

MyChart—A New Mode of Care Delivery: 2005 Personal Health Link Research Report

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Introduction

MyChart is one of the new, innovative features of Kaiser Permanente (KP) HealthConnect—the comprehensive, integrated, organizational, and personal electronic health and medical record. *MyChart*, an Epic Systems Corporation (Verona, WI) product, is a secure member Web site where registered patients can view portions of their medical record, and exchange secure messages with their primary care physician (PCP) and other recently visited clinicians.

The KP Northwest (KPNW) Region, in Portland, Oregon, was the first KP Region to implement *MyChart*. Starting in late 2002, KPNW initiated a pilot project of *MyChart* as a stand-alone Web address in two medical offices.¹ KPNW named this feature Personal Health Link (PHL). By early 2005, all adult primary care physicians and affiliated clinicians (both groups are PCPs in this paper) were trained and set up to use PHL. Patients who registered for PHL could

send secure e-mail messages directly to their primary care clinician, incurring no copayment or fees. *MyChart* is now available to KP patients in all Regions, except Ohio, through KP HealthConnect online at www.kp.org.

Methodology

In 2005, a comprehensive evaluation of the PHL secure messaging between adult KP patients and 263 PCPs was conducted^a with Institutional Review Board approval. There were three sources of information for this evaluation.

eEncounter Survey

Patients' perceptions of e-mail encounters with their PCP were collected using an e-mail encounter survey (eEncounter) developed for this study (Table 1). In this study an e-mail "encounter" began with a message from a patient to his or her PCP, and included any follow-up messages sent by the patient or the PCP as a result of that first message.^b

The final questionnaire was developed on the basis of a review of published literature,²⁻⁷ discussions with clinical staff, and a pilot test, which included two rounds of cognitive interviews with patients who had e-mailed their PCP.

An invitation to participate in an online questionnaire was e-mailed to a random sample of 2677 patients

Table 1. eEncounter survey measures
The key outcome measure was satisfaction with the e-mail exchange. The measures in the four subsections were:
<p>1. <i>Attributes of eEncounter</i></p> <ul style="list-style-type: none"> • Completeness of PCP's responses • Timeliness of PCP's responses • PCP's use of hard-to-understand medical terms • Courtesy of PCP's responses • Whether e-mail exchange yielded the results the member wanted • Amount of influence member had in decisions
<p>2. <i>Profile of eEncounter</i></p> <ul style="list-style-type: none"> • Primary and secondary reasons for e-mailing PCP • What member would have done if not possible to e-mail their PCP • Number of messages sent and received • Who sent e-mail to PCP • Preference if PCP is out of office
<p>3. <i>Demographic and Health Status Information</i></p> <ul style="list-style-type: none"> • Overall health status • Have chronic disease • Current number of prescriptions • Visits to PCP in prior 12 months • Age, gender, and education
<p>4. <i>Overall Opinion of KP</i> (Questions taken from the KPNW Medical Office Visit Survey)</p> <ul style="list-style-type: none"> • How likely to recommend KP to family or friends • Satisfaction with ability to get needed care from KP • Rating of PCP's knowledge of member's medical history



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Table 2. Content of analysis of e-mail encounters

<p>Elements of <i>patient messages</i> to their primary care clinician:</p> <ul style="list-style-type: none"> • New versus existing problem • Definite or diffuse requests or complex, open-ended questions • Desired action: clinical assessment, clinical decision, or clinical action • Update on their current condition (eg, blood sugar levels)
<p>Elements of <i>PCP responses</i> to their patients:</p> <ul style="list-style-type: none"> • Responses involved nonclinical, low-clinical or high-clinical answers • Responses addressed all or part of patients' questions and requests • Patients received what they requested • Tone and style of PCP responses • Patient-centered behaviors

Table 3. Log template

The type of encounter: phone, e-mail, or visit
The length of time to complete each encounter including review of the medical record and placing orders
Whether the member was paneled to the clinician
Who initiated the encounter and the type of request
Level of staff involvement in preparing the encounter
The type of clinical decision: nonclinical, low-clinical intensity and high-clinical intensity
What the encounter would have been in an ideal practice
For PHL encounters, what the encounter would have been if PHL had not been available

who had e-mailed their PCP during the period of July 2005 through September 2005. Each sampled patient received an invitation within two weeks of the completed e-mail encounter with his or her PCP. A link to the online questionnaire was embedded in the invitation e-mail along with reference to a specific e-mail exchange: name of recipient's PCP and date of first e-mail message. The survey had a 64% response rate, with 1711 returned questionnaires.

