

Research Paper ■

## Web Messaging: A New Tool for Patient-Physician Communication

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**Abstract Objective:** There is a high demand by patients to communicate electronically with their doctor. This study evaluates the use of a web messaging system by staff and patients of UC Davis community Primary Care Network (PCN) clinic.

**Design:** Eight providers and their staff and patients were surveyed on use of this web messaging system, and physician productivity was measured with Relative Value Unit (RVU) and office visit data.

**Results:** 36.9% (238/645) of registered users responded to the survey. The web messaging system was preferred over phone calls by both providers and patients for the communication of non-urgent problems. A great majority of patients found it easy to use (88.8% or 206/232) and were satisfied (85.8% or 199/232). Satisfaction was significantly associated with timely provider response (Goodman-Kruskal Gamma = 0.667, 95% CI = 0.546–0.789). Clinicians were also favorable to the system and, despite concerns, were not inundated with messages. Most found it easy to use, perceived it to improve patient communication, and valued the insurance reimbursement capability. Furthermore, the system did not have a negative impact on physician productivity.

**Conclusion:** A patient-provider web messaging system, which provides a combination of security and access controls, customized routing, rich knowledge content, and insurance reimbursement capability, is a useful addition to the array of communication options available to health care providers and their patients.

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The number of people who have access to the Internet has greatly increased over the past several years. As compared with 1995 when only 9% of U.S. adults were reported to be online, April 2002 Harris Poll statistics show that as many as 66% of U.S. adults (137 million people) now have access to the Internet and are using e-mail to communicate.<sup>1</sup> UC Davis Health System surveyed its patients a year earlier and found that 55% reported having online access. Similarly, physicians have gone online in growing numbers and are frequent users of e-mail.<sup>2</sup>

E-mail has numerous advantages over the telephone in the health care setting. As an asynchronous form of communication, it helps avoid “telephone tag” and inconvenient interruptions.<sup>3</sup> E-mail also provides better documentation of communication,<sup>4</sup> as copies can be printed and/or (electronically) attached to the medical record. It is a better medium for education with templates and links to Web sites.<sup>5</sup>

Successful communication between patients and their health care provider is a key factor in providing quality health care. Numerous studies indicate that a significant number of patients desire to communicate via e-mail with their physicians.<sup>4,6–13</sup> As early as 1994 a majority of patients from two studies perceived this type of communication to increase speed, convenience, and access to medical care.<sup>7,8</sup> Couchman et al.<sup>4</sup> revealed that 90% of surveyed patients were interested in requesting medication refills, 87% in having non-urgent consultations, 84% in obtaining test results and 78% in making appointments via e-mail. Kleiner et al.<sup>9</sup> reported similar wishes for over 70% of parents of pediatric patients.

A recent Harris Interactive<sup>12</sup> poll found that 90% of those with Internet access would like to communicate with their physicians online, with 55% stating that the ability to communicate with their doctors electronically

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would influence their choice of health plans and 56% responding that this capability would influence their choice of physicians.

In reality, however, very few patients actually communicate with their physicians electronically. Lacher et al.<sup>14</sup> revealed that while 82% of physicians stated they use computers for personal or professional reasons, fewer than 7% acknowledged exchanging e-mail with their patients. In a study by Moyer et al.,<sup>13</sup> two-thirds of all patients revealed they would like to communicate with their doctors via e-mail, yet only 10% of e-mail users reported ever having done so. Similarly, Sittig et al.<sup>6</sup> found that only 6% of patients had ever sent an e-mail message to their provider. One study reported 79% of physicians had no desire to communicate directly with patients via e-mail.<sup>9</sup>

Several barriers discourage the use of e-mail between patients and providers. One is physicians' fear of being inundated with messages. They believe that e-mail would add to already busy schedules with no possibility of financial reimbursement.<sup>9,13</sup> Some patients, on the other hand, have expressed apprehension about using this technology with their provider because of potential slow responses, especially those that need immediate attention.<sup>6,13,15,16</sup> Privacy and security concerns also increase many physicians' and patients' reluctance to communicate via e-mail.<sup>6,7,9,13,16,17</sup> Unencrypted messages may be intercepted and read by unauthorized people. E-mail may be left open on the screen of a computer, allowing unauthorized individuals to see them. Computer terminals may be shared at work or at home, minimizing privacy.

Methods other than conventional e-mail are being studied and developed to address the concerns cited above, as consumer demand is so high. CHESS (Comprehensive Health Enhancement Support System) is a home-based interactive computer system developed at the University of Wisconsin-Madison to provide information, decision-making, and emotional support to people facing life-threatening illnesses.<sup>18</sup> A number of studies have reported its usefulness to patients by improving their quality of life and their utilization of health care.<sup>19-21</sup> More recently, a triage-based e-mail system was investigated in a case-controlled study at the University of Michigan and submitted to the *Journal of General Internal Medicine* for publication. In this study, Katz et al. found that e-mail increased the communication burden on physicians and staff and had little effect on physicians' or patients' attitudes toward communication. The study concluded e-mail was of limited use in improving the efficiency and effectiveness of clinical care.<sup>22</sup>

Secure web messaging offers another option to electronic communication by providing protected, encrypted communication. Messages can be automatically structured and triaged to appropriate staff, minimizing workload.<sup>13</sup> Websites can also provide education and other useful information. Because of their centralized

nature, they have the potential to be more consistent and reliable.<sup>23</sup> However, to the authors' knowledge, presently no studies are available about the performance of secure patient-provider Web messaging.

