Healthcare Consumers' Attitudes Towards Physician and Personal Use of Health Information Exchange

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BACKGROUND: Health information exchange (HIE), the electronic transmission of patient medical information across healthcare institutions, is on the forefront of the national agenda for healthcare reform. As healthcare consumers are critical participants in HIE, understanding their attitudes toward HIE is essential.

OBJECTIVE: To determine healthcare consumers' attitudes toward physician and personal use of HIE, and factors associated with their attitudes.

DESIGN: Cross-sectional telephone survey.

PARTICIPANTS: English-speaking residents of the Hudson Valley of New York.

MAIN MEASURE: Consumer reported attitudes towards HIE.

KEY RESULTS: Of 199 eligible residents contacted, 170 (85%) completed the survey: 67% supported physician HIE use and 58% reported interest in using HIE themselves. Multivariate analysis suggested supporters of physician HIE were more likely to be caregivers for chronically ill individuals (OR 4.6, 95% CI 1.06, 19.6), earn more than \$100,000 yearly (OR 3.5, 95% CI 1.2, 10.0), and believe physician HIE would improve the privacy and security of their medical records (OR 2.9, 95% CI 1.05, 7.9). Respondents interested in using personal HIE were less likely to be female (OR 0.4, 95% CI 0.1, 0.98), and more likely to be frequent Internet-users (OR 3.3, 95% CI 1.03, 10.6), feel communication among their physicians was inadequate (OR 6.7, 95% CI 1.7, 25.3), and believe personal HIE use would improve communication with their physicians (OR 4.7, 95% CI 1.7, 12.8).

CONCLUSIONS: Consumer outreach to gain further support for ongoing personal and physician HIE efforts is needed and should address consumer security concerns and potential disparities in HIE acceptance and use.

KEY WORDS: consumers; health information exchange; personal health records; medical informatics; survey research.

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INTRODUCTION

Health information exchange (HIE), the sharing of clinical and administrative data electronically across healthcare institutions, has the potential to improve healthcare quality, safety, and efficiency^{1,2}, and the expanded use of HIE has a prominent role in the healthcare reform.³ Healthcare consumers represent important stakeholders as their consent will be required for their medical information to be shared electronically by their physicians and other healthcare providers.

In addition, healthcare consumers could become HIE users themselves. Opportunities for personal HIE use are available in the form of personal health records (PHRs) or patient portals.^{4,5} Consumers may have access to their medical information as recorded by their provider, healthcare organization or health plan and the ability to enter, store and share their medical information and communicate electronically with their healthcare team. It is theorized that consumer HIE use could also improve healthcare quality and safety and reduce expenditures.^{4–7}

National online consumer surveys and focus groups have found considerable support for physician HIE at a national level (72% of respondents), interest in PHRs (47%) and support for the idea that patients should be able to view their health information online (61%) despite significant privacy and security concerns.^{8–11} Yet, the prevalence of health IT systems in physicians' offices nationwide is low and self-reported use of PHRs in the national surveys was only 3–10%.^{9,10,12}

In order to better understand the early effects of health IT and HIE efforts, we conducted a cross-sectional survey examining attitudes towards physician use of HIE and interest in using personal HIE among consumers residing in an area with considerable health IT and HIE implementation, the Hudson Valley of New York. To date, it is unknown whether populations in "high implementation areas" are more or less supportive of HIE. In addition, we sought to determine

factors associated with consumers' attitudes towards HIE, as there may be factors other than privacy and security concerns that impact consumer acceptance and interest in HIE use that still need to be identified and addressed as the development of HIE progresses.

METHODS

Survey Development. The survey was created by an internal team with experts in the areas of clinical informatics, healthcare quality, and survey methodology. Many survey questions were adapted from previously validated questionnaires.^{8,9,13-15} The survey was pilot tested for clarity and content with 25 adult outpatients, and was approved by the Institutional Review Board of Weill Cornell Medical College. Survey questions are included in the [online appendix](#).

