

# Trending Health Information Technology Adoption Among New York Nursing Homes

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Recent federal policy has focused upon building the nation's health information technology (HIT) infrastructure. Through the Electronic Health Record (EHR) Incentive Program, payments are available to hospitals and providers who meaningfully use EHRs.<sup>1</sup> This program, with total incentive payments estimated between \$14 billion and \$27 billion, has resulted in tremendous increases in adoption in both sectors.<sup>2,3</sup>

Unlike hospitals and providers, the long-term care sector has been excluded from federal incentive programs. While only a few large-scale studies have assessed rates of EHR adoption among nursing homes—and reported rates vary widely—it is believed this sector lags behind.<sup>4,9</sup> The barriers to adoption cited include the high cost of purchasing and maintaining EHRs, implementation and training challenges, and lack of evidence for return on investment.<sup>10</sup> However, for those facilities that invest in EHRs, there are many reported benefits, including improved information access, more accurate documentation, increased adherence to evidence-based guidelines, and improved employee satisfaction and retention.<sup>11</sup>

Currently, there are more than 1.5 million residents in long-term care facilities—a number expected to increase as the elderly population grows.<sup>12</sup> These patients are medically complex, have high medical costs, and are frequently transferred to acute care hospitals. Indeed, a 2011 report found that nursing homes transferred 25% of their Medicare residents annually to hospitals at a cost of \$14.3 billion.<sup>13</sup> As a result, this sector arguably has an urgent need to keep pace with the HIT adoption occurring in other sectors—a sentiment underscored by the Office of the National Coordinator for Health Information Technology.<sup>14</sup>

In 2012, we surveyed all New York state (NYS) nursing homes to assess their level of EHR adoption and health information exchange (HIE) participation.<sup>15</sup> NYS leads the nation in state-based HIT investments, primarily through the Health Care Efficiency and Affordability Law for New Yorkers (HEAL NY) Capital Grants Program.<sup>16</sup> While this program

## ABSTRACT

### Objectives

Federal policies are incentivizing hospitals and providers to adopt and meaningfully use electronic health records (EHRs). Nursing homes are not eligible for incentives. However, understanding health information technology (HIT) adoption among nursing homes will be critical to developing HIT policies for this sector. Our objective was to assess the pace of EHR adoption, changes in computerized function adoption, and participation in health information exchange by New York state nursing homes over time.

### Study Design

We used a repeated, cross-sectional study design.

### Methods

We surveyed all New York state nursing homes between February and May 2013, comparing results to the same survey administered in 2012.

### Results

We received responses from 472 of 630 nursing homes (74.9%). Rates of EHR adoption increased from 48.6% to 56.3% ( $P = .03$ ). Participation in health information exchange remained unchanged (54.5% to 55.3%,  $P = .8$ ). The top barriers to EHR adoption cited were: a) the initial cost of HIT investment (67.9%,  $n = 133$ ), b) lack of technical IT staff (46.4%,  $n = 91$ ), and c) lack of fiscal incentives (45.8%,  $n = 88$ ). Comparing nursing homes with EHRs in 2012 to nursing homes with EHRs in 2013, the availability of many types of computerized functionalities significantly increased, although no gains were seen for order entry or clinical tools.

### Conclusions

While some gains are being made by nursing homes, HIT adoption generally lags behind that of other sectors. Public policy focusing on building HIT infrastructure is essential to ensure that nursing homes keep up with other healthcare segments.

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### Take-Away Points

Although federal policies are incentivizing health information technology (HIT) adoption by hospitals and providers, nursing homes are excluded. Few large-scale or longitudinal assessments of HIT adoption in this sector have been published. We assessed electronic health record (EHR) adoption and health information exchange participation among New York state nursing homes over time.

- There was a 7.7 percentage point increase in rates of EHR adoption between 2012 and 2013.
- Rates of health information exchange remained stagnant.
- HIT engagement in this sector lags behind other healthcare sectors.
- Understanding HIT adoption in this sector is critical to guide policy development.

does not specifically provide funding to nursing homes, a primary focus is community-wide HIT investment.

