

Characteristics of Residential Care Communities That Use Electronic Health Records

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The Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted in 2009 to improve the quality, safety, and efficiency of healthcare.¹ Starting in 2011, the HITECH Act authorized financial incentives to eligible Medicare and Medicaid providers that demonstrate the adoption and meaningful use of certified electronic health record (EHR) systems.² The incentive programs are phased in 3 stages, with increasing requirements at each stage; for example, one of the Stage 2 meaningful use requirements is that EHRs must have the capability to provide care summaries to other providers electronically during transitions of care or referral by 2014.³ Physicians and hospitals are among the core set of eligible providers that have been targeted by the incentive program since it was instituted in 2011.

Assisted living and similar residential care communities (RCCs), as well as other long-term and post acute care providers, are currently ineligible for incentive programs under the HITECH Act, despite the fact that RCCs serve increasingly less healthy and more disabled populations. In 2012, about 33.5% and 13.1% of RCC residents were discharged to a nursing home and a hospital, respectively.⁴ EHR systems could be one of the key mechanisms for limiting complications during care transitions, as these transitions are associated with medication errors, delayed or inadequate treatment, and other adverse events.⁵⁻⁷ Yet, little is known about the adoption and use of EHRs among RCCs. Most of what we know on the adoption and use of EHRs and other health information technology is based on the hospital and ambulatory care settings.⁸⁻¹⁴

Two recent studies examined the use of EHRs in RCCs using data from the 2010 National Survey of Residential Care Facilities (NSRCF). One study found that about 17% of RCCs used any EHR system in 2010¹⁵; and a greater proportion of RCCs that used any EHR system were larger, nonprofit, chain-affiliated, co-located with another care setting, and located in a non-metropolitan statistical area (MSA) than those that did

ABSTRACT

Objectives: Residential care communities' (RCCs) use of electronic health records (EHRs) has the potential to improve communication and facilitate care coordination. This study describes the use of, and examines characteristics associated with, any type of EHR system among RCCs in the United States, nationally and by Census division.

Study Design: This study examined organizational and geographic characteristics, as well as resident case-mix in association with the use of EHRs among RCCs.

Methods: Data from the 2012 National Study of Long-Term Care Providers were used for the analyses. Of 4694 sampled RCCs that completed the questionnaire, 3987 cases with complete data were included in the study.

Results: About 20.2% of RCCs used any type of EHR system and 3.1% used EHRs that had 6 selected computerized capabilities to meet this study's definition for a basic EHR system. Compared with the national rate of 20.2%, a higher percentage of RCCs in the following Census divisions used some type of an EHR system: New England (23.2%), East North Central (26.3%), and West North Central (32.9%). Larger size, being chain affiliated, owned by other organizations or part of a continuing care retirement community, and geographic location were independently associated with the use of any EHRs among RCCs.

Conclusions: As RCCs serve increasingly less healthy and more disabled residents, improved communication and effective care coordination among RCC staff and across different care settings are critical. The estimates presented in this study can be used to establish a baseline for monitoring trends in EHR use among RCCs.

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Take-Away Points

- In 2012, 20.2% of assisted living and similar residential care communities (RCCs) in the United States used some type of electronic health record (EHR) system.
- RCCs that were larger, chain-affiliated, multi-level, and located in the Midwest region were more likely to use an EHR system.
- Estimates presented in this study can be used to establish a baseline for monitoring trends in EHR use among RCCs.
- With more hospitals and physicians advancing to Stage 2 “meaningful use,” it will become increasingly important to monitor RCCs’ use of EHR systems.

not use EHRs. Another study found that approximately 3% of RCCs reported having an EHR system that met the study’s definition of a basic system, which is defined as: having the capabilities to record resident demographics, resident, problem lists and clinical notes; to maintain the list of medications taken by the residents; to order prescriptions; and to view laboratory and imaging results.¹⁶ Due to the sampling design of the 2010 NSRCF data, neither of the studies examined geographic variations in relation to any EHR use. Geographic variations in the adoption and use of EHRs are observed in ambulatory care settings and hospitals despite financial incentives from the HITECH Act.¹²⁻¹⁴ Understanding whether similar geographic variations exist in the use of EHRs among RCCs would be important, as it may suggest the presence of disproportionate barriers to EHR adoption across healthcare settings in select geographic areas and disparities in access to benefits from EHRs. In addition, previous research on EHR use in RCCs examined resident case-mix limited to resident demographics.¹⁶ To build upon previous research and fill potential knowledge gaps in the literature, this study: 1) describes the use of any type of EHR system and basic system among RCCs in the United States, 2) describes the use of any type of EHR system among RCCs by Census division, and 3) examines the association between the use of any EHR system and the organizational and geographic characteristics, as well as resident case-mix of RCCs.

