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Research and Applications



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# Consumer perceptions of health IT utilization and benefits

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**ABSTRACT**

**Objectives:** The objective of this article is to examine consumer perceptions of health information technology (health IT) utilization and benefits through an integrated conceptual framework.
**Materials and Methods:** This article employs an integrated conceptual framework to examine consumer perceptions of health IT. A consumer survey yielded 1125 completed responses. A factor-based scale was developed for each sub-construct. Bivariate analysis using $\chi^2$ tests was performed to determine differences in the percentage of respondents who agreed with each sub-construct based on whether their physician used an electronic health record (EHR) system. Multivariable logistic regression that controlled for demographic characteristics of respondents was performed to determine adjusted odds of agreeing with selected opinions of health information exchange (HIE).
**Results:** Results indicate that respondents whose physicians used an EHR system were significantly more likely to agree that there was a perceived benefit with HIE and to care provided; that the patient should have control over the record; that they trust the physician and security of the medical information; that they understand the need for HIE, and that HIE must be easy to use.
**Discussion:** The results suggest that consumers who have experienced the use of one technology in the healthcare setting can recognize the potential benefit of another technology. Race/ethnicity, gender, and education played some role in respondents' views of EHRs and HIE, more specifically, non-Hispanic African American participants indicated lower levels of trust in HIE when compared with non-Hispanic Whites.
**Conclusion:** This cross-sectional survey indicated that physician use of EHRs significantly increases the odds of consumers' seeing perceived benefits of HIE and understanding the need for HIE.

**Key words**: consumer health informatics, health information exchange, health, informatics

## INTRODUCTION

Healthcare consumers are frustrated by the fragmented communication between care providers: 55% of respondents to a recent survey reported that essential health information (eg visits with other doctors, recent hospitalizations, and existing medical conditions) was missing from their record.[1] Generally, the burden has been placed on patients, as they are often required to arrive earlier for their appointments in order to complete paper forms.[1] Omitted health information is not only an inconvenience, but it is also potentially damaging if clinically relevant information is missing from patient records.[1–4]

Health information technology (health IT), such as electronic health records (EHRs) can enable the exchange of essential health information. Much of the existing literature on health IT, and health information exchange (HIE), is centered on how *care providers* and *vendors* perceive the benefits and barriers of the technology. Debra L. Ness, president of the National Partnership for Women & Families, highlighted the importance of the *patient* perspective: "It is

crucial to hear what patients have to say about how they experience EHRs and health IT as they receive care and manage their health".[4] Additionally, others suggest the time is right to bridge the gap between perception and action such that consumers are becoming more demanding for greater control over their health data.[5] Generally, healthcare consumers and providers alike believe that EHRs and HIE will improve quality of care: physicians who have adopted health IT in place of physical records (ie paper) are perceived to be more organized, efficient, innovative, and competent.[1,4,6–9] It is likely that this perception can be attributed to the benefits of health IT utilization. These benefits include more accurate and complete information, as well as better communication and coordination among multiple care providers.[2,9,10] While patient perceptions about a range of health IT systems have been studied in the past, including EMRs/EHRs, CPOE, PACS, and others; few studies have examined patient perceptions about HIE—which is the health IT context of this study.[11]

Using health IT can improve quality of care for many types of patients, including vulnerable populations, such as the elderly and the chronically ill.[12] For example, EHRs facilitate the retrieval of relevant health information, including but not limited to radiologic studies, during an emergency, in which saving a life hinges on a few crucial seconds.[2,13] Health IT has been shown to enable care providers to issue timely lifesaving treatments to their patients.[14] Most patients recognize that quick access to pertinent medical information is one of the many benefits of health IT.[3,13,15,16] However, patient perceptions on how broader information access for providers via HIE relates to health care provisioning improvements and patient health care benefits have not been broadly studied.[11]

HIE has been described in various ways in the literature but is generally understood as the *act* of information sharing, facilitated by computing infrastructure, which is conducted across affiliated physicians' offices, hospitals, and clinics; or between completely disparate health systems,[17] and this is the definition used in this article. HIE across disparate systems allows clinical information to follow patients as they move across different care settings, whether or not each organization shares an affiliation. This might include a hospital connected to an organization or infrastructure that acts as the "transacter" of the information. HIE is expected to transform the nation's healthcare system through access to patient data from EHRs to support care provision and coordination and improve care quality and population health.[18] The value of HIE must be considered in terms of benefits to all participants in the healthcare system: patients, providers, payers, and communities.[19] Most of the evaluation work on HIE has focused on provider perceptions of HIE with few studies focusing on consumers.[20,21]