The objective of this follow-up survey was to assess how rates of EHR adoption and HIE participation have changed over time. We also sought to identify characteristics associated with adoption during this time period, changes in computerized functions available, and barriers to EHR adoption. To our knowledge, this is the first such large-scale, repeated cross-sectional assessment. Given the rapidly changing HIT landscape, closely monitoring the progress of nursing homes can provide valuable data to inform HIT policies.

## METHODS

### Survey Development

This study was conducted as part of the HEAL NY program evaluation process, led by researchers from HEAL NY's designated evaluation entity, the Health Information Technology Evaluation Collaborative. Our survey instrument was a novel questionnaire developed with guidance from experts in HIT and HIE, as well as leaders from 3 key NYS long-term care associations: Continuing Care Leadership Coalition, LeadingAge New York, and New York State Health Facilities Association.<sup>17</sup> Survey questions remained consistent between 2012 and 2013, allowing for longitudinal comparison. We obtained Institutional Review Board approval from Weill Cornell Medical College.

### Survey Content

Our survey consisted of 10 questions and assessed EHR implementation, automation of 23 key functionalities, HIE participation, and barriers to EHR implementation.

### Survey Sample and Administration

We surveyed all 630 NYS nursing homes between February and May 2013. Surveys were e-mailed to each nursing home administrator by Cornell Survey Research

Institute, whose expertise is providing survey research support services. The 3 long-term care associations alerted administrators via electronic newsletters.

### Nursing Home Characteristics

We collected information about nursing home location, bed size, hospital system membership, ownership, and status as a continuing care retirement community from the CMS Nursing Home Compare database.<sup>18</sup> Continuing care retirement

communities are generally privately owned and combine independent living, assisted living, and nursing home facilities. We speculated that their rates of EHR adoption and HIE participation may be higher than that of other nursing homes in order to better standardize care and facilitate exchange of information between facilities.

To categorize location, we used the catchment areas of the NYS Department of Health regional long-term care offices (Capital District, Central, Western, Hudson Valley, New York City, and Long Island).<sup>19</sup> We divided bed size into 4 categories, with each representing approximately one-fourth of total nursing homes: less than 100, 100 to 159, 160 to 239, and 240 or more. We categorized ownership into privately owned for-profit, privately owned nonprofit, and publicly owned. Hospital affiliation, chain ownership, and status as a continuing care retirement community were dichotomized into yes/no variables.

### Statistical Analysis

We compared respondent and nonrespondent characteristics using Pearson  $\chi^2$  tests or Fisher's exact tests. We evaluated whether an EHR was implemented either fully or partially (counting those facilities as adopters) and whether the facility participated in HIE. We used descriptive statistics to assess the availability of computerized functionalities among nursing homes with EHRs, comparing 2012 and 2013 results. For facilities participating in HIE, we assessed the type and directionality of data exchanged. We compared results between 2012 and 2013 using 2 sample tests of proportions.

We also analyzed the relationships between EHR adoption and HIE participation with key nursing home characteristics (eg, location, bed size, membership in a hospital system, ownership, and status as a continuing care retirement community), using logistic regression to isolate the predictive effects of each characteristic. We examined barriers to EHR adoption among nursing homes without EHRs, using  $\chi^2$  or Fisher's exact tests.

Lastly, we compared nursing homes that adopted EHRs between 2012 and 2013 to those that did not, and nursing homes that began participating in HIE between 2012 and 2013 to those that did not, in order to identify characteristics associated with HIT acquisition. We again used  $\chi^2$  or Fisher's exact tests to describe differences. We used SAS 9.3 (Cary, North Carolina) for all analyses.

## RESULTS

We received responses from 472 of 630 nursing homes in 2013 (74.9%) (Table 1). There were no significant differences between respondents and nonrespondents.

### Rates of EHR Adoption Over Time

There was a 7.7 percentage point increase in adoption between 2012 and 2013, from 48.6% to 56.3% ( $n = 264$ ) ( $P = .03$ ). In 2013, among the 119 nursing homes planning to implement EHRs, 22.7% ( $n = 27$ ) planned to implement within 12 months, 37.8% ( $n = 45$ ) within 13 to 24 months, 20.2% ( $n = 24$ ) in 2 years or more, and 19.3% ( $n = 23$ ) were unsure of the timeline. Only 11.7% ( $n = 55$ ) reported no EHR implementation plans, similar to 2012 (11.4%).

