Patient-Physician Web Messaging

The Impact on Message Volume and Satisfaction

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BACKGROUND: Patients want electronic access to providers. Providers fear being overwhelmed by unreimbursed messages.

OBJECTIVE: Measure the effects of patient-physician web messaging on primary care practices.

DESIGN/SETTING: Retrospective analysis of 6 case and 9 control internal medicine (IM) and family practice (FP) physicians' message volume, and a survey of 5,971 patients' web messaging with 267 providers and staff in 16 community primary care clinics in the Sacramento, CA region.

MEASUREMENTS AND MAIN RESULTS: Case telephone volume was 18.2% lower (P=.002) and fell 6.50 times faster than control. Case total telephone plus web message volume was 13.7% lower (P=.025) and fell 5.84 times faster than control. Surveys were responded to by 40.3% (1,743/4,320) of patients and 61.4% (164/267) of providers and staff. Patients were overwhelmingly satisfied and providers and staff were generally satisfied; both found the system easy to use. Patient satisfaction correlated strongly with provider response time (Γ=0.557), and provider/staff satisfaction with computer skills (Γ=0.626) (Goodman-Kruskal Gamma [Γ] measure of ordinal association).

CONCLUSIONS: Secure web messaging improves on e-mail with encryption, access controls, message templates, customized message and prescription routing, knowledge content, and reimbursement. Further study is needed to determine whether reducing telephone traffic through the use of web messaging decreases provider interruptions and increases clinical efficiency during the workday. Satisfaction with web messaging may increase patient retention.

KEY WORDS: electronic mail; Internet; telemedicine; remote consultation; web messaging.
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Effective communication between patients and physicians improves health care quality.[1] Poor communication can lead to increased patient stress,[2] decreased satisfaction,[1,3] decreased adherence,[4,5] and elevated malpractice risk.[6] Face-to-face contact is not necessary for effective communication. Fifteen percent to 28% of all ambulatory medical contacts are made by telephone[7,8] and 70% of these encounters can be managed without the physician ever seeing the patient.[9]

E-mail does not require patients and providers to be available concurrently. Such asynchronous communication avoids "telephone tag" and the interruptions associated with telephone calls.[10–12] Telephone messages are often overlooked, misplaced, or transcribed incorrectly. E-mails are less likely to be lost, do not require transcription, and can be printed or attached to the chart.[10,11] Recognizing these advantages, the Institute of Medicine calls electronic patient-provider communication a core functionality of an electronic health record.[13]

Internet access has greatly increased in recent years. Of the 67% to 78% of U.S. adults with Internet access,[14–16] 90% want to communicate with their physicians electronically.[17] Of these, 56% say it would influence their choice of physician.[17] Physicians are far more reluctant. Although 89% of physicians have Internet access,[18] only 13% to 21% communicate with their patients by e-mail.[19,20] Several barriers to adoption can explain this low rate. Few payers reimburse for online patient care,[17,21,22] although the American College of Physicians, among others, has advocated that Medicare do so.[22] Security concerns are another barrier. Many physicians and patients report reluctance to use unencrypted e-mail that could be intercepted by unauthorized individuals.[23–25] Physicians also fear being overwhelmed by patient e-mails.[11,17,23–26] Katz et al. found e-mail increased the communication burden on physicians and staff, and concluded e-mail did little to improve the efficiency and effectiveness of clinical care.[27] Potential liability due to missed diagnosis or delayed treatment of acute problems is another barrier.[10,24] In addition, patients cite slow response times by their physicians as a concern, especially when an urgent response is needed.[23,26,28,29]

Secure web messaging is structured, encrypted communication via common web browsers such as Internet Explorer and Netscape, which improves upon the inherent weaknesses of e-mail.[30] Web messaging can control access and safeguard privacy with userIDs and passwords for providers, staff, and patients.[30,31] Structured forms can generate concise messages, which improve efficiency, and automated message routing to appropriate staff can reduce physician workload.[30,31] Patient fees and copayments can be paid by credit card.[30,31] The health industry has been slower to adopt web messaging technology than other service industries such as online retail and banking.[31]