Study Population and Survey Administration. The Hudson Valley is an eight county region in southern New York State (NYS) bordering the Hudson River that contains more than 10% of the total NYS population.¹⁶ Many of the healthcare centers in the Hudson Valley are affiliated with the Taconic Health Information Network and Community (THINC) including several hospitals, a clinical laboratory, and the Taconic Independent Practice Association (IPA), comprised of over 4,000 physicians at 1,145 practices. THINC has implemented electronic health records (EHRs) in ambulatory physicians' offices and established HIE among many practices, laboratories and hospitals.

The telephone survey was administered by the Cornell Survey Research Institute (SRI) in Ithaca, NY from January–April 2008 using the Computer-Assisted Survey Execution System.¹⁷ Survey respondents were identified using a random digit dial sample of fixed-line telephone numbers within the residential zip codes of the eight Hudson Valley counties. Trained interviewers contacted potential respondents, obtained verbal consent using a standard IRB-approved script, confirmed eligibility, and offered a \$10 incentive to eligible respondents. Eligible participants had to be at least 18 years old, English speaking and residing in the Hudson Valley. If there was no

answer at a phone number, the number was called a maximum of five times unsuccessfully before retiring the number.

Dependent Variables. Before assessing participants' attitudes towards physician use of HIE, EHRs and HIE were described, and examples of HIE use in an emergency room and an outpatient setting were given. Participants were asked how they feel about their medical records being shared electronically between their medical providers using a five-point likert scale (strongly support, somewhat support, no opinion, somewhat against, strongly against). Those who responded they strongly or somewhat support the idea were categorized as supporting physician use of HIE.

Personal HIE was described as "us[ing] the computer to find information about your health or view[ing] your own electronic medical record." Participants were then asked to respond to the following statement: "I am interested in using the computer and the Internet to manage my health care" on a five-point likert scale (strongly agree, agree, neutral, disagree and strongly disagree). The question was designed to be broad in order not to restrict to one type of personal HIE architecture (i.e. personal health record or patient portal). Those who responded they strongly agree or agree with the statement were categorized as interested in personal use of HIE. Participants were later asked about whether they currently do or would like to do specific healthcare-related tasks (i.e. viewing their medical record, e-mailing doctors, and requesting appointments) online.

Independent Variables. We adapted the Technology Adoption Model¹⁸ to identify factors potentially associated with participants' attitudes towards HIE (Fig. 1): demographic factors, experience with computers, perceived benefits and risks of HIE use, and the perceived need for HIE. The demographic characteristics assessed in the survey included age, gender, race, ethnicity and income. To ascertain participants' experience with computers, we asked if any of their doctors used computerized medical records and the frequency of their Internet use (several times daily, daily, weekly, monthly, rarely/never). For analysis, we dichotomized the categorical variables to compare the oldest (≥ 65 years), wealthiest (income $> \$100,000/\text{year}$), least frequent Internet users (rarely or never) and non-minority (white, non-Latino) participants to their counterparts.

Figure 1. Modified technology acceptance model.

Figure 2. Flow diagram of survey population.

To determine participants' perceptions about the risks and benefits of HIE use, we asked participants to indicate on a 5-point scale how they thought physician and personal use of HIE would affect the following items: the security and privacy, completeness and accuracy of their medical record, and communication among their physicians and between their physicians and themselves. For analysis, those who reported HIE would improve (greatly improve, improve) an item were compared to those who reported HIE would not improve (no change, worsen, greatly worsen) an item. To determine concerns about Internet security, we asked participants to rate the security ("safe from unwanted viewing") of personal information on regular and secure Internet connections. Participants were grouped into those who believed 1) both types of connections were secure, 2) only secure connections were secure, or 3) both types of connections were insecure.

Perceived need for HIE was measured by assessing participants' health, healthcare usage, role as a caregiver, and perceived efficacy of current healthcare communication. Questions to assess health included participants' self-rated overall health status¹⁵ and if they were current being treated for a chronic medical condition. We grouped respondents into three categories based upon their response to how often they had visited different healthcare providers and facilities during the past year: those who had no healthcare visits, those who had visit(s) only with their primary care physician, and those who had visit(s) with other providers or at other facilities (i.e specialists, ER visit or hospitalization). We also asked participants if they were making healthcare decisions for someone with a debilitating or chronic illness. Participants were asked to rate the efficacy of physician communication across different practice locations based on how often their physicians knew about what happened or had records from their visits at

other locations. For analysis, we compared those who thought communication was good (very well, well), those who thought the communication was suboptimal (it varies, poor) and those who reported they had only been to one practice or location.

