If You Build It, Will They Come? The Kaiser Permanente Model Of Online Health Care

As consumers increasingly adopt online health care services, the lessons learned at one large health care delivery system can instruct other health care providers, large and small.

by Anna-Lisa Silvestre, Valerie M. Sue, and Jill Y. Allen

ABSTRACT: Although health care has lagged behind other industries in adopting online services, consumers will embrace online tools such as obtaining results of lab tests, scheduling appointments, and doctor-patient e-mail. Many challenges in using health care technology faced by small and midsize medical practices can be overcome by examining how Kaiser Permanente and other large integrated health systems handle the same problems. Collaboration among providers, combined with government support, will help advance widespread consumer adoption of online health care. [*Health Affairs* 28, no. 2 (2009): 334–344; 10.1377/hlthaff.28.2.334]

Consumers today have unparalleled access to health information on the Internet, and there is extensive research literature on how electronic health systems are driving the transformation of health care delivery. Much of this work, however, is focused on the impact of health information technology (IT) on health care providers and organizations. Less is known about the consumer side of the equation.

With several years of consumer-level data from the most actively used electronic personal health record (PHR) in the world (that of Kaiser Permanente), many questions can be answered about consumers' online health behavior. For example, are consumers adopting online health services at the same rate they are using online banking and shopping? Which online health services are they using? What key factors contribute to consumers' acceptance of online health services? In this paper we examine Web-site usage and survey data from Kaiser Permanente to investigate these issues.

Patient-centered health IT, also known as Health 2.0, engages patients in their

The authors are all affiliated with Kaiser Permanente in Oakland, California. Anna-Lisa Silvestre is vice president, Online Services. Valerie Sue (valerie.m.sue@kp.org) is a consultant, Internet Services Group. Jill Allen is manager, Web Analytics, in the Internet Services Group.

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care through access to health records in physician offices, PHRs on the Web, online appointment scheduling, and doctor-patient e-mail. Within the industry, its full implementation has not been realized because of lack of organizational commitment, cost, and concerns about data quality.[1] The Kaiser Permanente experience adds support to the growing body of evidence demonstrating that consumers are eager to embrace online health tools. Many of the obstacles to implementation of health IT faced by small and midsize medical practices can be largely overcome by looking to lessons learned by large integrated health care systems.

Study Setting

Founded in 1945, Kaiser Permanente (KP) is a not-for-profit health care organization headquartered in Oakland, California. KP serves 8.7 million members in nine states and the District of Columbia. Nationwide, KP employs approximately 159,000 technical, administrative, and clerical staff and 14,000 physicians representing all specialties.

KP began offering online health services in 1996.[2] The Web site's health information and related tools are free and available to the public; however, sign-on is required for members to access secure portions of the site, such as appointment scheduling or ordering prescription refills.

The deployment of KP's electronic health record (EHR), KP HealthConnect, began in 2004. Physicians can contact patients electronically; order consultations, laboratory, and other diagnostic work; send prescriptions directly to the pharmacy; provide health literature; and set reminders for follow-ups. My Health Manager, KP's PHR, was fully deployed in 2007 and is linked to the EHR. Online health services available include the following: (1) Personal health record: My Health Manager allows members to view parts of their medical record, including lab results, immunizations, past office visits, prescriptions, allergies, and health conditions. KP sends clinical information to members' online health records and provides updates to medications, allergies, and so on. (2) Clinical transactions: Members can view, schedule, or cancel appointments, and they can refill prescriptions for themselves and other family members. (3) Proxy access: Members can act on behalf of another family member (child or adult) to access online services. (4) Electronic connectivity: Members can e-mail their doctors, ask questions of pharmacists, and contact member services. (5) Health and wellness: Members and the public may view health and drug encyclopedias, take a health assessment, get information about popular health topics, and use health calculators. Tailored behavior change programs for smoking cessation, weight management, nutrition, insomnia, pain, depression, and stress reduction enable members to actively engage in improving their health. (6) Account management tools: Members can use KP-provided tools to manage their health benefits, including estimating the cost of treatments and viewing medication formularies.