Content Analysis of E-mail Encounters

The e-mail encounters of 476 randomly selected eEncounter Survey respondents were analyzed to better understand the elements of e-mail exchanges that explain the differences in patients' satisfaction. The encounters analyzed were those about which the patients were surveyed, and consisted of nearly 690 patient messages and 750 PCP messages. Patients reporting lower satisfaction

with their e-mail encounter were oversampled to support a comparison of lower- and higher-satisfied patients. The coding form used for the evaluation in the PHL 2003 Pilot¹ was refined for this study; coding was conducted by four Registered Nurses, from the KPNW Center for Health Research, who were specially trained to build inter-rater reliability (Table 2).

PCP-Recorded Encounters

To estimate the time it takes clinicians to complete e-mail and telephone encounters, 22 KPNW PCPs in Oregon agreed to keep logs of all their patient encounters, and the work activity related to these encounters, for a period of two to four days. The 11 Portland PCPs were active PHL users, with at least 20% of their panel registered for PHL and receiving at least three messages per day. The 11 Salem PCPs, who practiced in a medical office 40 miles from Portland, were infrequent PHL users. Each study group logged about

1200 patient encounters: patient- or PCP-initiated phone calls, e-mail messages, and office visits.

The log template (Table 3) developed for this study enabled PCPs to record, in sequential time increments, all activities of a PCP workday at the patient level, as well as batched clinical work and administrative work. Each participating PCP received one-on-one training in how to consistently log their activities.

This part of the evaluation is a case-study design and the time estimates should be considered illustrative, not definitive and generalizable. The results are based on a convenience sample of 22 PCPs. The lengths of time to complete encounters vary greatly by practice style, and there was an insufficient number of PCPs to control for practice style differences.

Results

PCP Users of PHL

In 2005, 263 KPNW adult PCPs in Portland and Salem, OR, and Southwest Washington, had PHL available for use. The majority of these PCPs (63%) were low-level adopters, with fewer than 15 e-mail encounters per month. Only 7% of PCPs were "high adopters"—at least 15% of their panel registered for PHL and they received at least 40 e-mail encounters per month. The remaining 30% of PCPs were "medium adopters"—at least 15% of their panel registered for PHL but they received only 15 to 40 e-mail encounters per month; or at least 40 e-mail encounters but less than 15% of their panel registered for PHL (Figure 1). It is interesting to note that PCPs who have historically scored higher on the ongoing, Art of Medicine survey (ie, office-visit patient satisfaction) were not more likely to use secure messaging.

The lengths of time to complete encounters vary greatly by practice style ...