Although the utilization of health IT holds great promise, potential threats to wide-scale implementation exists. Consumers have consistently voiced concerns about a lack of trust in health IT systems—including the privacy and security of EHRs and information exchange.[10,21–25] For example, privacy and security concerns were found to be higher among minority groups.[22] Privacy and security concerns were also found to be high among employed individuals between 40 years and 64 years of age.[22] Despite the concerns associated with health IT use, many consumers believe that the benefits of using the technology outweigh the risks.[10,15,21,26,27]

The purpose of this article is to examine consumer perceptions of health IT utilization and benefits through an integrated conceptual framework that considers perceived benefit or value, trust, perceived ease of use, HIE familiarity, Internet usage, and EHR utility. In the following sections, the conceptual framework and key constructs are outlined. Next, we describe the methods, survey instruments, and the analysis employed for the study. Subsequently, the results, discussion, and implications for practice are presented.

## Theoretical framework and constructs of interest

This article employs an integrated conceptual framework to examine consumer perceptions of health IT. This section discusses constructs of interest that emerge from the framework. First, the Theory of Planned Behavior is considered.[28] The theory of planned behavior posits that human behavior is determined by 3 types of considerations, or beliefs. The first of these considerations is behavioral. This is also known as an individual's attitude toward performing an action.[29] Secondly, human behavior is guided by normative beliefs (eg what others expect). Finally, control beliefs (ie belief in the existence of factors that can enable or inhibit the performance of the behavior) guide behavior. Taken together, these 3 considerations can have a significant impact on human action or inaction.

Next, the technology acceptance model (TAM) is examined.[30] TAM emerged from the social psychology literature; specifically, it was developed from the theory of reasoned action. According to the theory of reasoned action, individuals' beliefs influence their attitude toward a particular action. In turn, attitudes guide the intention to perform the action; intentions subsequently influence behaviors. Similarly, TAM posits that individuals' intention to use a particular technology (also referred to as behavioral intention) is driven by 2 key determinants of attitude: perceived usefulness and perceived ease of use.

TAM is frequently applied to understand how consumers respond to IT.[27,31] However, one of the primary shortcomings of TAM is that the model does not consider the "social context" of technology adoption.[32,33] The unified theory of acceptance and use of technology (UTAUT) bears close resemblance to TAM in that both theories examine consumer intentions to use IT and subsequent usage behavior.[34] According to UTAUT, intention and behavior (ie intention to use technology and actual use) are directly influenced by 4 key constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions.

For the purposes of this study, the constructs under consideration that contribute to behavioral intention (intention to use technology) and, subsequently, actual behavior (use of technology) are as follows: *perceived benefit of change*; *compatibility with values, beliefs, past history, and current needs;* and *perceived ease of use*.

### Perceived benefit of change

Perceived benefit of change aligns with the perceived usefulness and performance expectancy constructs of TAM and UTAUT, respectively. Holden and Karsh (2010)[30] define perceived usefulness as "an individual's perception that using an IT system will enhance job performance" (162). In order to be perceived as acceptable by end users, technology must yield "relative advantages over existing practices," and it should produce "early demonstrable benefits".[35,36] Generally, these benefits are measured as how much the technology enhances efficiency and productivity; how useful the technology is for the completion of a job or specific task; and how much it improves effectiveness.[21,30,35]

### Compatibility with values, beliefs, past history, and current needs

This construct examines the social aspect of IT adoption. The extant literature indicates that most end users are not averse to the available technology itself. However, they are unlikely to use systems

that prove inadequate or that interfere with their values, aspirations, and roles.[21,35] Factors that have been found to influence the adoption of technology include personal and peer attitudes toward the technology (eg patients and colleagues); financial costs; and the technology's support of inter-professional roles and working.[37,38] Likewise, technology that undermines personal autonomy or social standing will not be widely accepted by end users.[35,37]

A subcomponent of the compatibility construct is user *trust*, which is considered a crucial factor in IT research.[21,33,39,40] Trust is frequently cited as an external construct in the UTAUT literature. Many IT users question potential outcomes of technology utilization. In response, vendors should aim to enhance consumer trust in their innovations.[33] In fact, a number of empirical studies have demonstrated that trust, as an external construct, does significantly influence behavioral intention.[33,41,42]

#### Perceived ease of use

Perceived ease of use is defined as "an individual's perception that using an IT system will be free of [physical or mental] effort".[30] Several sub-dimensions of perceived ease of use have emerged from the IT literature. These include: easy to use; clear and understandable; easy to become skillful with the system; easy to get the system to perform desired tasks; flexible; requires little mental effort; tasks are easy to remember; does not demand a lot of care and attention; navigable.[2,11,30,39,43]

## METHODS

Survey development was based on the literature and centered around 3 overarching concepts: perceived benefit or value, trust, and perceived ease of use. Other questions that were of interest were added around HIE familiarity, Internet usage, EHR utility, and demographics.