Several studies report positive results with e-mail and/or web messaging between patients and their providers. Parents, guardians, and pediatric gastroenterologists found that e-mail was faster and more convenient than telephone consultations.[32] Penson et al. conclude e-mail within an established doctor-patient relationship increases patient satisfaction and doctor-patient communication.[33] A recent pilot study of web messaging at a primary care clinic found 79% of patients and 61% of physicians preferred it to telephone use.[30]

This study examines how a commercial web messaging system affected patient, provider, and staff satisfaction, and provider message volume. From a pilot study,[30] we hypothesized that: 1) patient satisfaction would be high and would correlate with message response time; 2) provider/staff satis-

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faction would be mixed and would correlate with ease and frequency of system use; 3) incoming patient message volume would not differ between sites using and not using patient web messaging; and 4) telephone call volume would decrease at the site using web messaging.

METHODS

Study Sites

The University of California Davis Heath System (UCDHS) is a 528-bed teaching hospital with a network of 16 primary care network (PCN) offices serving Sacramento and 3 other California counties. This study was conducted at the UCDHS PCN clinics and was approved by the UCDHS Institutional Review Board (IRB). The clinic at Folsom, CA, which served as the implementation pilot site for patient-provider web messaging,[30] was the case site. The other PCN clinics started web messaging between June and November 2002, after first converting to open access (same-day appointment) scheduling.

Case telephone and total incoming message volume were retrospectively compared to the control site at Auburn, CA from November 2001 to November 2002. The sites were selected after the study period. Folsom and Auburn are foothills communities east of Sacramento (see Table 1). Prisoners at Folsom State Prison were not included. Folsom and Auburn provide internal medicine (IM), family practice (FP), and pediatric and obstetric/gynecology (OB/GYN) services to 19,552 and 15,217 patients, respectively. The case IM and FP physicians and staff began web messaging with patients in November 2001, 13 months before the control site. Both clinics converted to open-access scheduling from July to September 2002.

Web Messaging System

The UCDHS web messaging system is provided by RelayHealth Corporation of Emeryville, CA. It features structured message types including branched-logic problem-specific clinical messages called webVisits,® and requests for prescription refills, appointments, and test results. Message routing is automated and customizable by message type and provider. Prescriptions are routed to retail pharmacy fax machines. Security tools include secure servers, firewalls, 128-bit SSL encryption, user-ID and password authentication, and auditing of all views and transactions. UCDHS marketing efforts included direct mail, office brochures, newsletters, and television news stories.

Patients self-register with RelayHealth online and, by selecting a provider, automatically send a message requesting an online relationship to that provider's office. Per California law, only patients previously seen by their selected provider are accepted; all others are rejected or offered appointments to establish care. Authorized patients, providers, and staff each have a unique userID. Caregivers can communicate on behalf of dependents as proxies. Providers received no compensation for web messaging during the study period.

RelayHealth Corporation provided web message metrics. Data were collected from November 2001 to May 2003 at monthly intervals, including numbers of patients enrolled, message volume, message types, and the age and gender of enrolled patients.

Telephone and Message Volume

UCDHS administration provided the case and control IM/FP physicians' monthly incoming telephone call volume, days worked per month, and patient panel size. Clinic incoming telephone data are captured by an automated call distribution system (Executone Information Systems). Telephone data were not available for February 2002. The RelayHealth Corporation supplied the monthly volume of incoming web messages to the case physicians. February 2002 data were excluded from analysis because of the lack of telephone data. UCDHS calculates panel sizes using a rolling 24-month lookback. Patients are assigned to the primary care physician's panel whom they saw the most; with ties, patients are assigned to the physician their insurer has linked them to.