METHODS

Data

The CDC’s National Center for Health Statistics (NCHS) conducted the National Study of Long-Term Care Providers (NSLTCP). Data from the 2012 NSLTCP were used for the analyses.¹⁷ To be eligible for the study, an RCC: 1) had to be licensed, registered, listed, certified, or otherwise regulated by the state; 2) provided room and board with at least 2 meals a day, and around-the-clock on-site supervision; 3) helped with personal care or health-related services; 4) had 4 or more beds; 5) had at least 1 resident

currently living in the community; and 6) served a predominantly adult population. Excluded, were RCCs that exclusively serve individuals with severe mental illness or intellectual or developmental disability; nursing homes were also excluded. The sampling frame was constructed based on these eligibility criteria, which are consistent with the definition and approach used to build the sampling frame for 2010 NSRCF. Based on

the benchmarking results of the 2010 NSRCF sampling frame, the eligibility criteria identified a comprehensive and nationally representative list of RCCs that served older adults and individuals with physical disabilities.¹⁸

From 39,779 communities in the sampling frame, 11,690 RCCs were sampled, stratified by state and bed size. Data collection was conducted using a multi-mode survey protocol with mail, Web, and telephone follow-up for nonresponse. The questionnaire was completed for 4694 eligible communities, for a weighted response rate of 55.4%. (More detailed information on the study design and data collection is available elsewhere¹⁷ and in other published reports.^{19,20}) This study was exempt from NCHS’ Institutional Review Board because it met the definition of nonhuman subjects research.

Variables

Use of any and basic EHR systems. EHR systems are often categorized into any, basic, and fully functional systems. The criteria to define basic and fully functional EHR systems are based on the capabilities available in the system.²¹ A basic EHR system needs to have a subset of capabilities available in a fully functional system. In contrast, any type of EHR system refers to a wide range of systems that providers consider and report as an EHR system.

RCCs were coded as having any type of EHR system in use if the respondent reported “Yes” to the question, “An electronic health record is a computerized version of the resident’s health and personal information used in the management of the resident’s healthcare. Other than for accounting or billing purposes, does this residential care community use electronic health records?” RCCs were coded as having a basic system if they used any type of EHR system and reported having all 6 of the following selected computerized capabilities to collect or track: 1) resident demographics; 2) clinical notes, including medical history and daily progress notes; 3) resident problem lists; 4) lists of medications; 5) orders for prescriptions; and 6) viewing laboratory or imaging results. The definition of a basic system was adapted from other studies.^{10,12}

Organizational characteristics and resident case-mix. Informed by previous research on the use of EHRs in various healthcare settings,^{12-16,22-27} organizational and geographic characteristics and resident case-mix variables were selected as independent variables. Organizational characteristics included: ownership status; chain affiliation status, owned by other organization(s) or part of a continuing care retirement community (CCRC) (which can include RCCs), facility size, occupancy, status of having been in operation for 10 years or more, and staffing variables. The cutoff points for facility size and years in operation were pre-determined as they were collected as categorical variables. The staffing variables indicate hours per resident day (HPRDs) by registered nurse (RN) employees, licensed practical or vocational nurse (LPN/LVN) employees, and aide employees. HPRDs were computed by multiplying the number of full-time equivalent employees for each staff type by 35 hours, and then dividing the product by the number of residents, and by 7 days.