The survey for this study was conducted between January and April 2012. Respondents consisted of Virginia residents age 18 and over. In order to capture a wide cross-section of Virginia residents, a multi-mode fieldwork approach was used. The approach, outlined below, included Internet, paper, and telephone surveys to ensure that Virginia residents in various locations had an opportunity to participate in this study. To avoid survey bias, online and telephone surveys rotated questions. Survey incentives were not offered to participants. All participants answered affirmative to the consent prior to participating in the survey.

The following 3 approaches yielded 1125 completed responses:

- Random internet sample ($n = 278$): in order to ensure that all Virginians were represented—not just those visiting participating providers on a regular basis—an Internet survey among a random sample was conducted. This online fieldwork was performed using Virginia residents in the eRewards panel. eRewards, a Research Now company, is one of the leading providers of online samples in the U.S. marketing research industry.[44] For this study, eRewards was contracted for 275 completed surveys. eRewards did not provide the research team with the total number of contacts made to result in the final 278 respondents.
- Paper survey in providers' offices ($n = 302$): this mode consisted of a paper survey distributed to consumers/patients by providers in a practice setting. Eight Practice offices were invited to participate based on their participation with ConnectVirginia, Virginia's statewide health information exchange organization. Respondents who were interested in taking the survey were given the paper survey along with a prepaid business reply envelope to mail the completed instrument. A total of 800 surveys, 100 per office, were distributed. This represents a 37.75% response rate.
- Random telephone survey ($n = 545$): in order to include populations that might not have Internet access to take the online survey or might not visit a provider office regularly, a telephone version of the online survey was also conducted. This survey used a random digit dialing telephone sampling approach adhering to the most current industry guidelines and regulations.

Respondents indicating that their physician did not use an EHR ($n = 319$) or that they were unsure ($n = 73$) were excluded from this analysis. The final sample consisted of 733 usable consumer surveys for analysis.

This study was approved by Claremont Graduate University IRB # 1919.

### Operational definitions of independent variables

Independent variables for this analysis included demographic characteristics of respondents, such as age (≤24, 25–44, 45–64, ≥65), race/ethnicity (non-Hispanic White, non-Hispanic African American, Hispanic, and Other), gender (male, female), highest level of education (less than high school, some college, bachelor's degree, more than 4 years of college), and income (≤$34 999, $35 000–$49 999, $50 000–$74 999, $75 000–$99 999, ≥$100 000). Additionally, household demographics of insurance type (public, private, self-pay, none), children in household (yes, no), number of household doctor visits per year (0–3, 4–5, 6–11, ≥12), and Internet use (daily or almost daily, occasionally, rarely, never). Lastly, familiarity with HIE (not at all familiar, familiar) and survey method (online, phone, paper) were also included as independent variables in this analysis.

### Operational definitions of dependent variables

Principal factor analysis was used to determine meaningful components. An eigenvalue of 1 was used as the cut-off point, which resulted in 8 key factors. In addition to the principal factor analysis, the literature provided theoretical insight on constructs and subcategories to use in the analysis. Table 1 depicts each construct, sub-category, and survey question.

A factor-based scale was developed for each sub-construct by calculating the average score for each sub-construct. Each question was answered by respondents using the Likert scale, where 5 was strongly agree and 1 was strongly disagree. The survey questions for each sub-construct were averaged using only the number of non-missing variables. For example, "benefit in emergency care" has 2 associated questions, thus a total maximum sum of 10. This sum was then divided by the number of non-missing variables. Assuming no missing values, the maximum score for the sub-construct "benefit in emergency care" would be 5. The averaged scores allowed us to interpret each sub-construct using the same scale respondents answered in. In other words, each sub-construct was scored from 1 to 5, or strongly disagree to strongly agree.

To dichotomize the results, any sub-construct score of 4 or 5 (agree or strongly agree) was combined into a single category that demonstrated agreement with the sub-construct. Lack of agreement with the sub-construct was defined as any score below 4.