The RelayHealth system, developed by the RelayHealth Corporation (formerly Healinx Corporation) of Emeryville, California, provides web-based provider-patient communication services that are secure and clinically structured. Besides electronic messaging, the system offers non-urgent asynchronous consultations, appointments, medication refills, and preventive care reminders via an Internet browser. Security is achieved with 128-bit Secure-Socket-Layer (SSL) 3.0 encrypted messages and a secure server with a firewall blocking access to unauthorized individuals. The messages can be read only by the registered doctor, his/her authorized staff, and patients with their personal login name and password. The system allows providers to control which patients may have access to the services and to charge patients for message responses.<sup>24</sup>

This study evaluates this patient-physician web messaging system to determine how it satisfies patients' demand to communicate electronically with and have improved access to their providers; it also evaluates provider satisfaction and examines the impact on practice productivity. We hypothesized that productivity would not be impaired and might be enhanced through better use of "micro down-time," ability to batch-process messages rather than handling them one by one, decreased time and increased convenience of handling electronic messages over phone calls, and replacement of lower-level office visits with higher-level office visits to generate more revenue.

## Methods

The study was conducted at the UC Davis Primary Care Network (PCN) site located in Folsom, CA. The clinic provides internal medicine, family practice (IM/FP) and pediatrics services. The Pediatrics Department postponed initiation of the web messaging system due to administrative issues (MA and triage nurse positions were unfilled); thus, that department was not included in this study. Institutional Review Board approval was obtained.

The staff included 8 clinicians (7 physicians and 1 nurse practitioner), 9 medical assistants (MAs), and 4 clerical front office staff. All staff were provided with a PC, Internet browser software, and an Internet connection via T-1 line. They were also given the option of using a Citrix-delivered browser for Internet access that offered enhanced speed for those with older PCs. The staff was trained in groups to use the system for approximately one hour each.

The system was made available to the Folsom PCN patients in late November 2001. Patients were provided written information about arrival at the clinic and from mass mailings in January and March 2002. These patient

Table 1 ■ Provider and Staff Questions

1. How satisfied are you with your experience with the RelayHealth webVisit system?
2. How likely will you be to continue to use on-line communication with patients once the pilot is concluded?
3. How easy was it to use the RelayHealth webVisit system?
4. How has communication changed between you and your patients who use the RelayHealth webVisit system:
5. Since you began using the RelayHealth webVisit system, how has the number of *non-urgent* office visits changed among patients using the system?
6. As a result of using the RelayHealth system, how has the number of phone calls you receive from your patients changed?
7. How has use of the RelayHealth webVisit system affected the staffing resources of your office?
8. How would you rate communicating with a patient using the RelayHealth system compared to a phone conversation?
9. Please think about the last time you contacted a patient participating in the study by phone. Why did you use the phone rather than make the contact through the webVisit system? (Check all that apply)
10. Please think about the last time you responded to a patient's RelayHealth message by asking him/her to come to your office for a non-urgent office visit. Why did you want to see the patient in the office rather than make the contact through the webVisit system?
11. Which method would you most prefer to use when communicating with your patients about non-urgent health needs?
12. (Providers only): How important is it to you that you be reimbursed for the time you spend communicating with patients on-line?
13. Please share any suggestions you have for improving the RelayHealth webVisit system.

information materials were developed in conjunction with UC Davis Medical Center Administration, Risk Management, Compliance and Legal Departments to ensure compliance with AMIA guidelines<sup>5</sup> and HIPAA regulations.<sup>25</sup> Patients were instructed to self-register at the RelayHealth Website because, for security reasons, it was designed to support only registration of patients themselves. During registration patients read and agreed to the Terms of Use and Privacy Policy.

Although this web messaging system allows clinicians to charge patients for reading their responses, UC Davis decided not to have providers charge patients directly as a revenue tool. Instead, providers were instructed to consider charging only in an attempt to reduce excessive messaging behavior. No provider chose to use this tool during the study.

RelayHealth conducted two other simultaneous studies, in which UC Davis Folsom PCN clinic patients insured by a major PPO payer or employed by a Silicon Valley Employer Foundation company took part. UC Davis Folsom clinicians were reimbursed \$25.00 for each

online clinical consult performed with these patients, of which RelayHealth Corporation received \$5.00.

We collected data separately from the company studies. Message metrics were obtained from the RelayHealth Corporation every two weeks. These included number of patients enrolled and the total and type of message volume for each clinician in the IM/FP clinic. Face-to-face structured interviews also were conducted with all clinicians, MAs, and front office staff on their satisfaction in April 2002. The questions are listed in Table 1. Five-point Likert scales were used for most answers. Personnel were encouraged to expand on their answers, and their responses were noted. Data collected were entered into an Access 2000 (Microsoft Corporation, Redmond, WA) database.

E-mails were sent in June 2002 to Folsom PCN patients who had registered and selected a participating provider (645 e-mail addresses). These e-mails contained a link to a satisfaction survey. A second e-mail was sent to nonresponding patients one week later. Most answer choices were five-point Likert scales (Table 2). Responders' answers were entered into a database without patient identifiers and provided to study investigators in Excel 2000 (Microsoft Corporation, Redmond, WA) format for analysis.

Patient and provider surveys were examined to determine frequencies of responses. The Goodman-Kruskal Gamma measure of ordinal association was used to estimate the extent and direction of agreement between patient satisfaction and provider response time.

Relative Value Unit (RVU) reports were obtained from UC Davis Information Systems for the months preceding and during the study. The RVU report is used to determine physician productivity, and these numbers were normalized to HCFA 2002 equivalents. Monthly average visits/day, RVU/day, and RVU/visit were calculated for each physician and for the group of participating providers as a whole. Using paired two-tail t-tests, values obtained during the study period from December 01–May 02 were compared with values one year earlier for the five physicians employed at the clinic during both time intervals.

