore how various health care providers will interact with PHRs, including how PHRs are viewed, what information is valued and how the information is used.	No; perceptions & experiences; attitudes to sharing information; benefits & concerns about sharing information
There were mixed experiences with PHRs amongst participants, but once explained, the perceptions were generally positive. It was pointed out that PHR could help in decisions and management, and useful for updating records in hospital / primary care, useful in emergency situations where care is sought in a place which is not local. It was also thought useful for pts to have written records, helping to empower them. Participants in different specialities looked for different information, and hoped that data could be presented in a way that facilitated their work/ knowledge. Most professionals expressed reservation about quality and trustworthiness of patient generated data. Comfortable with sharing medical information but not their own notes into a PHR. / Providers have conflicting feelings about PHRs. In order for PHRs to be adopted by practitioners issues such as interoperability of EMR and PHR, the quality of pt information, legal basis for sharing information need to be established. PHRs should play a role in strengthening the partnership between dr and pt.				
Mynors & Newsom-Davis (2012) (Multiple)	Descriptive case studies; n=21; Literature review/review, Book;	Setting= other; Scale= international	A guide bringing together perspectives of policy makers, clinicians, suppliers and pts regarding the current status of record access around the UK and the rest of the world.	No; descriptive

<p>There is tension between the ideal and what is immediately achievable. Allowing access to records should form foundations to a confident, empowered and informed pt. Healthcare increasingly exists in an online, electronic environment and the future looks set to EHR access. Long term aims should be for shared records for all service users, which enables them to link and contribute to information from all sectors of the health and social care system. / Pt organisations should campaigned for shared PHR, allowing them to link information from all parts of the health and social care system. In order to achieve this, several things are needed, including a funding model, inter-operability, information governance, commissioners and provider buy in. A national road map is also needed. Self-care should highlight record access./ Information is an intervention in its own right and record access must become standard practice so that everyone can benefit from the information revolution.</p>				
Medical Protection Society (2013) (UK)	Policy press release & survey; N=650 survey responses; Health professionals (members of Medical Protection Society); 11/2012. Partial results only	Setting= other (England, UK); Population= 15,000 UK MPS members; Scale= national	A summary of health professionals views, who are members of the MPS, and survey of English adults in England about online access to medical records	No; descriptive
<p>The MPS is concerned that when access is granted, it could have unintended and severe consequences, such as sensitive information being accessed by a pts' family members. This view is shared by both the public and MPS professionals (80% and 86% respectively), as they have concerns about security of online access of pts medical records. The majority of public (73%) and drs (66%) report concerns about sensitive information (mental health, sexual health, child protection), and that this information should never be accessible online. Less than 30% of doctors think that allowing pts access to their medical records is a good idea. / There were concerns about the possible unintended consequences of accessing information by family members for example./ Both patient and professionals were concerned about security. Specific aspects of information should never be accessible online.</p>				
Kittler, Wald, et al (2004) (USA)	Survey & re-survey; N= 113 Primary health care staff; 01/2002-03/2003	Setting= primary care clinic ; Population=113; Practice No=10 ; Practice size=large; Scale= local	To evaluate non-physician staff attitudes towards the use of e-mail with pts. Also re-survey staff at three clinics after implementation of a secure application designed to aid electronic communication between pts and their clinics.	Yes; staff attitudes; satisfaction
<p>Before Patient Gateway implementation, 88% of staff already used e-mail at least once a day for work. Many staff members (24%) were already using e-mail with patients. After implementation, users reported high satisfaction with the application and staff felt more enthusiastic about increasing e-mail use with pts. / Non-clinical staff are generally enthusiastic about electronic communication with pts and benefits of using this form of communication. However, many staff initially did not believe that email would reduce workload, and approximately half were concerned about security. The findings suggest if applications such as Patient Gateway are well-designed, staff use of email may rise rapidly, especially if fears about using emails reduce.</p>				
Chhanabhai, Holt et al (2006) (New Zealand)	Literature review/review	Setting= mixed; Scale= international	A review of literature/ media and preliminary results of a national New Zealand study to explore health consumers perceptions of EHRs and possible security problems with EHRs.	No