Study Data And Methods

Two Web-site usage data sources and one member e-mail survey provided the data used for the analyses in this paper.

First, we used KP's online member registration database to determine Web-site registrations over time and to create the demographic profile of members who have access to the secure features on the Web site. We used Web-site traffic data from 2004 to 2008 to examine the number of visits to the site in general and usage of particular features such as lab results, prescription refills, appointment requests, and clinical messaging. These data were also evaluated to establish patterns of repeat visits to the site over time.

In spring 2008 we conducted an e-mail survey of KP members who were registered to use the Web site. Survey invitations were sent to 10,000 randomly selected registered members who had signed on to use the Web site at least twice in the six months preceding the questionnaire mailing. The response rate was 17 percent (n = 1,702), and the distribution of the respondents closely matched the distribution of registered members in terms of sex (57 percent female) and geographic representation. The age range of the survey sample was 19–95, and the average age was sixty—eleven years older than the population mean age of forty-nine.[3] More than half (52.2 percent) of the respondents had completed a college degree. Of the respondents who answered the question about income (n = 1,368), 12 percent reported annual household incomes of less than $35,000 a year, 38 percent indicated incomes of $35,000–$74,999, and 50 percent had household incomes of $75,000 or more a year. Data on educational level and income are not collected when members register to use the site. Therefore, we do not have population data for comparison.

Study Results

Our operational definition of *adoption of online health services* comprises two indicators: (1) the number of members who register to use the site's secure features, and (2) members' actual usage of the site. Registration numbers tell us how many members have taken the first step toward adoption; actual usage, on the other hand, informs us about patients' subsequent and continued use of the site. Although it is tempting to rely solely on actual usage as a measure of adoption, such a limited view might overlook members who are prepared to use the site but have not yet done so.

■ **Site registrations.** As of July 2008, 2.4 million KP members had obtained user IDs and passwords to access secure functionality on the site. Members began accessing an early version of the KP Web site in 1996 to refill prescriptions, request appointments, and access health information. The new Web site was launched in the winter of 2003; since then, member registrations have grown steadily. On average, 58,734 KP members register to use the site each month. The high point was in Janu-

ary 2008, when 100,526 members registered to use the site.

Registrations began to increase rapidly in 2006, when PHR functionality, including online test results and e-mailing a doctor's office, became widely available to the membership. Web-site registrations tripled, from 9 percent of the total KP membership in December 2005 to 27 percent in June 2008 (Exhibit 1).

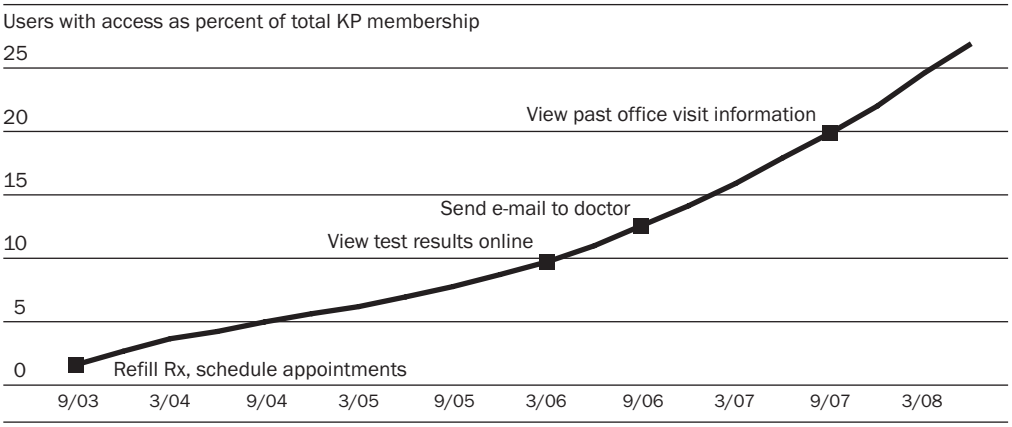
■ **Demographic characteristics of site members.** Over the lifespan of KP's member Web site, members who have access to the site's secure features have been consistently 60 percent female and 40 percent male. The age distribution of the current site membership is shown in Exhibit 2. The age range of site users is thirteen (the minimum age at which members may register to use the site's secure features) to ninety-five. The mean age is forty-eight and the median, forty-seven. Contrary to one popular notion that Americans who use online health care are primarily younger, Internet-savvy consumers, our evidence demonstrates that members across the age spectrum are using online health services.