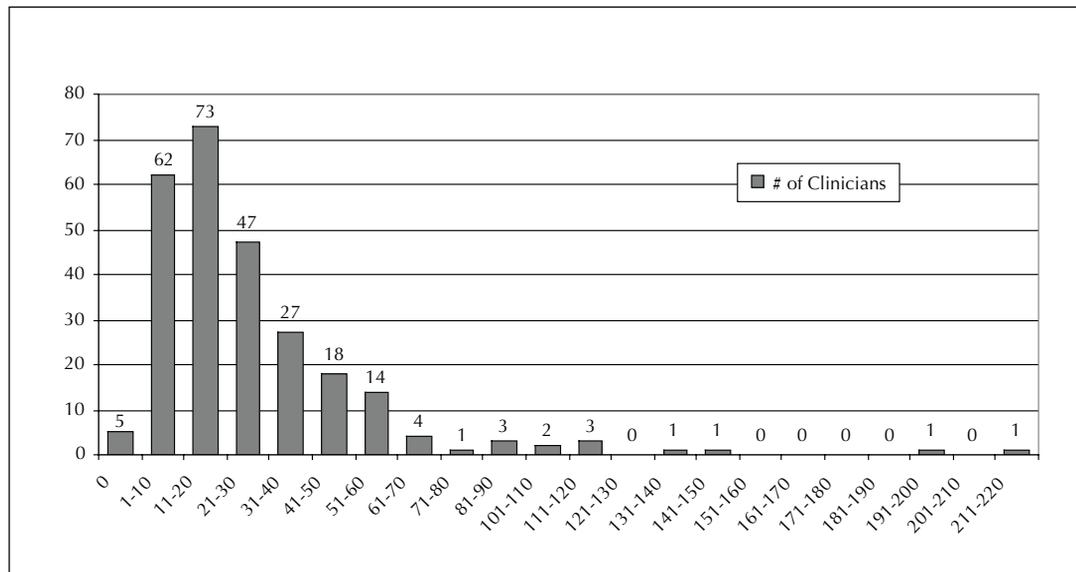


Figure 1. Use of Personal Health Link by PCPs.

Number of e-mail encounters in January 2006 by number of PCPs (total 263). Average of 27 encounters per PCP.

... there was no difference in the rate of messaging between men and women after adjusting for age and health ...

Patient Users of PHL

During the study period patients who were paneled with a PCP were eligible to register for PHL. As of September 30, 2005, there were 16,990 PHL users representing 5% of all 337,423 adult paneled patients in the KPNW Region. Older patients—women 45-64 years old, and men over 45 years—were more likely to register for PHL than other age groups; these age groups comprised 44% of paneled patients, but 62% of PHL users. Patients with chronic diseases were also more likely to register than other groups; for example, patients with diabetes represented 8.7% of paneled patients, but 13.6% of patients registered for PHL.

Women were somewhat more likely than men to register with PHL (5.6% vs 4.4%). However, there was no difference in the rate of messaging between men and women after adjusting for age and health status. Of those who were registered with PHL, 62% had sent at least one message to their PCP.

Profile of Patient-Initiated E-mail Encounters

Slightly more than two-thirds (68%) of e-mail encounters involved one member message and one clinician response. Another 20% of e-mail encounters consisted of two member messages and two or more PCP responses. Often the reason for multiple clinician responses is that the initial response was an out-of-office automatic reply. Less than 10% of e-mail encounters had three or more member messages.

Reasons Patients E-mailed PCPs

Slightly less than half (45%) of encounters began with a clear request—the patients knew what they wanted. However, 34% of the encounters began with diffuse, open-ended or complex questions. The vast majority (75%) of e-mail encounters were for ongoing medical problems or care plans, while nearly one quarter were concerning a new medical event, condition, or symptom.

When patients e-mailed their PCP

they typically reported more than one reason for the e-mail. Nearly one-third (31%) reported that they had two reasons for e-mailing their PCP and 38% reported three or more reasons. The five leading primary reasons for patients to e-mail their PCP were: report a change in a condition, 16%; discuss lab results, 14%; discuss a new condition, 12%; discuss changes in prescription dose, 11%; and discuss need for new prescription, 10%.^c

E-mail messages from patients were clinically relevant; 63% of patient-initiated e-mail encounters required clinical assessments or decisions. Another 24% of e-mail encounters were requests that required clinical actions (orders, tests results). Less than 5% of patients mentioned a nonmedical reason for e-mailing (Figure 2).

Member Satisfaction with PHL

Overall patients were extremely satisfied with e-mail exchanges they had with their PCP; the vast majority (85%) rated their encounters 8

or 9 on a 9-point satisfaction scale (70%-9; 15%-8). Satisfaction was positively associated with whether all of the patient's questions were answered, completeness of answers, timeliness of PCP response, whether the e-mail exchange yielded the results the patient wanted, courtesy of PCP response, and the amount of influence the patient wanted and had in decisions (all statistically significant at $p < 0.01$).

