Consumer experience with and attitudes toward health information technology: a nationwide survey

Jessica S Ancker,[1,2] Michael Silver,[1,2] Melissa C Miller,[1,2] Rainu Kaushal[1,2,3]

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[1]Center for Healthcare Informatics and Policy, Weill Cornell Medical College, New York, NY, USA
[2]Health Information Technology Evaluation Collaborative (HITEC), New York, NY, USA
[3]NewYork-Presbyterian Hospital, New York, NY, USA

Correspondence to
Dr Jessica S Ancker, 425 E. 61st Street, Suite 301, New York, NY 10065, USA; jsa7002@med.cornell.edu

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ABSTRACT

Electronic health records (EHR) are becoming more common because of the federal EHR incentive programme, which is also promoting electronic health information exchange (HIE). To determine whether consumers' attitudes toward EHR and HIE are associated with experience with doctors using EHR, a nationwide random-digit-dial survey was conducted in December 2011. Of 1603 eligible people contacted, 1000 (63%) participated. Most believed EHR and HIE would improve healthcare quality (66% and 79%, respectively). Respondents whose doctor had an EHR were more likely to believe that these technologies would improve quality (for EHR, OR 2.3; for HIE, OR 1.7). However, experience with physicians using EHR was not associated with privacy concerns. Consumers whose physicians use EHR were more likely to believe that EHR and HIE will improve healthcare when compared to others. However, experience with a physician using an EHR had no relationship with privacy concerns.

INTRODUCTION

Physicians and hospitals are adopting electronic health records (EHR) at unprecedented rates[1 2] as a result of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, which provides incentives to adopt and use health information technology (IT).[3 4] In addition, the nation continues to move toward a health information exchange (HIE) infrastructure that would allow patient data to be exchanged electronically among healthcare providers.[5–10]

It is important to understand consumer attitudes toward these initiatives, as attitudes could influence perceived healthcare quality, choice of providers, and willingness to participate in HIE. Research in recent years has found generally favorable public opinions toward health IT and HIE coupled with strong concerns about privacy and security.[11–14] However, consumer attitudes are likely to evolve rapidly as more consumers gain personal experience of healthcare providers who use EHR. Such personal experiences could lead to either positive or negative opinions about health IT. Patients might develop favorable opinions if they notice that EHR help their doctors become better informed about them. Conversely, patients might develop negative opinions if they are affected by electronic data breaches or perceive that their provider is distracted by technology. Patient opinions about HIE also seem likely to be affected by their views on provider use of technology, given that HIE gives providers access to electronic data.

The only recent survey to have examined the relationship between consumer experience of physician EHR use and attitudes toward EHR restricted sampling to respondents who knew whether their physician used an EHR.[13] However, in another national survey, only 26% of respondents reported having a doctor who used an EHR, and an additional 56% were unsure.[11] This raises the possibility that a sample restricted to those who know about their doctor's use of technology might not be representative. It also suggests that in many previous surveys, consumer opinions about health IT may have been informed by news stories or other sources rather than personal experience.

As a result, in this survey, we sought to determine the relationship between consumer experience with a physician who uses an EHR and consumer opinions about health IT.

METHODS

The Cornell National Social Survey is a random-digit-dial telephone survey of a national sample of 1000 adults, conducted by the Cornell Survey Research Institute. The study was approved by the Cornell University Institutional Review Board.

Sampling strategy

The sample was generated by a dual-frame random-digit-dial sampling of landline and cell phone exchanges in the continental USA. In this dual-frame method, the proportion of cell phone numbers generated for the sample is determined by a count of cell phone-only households in each US county. The sample, generated by Marketing Systems Group (Fort Washington, Pennsylvania, USA), included listed and unlisted numbers provided by telephone companies, cable companies, and voice-over-internet protocol, but excluded known business, disconnected, and non-household numbers. After the household was reached, an adult respondent was selected using the 'most recent birthday' method, which when applied consistently to all surveys conducted by the polling organization, ensures that each adult in the household has an equal chance of selection.[15]

Survey development

After competitive review, the Cornell Survey Research Institute accepted five questions about health IT. The five questions covered: (1) awareness of physician use of EHR; (2) perceived effect of EHR on healthcare quality; (3) perceived effect of EHR on privacy and security; (4) perceived effect of HIE on healthcare quality; and (5) perceived

effect of HIE on privacy and security. Questions (see supplementary appendix 1, available online only) were adapted from previous surveys.[14 16 17] For the first question, we sought to facilitate comparisons with the California Healthcare Foundation Survey of 2010[11] by adopting their wording, asking whether 'your doctor use[s] an electronic medical record for you'. However, in this paper we use 'electronic health record' consistent with the glossary published by the Office of the National Coordinator: http://bit.ly/bCdsPX.