The Automated Call Delivery Performance (ACD) reports were similarly obtained to provide incoming call metrics, including possible changes in call volume, call abandonment rate, and length of time to answer calls. Unfortunately, unrelated factors led to personnel shortages during the study period. This had an equal negative effect on both IM/FP study physicians and non-study pediatricians at the same clinic site. Hence, potential changes in these call metrics could not be appropriately evaluated in this study.

## Results

### Message Metrics

Figure 1 reveals the total number of enrolled patients and the number of messages received from patients dur-

ing two-week time intervals from system initiation through 6/23/02. At the time of the patient survey, 826 IM/FP patients had enrolled in the system, and 2275 total incoming messages had been received. Of these, 398 were consults, 175 appointment requests, 120 test result requests, 112 medication refill requests, and 78 referral requests. During the final two-week period, 187 messages came in, and the most active web-messaging clinician, Physician B, received 63 messages and had 250 enrolled patients.

**Patient Survey**

**Response Rate.** 36.9% (238/645) of patients responded to the online survey. Not all responders answered each question.

**Rate of Use.** 49.6% (118) of responders reported having used the system once or twice. 26% (63) used it 3 or 4 times, 21% (50) used it 5 or more times, and 3% (7) had never used the system.

**Ease of Use.** 66.4% (154/232) of responders found the system “very easy” and 22.4% (52) found it to be “easy” to use. 3.0% (7) found it “somewhat difficult,” and only 1 responder reported the system to be “very difficult” to use, while 7.8% were “neutral.”

**Satisfaction.** Of 232 patients who used the system, Figure 2 shows that 61.2% (142) reported being “very satisfied” and 24.6% (57) “satisfied” with this method of communication. In contrast, 4.3% (10) were “somewhat dissatisfied,” and 1.7% (4) were “very dissatisfied,” while 8.2% (19) had no opinion. The main reason for dissatisfaction was the lack or slow response from the clinic.

**Response Time.** 13.0% (31/238) of patients reported getting a response to their message “right away” and 43.7% (104) “by the next business day.” 29.0% (69) wait-

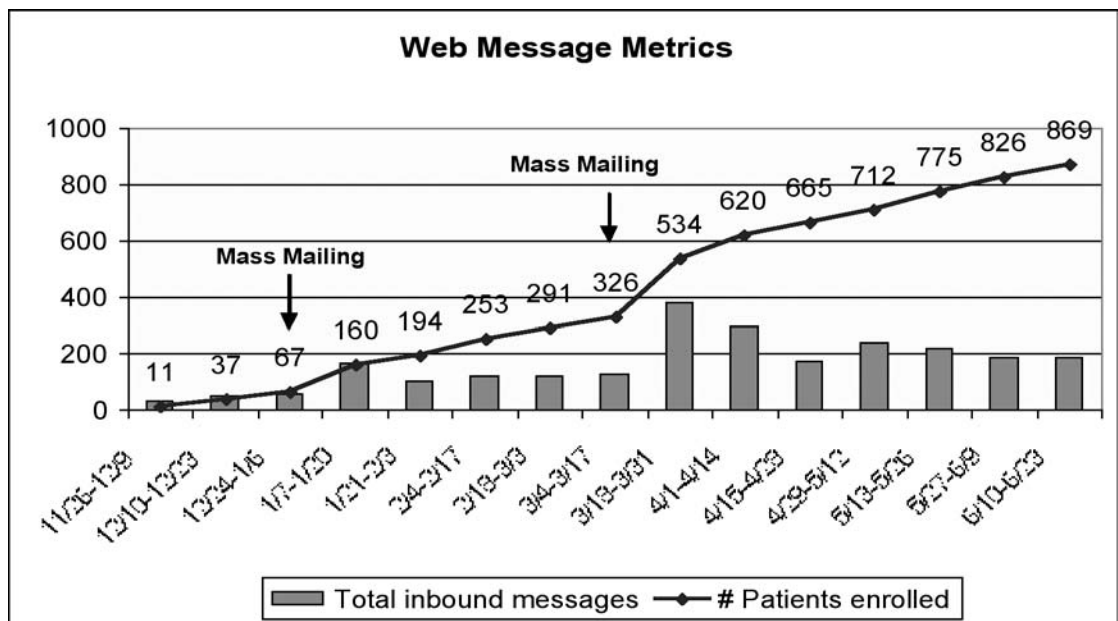
Table 2 ■ Patient Questions

1. How many times have you communicated with your UC Davis doctor using the RelayHealth webVisit™ system?
2. Overall how satisfied are you with the RelayHealth webVisit™ system as a method of communicating with your UC Davis doctor?
3. How would you rate the ease or difficulty of contacting your doctor using the RelayHealth webVisit™ system?
4. Typically, how much time passed between the time you sent your UC Davis doctor a message using the RelayHealth webVisit™ and the time you received a response?
5. How would you rate this method of communicating as compared to calling your UC Davis doctor on the phone?
6. Please think about the last time you contacted your UC Davis doctor’s office by phone. Why did you use the phone rather than make the contact through the webVisit™ system?
7. How would you rate your access to your UC Davis doctor now as compared to before you started using the RelayHealth webVisit™ system?
8. Please share any suggestions you may have as to how we can improve the RelayHealth webVisit™ system for patients like you.

ed “1-2 business days” and 9.2% (22) waited “over two business days for a response.” 5.0% (12) indicated they had not sent a message to their provider.

