Review

The impact of patient–physician web messaging on healthcare service provision

David McGeady*, Jaakko Kujala, Karita Ilvonen
Helsinki University of Technology, Finland

ABSTRACT

Background: Information technology can support the delivery of healthcare. Patients are eager to make use of such tools as web messaging, yet its deployment has been limited to date. A fear still pervades that the cost associated with a possible increase to physician workloads may outweigh any suggested benefits.

Goal: This paper aims to review the body of research completed in the area of patient–physician web messaging. The findings of this review will then be assessed and synthesised, with the intention of creating an overview of both the benefits and costs of patient–physician online messaging. Areas of particular importance to future research may then be identified.

Results: Demand and support for online communication tools amongst patients is strong, and can increase quality of care due to increased patient–physician communication. Although there would seem to be great potential to increase process efficiency, there would not seem to be sufficient evidence as of yet to suggest that this is the case.

Conclusion: Further quantitative research in particular is required to assess the impact of online communication, with special regard to the effect on overall patient demand and on healthcare process efficiency.

© 2006 Elsevier Ireland Ltd. All rights reserved.

Contents

1. Introduction ................................................................................................................... 00
2. Methodology ................................................................................................................... 00
3. Online communication between physician and patient ..................................................... 00
4. Electronic messaging based online communication ........................................................ 00
5. Impact on process effectiveness (quality of care) ............................................................ 00
   5.1. Customer satisfaction ........................................................................................... 00
   5.2. Disease management/prevention ........................................................................... 00
6. Impact on operational efficiency .................................................................................... 00
   6.1. Physician productivity .......................................................................................... 00
   6.2. Impact on communication volumes ......................................................................... 00

* Corresponding author.
E-mail addresses: dave.mcgeady@gmail.com (D. McGeady), jaakko.kujala@hut.fi (J. Kujala), Karita.ilvonen@hut.fi (K. Ilvonen).
1386-5056/$ – see front matter © 2006 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.ijmedinf.2006.11.004

1. Introduction

It is not at all unusual for people to buy groceries, do their banking and communicate with their lawyer online. Consequently, patients are also very enthusiastic about communicating with their physician electronically [1–5], while many consider it to be influential to their choice of physician [6] and health plan [7]. Indeed, it has been noted that the term ‘patient’ is slowly being replaced by ‘consumer’ [8], and to more adequately address their ever increasing needs, some healthcare providers (organisations that provide healthcare services) have embraced e-health: the support and delivery of healthcare with information and communication technology. The resulting patient portals have enabled patients to perform a number of functions online, including viewing their personal health record (including test results), renewing prescriptions as well as communicating electronically with their physician and other specialists.

The motivation behind the provision of these services is primarily to improve healthcare delivery [9], which currently suffers from a number of shortcomings. For example, many patients are left frustrated because their needs are not fully met during the course of medical encounters [10], including not receiving as much information as they would like [11,12]. The wider implications of interview topics may not become apparent to the patient until they have had some time to reflect, at which point the appointment is long terminated [13]. Yet, patients find it difficult to contact their physicians by telephone [4], and physicians themselves are frustrated with playing ‘telephone tag’ [4]. Patients can also be reluctant to discuss sensitive issues, not just in appointments but also by telephone, and are more comfortable doing so online [14–16].

Despite the great promise of online healthcare solutions, their proliferation has been limited to date. Concerns remain over the type, scope and extent of the resultant impacts of electronic communication. A number of studies have assessed the impact of these tools, although with varying foci, settings, systems and perspectives. As a result, many will remain reluctant to deploy these tools until a more comprehensive understanding of their costs and benefits emerges. The research question is: What is the impact of electronic communication to the efficiency and effectiveness of healthcare service provision? This study aims to address this research question by providing a synthesis of findings based on the research conducted in this area to date, and to then suggest directions for future research.

As healthcare systems in different countries vary; the specific context in which healthcare services are offered must be taken into account when analyzing the challenges and potential benefits of introducing online patient–physician communication. The US has been selected as a nominal setting for this discussion, although the main themes may be relevant to many other countries also.