Survey administration

The survey was conducted in English and administered from September to December 2011. The survey contained 87 questions and took an average of 19 min.

Analysis

Descriptive statistics were computed to characterize respondents and attitudes. Four questions were considered the primary outcomes: (1) belief that EHR would improve quality; (2) belief that EHR would improve privacy and security; (3) belief that HIE would improve quality; and (4) belief that HIE would improve privacy and security. The research team reviewed the remaining 83 questions available in the survey to select questions to be used as predictors. All available demographics, with the exception of potentially redundant questions (eg, political orientation and political party), were selected (age, gender, marital status, presence of children in household, education, ethnicity, race, household income, employment status, and political perspective). In addition, we selected three questions that previous surveys by our group and others[16–18] have suggested might be associated with health IT attitudes: use of internet/e-mail, self-rated health, and caregiver for another person with an illness. Associations between these 13 variables and with attitudes toward EHR and HIE were computed with OR and 95% CI. Predictors significant in the univariate analysis were added to multivariate logistic models to predict the four primary outcomes. Analyses were conducted using SAS V.9.2.

RESULTS

A total of 6782 phone numbers was attempted to obtain 1000 completed surveys. Of the 1603 eligible respondents reached by telephone, 1000 participated (63%).

As shown in table 1, 50% of respondents were women; 28% were under the age of 40 years and 17% were 65 years and older; 63% were employed. Distributions of age, sex, and employment status were similar to national 2010 population estimates. However, the sample had more white individuals (84% compared to 72% nationally), fewer Hispanic individuals (7% vs 16% nationally), higher income (61% with income higher than US$50 000, compared to 52% nationally), and more education (48% with a college degree vs 28% nationally; national data from http://www.census.gov).

Sixty per cent rated their health as very good to excellent, and 15% reported being a caregiver for a person with an illness.

When asked whether their doctor used an EHR, 64% said yes, 13% said no, 18% were not sure, and 5% responded that they had no regular doctor.

Attitudes toward EHR

Overall, 66% believed EHR would improve healthcare quality. However, 50% believed EHR would worsen privacy and security, and 18% believed EHR would improve privacy and security.

In multivariate analyses (table 1), belief that EHR would improve healthcare quality was significantly more common among those under the age of 40 years than other age groups (adjusted OR 2.2, 95% CI 1.2 to 3.9) and those with a doctor with an EHR (adjusted OR 2.3, 95% CI 1.5 to 3.4). Respondents who were unsure whether their doctor used an EHR and those without a doctor were no more likely to believe that EHR would improve quality.

Participants under the age of 40 years were more likely to believe that EHR would enhance privacy (adjusted OR 2.5; 95% CI 1.2 to 5.2); no other sociodemographic variable was associated with privacy and security concerns.

Attitudes toward HIE

Support for electronic HIE was even stronger, with 79% of respondents answering that electronic HIE would improve quality of care. A total of 48% believed HIE would worsen privacy and security, and 19% believed HIE would improve it.

In multivariate analyses, belief that HIE would improve healthcare quality was less common among respondents with a high school education or less (adjusted OR 0.5, 95% CI 0.3 to 0.8) and higher among those whose doctor used an EHR (adjusted OR 1.7, 95% CI 1.1 to 2.8). Respondents who were unsure whether their doctors used an EHR and those without a doctor were not significantly more likely to believe that HIE would improve quality.

None of the sociodemographic variables was significantly associated with privacy and security concerns about HIE in multivariate analyses.

DISCUSSION

Consumers with physicians who use EHR were markedly more likely than those whose physicians do not use EHR to believe EHR and HIE will improve healthcare quality. Consumers who were unsure whether their physicians used EHR, and those without a regular doctor, had attitudes similar to those of consumers whose physicians did not use EHR. These associations might indicate that patients develop positive opinions after experience with a physician using an EHR. Alternatively, they might indicate that patients with positive views of health IT are preferentially choosing physicians who use it, or that patients with preexisting opinions about health IT are more likely to notice EHR in use.

While the effect of experience with a doctor with an EHR was strong, few other demographic variables were significantly associated with health IT attitudes. Younger respondents were more likely to believe that EHR offered benefits both for healthcare quality and for privacy. Respondents with less education were less likely to believe HIE would improve quality.