Patient, Provider, and Staff Surveys

The UCDHS Market Research Department provided assistance in developing patient and provider/staff surveys. Five-point Likert scales were used for most answers. E-mails containing a link to a survey web page were sent on May 9, 2003 to all 267 UCDHS PCN providers and staff using web messaging (88 physicians, 5 nurse practitioners and physician assistants, 38 nurses, 35 medical assistants, and 101 clerical office staff) and to all 5,971 patients (at 4,320 e-mail addresses) registered to web message with a PCN provider on that date. Because parent proxies represent minors, the survey recipients were all adults. A preparatory e-mail was sent to all eligible patients, providers, and staff several days prior to the survey e-mail. A second e-mail was sent out to all patients, providers, and staff 1 week later requesting that nonresponders take the survey. RelayHealth, which had no role in creating the surveys or analyzing the responses, set up the survey web sites and provided the aggregated responses in an MS Excel 2000 spreadsheet (Microsoft, Redmond, WA). Also, UCDHS provided data from a periodic telephone satisfaction survey of randomly selected patients seen in PCN clinics for comparison with our patient survey data. Because survey data were collected anonymously, IRB exemption was sought and obtained.

Statistical Analyses

Two-tailed *t* tests were used to test hypotheses. The extent and direction of correlation was tested using the Goodman-Kruskal Gamma (Γ) measure of ordinal association. Time trends were analyzed using linear regression. The UC Davis Statistics Department assisted our statistical analyses.

RESULTS

Web Message Metrics

From December 2002, the first month all PCN clinics offered web messaging to patients, to May 2003, patient enrollment increased at a compound rate of 10.8% per month, reaching 6,394 (4.74%) of 134,768 PCN patients in May 2003, when satisfaction surveys were sent (Fig. 1). In November 2002, the end of the case-control study period, 9.2% of the case IM and FP physicians' patients were using the system. Table 1 describes the demographic characteristics of patient survey respondents, adult patients enrolled to use web messaging, and adult patients seen in PCN clinics between December 1, 2002 and May 31, 2003.

Table 1. Characteristics of Patient Survey Respondents

Characteristics	Survey Respondents (*N*=1,743)	Adults Using Message Service (*N*=5,076)	Adult PCN Patients* (*N*=59,083)	Adult Residents of Folsom, CA† (*N*=51,884)	Adult Residents of Auburn, CA† (*N*=9,560)
Age, y (%)					
18–24	1.8	4.5	7.8	8.7	9.4
25–34	11.5	13.0	15.6	22.7	13.5
35–44	20.8	24.3	20.9	28.7	20.0
45–54	31.9	30.0	21.3	19.2	21.6
55–64	19.9	18.0	14.7	9.0	11.9
65–74	9.7	7.6	9.8	5.8	10.4
≥75	2.1	2.6	9.9	5.8	13.2
Decline/no answer	2.4				
Gender, %					
Male	34.4	39.8	39.0	56.7	45.4
Female	62.1	60.2	61.0	43.3	54.6
Decline/no answer	3.4				
			Adult Residents of Sacramento County, CA† (N=772,488)		
Education, %					
No HS diploma	0.3		16.7	11.1	9.0
High school graduate	21.2		58.5	51.3	63.3
College graduate	45.7		16.7	25.7	19.0
Postgrad degree	26.9		8.1	11.9	8.6
Decline/no answer	1.4				
Income, %					
<$25,000	2.9		26.2	12.7	21.7
$25,000–$49,999	11.2		30.0	18.7	29.7
$50,000–$74,999	20.3		20.5	20.2	20.8
$75,000–$99,999	17.7		11.0	18.0	13.0
$100,000≥	26.9		12.3	30.4	14.8
Decline/no answer	21.0				
Health, %					
Excellent/very good	57.3				
Good	30.4				
Fair/poor	11.7				
Decline/no answer	0.6				

**All adult patients seen at PCN clinics December 1, 2002 to May 31, 2003.*
†2000 U.S. Census data.
PCN, primary care network.

A total of 6,731 incoming messages were sent by or on behalf of patients from November 2002 to May 2003 (Fig. 1). Fewer than 10% of adults sent over 5 messages: 45.4% sent a single message; 20.7% sent 2 messages; 12.2% sent 3 messages; 7.1% sent 4 messages; and 4.5% sent 5 messages. Fewer than 4% of users sending messages on behalf of minors sent over 5 messages: 60.5% sent a single message; 22.0% sent 2 messages; 7.2% sent 3 messages; 4.0% sent 4 messages; and 2.7% sent 5 messages.