**Satisfaction to Response Time.** As Figure 3 shows, all patients receiving a response right away (31) were very satisfied and 73.8% (76) were very satisfied if they received a response by the next business day. The Goodman-Kruskal Gamma estimate of agreement between satisfaction and timely responses from providers was statistically different from zero and indicated a moderately high degree of ordinal association ( $\chi = 0.667, 95\% \text{ CI} = 0.546\text{--}0.789$ ).

Figure 1.



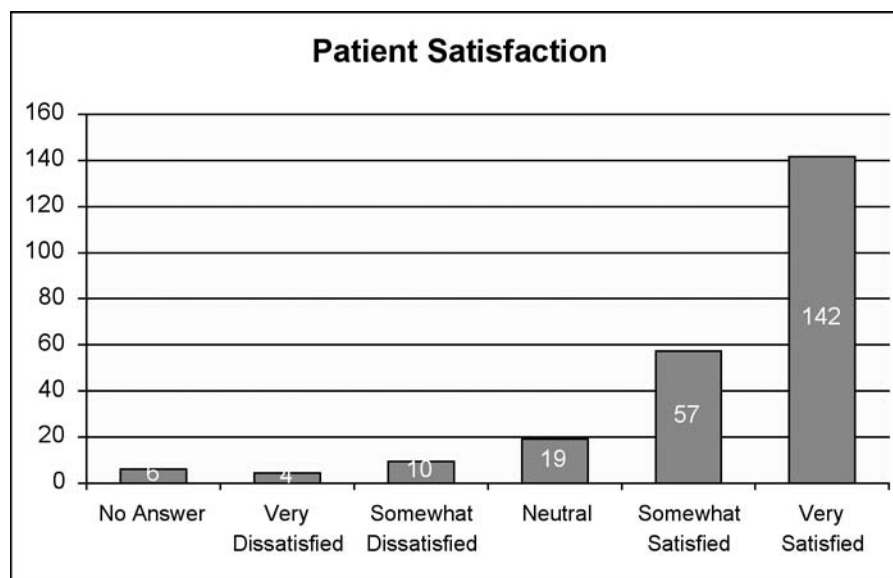


Figure 2.

**Compared with the Phone.** 50.4% (120/238) rated web messaging “much better” and 28.6% (68) rated it “better” than calling their doctor on the phone. 3.8% (9) thought it was “somewhat worse” and 2.5% (6) rated it “much worse” than the phone. Eight patients did not respond mainly due to not having messaged the clinic.

**Phone Rather Than Web Use.** When asked why they may have used the phone instead of the web to communicate with their doctor’s offices, most responded that it was because the electronic method was not in place yet. Other responses included wanting quicker answers than the system would permit and the phone being easier than explaining the problem in writing.

**Access to provider.** 44.1% (105/238) of patients stated access to their provider was “much better” and 34.5% (82) stated it was “better” with the system; 14.7% (35) reported access to be the same. In contrast, 1.7% (4) reported access to be “somewhat worse,” and only 1 (0.4%) responded access to be “much worse” with the system. Eleven patients (4.6%) did not respond to this question.

**Suggestions made by patients.** Quicker response times and adding additional features to the site such as links to lab results and medical records, were the primary suggestions made.

### Staff Survey

**Satisfaction.** Figure 4 provides the results of overall user satisfaction. Five of 8 clinicians (62.5%) were “satisfied,” and 1 (12.5%) was “very satisfied” with the system. The opinion of the remaining 2 was “neutral” (one of these had just started using the system the previous day). Three of four (75%) front office workers were neutral on this issue while the remaining clerk (25%) reported being satisfied. In contrast, only 2/9 MAs (22%) were

satisfied, while 2 were “dissatisfied” and 2 were “very dissatisfied.” Reasons cited for being displeased revolved around the inadequate speed of the computers and the extra workload involved.

**Likelihood of Continued Use.** After study completion, 5 clinicians (62.5%) indicated being “very likely” and 1 (12.5%) “somewhat likely” to continue using the system, the remainder being “neutral.” Three MAs (33.3%) reported being “very likely,” 1 (11.1%) “somewhat likely,” and 3 (33.3%) “not at all likely” to continue its use. Two clerical workers (50%) reported to be “little” and 1 (25%) “not at all” likely to do so.

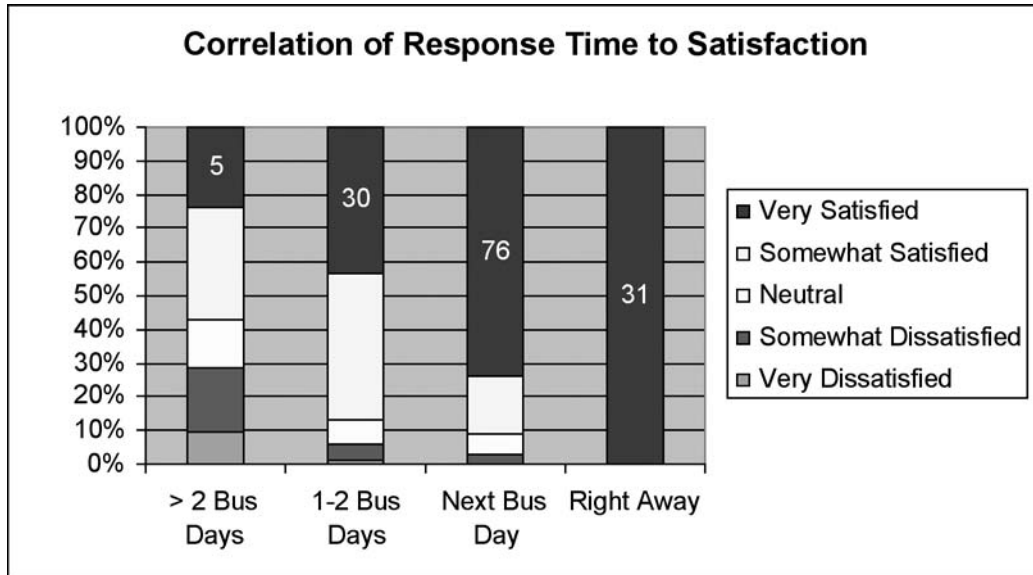
**Ease of Use.** Figure 5 shows how easy the staff considered the system to use. Eight staff members (38%) found the system “very easy” to use, and the same number found the system “easy” to use. Only two clinic personnel (9.5%) found it “difficult” to use.