Satisfaction was not associated with the specifics of patients' requests, such as whether the member e-mailed about a new or ongoing problem, and whether the requests were complex or open-ended. Satisfaction was not associated with the following characteristics of PCP responses: clinical intensity of the assessments or actions, use of slang (eg, abbreviations commonly used in e-mails), grammar and spelling errors, or whether the exchange included an out-of-office auto reply.⁴ Almost none of the patients (2%) reported that their PCP used medical terms that they did not understand. Interestingly, PCPs' historic *Art of Medicine* scores are not a predictor of patients' satisfaction with their e-mail encounters. This suggests that the skill set required for a successful e-mail encounter is not the same skill set required for a successful in-person office visit.

PHL and Overall Satisfaction with KP

Patients less satisfied with their e-mail encounters were also less satisfied with KP in general. For example, only 34% of patients who were less satisfied with their e-mail encounter (gave a score of 6 or lower on a 9-point scale) indicated that they would definitely or very likely recommend KP to family or friends. Whereas 70% of members who were very satisfied with their

e-mail encounter (gave a score of 7, 8 or 9) indicated that they would definitely or very likely recommend KP. This evaluation was not designed to study the causal relationship between patients' overall satisfaction with KP and satisfaction with e-mail encounters. Over time one would expect that repeated positive experiences with e-mail encounters would increase patients' overall satisfaction with KP. On the other hand, one would expect that patients who were very satisfied with KP, and liked their PCPs, would be more likely to give high ratings to their PCPs' performance in e-mail encounters.

However, the content analysis of e-mail encounters provides some insights into this relationship. The content analysis found no substantive or significant differences between high- and low-satisfaction e-mail encounters, in either the member messages or PCP responses. Therefore, the ratings of e-mail encounters appear to be more a function of patients' perceptions of the e-mail encounters, than of observ-

able differences between encounters. Patients' perceptions of these encounters are possibly influenced by their prior experiences with their PCP and KP, and not just by what occurred during these encounters. Patient satisfaction scores may be subject to inertia—eg, it may take several positive, better than expected experiences before a patient who has been somewhat dissatisfied will give a PCP a higher rating.

Timeliness of PCP Responses

Patients sending secure messages to their PCP were told that they would receive a response from their PCP within two business days. Forty percent of patients reported receiving their PCP's responses within eight hours, and nearly 75% of patients reported receiving responses within 24 hours. Only 4% reported waiting over 48 hours. Nearly nine out of ten patients rate their PCP's response times as excellent if the responses come within 24 hours. Patients' ratings of PCPs' response times

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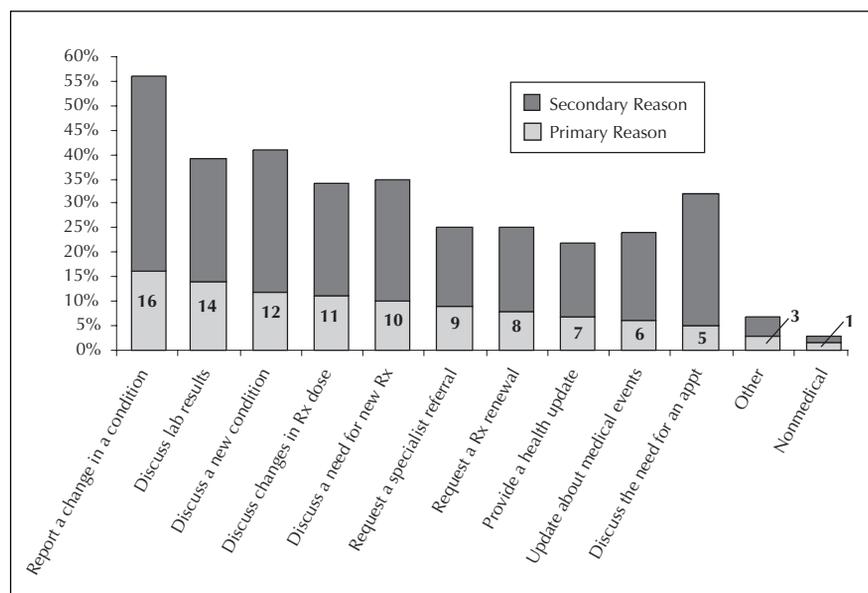


Figure 2. Reasons patients e-mailed their PCP. Rx = prescriptions.