Geographic characteristics of RCCs included MSA status and Census division. The 9 Census divisions are groupings of the 50 states and the District of Columbia, and are subdivisions of the 4 regions; the lists of states by Census division and Census region are available elsewhere.²⁸ Census divisions were used to describe whether there were differences in the rate of using any type of EHR system within each division compared with the national rate (Table 1). However, for descriptive (Table 2) and multivariate analyses (Table 3), Census divisions were grouped into 4 Census regions because of inadequate sample size within each division.

Variables indicating resident case-mix were the percentages of RCC residents that had the following characteristics: non-Hispanic white, female, 85 or older, with Medicaid paying for some or all of their long-term care services in the previous 30 days, diagnosed with Alzheimer's disease or other dementias, needing any assistance with eating, percent of residents needing any assistance with bathing, percent of residents receiving assistance with medication management, treated in a hospital emergency department (ED) in the previous 90 days, and discharged from an overnight hospital stay in the previous 90 days. When counting the number of residents needing assistance with eating or bathing, respondents were instructed to include residents who needed any help or supervision from another person, or the use of special equipment to perform a given activity of daily living.

Data Analysis

Descriptive analyses using χ^2 and *t* tests were conducted to examine the variation in use of EHR systems among RCCs' organizational and geographic characteristics and

Table 1. Percentage of Assisted Living and Similar Residential Care Communities That Used Any Type of EHR System, by Census Division: United States, 2012

Census Region	Census Division	% (SE)
Northeast	New England	23.2 (1.28)
	Middle Atlantic	23.9 (2.88)
Midwest	East North Central	26.3 (2.25)
	West North Central	32.9 (1.89)
South	South Atlantic	15.0 (1.69)
	East South Central	17.7 (1.29)
	West South Central	25.3 (3.87)
West	Mountain	19.2 (1.93)
	Pacific	15.2 (1.98)

EHR indicates electronic health record; SE, standard error.
Source: CDC/NCHS, National Study of Long-Term Care Providers, 2012.

resident case-mix variables. Multivariate logistic regression analyses were used to examine factors associated with the use of any EHRs. All significance tests were 2-sided using $P < .05$ as the level of significance. Analyses were performed using the statistical package SAS-callable, SUDAAN version 11 (RTI International, Research Triangle Park, North Carolina) to account for complex sampling design used in NSLTCP.

RESULTS

Of the 4694 cases who completed the questionnaire, 3987 cases with complete data were included in the study; therefore, 9% of cases were excluded because of missing data on the use of any EHRs or any other variables in the analyses. Variables on the use of EHRs (9%) and the number of residents treated in a hospital ED (9%) had the highest percentage of missing data. Based on the comments provided by respondents, some respondents failed to answer these questions if the RCC was in the process of obtaining an EHR system, or the respondent was not sure if the RCC's internal database could be considered an EHR system. In addition, respondents could not provide valid responses if the community did not track the number of residents treated in an ED. A higher proportion of cases excluded from the analyses were extra-large RCCs with over 100 beds, located in an MSA, and had higher RN employee HPRDs and aide employee HPRDs compared with cases with no missing data. Excluded cases had a higher percentage of residents diagnosed with dementia compared with those included in the analyses. No significant differences were observed relative to other characteristics (data on missing analysis are available upon request).

RCCs That Used Any Type of EHR System and Basic System

About 20.2% of RCCs used any type of EHR system in 2012, and 3.1% of RCCs had a basic system with all 6 selected computerized capabilities. Among RCCs that used any EHR system, 7% had none of the selected computerized capabilities; 18% had 1 to 2 capabilities; 36% had 3 to 4 capabilities; 24% had 5 capabilities; and 15% had all 6 capabilities. More than two-thirds of RCCs that had 5 of the 6 selected capabilities for a basic system did not have the capability to view laboratory or imaging results.

The percentage of RCCs that used any type of EHR system ranged from 15% in the South Atlantic to 32.9% in the West North Central (Table 1). Compared with the national average of 20.2%, a higher percentage of RCCs in New England (23.2%), East North Central (26.3%), and West North Central (32.9%) divisions used any type of EHR system. The percentage of RCCs that used any EHRs in the South and West regions were either lower than or comparable to the national average.