This paper commences with a description of the methodology used to find relevant articles. This is followed by an examination of online patient communication and the various forms that it can take. Its impact on process effectiveness is then examined. This is then followed by an investigation into the effect of operational efficiency, with particular reference to the effect on communication volumes.

2. Methodology

Articles for our literature review were gathered by means of an online search of the following databases: Medline, Pubmed and ScienceDirect. Search terms included web messaging, electronic communication, email, e-mail, and online communication. Reference lists of articles uncovered by this search were scanned in order to find other relevant material that was not covered by the parameters of our initial search. Our search was restricted to the body of research conducted in English. The most relevant articles found are discussed and further analyzed in this paper. However, it should be noted that online patient–physician communication is an emerging phenomena, and most research findings are based on expectations of medical personnel or results of small-scale exploratory interventions.

3. Online communication between physician and patient

E-health has been defined in many ways, although we chose to use the following definition for the purposes of our study: the use of emerging information and communication technology to improve healthcare delivery [9]. This encompasses everything from patient-accessible Electronic Health Records (EHRs) to patient–physician online communication to electronic prescribing. Online patient–physician communication is a particularly important aspect of e-health since it serves as both a new communication channel and also as a potential substitute for other channels such as the telephone and face-to-face appointments.

4. Electronic messaging based online communication

Both synchronous and asynchronous online communication tools have been tested in the healthcare environment. Synchronous online communication in the form of ‘webchat’ was found to alleviate problems associated with shyness, although
ultimately is of limited use due its increased time demands compared to face-to-face appointments [17].

The proliferation of asynchronous communication tools such as email for clinical purposes has also been limited to date. Concerns were raised over their suitability in the context of healthcare communication, although guidelines were then proposed and developed in order to help both patients and healthcare staff to discern when their use may be appropriate [18,19]. However, security related concerns have been a major hurdle; both patients and physicians alike are still concerned that emails containing matters of a personal nature could be read by others [4,19]. Emails are vulnerable to malicious interception, while many companies actually reserve the right to review all emails sent and received from staff accounts. In response to this, we have seen the rise of secure online communication tools such as ‘web messaging’. Whereas emails are transferred across many different servers en-route from sender to receiver, web messages remain in a single server, which is accessed remotely by both sender and receiver [20–22]. As far as patients are concerned, the only practical difference between email and web messaging is that instead of just sending an email from their own personal or work email accounts, they must log into a separate secure web site in order to send and receive their messages.

Although web messaging has come a long way in addressing security related concerns, it also has its drawbacks. One of the advantages of email communication is that it is extremely quick and convenient since patients can send a note from their own email accounts. In contrast, web messaging sites require patient identification prior to sending or receiving messages. Patients tend to find this hurdle cumbersome, and so this may serve to discourage their use [23].

Web messages can be unstructured in format, so that the patient writes a simple note to their physician in the same way as they would write an email or a letter. However, there also exists a structured form of web messaging, where the patient does not write a free form message, but instead completes a branched logic questionnaire. This involves answering a multiple choice questionnaire that attempts to more accurately define the patient’s condition by soliciting the most relevant information as possible based on the patient’s prior responses. Structured web messages are sometimes referred to as ‘web visits’, as a result of one particular product called webVisit® [24].

Both email and web messaging, have been added to the various existing clinical communication options, including telephone calls to physicians and advice lines, and face-to-face appointments. The advantage of email and web messaging is that they are both asynchronous and remote, and so do not require that both parties coordinate their time or place in order to communicate (Fig. 1).

Tasks that can be completed via web messaging include, for example, non-urgent patient inquiries and questions regarding test results and treatment updates [20–22]. Web messaging systems tend to be made available to patients without charge, or else on the basis of an annual fee. Per-message charging does not seem to have become a characteristic of its deployment.