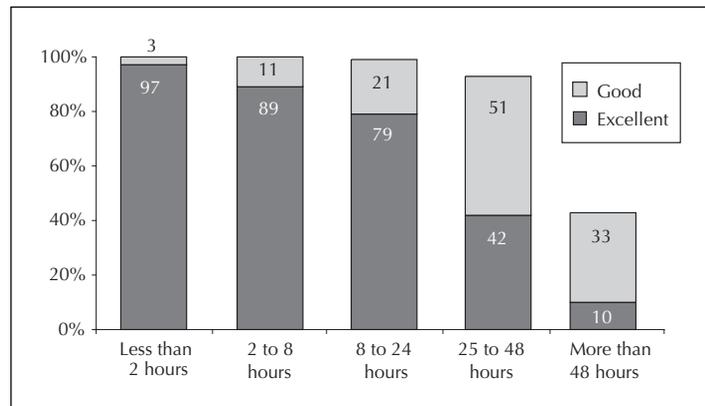


Figure 3. Timeliness of PCP response.

begin to fall sharply after 24 hours; although the vast majority of patients still rate response times as good or excellent if they receive their PCPs' responses within 48 hours (Figure 3).

Impact On PCP Workload Number of Messages Sent

On average, PHL users sent their PCP 0.35 messages per user per month, or approximately 4.2 messages per year. This represents about 2.9 e-mail encounters per PHL user per year—the average e-mail encounter with a PCP involves about 1.4 member messages. Although older patients were somewhat more likely to register for PHL, they tended to send fewer messages. PHL users age 35 years or less sent 0.42 messages per month; PHL users age 45 years or older sent 0.33 messages per month.

PHL Effect on Office Visits and Telephone Visits

One concern expressed regarding e-mail messaging is that it will lead to a large, and often inappropriate increase in the demand for care.^{6,8} This study found strong evidence that e-mail encounters reduced office visits and telephone calls to KP.

Patient Perspective

From the patient perspective, many thought using PHL did sub-

stitute for office visits. When asked what they would have done if e-mailing their PCP had not been available, 25% said they would have scheduled an appointment and 3% stated they would have walked in for unscheduled medical care. Although many of these calls for appointments might have been resolved on the phone by the doctor or an advice nurse, this high percentage reflects the high value patients have for secure messaging. In addition, 44% of patients said they would have called their PCP's office for advice and 18% stated they would have called the advice nurse.

Eleven percent of patients indicated they would not have contacted KP for care if e-mail had not been available. These patients' e-mails contained fewer questions and requests than other patients' e-mails, but their reasons for e-mailing were similar and clinically relevant. (Table 4)

PCP Perspective

PCPs who kept time logs of all patient encounters observed that the profile of patients' requests was very similar for e-mail encounters and patient-initiated phone calls. These PCPs indicated that nearly all low clinical intensity e-mails, and most of the higher clinical intensity e-mails, would have been

patient-initiated phone calls if PHL had not been available.

Utilization Data

A separate component of the 2005 PHL Evaluation compared primary care office visit rates and phone call rates by PHL users prior to and after registering for PHL, with those from a matched control group.⁹ This analysis found a 7-10% reduction in primary care office visits for PHL users (statistically significant at $p < 0.005$).^c This finding is based on patients who accessed any of the PHL features at least once, but not necessarily secure messaging.

