A Statewide Assessment of Electronic Health Record Adoption and Health Information Exchange among Nursing Homes

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Objective. To determine rates of electronic health record (EHR) adoption and health information exchange (HIE) among New York State (NYS) nursing homes.

Data Sources/Study Setting. Primary data collected from a novel survey administered between November 2011 and March 2012 to all NYS nursing homes.

Study Design. We used a cross-sectional study design to assess level of EHR implementation, automation of key functionalities, participation in HIE, and barriers to adoption.

Data Collection/Extraction Methods. We used descriptive statistics to characterize rates of EHR adoption and participation in HIE and logistic regression to identify nursing home characteristics associated with EHR adoption and HIE.

Principal Findings. We received responses from 375 of 632 nursing homes (59.3 percent). Of respondents, almost one in five ($n = 66$, 18.0 percent) reported having a fully implemented and operational EHR and a majority ($n = 192$, 54.4 percent) reported electronically exchanging information. Nursing homes with 100–159 beds were significantly less likely than other facilities to have implemented or be in the process of implementing an EHR ($p = .011$).

Conclusions. Our findings present an important systematic look at EHR adoption and HIE by NYS nursing homes. Although the nursing home sector has been reported to lag in health information technology adoption, our results are encouraging. However, they suggest much room for growth and highlight the need for targeted initiatives to achieve more widespread adoption in this important health care sector.

Key Words. Nursing home, electronic health record adoption

Electronic health records (EHRs) have great potential to improve health care delivery and unprecedented federal investments are providing incentives for providers and hospitals to adopt EHRs (Chaudhry et al. 2006; Jamal,

McKenzie, and Clark 2009; The Office of the National Coordinator for Health Information Technology 2010; Buntin et al. 2011). None of the incentives are directed toward the approximately 16,100 nursing homes nationwide, although nursing homes face substantial barriers to EHR adoption, including the high costs, challenges with implementation and training, and lack of evidence for return on investment (Cherry et al. 2008). Yet the need for EHR use in the nursing home setting appears all the more urgent given the complexity and high cost of caring for this patient population. Indeed, early nursing home EHR adopters have reported many benefits, including improved access to patient information, increased documentation accuracy, better evidence-based practice implementation, and cost reductions (Cherry, Ford, and Peterson 2011).

Despite the benefits, nursing homes are generally perceived as lagging in EHR adoption, although data are limited and reported rates vary widely, from 18 to 47 percent (Richard et al. 2009; Kramer, Richard, and May 2010). Recent, reliable rates of EHR adoption in nursing homes may inform policy discussions. However, few systematic, large-scale studies have been conducted (Snap-Shot of the Use of Health Information Technology in Long Term Care 2006; Hudak and Sharky 2007; Information Technology in Long Term Care – State of the Industry 2007; Resnick et al. 2009; Minnesota e-Health Factsheet 2012).

Our study was conducted to assess rates of EHR adoption and health information exchange (HIE) among all New York State (NYS) nursing homes. HIE refers to the electronic sharing of health information across organizations. NYS has invested nearly \$840 million to support its health information technology (HIT) infrastructure, making it a leader in this regard. Nearly \$440 million has been through the Health Care Efficiency and Affordability Law for New Yorkers (HEAL NY) Capital Grants Program (Office of Health Information Technology Transformation 2010). This program does not specifically support EHR implementation by nursing homes, although there are

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publically subsidized programs, such as the NYS Nursing Home HIT Demonstration Project, which support EHR implementation by a small number of facilities (The Commonwealth Fund 2010). Monitoring the pace of HIT adoption across states will be critical for providing data to formulate future state and federal HIT policies.

MATERIALS AND METHODS

Survey Development

This study was conducted by researchers from the Health Information Technology Evaluation Collaborative—HEAL NY’s designated evaluation entity. In consultation with 10 experts in HIT and HIE, as well as three key NYS long-term care associations—Continuing Care Leadership Coalition, Leading Age New York, and New York State Health Facilities Association—we developed a novel survey to assess nursing home HIT adoption. Experts had varied backgrounds, including academia and government, and most had statewide or national reputations. We received Institutional Review Board approval from the NYS Department of Health (DOH).