### Available Computerized Functionalities

As of 2013, among EHR adopters, the functionalities most likely to be all electronic were minimum data set reporting, financial management, and patient demographics (Table 2). Computerized provider order entry was available in 56.9% ( $n = 148$ ) of facilities, and clinical notes were available in 51.4% ( $n = 133$ ). Clinical decision support was only available in 8.2% ( $n = 21$ ). Between 2012 and 2013, the availability of many types of computerized functionalities significantly increased among nursing homes with EHRs, particularly with regard to documentation and results viewing (Table 2). However, there was no significant change in the availability of medication or other type of order entry or clinical tool functions.

### Participation in HIE

As of 2013, 50.5% ( $n = 233$ ) of nursing homes exchanged

**Table 1.** Characteristics of Respondents Versus Nonrespondents

Characteristic	Respondents N (%)	Nonrespondents N (%)	P
<b>Number of Nursing Homes</b>	<b>472 (74.9)</b>	<b>158 (25.1)</b>	--
<b>Size</b>			.7
Very small (under 100 beds)	102 (21.6)	39 (24.7)	
Small (100-159 beds)	119 (25.2)	38 (24.1)	
Medium (160-239 beds)	138 (29.2)	39 (24.7)	
Large (240+ beds)	112 (23.7)	41 (26.0)	
Missing	1 (0.2)	1 (0.6)	
<b>Region</b>			.9
Upstate	217 (46.0)	74 (46.8)	
Downstate	255 (54.0)	84 (53.2)	
<b>Ownership status</b>			.4
For-profit	245 (51.9)	82 (51.9)	
Private nonprofit	191 (40.5)	58 (36.7)	
Public	29 (6.1)	16 (10.1)	
Missing	7 (1.5)	2 (1.3)	
<b>Hospital affiliation</b>			.3
Yes	46 (9.8)	9 (5.7)	
No	419 (88.8)	147 (93.0)	
Missing	7 (1.5)	2 (1.3)	
<b>Member of a nursing home chain</b>			.8
Yes	56 (11.9)	22 (13.9)	
No	409 (86.7)	134 (84.8)	
Missing	7 (1.5)	2 (1.3)	
<b>Continuing care retirement community</b>			.9
Yes	14 (3.0)	4 (2.5)	
No	451 (95.6)	152 (96.2)	
Missing	7 (1.5)	2 (1.3)	

key clinical information electronically within their care system and 27.2% ( $n = 125$ ) exchanged information electronically outside their care system. Overall, the rate of HIE in 2013 was 55.3% ( $n = 256$ ). There was no significant change in rates of HIE from 2012 to 2013 (54.5% to 55.3%,  $P = .8$ ). Similar to 2012, the most common data exchange partners were pharmacies, hospitals, and laboratories (Table 3). Comparing facilities engaged in HIE in 2012 and 2013, there were no significant differences with regard to data exchange partners or the level of bidirectionality of data exchange.

### Characteristics Associated With EHR Adoption and Participation in HIE

Only being part of a nursing home chain was significantly associated with having an EHR (odds ratio [OR]

**Table 2.** Computerized Functionalities Among Nursing Homes With EHRs by Year

Functionality	Fully Computerized in 2012 (n = 176) N (%)	Fully Computerized in 2013 (n = 264) N (%)	P
<b>Administrative Functions</b>			
Minimum data set (MDS)	145 (85.8)	225 (86.2)	.9
Assessments other than MDS	62 (37.1)	148 (56.7)	.0001
Financial management	106 (63.1)	186 (72.4)	.04
Quality improvement and reporting	33 (20.0)	70 (27.0)	.1
Patient care planning	86 (51.5)	139 (53.7)	.7
Task list (eg, CNA work flow)	74 (44.6)	117 (45.2)	.9
<b>Documentation</b>			
Patient demographics	136 (81.0)	176 (67.7)	.003
Advance directives	30 (18.1)	80 (30.8)	.004
Medical history	50 (30.1)	105 (40.5)	.03
Clinical notes	82 (49.4)	133 (51.4)	.7
Problem list	63 (38.4)	127 (49.2)	.03
Allergy list	94 (56.3)	158 (61.0)	.3
Medication administration record	80 (47.6)	132 (51.0)	.5
Treatment administration record	79 (47.0)	131 (50.4)	.5
Summary reports, including transfer, discharge, and consults	42 (24.9)	75 (29.1)	.3
<b>Order Entry</b>			
Medication order entry	84 (50.0)	148 (56.9)	.2
Other order entry	77 (48.4)	128 (50.8)	.6
<b>Results Viewing</b>			
Labs	44 (25.9)	92 (35.7)	.03
Radiology	37 (21.9)	76 (29.5)	.08
Other diagnostic tests	23 (14.0)	60 (23.3)	.02
Consults	10 (6.2)	48 (18.7)	.0003
<b>Clinical Tools</b>			
Clinical decision support	16 (10.3)	21 (8.2)	.5
Telemonitoring/telehealth	10 (6.5)	21 (8.2)	.5