Although it is our intention to provide a comprehensive overview of the studies conducted in this area, many are quite different by nature and so their results may not be directly comparable. For example, many quantitative studies in this area focused on pilot trials only, which tended to be of at most 1 year’s duration. It is also important to note that some studies focused on web messaging systems that were triaged by non-physicians. Others focused on what were effectively stand-alone communication systems. However, many web messaging systems feature integrated functions such as the ability to view personal health records and test results, while also making appointments and administrative enquiries. These additional features would seem to have great potential to influence the scope and frequency of patient usage and so their inclusion is crucial in order to deduce firm conclusions regarding patient usage levels, and hence resource consumption. Furthermore, many studies focused on structured web messaging systems, the results of which may not be directly applicable to unstructured messaging systems due to their inherent differences in format. Nevertheless, although the differences between the various systems and settings should be noted, this review intends to identify broad consensuses between the results of these studies in order to provide some indicative findings.

5. **Impact on process effectiveness (quality of care)**

5.1. **Customer satisfaction**

Patients perceive access to online communication to be a factor that would influence their choice of physician [6], while Internet users in particular consider it to be something that would influence their choice of health plan [7]. The implication is that patient demand for access to this type of service is strong, and provided that attempts are not made to restrict access to physicians by telephone or for appointments, there is no reason to suggest that granting them access to an additional channel of communication would serve to impair their healthcare experience. Indeed, patient satisfaction levels are increased where communication effectiveness is enhanced [25]. Online communication constitutes an added source of convenience to the patient; for example, messages written from an employee’s desk at lunchtime could replace appointments of a trivial nature. As an aside, one of the implications of the SARS outbreak in East Asia was that patients sought to shift to online interactions with healthcare professionals, while a heightened caution about visiting healthcare facilities is one of the long-term implications of the outbreak [26].
5.2. Disease management/prevention

Maintaining wellness and managing disease is becoming less episodic and hence more continuous in nature [8]. Online communication could therefore facilitate more frequent patient–physician communication, and so could positively impact patient health levels. Indeed, more frequent and more effective communication has been shown to lead to improved diagnoses [27] and outcomes [28,29], greater adherence to medication schedules [30], increased preventive care [25], and lower malpractice claims [30]. Indeed, the use of remote medicine technology has been recommended, as it has been shown to improve continuity of care, with significantly improved results in the areas of preventive care and chronic disease management [31]. It should be noted that increases in quality of care are not necessarily accompanied by decreases in cost of care [32].

6. Impact on operational efficiency

6.1. Physician productivity

Physicians who use web messaging in their practices have been shown to achieve a higher level of patient visits per day [20,21]. This may be due to a resultant increase in process efficiency, which has been suggested anecdotally [20]. For example, web messaging is a self-documenting communication channel, and so does not require the physician to compile a separate log. However, the authors were unable to find a study measuring the processing time per message, telephone call, or appointment. It may well be the case that messages require less time to process, although it should be stressed that messages generally contain only 1 request [33], while patients make an average of 6 requests during each face-to-face visit [34]. It has been reported that physicians send many messages during their lunch-break and before and after work [20]. If physicians are not reimbursed for web messaging, this serves to increase physician output and thus productivity at no additional cost to their employer.

6.2. Impact on communication volumes

Physicians expect that some telephone calls could be substituted for web messages [35]. Although quantitative studies focusing on this particular phenomenon are still few in number, they do indicate that telephone call volume has been either unchanged [5,36], or decreased [22]. Encouragingly, one particular randomised controlled trial reported that users of web messaging made slightly fewer appointments compared to the control group [36].