Nevertheless, concerns about adverse effects on privacy and security of medical information were expressed by approximately half of respondents, and these concerns were not affected by experience of doctors using EHR.

Notably, 64% respondents reported having a doctor who used an EHR, and only 18% were unsure. By contrast, in the California Healthcare Foundation survey conducted in 2009 and 2010, using a question with similar wording, only 26% reported that their doctor had an EHR and 56% were unsure.[11] The increase may be related to recent sharp increases in EHR adoption; the proportion of office-based physicians with EHR rose from 48% in 2009 to 57% in 2011.[1] The increase may also reflect increasing awareness of health IT. The HITECH Act of 2009 led to news stories about EHR and also mandated public reporting of electronic medical data breaches (http://www.hhs.gov/ocr/privacy/hipaa/administrative/breachnotificationrule/breachtool.html).

Table 1 Demographic and health factors associated with perceptions of EHR and HIE

Characteristic	n (%) or mean (SD)	Association with belief that EHR improve healthcare quality		Association with belief that EHR improve privacy		Association with belief that HIE improves healthcare quality		Association with belief that HIE improves privacy	
		Univariate OR (95% CI)	Adjusted OR (95% CI)	Univariate OR (95% CI)	Adjusted OR (95% CI)	Univariate OR (95% CI)	Adjusted OR (95% CI)	Univariate OR (95% CI)	Adjusted OR (95% CI)
Age, years	49.7 (16.2)	0.99 (0.98 to 1.0)	–	0.99 (0.98 to 1.0)	–	1.0 (0.99 to 1.0)	–	1.0 (0.99 to 1.0)	–
<40	270 (27.6)	**2.64 (1.6 to 4.2)**	**2.2 (1.2 to 3.9)**	**2.1 (1.1 to 4.1)**	**2.5 (1.2 to 5.2)**	1.2 (0.7 to 2.0)	1.1 (0.6 to 2.3)	1.4 (0.7 to 2.8)	–
40–49	184 (18.7)	**2.06 (1.3 to 3.4)**	1.6 (0.9 to 2.9)	1.6 (0.8 to 3.3)	1.8 (0.8 to 3.9)	1.7 (0.95 to 3.0)	1.2 (0.6 to 2.4)	1.6 (0.8 to 3.2)	–
50–59	249 (25.4)	**2.20 (1.4 to 3.5)**	1.6 (0.9 to 2.8)	1.2 (0.6 to 2.4)	1.2 (0.6 to 2.6)	2.2 (1.3 to 3.9)	1.5 (0.7 to 2.9)	1.8 (0.9 to 3.4)	–
60–69	170 (17.3)	**2.04 (1.2 to 3.4)**	1.7 (1.0 to 2.9)	1.7 (0.8 to 3.5)	1.7 (0.8 to 3.5)	1.2 (0.68 to 2.1)	0.8 (0.4 to 1.6)	1.8 (0.9 to 3.6)	–
70+	109 (11.1)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Gender									
Female	501 (50.1)	0.95 (0.7 to 1.2)	–	1.0 (0.7 to 1.4)	–	1.2 (0.9 to 1.7)	–	0.8 (0.6 to 1.1)	–
Male	499 (49.9)	Ref.	–	Ref.	–	Ref.	–	Ref.	–
Married	600 (60.2)	1.20 (0.9 to 1.6)	–	1.1 (0.8 to 1.5)	–	**1.5 (1.1 to 2.0)**	0.96 (0.86 to 1.1)	**1.5 (1.1 to 2.1)**	–
Have children in household	336 (33.7)	1.05 (0.8 to 1.4)	–	1.2 (0.8 to 1.6)	–	0.9 (0.65 to 1.2)	–	1.2 (0.9 to 1.7)	–
Education level									
To high school	241 (24.2)	0.52 (0.36 to 0.76)	0.68 (0.4 to 1.1)	0.9 (0.6 to 1.4)	0.9 (0.5 to 1.5)	**0.31 (0.2 to 0.5)**	**0.46 (0.3 to 0.8)**	0.8 (0.5 to 1.3)	–