**Table 1.** Mapping of survey questions to theoretically driven constructs and sub-constructs based on principal factor analysis

| Construct | Sub-construct | Survey question |
|---|---|---|
| Perceived benefit or value | Benefit in emergency care | • Sharing my medical information can save my life in an emergency by providing my doctor with accurate information about the medications I take and the conditions I have |
| | | • My medical information should be shared in case of an emergency, even if I have not "opted in" |
| | Benefit in administrative work | • Reduce the amount of medical forms that I need to complete |
| | Benefit to care provided | • Reduce medical errors |
| | | • Provide information to my doctor that will improve his/her ability to treat me |
| | | • Electronic medical information from all of my doctors would provide a more accurate medical history than I could provide on my own |
| | | • Improve my overall health through better care coordination between my doctors |
| Compatibility with values, beliefs, past history, and current needs | Need control over record | • I am notified if an unauthorized person gets into my medical information |
| | | • I am able to review who has accessed my medical information |
| | Need control over who sees information | • I can restrict the ability of my employer to access my medical information |
| | | • I can restrict the ability of my health insurance company to access my medical information |
| | Trust | • I trust that my doctors will use my medical health information responsibly |
| | | • I worry about security and privacy of my medical information[a] |
| | Need HIE | • I don't need electronic exchange of my medical information to handle my health needs[a] |
| Perceived ease of use | | • Electronic medical records might be too difficult to use[a] |
| | | • I should be able to easily add permission for a family member to view my medical information |
| | | • I should be able to easily name someone who can make medical decisions for me if I am unable to make medical decisions on my own |
| | | • I should be able to easily correct wrong information in my electronic health record |

[a]Survey response flipped because of question phrasing to avoid order bias.

### Analysis

Demographic characteristics of the study population were compared with determine significant differences between respondents whose physicians used EHRs versus physicians who did not use EHRs (Table 2). Bivariate analysis using $\chi^2$ tests was performed to determine differences in the percentage of respondents who agreed with each sub-construct based on whether their physician used an EHR system (Table 3). Multivariable logistic regression that controlled for demographic characteristics of respondents was performed to determine adjusted odds of agreeing with selected opinions of HIE (Table 4). Reference values and 95% confidence intervals (CIs) for the multivariable logistic regression are provided in the table.

## RESULTS

### Characteristics of respondents

Table 2 presents demographic information for survey respondents. Overall, a majority of survey respondents were greater than 45 years old (70.3%), non-Hispanic White (80.5%), females (57.9%). The majority of respondents also had private insurance (63.4%), no children (74.6%), used Internet on a daily or almost daily basis (85.7%) and were not at all familiar with HIE (60.7%).

A greater proportion of respondents who indicated their physician used an EHR system than respondents whose physicians did not use an EHR system had an income greater than or equal to $100 000 (31.4% vs 19.5%, $P = 0.0099$), had more than 12 household doctor visits per year (31.1% vs 20.4%, $P = 0.0158$), used Internet daily or almost daily (87.5% vs 75.0%, $P = 0.0007$), were familiar with HIE (42.1% vs 23.2%, $P = 0.0002$), and had completed their survey on paper (35.8% vs 3.7%, $P < 0.0001$).

More respondents whose physicians did not use an EHR system were within the 25–44 year age group (38.0% vs 25.1%, $P = 0.0055$), non-Hispanic African American (16.7% vs 9.3%, $P = 0.0097$), had less than a high school education (31.1% vs 18.7%, $P = 0.0037$), used the Internet rarely or never (15.7% vs 6.7%, $P$ strongly $=0.0015$), had no familiarity with HIE (76.9% vs 57.9%, $P = 0.0002$), and had taken the survey online or via telephone (52.8% vs 41.3%, $P = 0.0258$ and 43.5% vs 22.9%, $P < 0.0001$, respectively).