CNA indicates certified nursing assistant; EHR, electronic health record. Denominators vary slightly due to question nonresponse.

= 1.9; 95% CI, 1.0-3.4) (Appendix Table 1). Being affiliated with a hospital (OR = 2.4; 95% CI, 1.2-4.8), having an EHR (OR = 2.2; 95% CI, 1.5-3.2), and being a private nonprofit nursing home versus a for-profit nursing home (OR = 1.8; 95% CI, 1.3-2.7) were all significantly associated with HIE participation.

We also looked specifically at the 141 nursing homes that did not have EHRs in 2012 to identify any characteristics that distinguished the 2013 adopters (n = 45) from those who remained nonadopters (n = 96). We found no

difference in facility characteristics between these 2 groups; however, among recent adopters we saw a significant increase in the use of many available computerized functionalities, a change we did not see among nonadopters. This was true for 16 of 23 functionalities, including 4 of 6 administrative functionalities, all documentation functionalities, all order entry functionalities, and consult viewing.

Similarly, we looked specifically at the 129 nursing homes that did not participate in HIE in 2012. We compared characteristics of those that participated in HIE in 2013 (n = 60) to nonparticipants both years (n = 69). We found that more of the facilities that newly engaged in HIE were medium-size (P = .02). In addition, there was significantly greater adoption in those facilities of several computerized functionalities—specifically medical history documentation (P = .04), allergy documentation (P = .04), and electronic laboratory results viewing (P = .01).

### Barriers to EHR Adoption

The top barriers to EHR adoption among nursing homes without an EHR were stated to be: a) initial cost of HIT investment (67.9%, n = 133), b) lack of technical IT staff (46.4%, n = 91), and c) lack of fiscal incentives (45.8%, n = 88). Significantly more nursing homes without an EHR identified these as major barriers compared with those that had an EHR (P = .001, P < .0001, P = .03, respectively) (eAppendix Table 2).

## DISCUSSION

To our knowledge, this study represents the only large-scale study to track EHR adoption and HIE participation by nursing homes over time. Our results show that there was a 7.7 percentage point increase in EHR adoption among NYS nursing homes between 2012 and 2013, and rates of HIE participation remained stagnant. These results provide important information about the pace of HIT adoption in nursing homes that can help guide policy discussions.

Our results suggest that nursing homes are not keeping pace with the achievements in HIT acquisition seen among office-based providers and hospitals. National data

from the CDC show that adoption of any EHR system (defined similarly to our study) by office-based physicians increased from 71.8% to 78.4% between 2012 and 2013.<sup>20</sup> While this is also a 6.6 percentage point change, rates of overall EHR adoption by providers are much higher. Between 2011 and 2012, the adoption of EHR grew from 51.7% to 71.8%.<sup>2</sup> Prior to the start of incentive payments, rates of adoption were increasing only 4% per year.

Among hospitals nationally, rates of adoption of at least a basic EHR system have nearly tripled since 2010, increasing by 15 percentage points from 2012 to 2013.<sup>21</sup> While this comparison differs slightly in that we assessed adoption of any EHR system, not utilizing the stricter criteria for a basic EHR system as defined by the Office of National Coordinator for Health Information Technology in the above report, it is worth noting that 87% of all hospitals in 2013 reported receiving at least 1 meaningful use incentive payment (and thus, by definition, must have an EHR).<sup>3</sup> Prior to 2010, rates of EHR adoption were increasing only 3% per year among US hospitals. Also of note, in NYS, we did a similar cross-sectional survey of hospitals assessing adoption of any EHR and participation in HIE, and found that as of 2012, 97% of hospitals had adopted an EHR and 79% were engaging in HIE with other partners (manuscript in press).