Some college/tech school	277 (27.8)	0.77 (0.53 to 1.1)	0.8 (0.6 to 1.3)	1.0 (0.6 to 1.5)	1.0 (0.6 to 1.6)	0.65 (0.4 to 1.0)	0.7 (0.4 to 1.1)	0.7 (0.5 to 1.1)	–
College graduate	262 (26.2)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Postgraduate training	216 (21.6)	1.38 (0.9 to 2.1)	1.4 (0.9 to 2.2)	0.8 (0.5 to 1.3)	0.8 (0.5 to 1.4)	1.5 (0.85 to 2.6)	1.4 (0.7 to 2.5)	0.7 (0.4 to 1.1)	–
Hispanic/Latino ethnicity	65 (6.5)	0.65 (0.39 to 1.1)	–	2.5 (1.4 to 4.3)	–	**0.5 (0.28 to 0.8)**	0.7 (0.4 to 1.3)	1.3 (0.7 to 2.4)	–
Race*									
White	841 (84.1)	0.91 (0.6 to 1.3)	–	0.6 (0.4 to 1.0)	–	1.5 (1.0 to 2.2)	1.8 (0.7 to 4.6)	0.6 (0.4 to 0.9)	–
Black	129 (12.9)	0.93 (0.6 to 1.4)	–	1.4 (0.9 to 2.1)	–	**0.6 (0.4 to 0.9)**	1.1 (0.4 to 2.9)	1.4 (0.9 to 2.1)	–
Native American	34 (3.4)	0.7 (0.36 to 1.50)	–	0.8 (0.3 to 2.1)	–	0.6 (0.3 to 1.3)	0.7 (0.3 to 1.6)	1.7 (0.8 to 3.6)	–
Asian	34 (3.4)	2.0 (0.86 to 4.6)	–	1.1 (0.4 to 2.7)	–	2.9 (0.9 to 9.5)	3.1 (0.8 to 12.4)	1.5 (0.6 to 3.3)	–
Household income									
<US$50 000	372 (38.8)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
US$50 000–100 000	324 (33.7)	1.3 (0.95 to 1.8)	0.9 (0.6 to 1.3)	0.8 (0.5 to 1.2)	0.8 (0.5 to 1.2)	**2.4 (1.6 to 3.4)**	1.6 (1.0 to 2.5)	0.7 (0.5 to 1.1)	–
≥US$100 000	263 (27.4)	**1.8 (1.2 to 2.5)**	1.0 (0.7 to 1.6)	1.1 (0.7 to 1.6)	1.2 (0.7 to 1.9)	**2.6 (1.7 to 3.9)**	1.3 (0.8 to 2.3)	1.1 (0.8 to 1.7)	–
Employment status									
Employed	629 (62.9)	**1.46 (1.1 to 1.9)**	1.0 (0.7 to 1.4)	0.8 (0.6 to 1.2)	0.7 (0.5 to 1.1)	**1.5 (1.1 to 2.0)**	0.8 (0.5 to 1.3)	0.9 (0.6 to 1.2)	–
Retired	194 (19.4)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Not employed	132 (13.2)								
Disabled/unable to work	43 (4.3)								
Political ideology									
Slightly–extremely liberal	273 (27.7)	1.1 (0.76 to 1.5)	–	1.3 (0.9 to 2.0)	–	**1.6 (1.1 to 2.4)**	1.3 (0.8 to 2.1)	1.1 (0.7 to 1.6)	–
Moderate/middle of the road	380 (38.0)	Ref.	–	Ref.	–	Ref.	Ref.	Ref.	Ref.
Slightly–extremely conservative	332 (33.7)	0.7 (0.56 to 1.0)	–	0.9 (0.6 to 1.4)	–	1.0 (0.7 to 1.4)	0.92 (0.6 to 1.4)	1.0 (0.7 to 1.5)	–
Internet or e-mail use every day	755 (75.5)	**2.2 (1.6 to 3.0)**	1.4 (1.0 to 2.1)	1.2 (0.8 to 1.8)	1.2 (0.7 to 1.9)	**2.4 (1.7 to 3.3)**	1.3 (0.8 to 2.0)	0.8 (0.6 to 1.2)	–
Self-rated health									
Very good to excellent	604 (60.4)	**1.5 (1.1 to 2.0)**	1.3 (0.9 to 1.8)	1.0 (0.7 to 1.5)	0.9 (0.6 to 1.4)	1.5 (1.0 to 2.1)	1.1 (0.7 to 1.6)	0.8 (0.6 to 1.2)	–
Good	271 (27.1)	Ref.	Ref.	Ref.	Ref.	Ref.	–	Ref.	–
Fair to poor	125 (12.5)	0.9 (0.56 to 1.3)	1.1 (0.7 to 1.7)	1.5 (0.9 to 2.5)	1.6 (0.9 to 2.8)	0.8 (0.5 to 1.3)	1.0 (0.6 to 1.7)	0.9 (0.5 to 1.6)	–
Caregiver for person with illness	150 (15.0)	1.2 (0.8 to 1.8)	–	1.1 (0.7 to 1.8)	–	1.2 (0.8 to 1.9)	–	1.2 (0.8 to 1.9)	–