Analysis. We used descriptive statistics to summarize respondents' characteristics. In order to compare the study population with the Hudson Valley population, we calculated weighted averages of age, race, ethnicity and median income from the census data of eight Hudson Valley counties.¹⁹ We estimated bivariate associations between each of the two dependent variables, support of physician HIE use and interest in personal HIE use, and the independent variables using odds ratios. Multivariate logistic regression models were used to determine independent associations with each dependent variable. All data were analyzed using SAS® software, version 9.2.¹

RESULTS

Study Population. One hundred ninety nine eligible residents were reached by telephone, and 170 completed the survey,

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giving a response rate of 85% (Fig. 2). Similar to 2009 Census Data of Hudson Valley and United States (US) residents¹⁹, most respondents (Table 1) reported they were Caucasian (81% study, 82% Hudson Valley, 80% US). However, only 4% of respondents identified themselves as being of Hispanic or Latino origin compared to approximately 15% of Hudson Valley and US residents.

Table 1. Characteristics of Study Population (n=170)

	n (%) ^a
Demographic variables	
Age	
18–44 years	34 (41)
45–64 years	38 (40)
≥ 65 years	32 (19)
Female gender	92 (54)
Race ^b	
White	138 (81)
Black or African American	13 (8)
Asian	6 (4)
Other	3(2)
Refused	9 (5)
Ethnicity: Hispanic or Latino origin	7 (4)
Household Income ^b	
< \$30,000	28 (17)
\$30,000–\$60,000	36 (21)
\$61,000–\$80,000	25 (15)
\$81,000–\$100,000	15(9)
> \$100,000	54 (32)
Refused	11 (7)
Computer experience and security beliefs	
Doctors use computers for medical record	
Yes	105 (62)
No	32 (19)
Don't know	33 (19)
Frequency of accessing the Internet	
Several times a day	77 (45)
About once daily	40 (24)
Once weekly	11 (7)
Once monthly	5 (3)
Rarely or not at all	36 (21)
Beliefs about Internet connection security:	
Both regular and secure connections are not secure	45 (27)
Secure connections are secure while regular connections are not	87 (52)
Both regular and secure connections are secure	36 (21)
Health and healthcare usage	
Self-reported health status:	
Excellent	42 (25)
Very good	66 (39)
Good	41 (24)
Fair	13 (8)
Poor	7 (4)
Have a chronic medical condition	69 (41)
Caring for someone with debilitating or chronic illness	29 (17)
Health care visits in the past year:	
None	13 (8)
Visit with PCP only	42 (24)
Visit(s) with other providers/sites	115 (68)
Opinion of how well healthcare providers communicate	
I don't know, have only been to one practice/location	48 (28)
Very well	46 (27)
Well	27 (16)
It varies	26 (15)
Not well	22 (13)

^a All variables are expressed in number (percent of total) unless otherwise indicated. All variables have <5 missing or refused unless otherwise indicated. All percentages have been rounded to the nearest whole number

^b Missing or refused indicated

The percent of respondents aged 65 or older (19%) was similar to the Hudson Valley and US population (17–18%). Although difficult to compare directly to census data, 34% of respondents reported earning more than \$100,000 a year, which may be more comparable with the median annual income in the Hudson Valley of \$75,195 than with the US median of \$52,029.

Over 60% of respondents reported that their doctors currently use computers in their care and 79% stated they accessed the Internet at least monthly. Three-quarters of respondents believed in the security of at least secure Internet connections, but a quarter felt neither type of connection was secure. About half of Hudson Valley residents reported being treated for a chronic condition, but the vast majority reported being in good or excellent health (88%). Over two-thirds of respondents had visit(s) with other providers or at other facilities in the past year including 104 with specialist visits, 32 with ER visits, and 21 who were admitted to the hospital. Forty-eight (40%) of 121 respondents who received care in multiple locations reported communication between providers involved in their care was suboptimal.