Survey Content

Our survey consisted of 10 questions and assessed EHR implementation, automation of 23 key functionalities, participation in HIE, and implementation barriers (see Appendix). We grouped functionalities into five categories: administrative functions, documentation, order entry, results viewing, and clinical tools.

Survey Sample and Administration

We surveyed all 632 nursing homes in NYS using administrator contact information provided by the NYS DOH. The Center for Health Workforce Studies emailed survey letters to each administrator. Administrators were also alerted to the survey by the three long-term care associations.

Respondents completed the survey through an online email application link or by printing the survey and returning by mail or facsimile. Nonresponding nursing homes received multiple reminders. We performed data collection between November 2011 and March 2012.

Nursing Home Characteristics

We gathered data about nursing home characteristics from the Center for Medicare and Medicaid Services Nursing Home Compare database, which included information about location, bed size, ownership, membership in a hospital system, and status as a continuing care retirement community (Centers for Medicare and Medicaid Services). A continuing care retirement community is a combination independent living, assisted living, and nursing home facility generally owned and operated by a private company. Because of their unique structure, we speculated that their adoption rates may differ from other nursing homes.

We defined bed size in four categories, with each representing approximately one-quarter of nursing homes: <100 beds, 100–159 beds, 160–239 beds, 240+ beds. We categorized region by the six catchment areas of the NYS DOH regional long-term care offices (Nursing Homes In New York State). We collapsed ownership into three categories: privately owned for-profit, privately owned nonprofit and publicly owned. Hospital affiliation, chain ownership, and continuing care retirement community status were designated by dichotomous variables.

Statistical Analysis

We compared characteristics between respondents and nonrespondents using Pearson chi-squared tests or Fisher's exact tests. We then evaluated whether an EHR was implemented fully or partially and whether the facility participated in HIE. We used descriptive statistics to assess the availability of computerized functionalities.

Furthermore, we analyzed the relationships between EHR adoption and HIE participation with key nursing home characteristics using chi-squared or Fisher's exact tests. Next we used logistic regression to isolate the predictive effects of each characteristic. Results were considered statistically significant at the $p < .05$ level. We used SPSS 11 (SPSS Inc., Chicago, IL, USA) for all analyses.

RESULTS

We received responses from 375 of 632 nursing homes (59.3 percent). Nine nursing homes (2.4 percent of respondents) returned their survey anonymously, leaving 366 for analysis. Respondents and nonrespondents differed

significantly in region, ownership status, and hospital affiliation status (Table 1). Specifically, more respondents were from the upstate region and were for-profit or private nonprofit, and most were not hospital-affiliates. The results based on respondents are presented below.

Rates of EHR Adoption

We found almost one in five respondents ($n = 66$, 18.0 percent) have a fully implemented and operational EHR, while another third ($n = 110$, 30.0 percent) have a system partially implemented and operational. Only 11.4 percent of respondents ($n = 41$ 11.2 percent) report no implementation plans.

Characteristics Associated with EHR Adoption

Of all characteristics assessed, only bed size was significantly related to EHR adoption (Table 2). Nursing homes with 100–159 beds were significantly less

Table 1: Characteristics of Respondents and Nonrespondents

	<i>Respondents</i> <i>N (%)</i>	<i>Nonrespondents*</i> <i>N (%)</i>
Characteristic	366 (57.8)	267 (42.2)
Size		
Very small (under 100 beds)	80 (21.9)	60 (22.50)
Small (100–159 beds)	86 (23.5)	67 (25.1)
Medium (160–239 beds)	108 (29.5)	70 (26.2)
Large (240+ beds)	91 (24.9)	69 (25.8)
Missing	1 (0.3)	1 (0.4)
Region		
Upstate	239 (65.3)	140 (52.4)
Downstate	127 (34.7)	127 (47.6)
Ownership status		
For-profit	166 (45.4)	166 (62.2)
Private non-profit	169 (46.2)	87 (32.6)
Public	31 (8.5)	14 (5.2)
Hospital affiliation		
Yes	40 (10.9)	15 (5.6)
No	326 (89.1)	252 (94.4)
Member of a nursing home chain		
Yes	51 (13.9)	31 (11.6)
No	315 (86.1)	236 (88.4)
Continuing care retirement community		
Yes	9 (2.5)	9 (3.4)
No	357 (97.5)	258 (96.6)

*Includes respondents who could not be identified.