Table 2 lists the templated, branched-logic clinical patient questionnaires (webVisits®) that were used from November 2001 to May 2003 over 1% of the time. Most webVisits® (67.7%) were general in nature, with "medications," "other medical questions," and "general chronic symptom or health condition" together comprising half of all webVisits;® messages for "recent office visit" was used 7% of the time. Of the 32.3% of condition-specific webVisits® used, those for chronic pain, allergies, and depression were used most frequently.

The time to initial response to a patient message was calculated using business hours of 8:00 AM to 6:00 PM Monday to Friday, excluding holidays. Just over half (52.6%) of initial responses were sent within 4 business hours; 70.2% within 8 hours; and 85.5% within 16 hours.

Telephone and Message Volume

Monthly inbound web message volume rose slowly while patient enrollment increased rapidly (Fig. 1). Figure 2 shows mean incoming telephone calls and calls plus web messages per 1,000 panel patients per workday for the case and control physicians from November 2001 to November 2002. Case call volume averaged 18.2% less than control (21.61 vs 26.43; P=.002), and fell 6.50 times faster. Case message (phone plus web) volume averaged 13.7% less than control (phone only) (22.80 vs 26.43; P=.025), and fell 5.84 times faster.

Patient Survey

We received responses from 40.3% (1,743/4,320) of the e-mail addresses sent surveys. These respondents constituted 29.2% of the 5,971 patients enrolled in the system, because many patients (i.e., family members) share an e-mail address. Not all responders answered every question.

Figure 3 shows the results of 3 main survey questions (satisfaction, ease of use, and willingness to recommend doctor). On a 5-point Likert scale, mean reported satisfaction with the web messaging system was 4.02 (standard deviation [SD], 0.53). Mean ease of use was 4.11 (SD, 0.45). Mean willingness

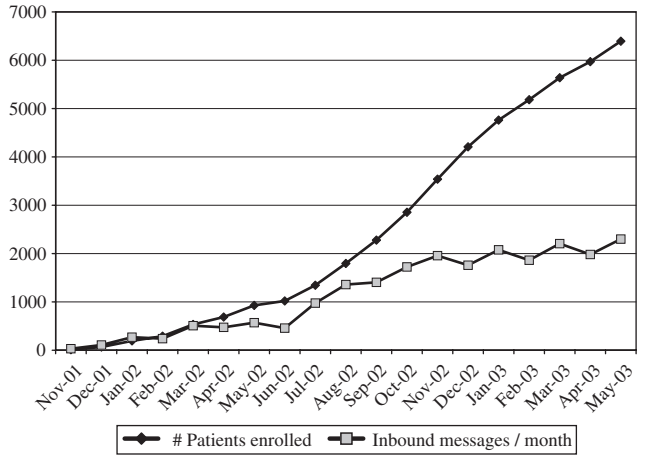

FIGURE 1. Patient enrollment and monthly message volume.

to recommend their provider was 4.32 (SD, 0.42), nearly identical to the UCDHS PCN phone survey, at 4.33.

Just over one tenth (11.2%, 196/1,743) reported receiving a message response "right away," 39.6% (690) "by the next business day," 27.3% (476) within "1–2 business days," and 11.2% (195) "over 2 business days." Of patients reporting receiving a response right away 67.7% (132/195) were very satisfied, as were 55% (378/687) reporting receiving a response by the next business day (Γ=0.557; 95% confidence interval [CI], 0.505 to 0.608).

Provider and Staff Survey

Over half (61.4%, 164/267) of providers and staff responded to the survey. Figure 4 shows the results of the survey divided into provider, medical assistant, and registered nurse (MA and RN), and clerical staff. MAs and RNs were most satisfied, with a mean score of 3.57 (SD, 0.45), while clerical staff found the system easiest to use with a mean score of 3.83 (SD, 0.48). Providers were neutral (mean, 2.97; SD, 0.72) about the ease of integrating the system into workflow, while MAs/RNs (mean, 3.49; SD, 0.58) and clerical staff (mean, 3.28; SD, 0.6) found it easier to integrate. Providers and staff found web messaging to be as efficient as the telephone; however, providers reported the quality of telephone care to be equal to