### Agreement with opinions of HIE, by physician EHR use

In bivariate analysis, the percentage of respondents who agreed (agree and strongly agree) with each sub-construct was stratified by whether the respondents' physicians used an EHR system (Table 3). Results indicate that respondents whose physicians used an EHR system were significantly more likely to agree that were was a perceived benefit with HIE [in emergency care (71.2% vs 50.9%, $P < 0.0001$), administrative work (81.2% vs 60.8%, $P < 0.0001$), and to care provided (75.2% vs 55.6%, $P < 0.0001$)]; that the patient should have control over the record (95.2% vs 87.0%, $P = 0.0010$); that they trust the physician and security of the medical information (38.5% vs 25.0%, $P = 0.0069$); that they understand

**Table 2.** Demographic characteristics of study population ($n = 733$)

| | Physician uses EHR ($n = 625$) | Physician does not use EHR ($n = 108$) | Total ($n = 733$) | *P*-value use vs. does not |
|---|---|---|---|---|
| Age (years) | | | | |
| ≤24 | 2.4 | 4.6 | 2.7 | 0.1891 |
| 25–44 | 25.1 | 38.0 | 27.0 | 0.0055 |
| 45–64 | 41.6 | 33.3 | 40.4 | 0.1059 |
| ≥65 | 30.9 | 24.1 | 29.9 | 0.1536 |
| Race/ethnicity[a] | | | | |
| NH White | 82.7 | 68.5 | 80.5 | 0.0538 |
| NH African American | 9.3 | 16.7 | 10.4 | 0.0097 |
| Hispanic | 2.9 | 3.7 | 3.0 | 0.5715 |
| Other | 5.2 | 11.1 | 6.1 | 0.0092 |
| Gender[a] | | | | 0.5913 |
| Male | 41.7 | 44.4 | 42.1 | |
| Female | 58.3 | 55.6 | 57.9 | |
| Highest level of education[a] | | | | |
| <High school | 18.7 | 31.1 | 20.6 | 0.0037 |
| Some college | 30.9 | 24.5 | 30.0 | 0.1830 |
| Bachelor | 27.4 | 25.5 | 27.1 | 0.6831 |
| >4-Year college | 23.0 | 18.9 | 22.4 | 0.3489 |
| Income[a] | | | | |
| ≤$34 999 | 18.8 | 30.5 | 20.4 | 0.0614 |
| $35 000–$49 999 | 14.6 | 7.3 | 13.7 | 0.0405 |
| $50 000–74 999 | 20.0 | 24.4 | 20.6 | 0.6610 |
| $75 000–99 999 | 15.2 | 18.3 | 15.6 | 0.7557 |
| ≥$100 000 | 31.4 | 19.5 | 29.8 | 0.0099 |
| Insurance[a] | | | | |
| Public | 24.4 | 24.1 | 24.3 | 0.9867 |
| Private | 64.3 | 58.3 | 63.4 | 0.3188 |
| Self-pay or none | 11.4 | 17.6 | 12.3 | 0.0604 |
| Children in household | | | | 0.5646 |
| Yes | 25.8 | 23.2 | 25.4 | |
| No | 74.2 | 76.9 | 74.6 | |
| Number of household Doctor visits[a] | | | | |
| 0–3 | 16.3 | 25.2 | 17.6 | 0.0448 |
| 4–5 | 18.1 | 19.4 | 18.3 | 0.8812 |
| 6–11 | 34.5 | 35.0 | 34.6 | 0.8544 |
| ≥12 | 31.1 | 20.4 | 9.6 | 0.0158 |
| Internet use[a] | | | | |
| Daily or almost daily | 87.5 | 75.0 | 85.7 | 0.0007 |
| Occasionally | 5.8 | 9.3 | 6.3 | 0.1662 |

[a]Respondents were missing in each category: race/ethnicity ($n = 42$), gender ($n = 6$), highest level of education ($n = 13$), income ($n = 125$), insurance ($n = 9$), number of household doctor visits ($n = 10$), Internet use ($n = 1$).

the need for HIE (71.5% vs 42.2%, $P < 0.0001$), and that HIE must be easy to use (81.9% vs 64.8%, $P < 0.0001$). The only subconstruct that did not result in a significant difference between those who had physicians who used an EHR and those who did not was the need for control over who saw this information ($P = 0.0709$). A large majority of respondents (80.4%) agreed that they needed to have control over who was able to see their medical information.

### Adjusted odds of agreements with opinions of HIE

After controlling for independent variables on respondent demographics, household demographics, and survey method, respondents with physicians who used an EHR system had greater odds of perceiving the benefit of HIE in emergency care [odds ratio (OR) 1.79, 95% CI 1.11–2.88] administrative work (OR 2.23, 95% CI 1.35–3.69), and in care provided (OR 1.75, 95% CI 1.08–2.83). Additionally, these respondents had greater odds than respondents who did not have a physician who used EHRs of recognizing the need for HIE (OR 1.91, 95% CI 1.07–3.40) and agreed that it must be easy to use (OR 2.13, 95% CI 1.27–3.57).