<p>New Zealand health consumers were concerned about privacy and security of their electronic medical records. Concerns were raised about their own lack of understanding about electronic records, lack of control over their personal information, lack of knowledge about privacy laws, security aspects in sharing information. These may be barriers to total acceptance by the health consumer. However, by educating consumers about the procedures that could facilitate greater privacy and security, consumers will find that storing their health information electronically will provide a number of benefits. / When developing electronic health records it is important to acknowledge pt perceptions and ideas, in order to produce a system which will be acceptable to all. Security and privacy concerns are barriers to total acceptance; however this can be overcome by educating patients.</p>				
London Connect (2012) (UK)	Rapid literature review; 1980-09/2012	5 bibliographic databases searched, 89 articles relevant; Scale= international	To examine what pts and commissioners think about using and providing personalised health and social care information. Also, people's attitudes; and perceived benefits and risks of personalised health information.	No
<p>Pts report they value access to personalised health information, but they may not always use the information that is open to them. Some evidence indicates people are more likely to use information tailored to personal needs and which allows interaction. Usage depends on pts age; health conditions; and confidence in understanding health information and using technology. Relationships with professionals may also play a part. Giving access to records may be less effective than more interactive tools. / There was little research available about commissioners' views. Managers tend to focus on the practical and legal technicalities. May be useful to explore how the attitudes and behaviours of health professionals can help or hinder uptake of personalised health information. A few studies suggest that managers were less positive than pts about providing personalised health information, and that they were concerned about confidentiality and control issues.</p>				
Neville, Reed, Boswell, Sullivan et al (2011) (Scotland, UK)	Observation of service use & semi-structured interview; N=180 in study; Adults - patients; 2006	Setting= City; Population= 11000 in practice, N=180 in study, participants drawn from whole practice list; Practice No=1; Practice size= medium; Scale= Single practice, hospital or clinic	This paper reports on technical feasibility and qualitative findings of allowing pts access to care from mainstream NHS GP services via SMS.	Yes; service utilisation, patient views
<p>It was technically feasible to enable access to mainstream NHS general practice services using SMS for appointment booking, repeat prescription ordering, clinical enquiries and remote access to the clinical summaries. The study highlighted several issues: safety; no pts raised the issues of cost of sending / receiving SMS messages, and guidelines were provided to pts to avoid using text language; staff were initially resistant to SMS, then accepted its use when texts were converted to email formats. / Mainstream NHS GP services including appointment booking, repeat prescription ordering and clinical enquiries can be safely accessed using SMS and mobile phones. The majority of pts using the service did so to make their existing use of services, particularly ordering repeat prescriptions, more convenient.</p>				
North, Hanna, Crane (2011) (USA)	Cohort study; 3 part - video intervention, paper instruction and control; N=38,181 (patient pool); Adults - Patients; 11/2010-	Setting= city; Practice No= 1; Practice size= large; Scale= single practice, hospital or clinic	To examine use of a promotional video to educate pts about a pt portal, enabling them to view their EHR, communicate with their health care professionals, manage	Yes; proportion of pt online registrations; portal messaging use within 6 months of intervention; ; disruption of office visit; access problems; and provider satisfaction/ control cohort did not receive video or paper instruction for online services

	01/2011		appointments and mediations.	registration
There was significantly higher registrations and subsequent portal messaging following the use of a pt portal promotional video. There were no major barriers to the implementation of an exam room video system beyond a modest initial investment of time and resources. Workflow was not disrupted for the providers or rooming personnel and pts did not mind watching the video while waiting in the exam room. / This study shows the exam room video can be successfully implemented and used in a workflow-friendly way to increase portal registration and subsequent portal message use, and portal use may also increase. However, despite the video ability to meet some requirements for successful registration, it does not reach outside clinic walls like other promotions.				
Sciamanna, Rogers, Shenassa et al (2007) (USA)	Case data analysis from cross sectional survey of outpatient practices; N=2,725 (physicians) N=55,658 (patient visits); Adults - Patients; 2001-2003	Setting= mixed (primary and speciality care); Practice size= all sizes; Scale= national	To describe the frequency that pts visited drs who conducted internet or email consultations and describe associated patient and provider characteristics.	Yes; frequency of use
The main observation was the low overall rate in the proportion of visits to providers who reported doing internet or e-mail consultations (9.2% in 2001, 5.8% in 2002 and 5.5% in 2003) and lack of an increase in the rate. Access to providers who conducted e-mail consultations was higher among male pts. Also, pts who saw primary care providers and pts seen for pre-/postoperative care were more likely to see a provider who conducted internet or e-mail consults. / Despite growth in technology with health related internet services, internet or e-mail consult rates were generally low and did not appear to be increasing.				
Hwang, Han, Kuo et al (2012) (Taiwan)	Online survey; N=213; Adults - health care information management professionals; no dates	Setting= other (Taiwan); Population= member of an academic association linked to health care information professionals; Scale= regional	To investigate users concerns about privacy and security of EHRs looking at different genders, education level, age, electronic medical record awareness/ knowledge and health or non-health occupation.	Yes; privacy concerns regarding health information exchange; professional demographics (education gender); familiarity with EMR systems
People's educational level and EMR awareness are positively correlated with their increased concerns about privacy and unauthorised access. The study did not identify other significant correlations between gender, age and occupation and their privacy concerns regarding EMRs. These findings point to several strategies whereby concerns can be reduced including; use of government media (TV, radio) to promote EMR awareness; encouragement of medical institutes to develop regulations that can be audited; and the development of security management systems that adheres to international standards. / Despite significant time and resources employed in this project, privacy concerns remain regarding electronic medical records and are greater among those with higher education attainment or greater familiarity with EMR.				