Among nursing homes with EHRs, the proportion of computerized functionalities available significantly increased for many functions between 2012 and 2013. Unfortunately, 2 areas where this did not occur were order entry and clinical tools. These areas are generally more difficult to implement; however, their use is likely necessary to achieve maximal quality and safety benefits. Such gains have already been seen in the nursing home setting. For example, several dozen nursing homes in California reduced their rates of pressure ulcers by 42% to 55% through use of clinical decision support embedded in EHRs.<sup>22</sup>

Our data suggest that the pace of HIT adoption will be much slower in healthcare sectors not receiving financial incentives, such as nursing homes. Indeed, 2 of the top barriers to adoption identified in our survey were the initial cost of HIT investment and lack of fiscal incentives. This is supported by research in other sectors excluded from the EHR Incentive Program. For example, a recent national study examining EHR adoption among non-acute care hospitals not eligible for federal incentives found that only 6% of long-term care hospitals, 4% of

■ **Table 3.** Data Exchange Partners Among Nursing Homes With HIE in 2013 (n = 256)

Data Exchange Partner	Receive Information N (%)	Send Information N (%)	Both Receive and Send Information N (%)
RHIO	15 (5.9)	10 (3.9)	20 (7.8)
Primary care physicians	12 (4.7)	16 (6.3)	55 (21.5)
Specialty care physicians	12 (4.7)	13 (5.1)	47 (18.4)
Hospitals	76 (29.7)	7 (2.7)	78 (30.5)
Pharmacies	27 (10.5)	19 (7.4)	131 (51.2)
Laboratories	56 (21.9)	11 (4.3)	84 (32.8)
Other nursing homes	7 (2.7)	4 (1.6)	34 (13.3)
Home healthcare organizations	4 (1.6)	12 (4.7)	29 (11.3)
Assisted living facilities	3 (1.2)	7 (2.7)	26 (10.2)
Hospice	8 (3.1)	9 (3.5)	29 (11.3)

HIE indicates health information exchange; RHIO, regional health information organization.

rehabilitation hospitals, and 2% of psychiatric hospitals have at least a basic EHR system.<sup>23</sup> By comparison, among office-based physicians eligible for EHR incentives, top barriers to adoption often center around work flow challenges, lack of interoperability of EHR systems, and the costs of purchasing and maintaining EHRs.<sup>24</sup>

In contrast to EHR adoption, there was no change in HIE participation between 2012 and 2013. Among the nursing homes we surveyed, 50.5% engaged in HIE with providers within their care system and 27.2% engaged in HIE with providers outside their care system. By comparison, among hospitals nationally as of 2012, 65% were participating in HIE with hospitals inside their organization and 58% were exchanging data with providers outside their organization.<sup>25</sup> Similar to hospitals, having an EHR system significantly increases the likelihood of HIE participation in our sample of nursing homes.<sup>25</sup> Meaningful use of Stage 2 criteria requires that eligible hospitals who transition patients to another care setting provide a care summary, electronically or via exchange, for a percentage of patients. Perhaps this is helping to facilitate some HIE between nursing homes and hospitals.<sup>1</sup> However, there are many challenges to HIE beyond lack of technology, including required collaboration between competitors and lack of sustainable business models.<sup>26</sup> These may explain why EHR adoption is increasing, even if slowly, while HIE rates remain unchanged.

### Limitations

There are several limitations to our study. First, our results may be subject to nonresponse biases, although

we achieved a 74.9% response rate and there were no differences between respondents and nonrespondents. Our study sample was drawn exclusively from NYS, limiting generalizability. However, as NYS is a leader in HIT investment, it seems likely that rates of EHR adoption and participation in HIE would be lower among nursing homes in other states, underscoring the need for policy focused in this setting. Lastly, we asked about the availability of computerized functions but did not assess usage.

## CONCLUSIONS

This survey provides important information about the pace of EHR adoption and HIE participation over time among nursing homes in NYS with the largest statewide investment in HIT. We found a 7.7 percentage point increase in rates of EHR adoption between 2012 and 2013, while rates of HIE participation remained stagnant. HIT adoption by nursing homes appears to be lagging compared with other healthcare sectors in which federal policies are incentivizing adoption. To ensure that nursing homes keep pace with the rest of healthcare, it seems critical that public policy should specifically focus on helping nursing homes overcome barriers to EHR adoption and encourage broad participation in HIE.