In addition, PHL substituted for some of the scheduled telephone visits and other telephone calls documented in KP's electronic medical record system (KP HealthConnect). While the overall number of documented calls increased during the evaluation period (due to administrative changes at the call center), the documented calls for PHL users increased half as much as the control group—16% versus 30%. One limitation of this analysis is that only a fraction of phone calls to PCPs are documented in HealthConnect, although the clinically relevant calls are more likely to be documented.

Of note, PHL users are sicker than the general KPNW membership; the prediction of visit substitution amount needs to be adjusted according to the patient mix as well as the level of secure messaging use.

Efficiency: PHL Compared to Phone Calls

An important factor for determining the workload impacts of secure messaging is the relative efficiency of e-mail and phone encounters. This study found little difference in the average time for clinicians to complete an e-mail encounter and a simi-

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lar patient-initiated phone encounter. The estimates of how long it took PCPs to answer an e-mail encounter are based on time log data recorded by 22 PCPs—11 high-volume PHL users, and 11 infrequent PHL users. Total resolution of e-mail encounters took the PCPs an average of 5.7 minutes, including research and other work involved in the response. Total resolution of telephone encounters took the PCPs an average of 5.4 minutes. Because of the small number of PCPs in this case study and the wide variation in clinician practice styles, the average times reported here may not be predictive of overall PCPs. The particular value of this case study is the comparison of times to answer e-mail encounters and telephone encounters.^f

Factors Affecting Efficiency

Work time per e-mail encounter increases as clinical intensity increases: high clinical intensity encounters took over eight minutes to complete. Work time per telephone encounter showed a similar increase with clinical intensity. The work time per telephone encounter was also higher when the PCP directly talked with the patient, rather than relaying a message through a nurse or medical assistant. In this case study, there was no difference in the work time for e-mail encounters and the telephone encounters in which the PCP spoke directly with the patient.

Conclusions and Recommendations Use of Secure E-mail Messaging

During the first year that secure e-mail messaging was available to all PCPs in KPNW, the majority of PCPs were cautious about encouraging their patients to use e-mail messaging. At the end of the first year

of PHL's widespread availability, over 60% of PCPs had less than 15 e-mail encounters with patients per month, and only 5% of eligible patients (adult patients paneled with a PCP) were registered for PHL. This low level of adoption may in part be explained by the concerns of many PCPs that patients would overwhelm them with e-mails—many inappropriate—and without compensating declines in demand for office visit and telephone encounters. In addition, patient registration was also a barrier, as system design issues prevented PCPs from registering patients during an office visit.

Low use of PHL also reflects weak patient demand for e-mail encounters, in part from lack of awareness of this new service. Furthermore, many patients were discouraged from registering for PHL because of delays in the registration system. Patients wanting to e-mail their PCP for the first time must wait at least one week after registering online to receive a secure password, which is mailed to their home address.^g Frustrated, many patients call or come in for an office visit, without completing their online registration. Not surprising, patients most likely to register for PHL, and use secure e-mail messaging, had greater health care needs—older age, chronic conditions, and higher office visit utilization.

In contrast to PCP concerns, this study found that patients used e-mail messaging appropriately—seeking answers to clinically relevant questions. Nearly all patient-initiated e-mail encounters inquired about an ongoing medical problem or care plan, or a new medical problem. Less than 5% of e-mail encounters contained nonmedical requests or questions. On average PHL users sent 4.2 messages to their PCP per year—less than three e-mail encounters per year—the vast major-

Table 4: Patient description of potential action if e-mail encounter had not been available

Demand	Reason
44 %	Called PCP's office for advice
25 %	Scheduled an office visit
18 %	Called KP advice nurse
11 %	Would make no contact
3 %	Walk in for unscheduled medical care

Note: Percentages do not add up to 100% due to rounding.

ity not new demand. This study found strong evidence that patients who message through PHL reduced their primary care visit rate, and that PHL messages largely replaced phone calls. Furthermore PCPs could complete e-mail encounters in a time comparable to patient-initiated phone encounters. However, patients reported 11% of the encounters represented new demand—they would not have contacted KP otherwise.