■ **Web-site activity.** Use of KP's member Web site has increased steadily over time (Exhibit 3). In 2004 there were more than 10.7 million visits to the site, with an average of 30,661 visits per day. By the end of 2006 those numbers had more than doubled. In 2007 there were nearly thirty-three million total visits and an average of 90,315 visits per day—a threefold increase from 2004. Prescription refill, online appointment transactions, facility directory, and health encyclopedia visits consistently ranked among the six most-visited features during those four years.

When lab test results and patient-physician e-mail became widely available to members in 2006, the numbers of lab results viewed online and e-mail messages sent to doctors began to increase. At the end of 2007, lab test results viewed online

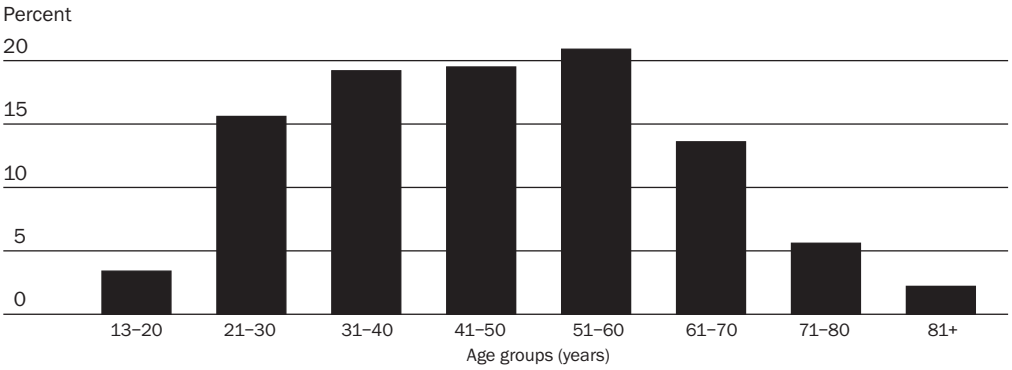
EXHIBIT 1

Changes In Kaiser Permanente (KP) Member Registrations On KP's Member Web Site Over Time, With Various Secure Site Features, September 2003–June 2008



SOURCE: Member registration data from KP's member Web site.
NOTES: Labeled items indicate that as of this point, more than 80 percent of site members had access to the feature. Does not include information from the Colorado Springs region, which has a network and not a group health delivery model.

EXHIBIT 2
Age Distribution Of Kaiser Permanente (KP) Web-Site Users With Access To Various Secure Site Features, 2008



SOURCE: Member registration data from KP's member Web site.

had increased 157 percent and e-mail messages to doctors had increased 152 percent from 2006. Viewing test results became the most-visited feature on the Web site, moving ahead of online appointments and prescription refills, which had previously held ranks one and two, respectively. This increase coincides with the changing slope in registrations evident in Exhibit 1.

Regarding frequency of use, as of June 2005, 27.7 percent of registered members accessed the site two or more times in a six-month period. By June 2007 that proportion had more than doubled to 62.1 percent (Exhibit 4).