**Communication Change with Patients.** Figure 6 shows three clinicians (37.5%) perceived communication was “better” and 2 (25%) believed it to be “much better” between themselves and patients using the system. Three front office workers (75%) also perceived “better” communication. Two MAs, (22.2%) felt communication with patients was “better,” 2 (22.2%) felt it was “much better” while 1 (11.1%) believed it had “gotten worse” and 1 (11.1%) thought it had “gotten much worse.”

**Change in Number of Non-urgent Office Visits.** There was no perceived change in number of non-urgent office visits by patients using the system by almost all staff. Only 2/21 (9.5%) personnel (both MAs) believed the number of office visits had decreased.

**Change in Number of Phone Calls.** 71.4% (15/21) of Folsom PCN clinic staff believed there was no change in

Figure 3.



the number of phone calls received from patients, while the remainder (4/8 clinicians and 2/9 MAs) believed the number of phone calls had decreased.

**Use of Staff Resources.** 52.4% of personnel (11/21) perceived no change in the use of staff resources with the web messaging system. Three believed it to be a better use of staff resources, while 7 believed it to be a poorer use (including 5/9 MAs) because there was more work to do.

**Comparison with Phone.** Figure 7 illustrates 38% (8/21) of clinic staff rated communicating with patients using web messaging "much better" than a phone conversation and 5 (23.8%) rated it "better." In contrast, only 3 (14.3%) believe it to be "much worse" and 2 (9.5%) "worse" than phone conversations. Interestingly, no clerical staff found this method worse.

**Phone response to Web Message.** Reasons why the clinic staff may have responded to a web message with a phone call primarily included speed (11), illness being

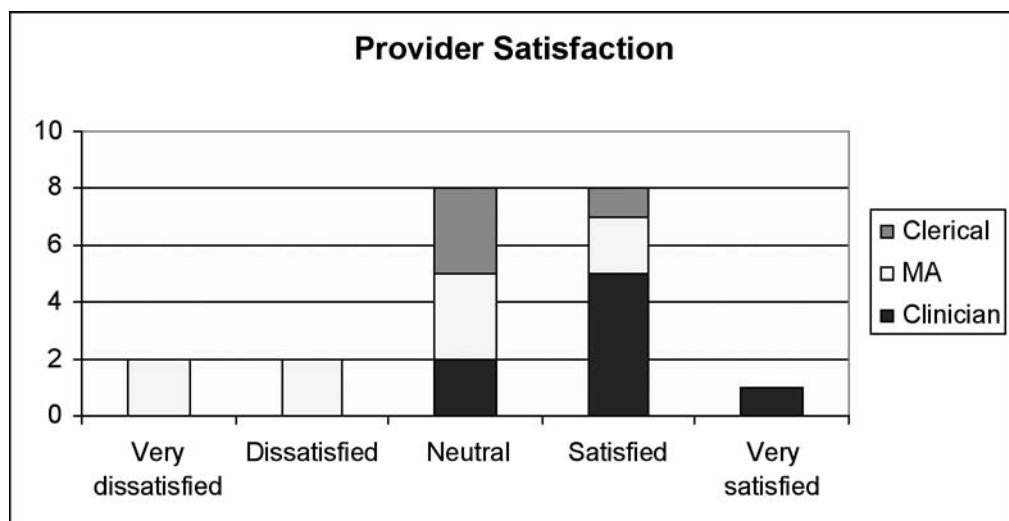
too urgent (9), and the impersonal nature of electronic communication (7).

**Office Visit Rather than Web Response.** When the clinic staff asked patients to come in for an office visit rather than providing an electronic consult, 80% (20/25) of reasons were due to the necessity of a physical exam or the illness being too urgent.

**Preferred Communication Method.** Figure 8 illustrates that the web was the preferred communication method for non-urgent problems by 11/21 (52%) of the staff, while 6 (28.6%) favored the phone, 2 (9.5%) preferred office visits and 2 had no preference.

**Reimbursement.** Four (50%) of clinicians reported it was "important" and 2 (25%) felt it was "very important" to be reimbursed for the time spent communicating with patients online. One felt it was of "little importance," and the final clinician was "neutral."

Figure 4.