Continued

Table 1 Continued

Characteristic	n (%) or mean (SD)	Association with belief that EHR improve healthcare quality		Association with belief that EHR improve privacy		Association with belief that HIE improves healthcare quality		Association with belief that HIE improves privacy	
		Univariate OR (95% CI)	Adjusted OR (95% CI)	Univariate OR (95% CI)	Adjusted OR (95% CI)	Univariate OR (95% CI)	Adjusted OR (95% CI)	Univariate OR (95% CI)	Adjusted OR (95% CI)
My doctor has an electronic medical record									
Yes	639 (63.9)	**2.2 (1.5 to 3.2)**	**2.3 (1.5 to 3.4)**	0.9 (0.6 to 1.5)	0.9 (0.5 to 1.4)	**1.9 (1.2 to 2.9)**	**1.7 (1.1 to 2.8)**	1.3 (0.8 to 2.1)	—
No	134 (13.4)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
N/A — No doctor	45 (4.5)	1.5 (0.8 to 3.1)	1.5 (0.7 to 3.1)	0.7 (0.24 to 1.7)	0.6 (0.2 to 1.6)	0.7 (0.3 to 1.4)	0.7 (0.3 to 1.7)	1.0 (0.4 to 2.5)	—
Not sure	181 (18.1)	1.2 (0.7 to 3.2)	1.2 (0.8 to 2.0)	0.9 (0.5 to 1.7)	0.9 (0.5 to 1.6)	1.0 (0.6 to 1.7)	1.2 (0.6 to 2.1)	1.0 (0.6 to 1.9)	—

OR highlighted in bold type are statistically significant at $p<0.05$.
*Respondents could choose more than one race.
EHR, electronic health record; HIE, health information exchange.

Comparisons with other surveys should be made cautiously, given different sampling methodologies and questions. In particular, many previous surveys have framed HIE entirely or primarily in the context of personal health records rather than of physician use of HIE or EHR.[11 17–21] In addition, these other surveys did not investigate relationships between HIE attitudes and consumer experience with physicians using EHR. Nevertheless, our results are broadly in accord with most of these surveys in that we found positive opinions of HIE accompanied by strong privacy and security concerns.[11–14 17 19–21] The California Healthcare Foundation Survey is the only national survey that did not find a majority supporting HIE, but the question in that survey asked about sharing medical data 'with health insurance plans, researchers, companies, and others', rather than HIE between physicians.[11] One recent survey did examine the relationship between consumer experience of physician EHR use and positive attitudes toward EHR, and found a similar relationship between the two variables.[13] However, that survey restricted sampling to respondents who knew whether their physician used an EHR, limiting generalizability and eliminating the ability to compare consumers who know to the relatively large proportion who do not.[13] Unlike some other studies in smaller regions, our survey found effects of age and educational level in the multivariate analysis but no other statistically significant effect of demographic variables,[16 17] status as a caregiver,[16] or income.[14]

Limitations

Random-digit-dial surveys have inherent limitations in generalizability because of limitations in sampling coverage as well as potential non-response bias.[22] Dual-frame (cell phone plus landline) methodology such as the one used in the survey generally produce samples that are much more representative of the national population than landline-only surveys, which tend to underrepresent young adults, men, and minorities.[22] We obtained a sample that was nationally representative in gender, age, and employment. However, our respondents were more educated and affluent, more likely to be white, and less likely to be Hispanic than the national population. Because the sample was designed to be nationally and locally representative of the distribution of cell phone-only households, we did not apply sample weights to adjust for cell phone versus landline status or geographical indicators. This survey included only a few questions about health IT, so attitudes could not be explored in detail. Questions used in the survey were new and were not validated, raising the possibility that respondents may not have fully understood concepts such as EHR or electronic HIE. Privacy and security were assessed with a single question, so no conclusions can be drawn about how respondents may have distinguished between these issues. The sample size of 1000 provided a margin of error of ±3.1%. Finally, as with any cross-sectional study, association does not necessarily imply causation.

CONCLUSIONS AND IMPLICATIONS

Consumers whose physicians use EHR are about twice as likely as consumers whose physicians do not use EHR to believe that EHR and HIE will improve the quality of healthcare. However, experience with a physician using an EHR has no effect on privacy and security concerns, which remain strong in all patient groups. These concerns should continue to be addressed through strong policies and controls, as well as public engagement with health IT policy.

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