Unsurprisingly, survey respondents age ≥65 years were more likely than ≤24 years old to see the benefit of accessing EHRs in case of emergency. Wen et al[45] also found that respondents aged 65 years and above were more likely to rate HIE as important when compared with other age groups. Those with children in their household reported experiencing less need to control access to their health information than respondents with no children in the household.

Interestingly, those who completed a paper survey were much more likely than online survey respondents to see the benefit of use in emergency care, administrative work, and provision of care.

**Table 3.** Percentage of respondents who strongly agree/agree with sub-constructs, by physician use of EHR ($n = 733$)

| Constructs | Physician uses EHR ($n = 625$) | Physician does not use EHR ($n = 108$) | Total ($n = 733$) | *P*-value use vs. does not |
|---|---|---|---|---|
| Perceived benefit of change | | | | |
| Benefit in emergency care | 71.2 | 50.9 | 68.2 | <0.0001 |
| Benefit in administrative work | 81.2 | 60.8 | 78.2 | <0.0001 |
| Benefit to care provided | 75.2 | 55.6 | 72.3 | <0.0001 |
| Compatibility with values, beliefs, past history, and current needs | | | | |
| Need control over record | 95.2 | 87.0 | 94.0 | 0.0010 |
| Need control over who sees information | 81.5 | 74.1 | 80.4 | 0.0709 |
| Trust | 38.6 | 25.0 | 36.6 | 0.0069 |
| Need HIE | 71.5 | 42.2 | 66.8 | <0.0001 |
| Perceived ease of use | 81.9 | 64.8 | 79.4 | <0.0001 |

## DISCUSSION

The results suggest that consumers who have experienced the use of one technology in the healthcare setting can recognize the potential benefit of another technology. Race/ethnicity, gender, and education played some role in respondents' views of EHRs and HIE, more specifically, non-Hispanic African American participants indicated lower levels of trust in HIE when compared with non-Hispanic Whites. Females were generally more likely than males to see the benefit of EHRs in administrative work and expressed more trust in HIE than males. This finding contradicts several studies that have reported women are less likely to use and trust health IT.[12,45] It also was noted that respondents with less than high school education had lower odds of needing control over records when compared with participants with more than 4 years of college. Patel et al[46] also found college education increases potential use and understanding of health IT. While other studies have found that frequent use of the internet leads to greater levels of support and potential use of health IT,[12,46,47] our study did not find any such differences. Participants