Table 2: Characteristics Associated with EHR Adoption and Participation in HIE

	<i>Implementation of EHR System Completed or In-Progress OR (95% CI)</i>	<i>p-Value</i>	<i>Participation in HIE OR (95% CI)</i>	<i>p-Value</i>
All nursing homes <i>N</i> (%)	176 (48.6)		192 (54.4)	
Continuing-care retirement community				
Yes	2.141 (0.527, 8.695)	.287	0.412 (0.101, 1.675)	.2155
Part of a nursing home chain				
Yes	1.227 (0.664, 2.267)	.515	2.291 (1.158, 4.533)	.017
Bed size				
Under 100	Reference	.011	Reference	.744
100–159	0.517 (0.278, 0.963)		0.848 (0.458, 1.570)	
160–239	1.078 (0.603, 1.928)		0.804 (0.444, 1.453)	
240+	1.417 (0.768, 2.612)		1.073 (0.578, 1.994)	
Hospital-affiliated				
Yes	1.325 (0.685, 2.565)	.403	2.342 (1.127, 4.870)	.023
Ownership status				
Public	Reference	.770	Reference	.052
For profit	0.775 (0.355, 1.69)		1.275 (0.581, 2.80)	
Nonprofit	0.865 (0.397, 1.884)		2.043 (0.93, 4.49)	
Region				
Capital (CD)	1.05 (0.499, 2.209)	.6318	1.00 (0.468, 2.138)	.0336
Central (CNY)	1.439 (0.745, 2.780)		2.601 (1.268, 5.336)	
Hudson (HV)	1.006 (0.491, 2.062)		0.905 (0.433, 1.889)	
Western (WNY)	0.831 (0.453, 1.525)		0.787 (0.427, 1.448)	
Long Island (LI)	0.776 (0.362, 1.663)		0.905 (0.423, 1.9330)	
NYC (NYC)	Reference		Reference	
Metropolitan area				
Yes	0.978 (0.551, 1.736)	.9394	1.23 (0.682, 2.216)	.4916
HER				
Yes	–		2.458 (1.596, 3.786)	<.001

likely to have implemented or be in the process of implementing an EHR ($p = .011$).

Availability of Computerized Functionalities

We have included a table with all 23 functionalities we assessed and their availability among respondents as an Appendix. The functionalities most likely to be all electronic among facilities with a full or partial EHR were Minimum Data Set (MDS) reporting ($n = 145$, 82.4 percent), patient demographics ($n = 136$, 77.3 percent), and financial management ($n = 106$, 60.2 percent). The MDS is a standardized assessment of all residents in Medicare or Medic-

aid certified facilities mandated by federal law. MDS is also the most commonly available electronic functionality among nursing homes without an EHR. On the other hand, only 48 percent of respondents with an EHR had computerized provider order entry (CPOE) ($n = 84$) and only 9 percent had clinical decision support (CDS) ($n = 16$). Electronic consult viewing and telehealth were rarely available (5.7 percent for both, $n = 10$).

Participation in HIE

Among respondents, 54.4 percent ($n = 192$) participated in HIE. Among facilities with an EHR, 59.7 percent ($n = 105$) exchanged key clinical information electronically with providers within their system, and 31.3 percent ($n = 55$) exchanged information with providers outside their system (see Figure 1). The majority of HIE was with pharmacies, followed by laboratories and other hospitals.

Characteristics Associated with Participation in HIE

Nursing homes with an EHR were 2.5 times more likely to participate in HIE than those without an EHR (Table 2). Among nursing homes with a full or

Figure 1: Nursing Home Participation in HIE

partial EHR, facilities that are part of chains or are hospital-affiliated are more likely than other nursing homes to exchange data (OR = 2.29, and 2.3 respectively). There was also significant regional variation.

Barriers to EHR Implementation

Figure 2 shows the top five reported major barriers to EHR implementation. Among facilities where EHR implementation has been completed or is in progress, the most frequently reported barriers were as follows: (1) the initial cost (51 percent, $n = 90$); (2) lack of fiscal incentives for adoption ($n = 54$, 31 percent); and (3) lack of interoperability with current systems ($n = 52$, 30 percent). Among nursing homes where implementation has not begun, the top two reported barriers were the same but the third was ongoing EHR maintenance costs.