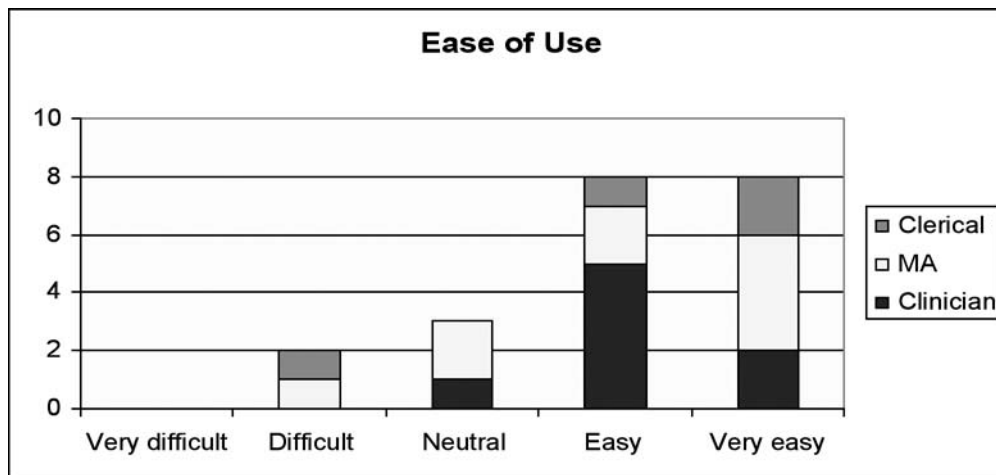


Figure 5.

**Suggestions.** Predominantly, suggestions involved improving the speed of the computers. Other ideas revolved around efficiency such as having one person handle all online messages and utilizing message alerts.

**Physician Productivity**

Table 3 shows the monthly average patient visits/day for each physician during the study period and the same months one year earlier. Each physician (for which data were available) had a higher overall average of visits/day for the five-month study period compared with the five-month period the previous year. The overall physician average for the two periods studied increased from 24.79 visits/day between December 2000 and May 2001 to 28.54 visits/day between December 2001 and May 2002 after the adoption of the Web messaging system and the paired t-test revealed this difference to be statistically significant ( $p = 0.02$ ).

Table 4 shows the monthly average RVU/workday for each physician during the study period and the similar five-month period one year earlier. Physician D did not work during May 2002; thus, corresponding data are

lacking. All five physicians had higher overall average RVUs per days worked from December 2001 to May 2002 compared with one year earlier. The overall average RVU/day for the 5-month periods increased significantly from 47.35 for December 2000–May 01 to 54.00 for Dec 2001–May 2002 ( $p = 0.005$ ).

Table 5 reveals the monthly average RVU/visit for Physicians A–E during the aforementioned two 5-month intervals. Again, no data are available for Physician D. Three of five physicians increased their monthly average RVU/visit during the study period compared with one year earlier. The overall average physician RVU/visit for the study period was 1.89 versus 1.91 for December–May the year before ( $p = 0.986$ ).

**Discussion**

Secure web messaging met patients’ demand for online interaction with their provider. There was high interest in the system as evidenced by the surges in patient enrollment following each of the two mass mailings. Over 80% of patients found the system easy to use, over 75% believed it had improved access to their provider, and over 85% reported satisfaction with it. As with the

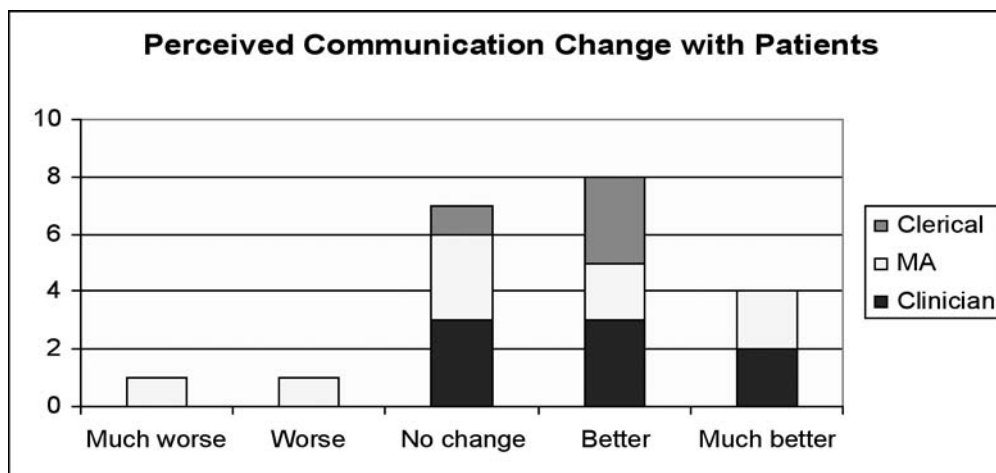
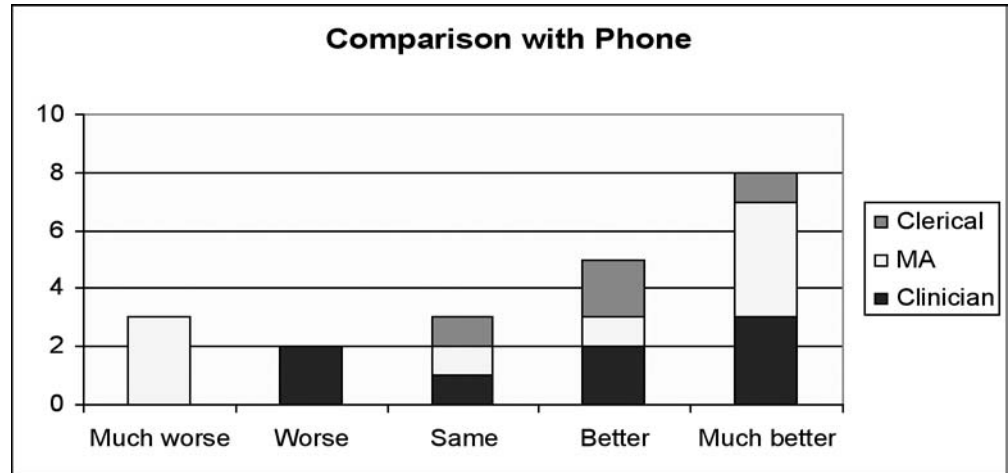


Figure 6.