**Table 4.** Adjusted odds of strongly agreeing or agreeing with selected opinions of HIEs (OR, 95% CI)

| | Benefit in emergency care ($n=663$) | Benefit in administrative work ($n=660$) | Benefit to care provided ($n=662$) | Need control over record ($n=662$) | Need control over who sees information $n=661$) | Trust ($n=663$) | Need HIE ($n=477$) | Must be easy to use ($n=663$) |
|---|---|---|---|---|---|---|---|---|
| Physician use of EHR (Ref: Do not use) | | | | | | | | |
| Use | **1.79 (1.11–2.88)** | **2.23 (1.35–3.69)** | **1.75 (1.08–2.83)** | 1.97 (0.90–4.34) | 1.37 (0.80–2.34) | 1.46 (0.87–2.43) | **1.91 (1.07–3.40)** | **2.13 (1.27–3.57)** |
| Age (years) (Ref: ≤24) | | | | | | | | |
| 25–44 | 2.56 (0.80–8.19) | 1.01 (0.27–3.73) | 0.84 (0.25–2.87) | 0.31 (0.04–2.83) | 0.86 (0.24–3.03) | 3.44 (0.72–16.44) | 0.79 (0.17–3.70) | 0.69 (0.17–2.72) |
| 45–64 | 2.74 (0.86–8.73) | 0.78 (0.21–2.87) | 0.64 (0.19–2.19) | 0.53 (0.06–4.91) | 1.18 (0.34–4.18) | 3.2 (0.67–15.27) | 1.06 (0.22–5.01) | 0.6 (0.15–2.36) |
| ≥65 | **3.45 (1.02–11.60)** | 0.94 (0.24–3.64) | 1.21 (0.34–4.36) | 0.75 (0.07–7.84) | 0.61 (0.17–2.28) | 3.68 (0.74–18.18) | 1.11 (0.23–5.42) | 1.37 (0.32–5.81) |
| Race/Ethnicity[a] (Ref: NH White) | | | | | | | | |
| NH African American | 1.62 (0.85–3.08) | 1.13 (0.56–2.26) | 1.09 (0.58–2.07) | 0.63 (0.23–1.76) | 1.16 (0.59–2.30) | **0.42 (0.22–0.80)** | 0.51 (0.25–1.04) | 1.33 (0.65–2.71) |
| Hispanic | 1.42 (0.50–4.08) | 2.16 (0.58–8.07) | 1.36 (0.46–3.98) | 1.46 (0.17–12.84) | 1.67 (0.45–6.28) | 1.33 (0.52–3.42) | 0.99 (0.30–3.24) | 2.57 (0.56–11.70) |
| Other | 0.95 (0.47–1.92) | 0.80 (0.37–1.72) | 0.45 (0.23–0.92) | 0.46 (0.16–1.36) | 1.16 (0.49–2.74) | 0.79 (0.37–1.67) | 1.12 (0.47–2.72) | 0.62 (0.29–1.29) |
| Gender[a] (Ref: Male) | | | | | | | | |
| Female | 1.42 (0.98–2.04) | **1.63 (1.08–2.47)** | 1.19 (0.81–1.74) | 1.47 (0.71–3.06) | 1.21 (0.81–1.83) | **1.67 (1.18–2.38)** | 0.74 (0.48–1.16) | 1.00 (0.66–1.53) |
| Highest level of education[a] (Ref: >4-year college) | | | | | | | | |
| <High school | 1.16 (0.65–2.09) | 1.24 (0.64–2.41) | 0.92 (0.51–1.68) | **0.29 (0.09–0.92)** | 0.26 (0.13–0.51) | 1.08 (0.63–1.86) | 0.96 (0.48–1.93) | 0.81 (0.42–1.56) |
| High School - some college | 0.99 (0.68–1.66) | 0.95 (0.52–1.71) | 0.97 (0.56–1.67) | 0.38 (0.13–1.18) | 0.49 (0.25–0.93) | 0.82 (0.50–1.32) | 1.81 (0.96–3.41) | 1.16 (0.62–2.18) |
| Bachelor | 0.83 (0.51–1.35) | 1.03 (0.58–1.81) | 0.94 (0.56–1.58) | 1.03 (0.31–3.42) | 0.56 (0.30–1.06) | 0.66 (0.41–1.05) | 1.03 (0.58–1.85) | 0.85 (0.48–1.51) |
| Insurance[a] (Ref: Private) | | | | | | | | |
| Public | 0.81 (0.49–1.33) | 0.73 (0.42–1.27) | 0.67 (0.40–1.12) | 1.49 (0.51–4.38) | 1.00 (0.59–1.72) | 1.01 (0.64–1.60) | 0.71 (0.40–1.27) | 0.83 (0.46–1.51) |
| Self-pay or none | 0.60 (0.35–1.03) | 0.73 (0.40–1.33) | 1.21 (0.67–2.16) | 0.63 (0.26–1.58) | 0.70 (0.38–1.27) | 1.32 (0.78–2.23) | 0.89 (0.43–1.85) | 0.82 (0.45–1.51) |
| Children in household (Ref: None) | | | | | | | | |
| Yes | 0.79 (0.51–1.23) | 0.82 (0.49–1.38) | 1.06 (0.66–1.68) | 1.05 (0.44–2.51) | **0.52 (0.31–0.86)** | 0.75 (0.49–1.16) | 0.69 (0.40–1.20) | 0.67 (0.41–1.10) |
| Number of household doctor visits[a] (Ref: ≥12) | | | | | | | | |
| 0–3 | **0.47 (0.26–0.82)** | **0.36 (0.19–0.67)** | **0.41 (0.23–0.73)** | 0.59 (0.21–1.69) | 0.78 (0.43–1.42) | **0.43 (0.25–0.73)** | **0.19 (0.10–0.38)** | 0.77 (0.40–1.46) |
| 4–5 | **0.32 (0.19–0.55)** | **0.43 (0.23–0.79)** | **0.40 (0.23–0.69)** | 0.79 (0.28–2.26) | 1.08 (0.60–1.96) | 0.76 (0.47–1.23) | 0.56 (0.29–1.07) | 0.76 (0.41–1.40) |
| 6–11 | **0.54 (0.34–0.86)** | 0.67 (0.38–1.16) | 0.75 (0.46–1.23) | 1.46 (0.51–4.17) | 1.27 (0.76–2.11) | **0.59 (0.39–0.89)** | 0.74 (0.42–1.30) | 0.75 (0.44–1.26) |
| Internet use[a] (Ref: Daily or almost daily) | | | | | | | | |
| Occasionally | 0.64 (0.30–1.37) | 0.70 (0.30–1.60) | 0.54 (0.26–1.15) | 0.34 (0.08–1.34) | 0.80 (0.35–1.81) | 0.47 (0.21–1.03) | 0.49 (0.21–1.18) | 0.65 (0.28–1.53) |
| Rarely or Never | 0.93 (0.42–2.05) | 0.95 (0.41–2.24) | 1.33 (0.58–3.03) | 0.58 (0.13–2.54) | 0.61 (0.28–1.34) | 1.19 (0.57–2.49) | 0.71 (0.28–1.77) | 0.56 (0.24–1.32) |
| Familiarity with HIE (Ref: Familiar) | | | | | | | | |
| Not at all familiar | 0.80 (0.55–1.16) | 0.78 (0.50–1.21) | **0.60 (0.40–0.89)** | 1.28 (0.59–2.78) | 1.19 (0.78–1.83) | **0.69 (0.48–0.97)** | 0.79 (0.50–1.24) | 1.02 (0.66–1.56) |
| Survey method (Ref: Online) | | | | | | | | |
| Phone | 1.29 (0.82–2.04) | 1.10 (0.66–1.85) | 1.31 (0.81–2.10) | 2.01 (0.74–5.50) | 1.36 (0.79–2.33) | 0.95 (0.61–1.48) | 0.63 (0.37–1.07) | 1.00 (0.59–1.68) |
| Paper | **2.25 (1.38–3.66)** | **2.19 (1.21–3.95)** | **2.39 (1.41–4.04)** | **6.10 (1.55–24.08)** | 1.56 (0.92–2.66) | 0.97 (0.63–1.49) | **2.19 (1.20–4.00)** | 1.35 (0.77–2.36) |