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**eAppendix Table 1.** Characteristics Associated With EHR Adoption and Participation in HIE

Characteristic	EHR	<i>P</i>	HIE	<i>P</i>
	OR (95% CI)		OR (95% CI)	
Size				
Very small (under 100 beds)	Reference	—	Reference	—
Small (100-159 beds)	0.8 (0.5-1.4)	.5	0.8 (0.5-1.3)	.4
Medium (160-239 beds)	1.1 (0.7-1.9)	.6	0.9 (0.6-1.6)	.8
Large (240+ beds)	1.3 (0.8-2.3)	.3	0.9 (0.5-1.6)	.8
Region				
Upstate	1.0 (0.7-1.5)	.9	1.4 (1.0-2.0)	.09
Downstate	Reference	—	Reference	—
Ownership status				
For-profit	Reference	—	Reference	--
Private nonprofit	1.3 (0.9-1.9)	.2	1.8 (1.2-2.7)	.002
Public	0.8 (0.4-1.7)	.5	1.5 (0.7-3.5)	.3
Hospital affiliation				
Yes	0.9 (0.5-1.6)	.6	2.4 (1.2-4.8)	.01
No	Reference	—	Reference	—
Member of a nursing home chain				
Yes	1.9 (1.0-3.4)	.04	1.7 (0.9-3.0)	.1
No	Reference	--	Reference	—
Continuing care retirement community				
Yes	1.9 (0.6-6.3)	.3	0.6 (0.2-1.7)	.3
No	Reference	—	Reference	—
EHR				
Yes	—	—	2.2 (1.5-3.2)	<.0001
No	—	—	Reference	—

EHR indicates electronic health record; HIE, health information exchange; OR, odds ratio.

Nursing homes with missing responses were excluded.

**eAppendix Table 2. Barriers to EHR Adoption**

Major Barrier	No EHR	EHR	P
	N (%)	N (%)	
<b>Financial Considerations</b>			
Initial cost of IT investment (purchase/installation of EHR)	133 (67.9)	135 (52.7)	.001
Ongoing cost of maintaining an EHR	74 (37.9)	69 (27.2)	.02
Return on investment of EHR	52 (27.1)	43 (16.9)	.01
Lack of fiscal incentives for HIT adoption	88 (45.8)	89 (35.5)	.03
<b>Workforce Considerations</b>			
Concern about loss of productivity during or after transition to the EHR	39 (20.0)	47 (18.4)	.7
Disruption in clinical care during implementation of an EHR	54 (27.7)	45 (17.8)	.01
Lack of technical IT staff	91 (46.4)	72 (28.4)	<.0001
Lack of resources for training patient care staff in basic computer literacy	84 (42.9)	59 (23.2)	<.0001
Resistance from clinical providers	36 (18.7)	43 (16.9)	.6
Resistance from administrative staff	12 (6.2)	11 (4.4)	.4
<b>Technical Considerations</b>			
Security and privacy concerns	31 (15.7)	34 (13.3)	.5
Lack of interoperability with current systems	61 (31.1)	63 (24.7)	.1
Lack of technical infrastructure	73 (37.4)	69 (27.3)	.02
Concerns about lack of future vendor support for upgrades and maintenance	32 (16.4)	38 (14.8)	.6
Inability to easily transfer historical paper medical record	74 (37.8)	71 (28.0)	.03
<b>Other Considerations</b>			
Lack of evidence for effectiveness of EHR	16 (8.1)	20 (7.9)	.9
Inability to evaluate/select most appropriate software system	34 (17.3)	29 (11.5)	.08
Inability to find an EHR that meets organization's needs	29 (15.0)	39 (15.5)	.9
Lack of clear state and federal policies/standards for an EHR	45 (23.1)	51 (20.1)	.4
Competing priorities	71 (36.2)	74 (29.0)	.1
Obtaining/updating patient consent	5 (2.6)	5 (2.0)	.8

EHR indicates electronic health record; HIT, health information technology; IT, information technology.

Denominators vary slightly due to question nonresponse.