Characteristics Associated With RCCs That Used Any EHR System

Compared with for-profit RCCs, a higher proportion of nonprofit or government-owned RCCs used any type of EHR system (Table 2). About a quarter of chain-affiliated communities (25.2%) and those owned by other

Table 2. Characteristics of Residential Care Communities, by Use of Any Type of EHR System: United States, 2012

	RCCs Using Any Type of EHR System (n = 967)	RCCs Using No EHR System (n = 3020)
	% or mean (SE)	
Organizational characteristics		
Ownership status, %***		
For profit	18.4 (0.9)	81.6 (0.9)
Nonprofit or government	27.1 (1.7)	72.9 (1.7)
Chain affiliation, %***		
Yes	25.2 (1.2)	74.8 (1.2)
No	13.3 (1.0)	86.7 (1.0)
Owned by other organization(s) or part of a CCRC, %***		
Yes	27.0 (1.5)	72.3 (1.5)
No	15.7 (1.0)	84.3 (1.0)
Facility size, %***		
Small (4-10 beds)	11.9 (1.4)	88.1 (1.4)
Medium (11-25 beds)	18.1 (1.5)	81.9 (1.5)
Large (26-100 beds)	27.9 (1.4)	72.1 (1.4)
Extra large (over 100 beds)	33.4 (2.7)	66.6 (2.7)
Years in operation, %		
<10 years	18.3 (1.4)	81.7 (1.4)
≥10 years	21.4 (1.0)	78.6 (1.0)
Occupancy	83.3 (0.7)	81.8 (0.5)
Staffing		
RN employee HPRD	0.29 (0.03)	0.30 (0.03)
LPN/LVN employee HPRD	0.24 (0.02)	0.19 (0.02)
Aide employee HPRD	2.34 (0.07)	2.32 (0.05)
Geographic location		
MSA status, %		
MSA	20.0 (1.0)	80.0 (1.0)
Non-MSA	21.2 (1.5)	78.8 (1.5)
Census region, %***		
Northeast	23.7 (2.0)	76.3 (2.0)
Midwest	28.9 (1.6)	71.1 (1.6)
South	17.1 (1.4)	82.9 (1.4)
West	16.3 (1.5)	83.7 (1.5)

(continued)

organization(s) or part of a CCRC (27%) used any type of EHR system, respectively. Compared with 11.9% of small RCCs, 33.4% of extra-large RCCs used any EHRs, and a greater proportion of RCCs located in the Midwest (28.9%) used any type of EHR system than those in other regions. About 88.7% of residents were non-Hispanic white in RCCs using any type of EHR system compared

with 82.1% in RCCs that used no EHRs. The RCCs using any EHR system had a lower percentage of residents needing assistance with eating (23.9% compared with 29.2%) and bathing (66.9% compared with 72.9%), and for whom RCC provided assistance with medication management (88.7% compared with 91.4%) than those that used no EHRs, respectively.

RCCs that were chain affiliated (odds ratio [OR], 2.24; 95% CI, 1.63-3.07) were more likely to use any EHRs than those that were not (Table 3). RCCs owned by another organization(s) or part of a CCRC (OR, 1.60; 95% CI, 1.19-2.15) had 60% increased odds of using any type of EHR system compared with those that were not owned by other organization or part of a CCRC. Compared with small RCCs, large RCCs (OR, 2.16; 95% CI, 1.35-3.44) were more than 2 times as likely to use any EHR system; extra-large RCCs had higher odds of using any EHR system than small RCCs (OR, 1.81; 95% CI, 1.01-3.25). The odds of RCCs in the Midwest to use any EHR system were 1.9 times, 2 times, and 1.6 times higher than the odds of RCCs in the Northeast (OR, 0.53; 95% CI, 0.36-0.79), South (OR, 0.50; 95% CI 0.33-0.77) and West (OR, 0.61; 95% CI, 0.42-0.90) regions, respectively. None of the variables indicating nursing employee HPRDs and resident case-mix in the model were significantly associated with the use of any type of EHR system.