*Note:* Income was not included in logistic models due to high number of missing responses ($n=125$). The bold face type represent significant values.

[a]Respondents were missing in each category: race/ethnicity ($n=42$), gender ($n=6$), highest level of education ($n=13$), insurance ($n=9$), number of household doctor visits ($n=10$), and internet use ($n=1$).

[b]Reference groups were not checking each category, as multiple categories could have been picked for each question.

who lacked familiarity with HIE saw less benefit to care provided and were less trusting when compared with those familiar with HIE. However, the paper survey respondents also expressed more need to control their health records and saw a greater need for HIE. This indicates that while paper survey respondents understand the potential benefit of the HIE, they desire more control and security measures.

Steps were taken to mitigate study limitations; however, some remain. Participant sampling was conducted to achieve an amount without regard for age or race. Even though the resulting sample size was large, this study may lack generalizability to other age ranges or other races. Survey questions were based on theoretically driven constructs as mapped in Table 1; however, the perception of bias may exist. Additionally, the study design did not include a baseline understanding of HIE and/or health IT from the consumers surveyed. Lastly, challenges with studies that try to understand perspective, consumer or otherwise, can offer findings that are not generalizable.

## CONCLUSION

This cross-sectional survey indicated that physician use of EHRs significantly increases the odds of consumers' seeing perceived benefits of HIE and understanding the need for HIE. This finding resonates with previous research on the topic of provider buy-in to the value of health IT. For instance, Ancker et al[25] found that physicians using EHRs were more likely to believe EHRs could improve the quality of provided care. Furthermore, patients' experiences with physicians using EHR were not associated with privacy concerns.[25] Implications of these findings are from 3 perspectives: provider, consumer, and vendor. Providers can increase consumer trust through improved care cost and quality, consumers can increase their knowledge and awareness of, and drive the use of, EHRs and HIE in various care environments, and vendors can use these study findings to create systems that instill consumer trust as well as more user-friendly interfaces that promote consumer and provider collaboration across the care continuum.

Moving forward, the authors of this study join other scholars in recommending that HIE vendors and healthcare providers improve consumer trust[22] and control by educating consumers on the benefits of health IT and by protecting against unauthorized viewing of EHRs.[48]

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## CONTRIBUTION

SF conceived of and designed the project and is responsible for data acquisition. GB contributed to the data analysis. SF, GB, and BS all made substantial contributions to the data interpretation and manuscript writing and editing. All authors (SF, GB, and BS) give final approval of the version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

*Conflict of interest statement*. None declared.

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