Attitudes towards HIE. Two-thirds of respondents (n=113) supported the idea of their medical records being shared electronically among doctors and health care locations where they receive medical care, and 58% (n=97) reported being interested in using the computer to manage their health care.

Most reported that physician use of HIE would improve communication between doctors involved in their care (88%) and the completeness and accuracy of their medical record (75%). Only about a third (32%), however, thought its use would improve the privacy and security of their medical record (26% no effect, 42% worsen). Similarly, a third (32%) thought the use of personal HIE would improve the privacy and security of their care (33% no effect, 35% worsen). Two thirds (67%) felt their personal use of HIE would improve their communication with their doctor.

Other than using the Internet to find doctors and file insurance claims (24%, Fig. 3), less than 6% of the respondents reported doing any other health care activity online. Most wanted the ability to view their medical records, communicate with their provider, and conduct administrative tasks online (i.e. request appointments, referrals and refills, and fill out paperwork before a physician visit).

Associations with Support of Physician Use of HIE. The odds of supporting physician use of HIE were higher among respondents: who care for others with chronic or debilitating illness; who thought that medical record privacy and security would be improved by HIE; and who had an annual household income of more than \$100,000 (Table 2, adjusted results).

Associations with Interest in Personal Use of HIE. The odds of interest in personal use of HIE were higher among participants: who believed their healthcare providers communication with each other was suboptimal; who believed that using personal HIE would improve their communication with their physicians and among more

Figure 3. Attitudes towards using the Internet to do health care activities, n=168. ■ I do this on the Internet now. ▤ I would like to do this on the Internet. ▨ I would not like to do this on the Internet.

frequent Internet users (Table 3, adjusted results). Surprisingly, interest in using personal HIE was lower in women.

DISCUSSION

Most healthcare consumers residing in a region with active health IT and HIE implementation supported the use of HIE by their physicians (67%) and expressed interest in using HIE themselves (58%). Supporters of physician use of HIE were more likely to be individuals caring for others with a chronic condition, with higher incomes, or who perceived that physician use of HIE would improve the privacy and security of their medical record. Supporters of personal use of HIE were more likely to be individuals who perceived that their providers were not communicating well with each other, who perceived that personal HIE would improve their communication with their physician, or were experienced Internet users.

Although we found consumers largely support physician use of HIE, higher levels of support are likely needed for successful HIE implementation in this region as the ability of HIE systems to improve care and provide cost savings are directly related to patient information contained within them.^{7,20,21} In addition, though difficult to compare directly given the different survey questions and methodologies used, support of physician HIE in our study population does not seem higher than levels reported by other national surveys despite the fact most of our population reported that their physicians use computerized medical records.⁷

Lower than expected levels of support for physician HIE in our population may be related to concerns about privacy and security of medical records consistent with prior studies.^{8,11} While privacy and security concerns were strongly associated with physician HIE support, they were not related to consumers' interest in

using HIE themselves. These differences may result from consumers' concerns about multiple parties viewing their data and their limited control over physician use of HIE as compared with personal use of HIE. Consumers may be unaware of the federal HIPPA laws designed to protect the privacy of their health information in situations where multiple users have access to a system or may feel current protections inadequate.^{11,22}