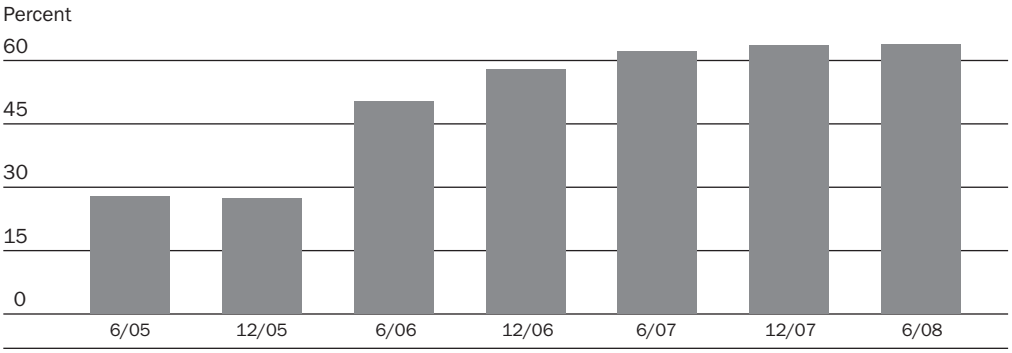
■ **Members' acceptance of online health services.** A host of models have been proposed in the past three decades to investigate users' acceptance of IT. One of the most fruitful has been Fred Davis's technology acceptance model (TAM).[4] Although TAM's application to e-health has been relatively recent, it has shown promise in modeling and predicting users' acceptance of health care technology.[5]

EXHIBIT 3
Kaiser Permanente (KP) Members' Usage Of The KP Member Web Site, 2004–2007

	2004	2005	2006	2007
Total annual visits	10,731,382	15,906,391	23,221,792	32,964,934
Average no. of daily visits	30,661	43,579	63,621	90,315
Prescriptions refilled	1,675,665	2,443,915	3,353,325	4,493,275
Appointment transactions	228,071	375,468	640,104	1,219,156
Facility directory visits	1,665,653	2,302,796	2,664,611	3,519,612
Health Encyclopedia visits	726,904	1,445,049	2,169,197	3,094,687
Lab test results viewed	–[a]	149,184	3,979,467	10,234,644
E-mail messages sent to doctors	–[a]	74,399	1,426,957	3,598,121

SOURCE: Site usage data from the KP member Web site.
[a] Not available.

EXHIBIT 4
Percentage Of Kaiser Permanente (KP) Web-Site Users Who Signed On To The Site Two Or More Times In A Six-Month Period, June 2005–June 2008



SOURCE: Member registration data from KP's member Web site.

TAM proposes that two factors, perceived usefulness and perceived ease of use, are instrumental in determining users' intention to adopt technology. Perceived usefulness is the degree to which a person believes that using the new system will facilitate the completion of his or her tasks. Perceived ease of use is the degree to which a person believes that using the system will be free of effort. Both of these characteristics are said to have a major impact on users' intention to use a system. The perceived quality of technological systems has also been shown to be influential in determining potential users' satisfaction with and intention to use innovations.[6] Quality applies to factors such as the speed, reliability, and aesthetic appeal of innovations.

To guide our exploration of the factors underlying consumers' adoption of online health services, we tested a modified version of TAM. Consistent with other applications of TAM, our model hypothesized that perceived ease of use and perceived usefulness would be positive and significant predictors of actual use. We added perceived system quality to the basic model as another predictor of usage. We believed that this hybrid model would provide the most complete understanding of the factors driving consumers to use online health services.

■ **Data.** The data used to test the model of consumers' acceptance of online health services are from the 2008 KP Web-site member e-mail survey. Perceived ease of use was measured with a survey question that asked respondents to use a five-point Likert-type scale to indicate whether they felt that the site was easy to use. Perceived usefulness was an index comprising three items measured on the same five-point scale. The first item asked participants how strongly they agreed or disagreed that the site made it more convenient for them to interact with their health care team; the second was about the site's usefulness in helping members manage their health care; the third asked respondents if the information they accessed on the site helped them make informed decisions about their health. The reliability of the

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index was evaluated and found to be acceptable (Chronbach's alpha = 0.81).

Perceived quality was a composite of nine items. Respondents used a five-point scale (1 = "not at all," 5 = "extremely") to rate how informative, trustworthy, secure, visually appealing, reliable, accurate, convenient, relevant, and innovative they thought the Web site was. Reliability analysis confirmed the usefulness of the index (Chronbach's alpha = 0.94).

Finally, our indicator of actual use was the number of times respondents signed on to the site in a six-month period. These data were captured when the sample was selected and retained for analysis. Recall that we sampled "active" members (those who had accessed the Web site at least twice in six months) for participation in this survey. Therefore, our conclusions are limited to statements about the impact of perceived ease of use, perceived usefulness, and perceived quality on active members' use of KP's member Web site.