What is the effect of secure e-mail messaging on PCPs' workload? Although this study found evidence that secure e-mail messaging *could* save PCPs' time, a definitive answer requires more information: 1) the precise extent that e-mail encounters substitute for office visits or telephone encounters, and 2) the actual time for PCPs to complete e-mail encounters versus comparable office visits or telephone encounters. Both of these depend on how PCPs work with their support staff to handle patients' calls, and which calls shift to e-mails. In particular, do patients' e-mails to their PCP cover the types of requests for which PCPs would call the patients directly, or the types of requests that the PCP would hand-off to their support staff?

Variation in PCP preferences and practice style, and confidence in their support staff, will determine the answers to these questions. Furthermore, secure e-mail messaging will have a changing impact over time on PCP workload, because of wider

Work time per e-mail encounter increases as clinical intensity increases ...

Patients were highly satisfied with the e-mail exchanges they had with their PCP. They were particularly satisfied that e-mail messaging allows them to conveniently communicate directly with their PCP.

adoption among patients and PCPs, and changes in how patients and PCPs use this new communication technology. For example, current users of secure e-mail messaging are sicker than the general population; so their current experiences may not accurately predict visit substitution for the general population. Finally, the answer will also depend on institutional parameters, such as the ease of telephone access to PCPs.

Secure E-mail Messaging and Patient Satisfaction

Patients were highly satisfied with the e-mail exchanges they had with their PCP. They were particularly satisfied that e-mail messaging allows them to conveniently communicate directly with their PCP. The most important factors associated with higher satisfaction are: all of their questions were *answered*; *completeness* of answers; *timeliness* of PCP responses; the e-mail exchange achieved the *results* the patient wanted; *courtesy* of responses; and the amount of *influence* they wanted and had in decisions.

Satisfaction was *not* associated with: the *specifics* of patients' requests—new versus ongoing problem; or whether *complex or open-ended* requests. Satisfaction was also *not* associated with the following characteristics of PCPs' responses: clinical *intensity* of the assessments or actions, use of *slang* (eg, abbreviations commonly used in e-mails), grammar and *spelling errors*, or whether the exchange included an out-of-office *auto reply*.

Interestingly, PCPs' scores on office visit patient satisfaction were not predictive of their patients' satisfaction with e-mail encounters. This suggests that the skill set required for a successful e-mail encounter is not the same skill set required for a successful office visit.

This evaluation reflects the experience of early-adopter patients (who were sicker than average patients), and of early-adopter PCPs. These findings are the best information available about the impact of secure e-mail messaging for KP patients, PCPs, and the KP care delivery system. However, these findings may not be predictive of future impacts, as secure e-mail messaging is used more broadly by patients, and as PCPs and support staff become more efficient and creative. Continuing to measure how much secure e-mail messaging substitutes for office visits and phone calls is crucial, as well as evaluating possible shift of work between PCPs and support staff. Finally, this evaluation was limited to adult primary care; similar evaluations should be considered as e-mail messaging spreads to pediatrics and specialty care departments. ❖

- ^a Although not part of this evaluation, 350 adult specialty physicians were added to PHL in 2005.
- ^b An e-mail encounter can also start with a message that a clinician sends to a patient. However, during this study period physician-initiated e-mail encounters were rare.
- ^c There was a high level of consistency in patients' self-reported reasons for e-mailing their PCP and the reasons documented in the content analysis.
- ^d The out-of-office auto reply informs patients that their PCP is away from the office until a specific date, and that the PCP will respond after s/he returns. The message also instructs patients to call their PCPs' office if they need help before their PCP returns to the office.
- ^e Primary care visits include primary care daytime visits, urgent care visits, and visits to KPNW emergenciers.
- ^f During the evaluation, PCPs could not place orders from within a PHL encounter, increasing the time required to resolve the e-mail encounters when orders were required.
- ^g Focus groups with KPNW patients conducted by KP's National Market

Research Department found that many patients were unaware of the option to send secure e-mail messages to their doctors, and that many others were discouraged from registering for PHL (ie, MyChart) because of the long wait to receive their password.

Acknowledgments

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