Many of the healthcare improvements expected from HIE use, an integral component of the patient-centered medical home model of care, are related to its ability to facilitate care coordination, especially among patients with chronic medical conditions who receive care from many providers and settings.²⁰ However, we found only consumers caring for others with chronic illness more likely to support physician HIE, not consumers who themselves had chronic illnesses and higher healthcare usage. In addition, while many consumers reported communication among their physicians was suboptimal and recognized the potential of both physician and personal use of HIE to improve communication, these perceptions were only associated with interest in personal HIE use. As identified in a national survey, some consumers may believe that they, aided with the use of personal HIE, should be responsible for maintaining the most accurate record of their care.¹⁰ It has been postulated that PHR adoption by consumers has the potential to surpass EHR adoption by physicians and PHRs may provide a more integrative record of care while EHRs work to establish HIE.^{4,23} There is also a growing body of evidence that patients can play key roles in their own healthcare by keeping up with preventive services and identifying threats to the safety of their care.^{24,25} Yet, consumers may be overestimating their abilities as accurate medical historians and documenters^{26,27}, and although most of our surveyed population used the Internet, few had taken advantage of personal HIE services. It is currently unknown whether we could see benefits in cost-savings or improved quality of care with personal use of HIE alone.

Table 2. Attitudes toward Physician Use of HIE According to Consumer Characteristics (Unadjusted and Adjusted Analyses, OR, 95% CI)

	Support Physician Use of HIE Odds Ratio, 95% CI	
	Unadjusted	Adjusted
Demographic characteristics		
Age ≥65	1.9 [0.8, 4.7]	4.4 [1.0, 19.3]
Female	0.7 [0.4, 1.4]	0.5 [0.2, 1.2]
White race, non-Latino ethnicity	2.2 [0.9, 5.0]	1.3 [0.4, 4.0]
Annual household income ≥\$100,000	2.4 [1.1, 5.2] ^a	3.5 [1.2, 10.0] ^b
Computer and Internet use		
Reports doctor uses computer	1.7 [0.9, 3.4]	1.9 [0.8, 4.6]
Accesses Internet at least monthly	1.4 [0.7, 3.0]	1.2 [0.4, 3.8]
Beliefs about the security of regular and secure Internet connections:		
Both types of connections are insecure	Reference	Reference
Secure connections are secure; regular connections are insecure	2.5 [1.1, 5.6]	1.2 [0.4, 3.5]
Both types of connections are secure	3.9 [1.5, 10.2] ^a	2.5 [0.8, 10.6]
Health, and Healthcare		
Good–excellent self-reported health	1.4 [0.5, 3.7]	2.2 [0.5, 9.6]
Being treated for chronic medical condition	1.6 [0.8, 3.2]	1.8 [0.7, 4.9]
Caring for other(s) with chronic condition	3.6 [1.2, 11.0] ^a	4.6 [1.1, 19.6] ^b
Healthcare usage in past year		
No visits	Reference	Reference
Primary care physician visits only	2.8 [0.8, 10.1]	1.2 [0.2, 6.5]
Visit(s) with other providers/sites	2.5 [0.8, 8.1]	1.0 [0.2, 5.0]
Opinions of how healthcare providers communicate:		
I don't know; only been to 1 location	Reference	Reference
Suboptimal (It varies- poor)	1.8 [0.7, 4.2]	2.1 [0.6, 7.4]
Good (Well-very well)	1.5 [0.7, 3.2]	1.0 [0.3, 2.8]
Perceived Effects of HIE		
Will improve the completeness and accuracy of their medical record	2.4 [1.2, 5.0] ^a	2.0 [0.8, 5.2]
Will Improve the privacy and security of their medical record	2.1 [1.0, 4.6] ^a	2.9 [1.0, 7.9] ^b
Will improve communication between the doctors involved in their care	2.0 [0.8, 5.1]	1.1 [0.3, 3.9]

^a $p \leq 0.05$ in unadjusted (bivariate) analysis

^b $p \leq 0.05$ in adjusted (multivariate) analysis

Table 3. Attitudes toward Personal Use of HIE According to Consumer Characteristics (Unadjusted and Adjusted Analyses, OR, 95% CI)