To test the proposed model, we first evaluated the bivariate relationships among the site's perceived ease of use, perceived usefulness, and perceived quality and members' actual use. Site usage was significantly correlated with ease of use ($r = 0.15$; $p < 0.01$), with perceived usefulness ($r = 0.21$; $p < 0.01$), and with perceived quality ($r = 0.22$, $p < 0.01$).

Stepwise regression analyses were then performed to test the effects of perceived ease of use, perceived usefulness, and perceived quality on Web-site usage. Perceived usefulness was a significant predictor of usage ($\beta = 0.15$, $p < 0.001$), as was perceived quality ($\beta = 0.16$, $p < 0.001$); however, perceived ease of use was not. In other words, the significant correlation between perceived ease of use and actual usage disappeared when entered into the regression equation with perceived usefulness and perceived quality.[7] Together, perceived usefulness and perceived quality accounted for 57 percent of the variance in usage.

Discussion

By examining member registration and site usage data over time, we observed gradual adoption of online health services in the initial stages of KP's member Web site, which later gave way to a more rapid adoption rate. Although the number of members registering to use the site's secure features is continuing its rapid increase, it will flatten as registrations approach total membership. Beth Israel Deaconess Medical Center's PatientSite tool experienced a similar pattern of fast adoption followed by a period of leveling off.[8] A key issue for future research will be to identify the point at which adoption saturation is achieved.

Member registration data established that consumers spanning the age continuum are adopting online health tools. Our survey data added evidence that regis-

tration for and use of KP's member Web site is not limited to the wealthy and educated; half of the survey sample reported household incomes of less than $75,000 annually, and nearly half had not completed a college degree. Data from the Pew Internet and American Life Project report that Internet penetration among households earning less than $40,000 annually is 61 percent and among high school graduates, 69 percent.[9] This compares with 91 percent in households earning more than $40,000 and 93 percent among college graduates. As Americans of all socioeconomic strata increasingly gain Internet access, it will become more feasible for health care services to reach traditionally underserved populations via the Web.

Reviewing Web-site activity over time demonstrated that KP members are moving beyond the initial step of registration. They are indeed using the site's features to conduct clinical transactions, communicate with their health care team, and find health information.

■ **Growth in usage.** The year-over-year growth shown in Exhibit 3 can be attributed to various factors, including greater awareness among members as a result of promotional activities by KP and wider availability of features across membership associated with the phased-in deployment of some features. Ongoing enhancements to the site have also contributed to increases in the usage of some features. "My Test Results" and "E-mail My Doctor," two of the newer PHR features added to the site, had the largest percentage increase in usage in recent years, while older features such as "Prescription Refill" continued to grow at a relatively steady pace. Repeat usage data verified that consumers are not casual users of these services; rather, they are fundamentally changing the way they seek and receive the medical care they need.

■ **Impact of online health services.** A full-scale investigation into the impact of this increased usage of online health services on more traditional delivery mechanisms is beyond the scope of this paper. However, emerging research conducted by others at KP and elsewhere is beginning to chronicle the major impact that usage of online health services is having on number of office visits, and scheduled phone appointments.[10] Our research agenda includes further evaluation of these first-order effects as well as the second-order consequences of the shift to Web-based delivery of health services.

■ **Ease of use, usefulness, and quality.** To advance our understanding of the mechanism driving members to use online health services, we modified and tested TAM. Perceived usefulness and quality were positive and significant predictors of actual usage, whereas perceived ease of use were not. This finding has important implications for the development of online health services. Designers of health care Web sites should focus attention on creating high-quality Web portals containing features that patients perceive to be useful. The KP experience indicates that members find the greatest use in a Web site that facilitates e-connectivity with their health care team, allows them to view key components of their medical records and conduct clinical transactions online, and provides them with information so that

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they can make knowledgeable decisions about their health. This is not to suggest that designers should disregard ease of use. It is possible that the impact of ease of use was subsumed when perceived quality entered the regression equation because the two concepts overlap in their ability to predict usage. It is also possible that consumers are willing to tolerate less ease of use if they perceive a Web site to be useful and of high quality. In future research we will work toward teasing apart the components of perceived ease of use and perceived quality to better identify the individual contributions of each construct to Web-site usage.