The barriers to usage of web messaging are low as a result of its speed and convenience, and also because patients feel relatively more comfortable using it to discuss sensitive issues [14–16]. This may serve to increase the overall number of patient enquiries beyond that which they currently make by telephone. The implication is that web messaging may indeed act as a substitute for some telephone calls and indeed some appointments, although in combination with the online patient health portal it may also stimulate demand for healthcare attention. As a result, patients may seek to satisfy not only their healthcare needs, but their wants also; many physicians fear that web messaging will stimulate latent demand for healthcare attention, increasing their workloads [3,37,38]. If this is the case, one key question that should be explored in greater detail is whether the time saved by the physician transferring some communications online is less or greater than the time spent dealing with ‘stimulated demand’. Indeed, potential changes in communication volumes and choice of communication channel raise some very interesting implications for the field of demand management in particular. For example, online communication tools may enable physicians to cope better with delivering effective patient services, while also creating demand for necessary preventive interventions. These possibilities have been evaluated in Table 1 with the reference to a demand management framework proposed by Pencheon [39].

It should also be borne in mind, however, that facilitating patient wishes to communicate with physicians online may be of net benefit to healthcare providers in the private sector; the added convenience associated with online communication improves patient satisfaction and thus would also make the healthcare provider more attractive to potential patients [21,22]. Indeed, the healthcare value chain advocated by Burns [40], recognises that it is not only patients that may be thought of as customers; ‘Financial Intermediaries’ such as insurers and ‘Payors’ such as employers may also be included. Therefore, indirect customers such as employers may demand that messaging be included in their employees’ health plans, and so insurers may actively seek to contract with healthcare providers that facilitate online patient–physician communication. This would enable private healthcare providers in

| Table 1 – Assessment of possible impact of messaging on demand management |
|----------------------------------|----------------------------------|----------------------------------|
| Aim                              | Positive impact                  | Negative impact                  |
| Curtail demand for ineffective services | Messaging may replace trivial and ineffective appointments and telephone calls | Messaging makes it easier to send messages to physician regarding trivial or otiose issues |
| Cope better with demand for effective services | Messages are quicker to deal with than phone calls or appointments, thus enabling physicians to cope better with demand | May reduce the amount of time that physicians have to devote to providing effective services |
| Create demand                    | Lower barriers to usage encourages patients to address their needs | Easier for patients to contact physician instead of: asking pharmacist, searching Internet, etc. |
Table 2 – Possible benefits of web messaging to each stakeholder

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Primary goal</th>
<th>How online communication could help to meet this goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>To obtain “greater service quality, technical quality, and outcomes of care relative to other choices available to us” [41]</td>
<td>Easy to discuss sensitive topics [14–16]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convenience [14]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More efficient [15]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can re-read advice [14,15]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improves access to care</td>
</tr>
<tr>
<td>Physician</td>
<td>To build a continuous relationship of care between themselves and their patients [42]</td>
<td>Opportunity to contemplate answer [15]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Self-documenting—avoidance of some routine and time consuming communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improved patient communication leading to higher quality of care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase in productivity [20]</td>
</tr>
<tr>
<td>Healthcare provider (i.e. hospitals, clinics, etc.)</td>
<td>To strike that optimal balance between quality and cost demanded of them by their stakeholders (owners, employees, patients and customers)</td>
<td>May help retain current patients and attract new ones</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduction in patient appointments [36]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential to increase process efficiency</td>
</tr>
<tr>
<td>Insurer (i.e. blue shield, blue cross, etc.)</td>
<td>To provide the customer with their chosen level of care for the lowest cost possible</td>
<td>Possibility to reduce per-patient costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Higher quality of service package</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Possible preventative effects may lower future patient costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential to reduce malpractice claims</td>
</tr>
</tbody>
</table>

7. Potential stakeholder benefits

The potential benefits of online communication that were explicitly mentioned in existing literature have been complemented by our own analysis, the results of which have been broken down by stakeholder, as shown in Table 2. This analysis was conducted with particular reference to the ‘raison d’etre’ of each stakeholder, and so the core motivation of stakeholder has also been included. Some of these benefits are self-evident. Others are not so self-evident yet have not been corroborated, and so should be investigated in further detail in the future.