DISCUSSION

Our study is one of few large-scale assessments of EHR adoption and HIE among nursing homes and is the first evaluating progress across NYS—a

Figure 2: Top Five Major Barriers to EHR Implementation

leader in HIT investments. Studying the pace of EHR adoption in this key health care segment is essential to inform federal policy and our results provide valuable information for this effort. Among respondents, we found that 18 percent of nursing homes have a fully implemented EHR and another third have a partially implemented system. Furthermore, we found that most nursing homes with an EHR were participating in HIE.

Our results are encouraging, particularly given that nursing homes are traditionally described as lagging behind other health care sectors in HIT adoption (Kramer, Richard, and May 2010). Notably, a recent national study examining EHR adoption among nonacute care hospitals that, like nursing homes, are not eligible for meaningful use incentives found that only 6 percent of long-term care hospitals, 4 percent of rehabilitation hospitals, and 2 percent of psychiatric hospitals have at least a basic EHR (Wolf, Harvell, and Jha 2012). There to date, however, has been limited assessment of nursing home EHR adoption, making it difficult to put the rates we found in full context. A review on this topic found that of seven surveys, rates of adoption ranged from 18 to 47 percent (Richard et al. 2009). The authors specifically noted that inconsistency in terminology and definitions and limitations in sample size make the accuracy of these estimates uncertain.

There are several reasons why nursing homes in NYS might be adopting EHRs despite the lack of federal incentives. First, research suggests that there are a number of benefits from EHR adoption in this setting, including improved quality of care, greater efficiency in meeting federal and administrative requirements, and enhanced care coordination through HIE (Kramer, Richard, and May 2010). Thus, nursing homes in NYS (and across the country) might be adopting EHRs to achieve these benefits. Second, there are important initiatives within NYS focused upon EHR implementation in nursing homes. For example, the NYS Nursing Home HIT Demonstration Project is a publicly subsidized initiative implementing EHRs in 20 facilities (The Commonwealth Fund 2010). Third, given NYS's support for EHR implementation and HIE through the HEAL NY program, nursing homes may be adopting EHRs to participate in community HIE.

The impact of targeted initiatives can be seen in Minnesota, where 69 percent of nursing homes are using an EHR. This is likely the result of the Minnesota legislature's mandate that all Minnesota health care providers have an interoperable EHR by 2015 (Minnesota e-Health Factsheet 2012). However, without state and federal mandates for adoption, and without federal

incentives, there may begin to emerge a large gap in adoption rates across states and between nursing homes and other health care sectors. Notably, the top barriers to EHR adoption reported by respondents to our survey were (1) start-up costs and (2) lack of fiscal incentives. Thus, our results suggest that providing financial incentives will be necessary to ensure rapid and uniform adoption of EHRs by nursing homes.

Importantly, many of the most commonly available electronic functionalities among those nursing homes with EHRs are administrative, rather than clinical. Less than half of respondents with an EHR had automated CPOE and only 9 percent had CDS. These features tend to be more difficult to implement; however, their use will likely be critical for maximizing improvements in health care delivery through EHRs (Chaudhry et al. 2006; Zhou et al. 2009).

The high rates of HIE we found are also encouraging. By comparison, only 38 percent of nursing homes with EHRs in Minnesota report having capability to electronically exchange health information (Minnesota e-Health Factsheet 2012). Moreover, the reported gaps between capability to exchange data and need to exchange data were quite large.

Limitations

Our study has several limitations. Our study was conducted only in NYS, limiting generalizability. Our survey asked only about availability of computerized functionalities, rather than use. Nine respondents returned their survey anonymously, so we were unable to ascertain characteristics for these nursing homes. Future studies should be conducted across states and over time to better understand the extent of usage and its evolution.

CONCLUSION

This is one of only a few studies to assess adoption of EHRs and HIE by nursing homes on a large scale. Our results are promising; however, they also suggest significant room for growth. Understanding EHR adoption in nursing homes will be critical for the development of federal and state policies focused on this sector. It will allow for close monitoring and targeted initiatives which appear needed, given the many barriers reported by nursing homes, to ensure that nursing homes can keep pace with the other health care settings.

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SUPPORTING INFORMATION

Additional Supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Appendix SA2: Available Computerized Functionalities among All Responding Nursing Homes.