Table 2. webVisits® Used Greater Than 1% of the Time

webVisit®	%
Medication	23.6
Other medical questions	15.2
General chronic symptom or health condition	12.3
Recent office visit	7.0
General adult symptom	5.2
Chronic pain	3.2
Allergies	2.6
Lab or test result	2.2
Medical procedure or operation	2.2
Depressive disorder	1.3
Hypertension	1.2
Cold/flu	1.2
Cough	1.2
Sinus pain or pressure	1.2
Headaches/migraines	1.1
Itching	1.1

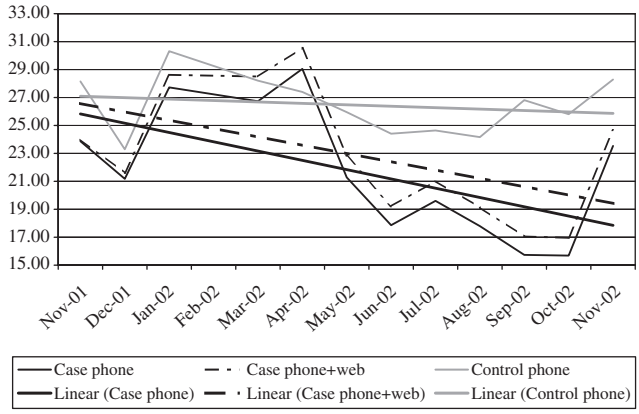

FIGURE 2. Incoming telephone calls and patient web messages per 1,000 panel points per workday. Phone means: case 21.61, control 26.43 (P=.002). Regression slopes: case −0.66, control −0.10. Phone+web means: case 22.80, control 26.43 (P=.025). Regression slopes: case −0.60, control −0.10.

or slightly better than web messaging (mean, 2.70; SD, 0.47). Finally, providers overwhelmingly stated that reimbursement for web messaging was "very important" or "somewhat important" (mean, 4.14; SD, 0.45).

Of providers and staff receiving 2 or more messages a day, 65% (26/40) reported being "very satisfied" or "somewhat satisfied." In contrast, 36.5% (46/126) of providers and staff receiving none or 1 message a day reported being "somewhat satisfied" or "very satisfied" and 45% (57) reported being "neutral." Of providers and staff receiving 2 or more messages a day 71.8% (28/39) reported that web message integration into workflow was "very easy" or "somewhat easy," whereas 34.1% (43/126) of providers and staff receiving none or 1 message a day reported workflow integration to be "very easy" or "somewhat easy," and 34.1% (43) were "neutral."

Forty-five percent (18/40) of providers and staff reporting the system very easy to use were very satisfied with it, and 30% (19) were somewhat satisfied; 41.2% (26/63) of those who reported the system somewhat easy to use were somewhat satisfied (Γ=0.626; 95% CI, 0.514 to 0.738).

DISCUSSION

Many patients want to access their doctor online. With the majority of even the medically uninsured going online at least once a month,[34] and with 90% of online patients wanting to communicate electronically,[17] web messaging with providers should expand rapidly where it is made available. The UCDHS PCN is experiencing rapid growth, with web messaging enrollment increasing at a compound rate of 10.8% a month as the

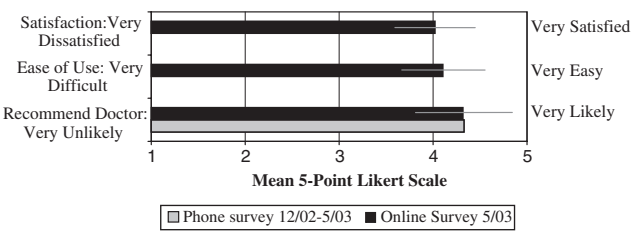

FIGURE 3. Patient satisfaction survey of the web messaging system. Black line represents standard deviation.