■ **Study limitations.** Because we wanted to collect feedback from members who had some familiarity with KP's member Web site, our survey sample was limited to registered members who had signed on to use the site's secure features two or more times in six months. Although useful for Web-site evaluations, this sampling strategy excluded members who may have visited the site once, did not find value in it, and therefore failed to return. Although we are confident that our analysis produced reliable model estimates, we cannot comment on how well, or poorly, the model functions among less active (or inactive) members. Our future research will endeavor to overcome this weakness by sampling a broader range of registered members. Our plans also include surveys of KP members who have not yet registered to use the site. This work will provide insight into potential barriers to adoption.

Potential For Health Care Transformation

Consumers have come to expect that they can manage the basic transactions of personal and business life through the Internet. According to a recent Pew Internet and American Life Project report, consumers are embracing online shopping because they say it is convenient and saves them time.[11] Despite concerns about security, two-thirds of online Americans bought something online in 2007, up from 46 percent in 2000. Also, 53 percent of online Americans reported that they use the Internet for banking, up from 18 percent in 2000.

Although online health services have lagged behind other industries, this paper provides clear evidence that consumers will use the Internet to manage their health. A recent Deloitte survey of health care consumers confirms that consumers want online health services. More than 70 percent said that they wanted their physicians to provide online access to medical records and test results, and online appointment scheduling; one out of four said that they would be willing to pay extra for these services.[12]

As patients increasingly use the Web to interact with health care organizations, questions surrounding how to best use the Internet to meet the complex health care needs of the nation's population will be paramount for industry leaders.

■ **Financing issues.** Chief among the issues for providers is the financing of the infrastructure necessary for online delivery of health care. Many providers, especially small and midsize organizations, do not have the resources to build systems from whole cloth and are hesitant to purchase vendor-supported systems until return on investment (ROI) can be demonstrated. It is important that these organizations view ROI broadly. Increased quality of care, greater patient and physician satisfaction, and improvements in health outcomes are desirable results that might not readily be manifested in dollars or time saved.

Regional health information organizations (RHIOs) and similar entities that can enable electronic data exchange may especially benefit solo or small group practices, as the costs of activities such as document scanning and data entry would be decreased. For these organizations to be viable, however, consumers must be convinced that they are trustworthy custodians of their health information.

■ **Collaboration among providers.** A culture of support and collaboration among providers is needed to advance a paradigm shift. Large providers have a responsibility to share their learning processes and experiences by publishing research findings and providing educational opportunities so that smaller providers can adopt best practices. For their part, those smaller providers should seek the counsel of more-experienced organizations and vigilantly attend to the research literature regarding online health care.

Not all innovations from large integrated health systems have the capacity to expand beyond the specific health system. However, many lessons will be useful, regardless of practice size. For example, knowing which online functionalities consumers use most, what sort of adoption rate to expect, and what factors are important for encouraging acceptance of online health services can guide providers as they develop implementation plans. Data from larger organizations are a starting point. Small and midsize organizations will need to supplement these lessons with their own knowledge and experience, paying particular attention to the needs and desires of their patients.

■ **Federal government role.** There is substantial rationale for federal government policy to facilitate the widespread adoption of health IT. Continued government sponsorship of research studies aimed at developing interoperability standards will aid providers of all sizes and, most importantly, be in the best interest of those receiving health care from multiple sources. Legislative actions could include tax deductions for PHR-related expenses and other monetary incentives to providers who implement e-health innovations. Agencies such as the Centers for Medicare and Medicaid Services could provide incentives for EHR and PHR use.

Because the value of online health services is not always apparent when viewed from a strictly financial perspective, policymakers should endeavor to better understand the significance of health IT by seeing it in person at demonstration sites and using that experience to inform their policy making. Large health care organi-

zations could serve an important function by connecting policymakers with patients, clinical staff, and physicians who can illustrate how online tools can affect health and health care delivery.

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NOTES

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