Figure 7.



CHES system from the University of Wisconsin, increasing availability to health care was well received by patients.

Patient satisfaction was significantly associated with response time and decreased sharply as reported response time increased. Similarly, other studies report the importance of timely responses to e-mail queries. Sittig et al.<sup>6</sup> reported 83% wished to wait less than 48 hours for a response from their health care provider and Couchman et al.<sup>4</sup> revealed 70% of study participants wanted test results within 24 hours. Thus, if providers want to meet patient demand to communicate electronically, they must be diligent and attentive to answering messages in a timely manner.

Despite physicians' fears, clinicians were not inundated with electronic patient messages. Message volume increased far more slowly than did patient enrollment. Half of responding patients used the system only once or twice and fewer people used it more often. Physician B, with the greatest number of enrollees and web messaging activity, received only about 6 messages per busi-

ness day in the final two weeks of the study. Therefore, it seems that patients are no more likely to contact their doctor's offices electronically than by phone.

Physicians and staff were generally quite favorable to the web messaging system. Most found it easy to use and reported that it improved communication with their patients. Physicians were happy to be reimbursed for their clinical web visits. In contrast, fewer than 25% of MAs reported satisfaction. The primary source of their dissatisfaction was the slow speed of many of their PCs. Those with newer PCs reported fewer barriers to incorporating this technology in their workdays, spent less time checking messages and were also most satisfied. MAs also cited that as more patients use the system, economies of scale would make it more efficient to use web-communication, increasing their satisfaction.

Web messaging was preferred over phone calls for the communication of non-urgent problems by both providers and patients. In fact, more clinic staff favored this over any other method combined, and 79.0% (188/238) of patients found web messaging a better way

Figure 8.

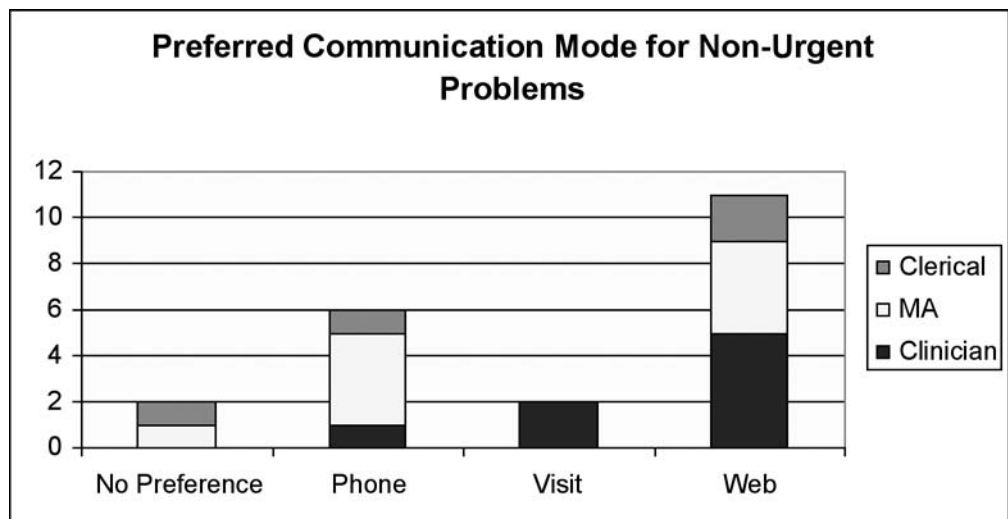




Table 3 ■ Visits per Day

	Physician A	Physician B	Physician C	Physician D	Physician E	Physician Average
Dec	13.81	19.08	18.56	19.13	12.71	16.64
Jan-01	26.30	30.00	30.56	37.94	24.27	29.51
Feb	32.95	28.06	25.65	31.40	23.47	27.76
Mar	19.33	24.39	22.92	27.57	22.00	22.97
Apr	21.85	28.96	25.95	28.75	22.83	25.25
May	21.37	23.90	26.00	32.65	25.81	25.91
<b>Dec-May01</b>	<b>21.91</b>	<b>25.88</b>	<b>25.01</b>	<b>29.74</b>	<b>22.13</b>	<b>24.79</b>
Dec	20.13	22.57	24.53	36.75	21.19	24.50
Jan-02	23.30	30.63	31.58	32.42	30.10	29.53
Feb	21.42	25.30	29.20	37.60	27.21	28.31
Mar	26.93	28.06	35.21	33.40	31.59	30.82
Apr	23.45	31.31	28.61	42.10	31.83	30.51
May	24.40	25.62	30.00	*	28.04	24.10
<b>Dec-May02</b>	<b>23.27</b>	<b>27.25</b>	<b>29.86</b>	<b>36.45</b>	<b>28.33</b>	<b>28.54</b>

p = 0.021

\*Physician D did not work during most of the month of May 2001.

to communicate with their physician. The phone was preferred only in situations in which personal contact was needed, for messages of a time-sensitive nature and when written explanations were too complicated or long. Similarly, as some worry that web messaging and consults may replace office visits altogether, this study supports face-to-face contact still to be the choice when physical exams are indicated and when the illness is urgent.

Based on our results, patients may be more comfortable using web messaging than conventional SMTP e-mail. Patients and providers have, until now, been reluctant

to widely utilize e-mail communication because of security, medicolegal, and other barriers that can be alleviated or diminished with this system. Also, the recent University of Michigan study concluded manually triaging SMTP e-mail messages to appropriate individuals was not efficient or effective.<sup>22</sup> In contrast, users in our study generally had a very positive reaction to this secure web messaging system.