8. Discussion

8.1. Theoretical implications

The studies reviewed in this paper indicate that differences in patient telephone call and appointment volume between web messagers and control groups are minor. Web messaging does have a positive impact on patient satisfaction, while there is no reason to suggest that it would do anything but improve quality of care. The consequent long-term effect of a closer patient-physician relationship, improved disease management and prevention should be explored in greater detail. Further research is clearly required in order to actually quantify these benefits in addition to their associated costs. Reference should also be made to patient profile characteristics such as age, gender, morbidity and Diagnosis Related Groups; the benefits and costs may vary along these dimensions. Healthcare providers hoping to reap large efficiency based savings as a result of web messaging should be wary. Although online communication would seem to offer time savings over the telephone, the extent of these time savings is not yet clear. Additional costs may be imposed also. For example, it remains to be firmly established whether web messaging is increasing patient demands for healthcare, rather than simply acting as a substitute for other channels of communication. As a summary, these benefits as well as the costs suggested by the various studies reviewed by this paper have been categorised in Fig. 2.

8.2. Managerial implications

Healthcare providers that offer messaging may benefit from increased patient volume since they are providing a service that many patients are demanding. This would naturally lead to greater interest and possibly custom from insurers and Health Maintenance Organisations. However, the issue of reimbursement for answering online medical related
enquiries has yet to be conclusively resolved. This can be broken down into two separate issues: healthcare provider reimbursement and staff (i.e. nurses, physicians) reimbursement. Many insurers are still unwilling to pay healthcare providers for the time spent by their physicians communicating online. However, even if healthcare providers do not receive reimbursement from insurers, they may still reimburse their staff for handling online communications just as they would for telephone calls, which are also not reimbursed by insurers. Nevertheless, the popularity of capitated care contracts underlines the importance of verifying whether online communication is cost effective or not. For example, if online communication does increase efficiency, there is a strong case to be made for providing it without charge to encourage patients to use it. However, if messaging imposes a net cost, this deficit must be filled somehow. In the absence of reimbursement from insurers, this service could be offered without a cost as a means of increasing patient satisfaction, or they may choose to impose a patient charging mechanism. Without more detailed information, this charging mechanism must be designed with reference to the demand side only; an estimation of how much patients are willing to pay. Therefore, a comprehensive understanding of the impact of web messaging on a healthcare provider, along with a quantification of these effects would provide a solid foundation with which to design both reimbursement and user charging mechanisms. Thus further research, preferably in the form of quantitative assessments are required in order to reassure managers in the healthcare provision industry that web messaging will not prove to be detrimental to their bottom line.

9. Conclusion

In this paper we provide a review and analysis of the current body of literature concerning online patient–physician communication, primarily in the form of web messaging. The key themes of this research were explored and summarised in this paper. A particular emphasis was placed on the importance of understanding the possible impact on patient demand from the perspective of demand management. Based on existing research it is too early to make strong conclusions about the impact of these systems on healthcare service production and patient demand. However, at this early stage there is little reason to believe that granting patients access to web messaging will greatly impact their demand for healthcare attention. Similarly, web messaging would seem to positively impact patient satisfaction while there is little reason to believe that there might be anything but a positive impact, however marginal, on quality of care. Further research, based on large-scale, long-term empirical case studies is required to fully understand the impact of online communication. As some healthcare organisations are in the process of introducing patient–physician web messaging systems for routine communication with the general patient population, an opportunity is provided for longitudinal large-scale empirical studies. A learning curve is associated with any management intervention, and so to fully understand the impact of patient–physician communication, research evaluating it over the course of several years after its introduction is required.

Summary points
What was known before the study:

- Web messaging has the potential to decrease per patient healthcare costs.
- Web messaging may increase clinical efficiency and effectiveness.
- Patient demand for web messaging is very high.

What this study has added:

- This study provides a review and analysis of the results of research conducted in this area.
- In particular, this study has identified the range of impacts that messaging can have on healthcare service provision across two key dimensions, cost of care and quality of care.

REFERENCES


[42] Committee on Quality of Health Care in America, Institute of Medicine of the National Academies, Table 3-1, Crossing the Quality Chasm: A New Health System for the 21st Century, National Academy Press, Washington, DC, 2001.