	Personal Use of HIE Odds Ratio, 95% CI	
	Unadjusted	Adjusted
Demographic Characteristics		
Age ≥65	0.4 [0.2, 0.8] ^a	1.2 [0.4, 4.5]
Female	0.6 [0.3, 1.2]	0.4 [0.1, 1.0] ^b
White race, non Latino ethnicity	1.0 [0.4, 2.3]	0.6 [0.2, 2.0]
Annual Household Income ≥\$100,000	1.9 [0.9, 3.7]	1.3 [0.5, 3.4]
Computer and Internet use		
Reports doctor uses computer	1.0 [0.5, 1.9]	1.3 [0.5, 3.2]
Accesses Internet at least monthly	1.6 [0.4, 15.5]	3.3 [1.0, 10.6] ^b
Beliefs about the security of regular and secure Internet connections:		
Both types of connections are insecure	Reference	Reference
Secure connections are secure; regular connections are insecure	2.4 [1.1, 5.4]	1.3 [0.4, 4.2]
Both types of connections are secure	1.2 [0.5, 3.0]	0.8 [0.2, 3.0]
Health, and Healthcare		
Good–excellent self-reported health	1.2 [0.5, 3.0]	0.4 [0.1, 1.8]
Being treated for chronic medical condition	0.6 [0.3, 1.2]	0.5 [0.2, 1.3]
Caring for other(s) with chronic condition	1.7 [0.7, 3.9]	2.2 [0.6, 8.7]
Healthcare usage in past year		
No visits	Reference	Reference
Primary care physician visits only	0.6 [0.2, 2.1]	0.9 [0.2, 5.2]
Visit(s) with other providers/sites	1.0 [0.3, 3.2]	1.9 [0.3, 10.8]
Opinions of how healthcare providers communicate:		
Can't say; only been to 1 location	Reference	Reference
Suboptimal (It varies- poor)	8.5 [3.0, 23.7] ^a	6.7 [1.8, 25.3] ^b
Good (Well-very well)	1.1 [0.5, 2.3]	1.1 [0.4, 3.0]
Perceived effects of HIE		
Will Improve the privacy and security of their medical record	1.8 [0.8, 3.5]	1.5 [0.5, 4.0]
Will improve communication between doctors and themselves	5.6 [2.8, 11.3] ^a	4.7 [1.7, 12.8] ^b

^a $p \leq 0.05$ in unadjusted (bivariate) analysis

^b $p \leq 0.05$ in adjusted (multivariate) analysis

In our study population, variations in income, gender and Internet use were associated with differing levels of support for HIE. Understanding how these factors could impact HIE support and use merits additional investigation as health IT has been described as having both the potential to decrease or enhance disparities seen in the US health care system.^{28,29} Current policymakers and funding agencies often provide assistance to healthcare organizations that serve underserved populations in an effort to address the digital divide³⁰, though more direct efforts might be needed. Interestingly, while some studies point to a narrowing in gender differences in the use the computer and Internet, our finding that women may be less

interested in using personal HIE adds to the conflicting literature about whether gender influences use the Internet for health related tasks.^{31–35}

This survey studies a population among the first in the nation to benefit from HIE, but it may not be generalizable to other areas in the country. Specifically, the Hispanic population present in the Hudson Valley and US were underrepresented in our study and the annual income in the Hudson Valley and our study population is higher than the median annual income in the US. Future studies should be conducted in more diverse communities with a greater representation of individuals with lower incomes and less computer experience. We used survey methodology and discrete data in order to identify and assess

the strength of key factors associated with consumer attitudes. However, we may have missed novel factors which could have been identified through qualitative methods.

Shedding light on the factors which may influence consumer attitudes towards HIE can help shape efforts designed to boost consumer support for both physician and personal use of HIE as the implementation of health IT and the development of HIE networks progress. We were able to describe baseline levels of consumer support of HIE in the Hudson Valley region and identify potential barriers to support of HIE which can be the focus of further investigation and interventions. As the role of consumer education and determination of consumer HIE preferences may primarily belong to providers^{11,36}, research that provides insight into factors of importance to consumers may help providers more efficiently fit this task into their daily workflow. In addition, education and outreach efforts should target populations less supportive of HIE to prevent the perpetuation or augmentation of disparities in healthcare. Further research should assess whether these interventions and the incorporation of consumer preferences related to privacy and security^{11,36} boosts consumers' support of HIE. In addition, as some consumers seek to actively participate in the coordination of their own healthcare, more research is needed to determine the ability of personal HIE use to improve the quality and safety of care.

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