Web messaging did not seem to have a negative impact on physician productivity. In fact, it may have had a positive influence on productivity as the average num-

Table 4 ■ RVUs per Day

	Physician A	Physician B	Physician C	Physician D	Physician E	Physician Average
Dec	26.74	35.35	33.87	33.56	21.93	30.27
Jan-01	47.87	52.71	53.44	92.02	41.38	56.50
Feb	52.40	47.07	47.26	72.67	41.87	51.76
Mar	35.27	44.78	43.08	78.08	44.92	47.58
Apr	40.38	54.84	52.15	58.55	43.69	49.12
May	37.49	41.75	47.85	61.21	45.54	46.77
<b>Dec-May01</b>	<b>39.31</b>	<b>46.25</b>	<b>46.28</b>	<b>65.98</b>	<b>40.49</b>	<b>47.35</b>
Dec	35.22	48.05	41.82	64.36	34.37	43.70
Jan-02	41.99	56.57	62.50	62.89	58.52	56.42
Feb	38.22	45.63	51.00	67.38	47.64	50.18
Mar	50.47	55.69	65.44	87.56	63.74	62.97
Apr	43.86	67.63	51.36	95.80	65.55	61.96
May	46.98	45.23	52.02	*	48.11	44.68
<b>Dec-May02</b>	<b>42.79</b>	<b>53.13</b>	<b>54.02</b>	<b>75.60</b>	<b>52.99</b>	<b>54.00</b>

p = 0.005

\*Physician D did not work during most of the month of May 2001.

Table 5 ■ RVUs per Visit

	Physician A	Physician B	Physician C	Physician D	Physician E	Physician Average
Dec	1.94	1.85	1.82	1.75	1.72	1.82
Jan-01	1.82	1.76	1.75	2.43	1.70	1.91
Feb	1.59	1.68	1.84	2.31	1.78	1.86
Mar	1.82	1.84	1.88	2.83	2.04	2.07
Apr	1.85	1.89	2.01	2.04	1.91	1.95
May	1.75	1.75	1.84	1.88	1.76	1.81
<b>Dec-May01</b>	<b>1.79</b>	<b>1.79</b>	<b>1.86</b>	<b>2.22</b>	<b>1.83</b>	<b>1.91</b>
Dec	1.75	2.13	1.70	1.75	1.62	1.78
Jan-02	1.80	1.85	1.98	1.94	1.94	1.91
Feb	1.78	1.80	1.75	1.79	1.75	1.77
Mar	1.87	1.98	1.86	2.62	2.02	2.04
Apr	1.87	2.16	1.80	2.28	2.06	2.03
May	1.93	1.77	1.73	1.43	1.72	1.85
<b>Dec-May02</b>	<b>1.84</b>	<b>1.96</b>	<b>1.81</b>	<b>2.03</b>	<b>1.85</b>	<b>1.89</b>

p = 0.986

\*Physician D did not work during most of the month of May 2001.

ber of clinic visits per day and RVU/day during the study period increased significantly compared with one year earlier. However, it is too early to say that this increase was solely due to web messaging, as other factors not measured in this study may have influenced the numbers, such as perhaps longer work hours. Interestingly, Physician B with the most web messaging activity also had the highest increase in RVUs/visit during the study period. A possible explanation is that lower intensity encounters, such as self-limited conditions and medication refills, moved out of the office and onto the web. The Sacramento area is currently experiencing a primary care physician shortage.<sup>26</sup> If appointment openings were created, they were likely filled with higher-need patients. Therefore, web messaging may have improved access to physicians both for users of the web messaging system and for sick patients who might otherwise have had to wait longer to see their physician.

### Limitations

We have assumed patient survey information collected from RelayHealth is accurate. We believe this assumption is reasonable, considering both patients and providers provided similar responses to similar questions, but cannot be sure.

While 826 patients were enrolled in the system, only 645 e-mail surveys were sent out. This was due to multiple patients having the same e-mail address, as is often the case with family members. Based on the number of surveys sent to patients, the response rate of 238 was equal to 36.9%. However, based on the total number of enrollees, only 28.8% provided their opinions. It is difficult to estimate if this is a representative sample of enrolled patients or if there was respondent bias.

Whether information from this study can be generalized to other clinics and other communities is difficult to determine. Folsom, CA is a technology-friendly area, and the opinions of this patient population may not reflect those of other areas. Also, the sample size of providers and staff was relatively small, since this was a pilot study.

A follow-up study would be helpful for several reasons. It may provide information about whether opinions are different after greater numbers have used this type of communication for a longer period of time. It may also provide further important information about office productivity, such as whether web messaging had an effect on the number of phone calls, hold times, and call abandonment rates and whether RVU data do indeed improve.

### Conclusion

Patient demand for electronic access to their provider is high; however, many barriers exist with conventional e-mail, making it unsatisfactory for widespread use. The secure web messaging system tested at the UC Davis Folsom PCN clinic may be a solution to this demand. Patients are satisfied with it, provided clinicians respond in a timely manner, and the system is acceptable to physicians. It is an improvement over conventional e-mail because it provides (1) security with encryption capability and access controls, (2) an embedded workflow engine whereby patients select message types allowing for customized routing, (3) rich knowledge content including patient education and pharmacy information, structured data entry and message templates, and (4) insurance reimbursement. Furthermore, it does not hurt clinic productivity. This combination seems to make the difference in the acceptance of elec-

tronic communication between health care providers and their patients.

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