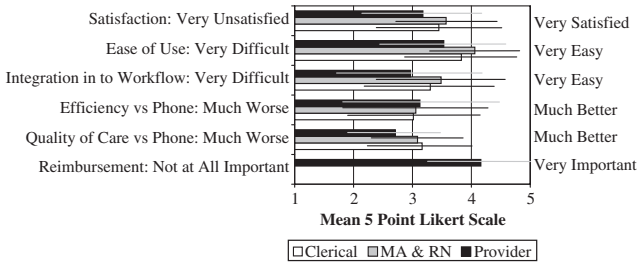

FIGURE 4. Provider and staff survey results of the web messaging system. Black line represents standard deviation.

system was rolled out to the rest of the PCN after conclusion of the pilot.

The vast majority of patients reported satisfaction with the system and found it easy to use. Because patients were not trained and were self-selected, their ease of use likely reflects strong computer skills. Patient satisfaction correlated with message response time; satisfaction decreased sharply if patients had to wait longer than 2 business days. These results are consistent with a report by Sittig et al. that 83% of patients surveyed wanted to wait less than 48 hours for an e-mail response from their health care provider,[26] and with the demographics of the users of the UCDHS web messaging system. Most users are healthy female "baby boomers," between the ages of 35 and 54, with a higher than average level of educational attainment and household income. For providers to satisfy patient demand for electronic communication, they should, therefore, answer messages quickly. Fortunately, UCDHS providers were usually attentive to patient demands, with over 70% of initial responses sent within 8 business hours.

Providers and staff were required to use the web messaging system. They reported more diverse, though mostly positive satisfaction and ease of use than did patients. Their satisfaction correlated to ease of use, a proxy for computer skills, and to frequency of use. Most found the quality of web care similar to telephone care. Nurses, medical assistants, and clerical staff integrated the system into their workflow better than physicians. Lack of reimbursement limits the growth of online care. UCDHS providers overwhelmingly want payment for web consultations. With reimbursement, providers will likely be more inclined to communicate with patients electronically, and promote it as an alternative for nonurgent problems.

Physicians' fears of being overwhelmed by electronic patient messages proved groundless; message volume increased far more slowly than patient enrollment once the clinic rollout ended in November 2002. A pattern of rapid growth in message volume was followed by a plateauing at the pilot site in the first half of 2002, then in the whole PCN starting from mid-2002. We believe this was the result of direct marketing, which expanded patient participation from heavier using "early adopters" to the majority of patients who rarely contact their doctor's office. From November 2002 to May 2003, 90% of patients sent fewer than 5 messages. The low rate of messaging among the majority does not appear to have been due to difficulty using the messaging system, because surveyed patients reported it easy to use, nor from lack of interest, because the substantial drop in case telephone message volume suggests that enrolled patients substituted web messaging for the phone. Instead, it is likely that patients who frequently contact their provider learned about and started using web messaging first, and were, therefore, overrepresented among the early web messaging enrollees.

Case total message volume declined substantially, suggesting that web messaging may have increased the efficiency of nonvisit care. Seven percent of structured webVisits® and an unknown number of free-text messages were sent in follow-up to recent office visits. Anecdotal reports from physicians and staff elicited a consensus that web messaging likely reduced telephone volume not only by moving messages to the web, but also by decreasing telephoned refill requests, repeat telephone calls, and "telephone tag." In addition to decreasing both telephone and total message volume, case providers and staff anecdotally report that web messages individually require less time than phone calls. Furthermore, they report that unlike phone calls, which can be unpredictably lengthy, web messages can be answered during brief breaks throughout the day. In addition, physician users anecdotally report that they can complete office visits triggered by web messages more expeditiously, because they already have the history.

Conclusion

Secure web messaging is an improvement over e-mail because it provides security with encryption and access controls, automated routing of messages, rich knowledge content, prescription routing to pharmacies, structured data entry and message templates, and reimbursement by payers and patients. Patients were overwhelmingly satisfied and providers/staff generally satisfied with the system. Satisfaction with the web messaging system may increase patient retention. Provider success comes from good computer skills and regular use. Web messaging, by reducing telephone and total message volume, potentially improves access to care both for patients who communicate electronically and for those who rely upon the telephone and office visit. Decreased patient messages may increase clinic efficiency and provider productivity. As use of web messaging increases, further research should allow a deeper understanding of the benefits to patients and their providers.

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