DISCUSSION

Nationally, 1 out of every 5 RCCs (20.2%) used any type of EHR system in 2012, whereas 3.1% had all 6 selected capabilities that met this study's definition for a basic system. RCCs in the New England division and divisions in the Midwest region (ie, West North Central, East North Central) used any type of EHR system at a significantly higher rate than the national average. Geographic differences persisted in multivariate analyses when the effect of

Table 2. Characteristics of Residential Care Communities, by Use of Any Type of EHR System: United States, 2012 (continued)

	RCCs Using Any Type of EHR System (n = 967)	RCCs Using No EHR System (n = 3020)
	% or mean (SE)	
Resident case-mix		
Non-Hispanic white, %***	88.7 (1.0)	82.1 (0.8)
Female, %	70.1 (1.1)	68.6 (0.7)
Aged ≥85 years, %	47.3 (1.4)	44.9 (0.9)
Medicaid paying for some or all of long-term care services in previous 30 days, %	42.0 (2.1)	44.7 (1.2)
Diagnosis with dementia, %	42.3 (1.4)	44.9 (0.9)
Needing any assistance with eating, %	23.9 (1.4)	29.2 (0.8)
Needing any assistance with bathing, %	66.9 (1.3)	72.9 (0.8)
RCC providing assistance with medication management, %	88.7 (1.0)	91.4 (0.6)
Treated in hospital ED in previous 90 days, %	11.5 (0.7)	12.4 (0.4)
Discharged from overnight hospital stay in previous 90 days, %	9.6 (0.6)	8.9 (0.4)
CCRC indicates continuing care retirement community; EHR, electronic health record; HPRD, hour per resident day; LPN/LVN, licensed practical/ vocational nurse; MSA, metropolitan statistical area; RCC, residential care community; RN, registered nurse; SE, standard error. *** indicates P <.05; **** indicates P <.01; ***** indicates P <.001. Source: CDC/NCHS, National Study of Long-Term Care Providers, 2012		

geography was assessed by the 4 Census regions. RCCs in the Midwest region were more likely to use any type of EHR system than those located in all other regions. A similar pattern was observed among office-based physicians and nonfederal acute care hospitals: states in the Midwest region had a higher proportion of office-based physicians and hospitals with a basic EHR system than the national average, respectively.^{12,29} With more hospitals and office-based physicians in the Midwest region using EHRs, there may have been greater external influence exerted on RCCs in the region to adopt EHRs than those in other regions, as the RCCs share information and coordinate care with the hospitals and physicians. In addition, based on additional analyses, RCCs located in the Midwest were more likely than those in other regions to be chain affiliated and owned by other organizations or part of a CCRC—both of which are associated with a higher likelihood of EHR system adoption. Lower EHR system adoption rates have been found among primary care providers in areas with a high concentration of minority and low-income populations designated as health professional shortage areas.^{13,14} Due to data limitations, small area variation in EHR use could not be examined using the 2012 NSLTC data. However, Census region differences observed in this study suggest that lower EHR use in RCCs is in regions with

a higher percentage of minority population and lower median household incomes. These findings suggest the presence of disproportionate barriers to EHR adoption across healthcare settings in certain areas irrespective of the providers' eligibility for HITECH incentives.

RCCs that were larger, chain-affiliated, and owned by other types of organization(s), or were part of a CCRC, were more likely to use any EHR system independent of other factors. These findings are similar to findings of previous studies on RCCs using the 2010 NSRCF data. Larger bed size and chain affiliation are consistent factors associated with the use of EHRs in RCCs, as well as in nursing homes, home health and hospice agencies, and residential care settings.^{15,16,22,27} A considerable amount of financial and human resources is required to use EHRs, especially when there is no financial incentive for RCCs and other long-term care providers—this can be particularly unfavorable to independent or small providers that are not chain-affiliated or part of a multi-level healthcare system.

A number of resident case-mix characteristics were examined in relation to RCCs' use of any type of EHR system. In bivariate analysis, RCCs that used any type of EHR system had a higher percentage of non-Hispanic white residents, and lower percentages of residents needing any assistance with eating and bathing, and treated in a hospital

ED. However, when size and other organizational and geographic characteristics were controlled for, resident case-mix variables were no longer independently associated with any EHR use. One possible explanation for this might be that the use of EHRs in RCCs may be driven largely by organizational characteristics and geographic locale, rather than by resident case-mix or care needs. In addition, it is possible that RCCs may have adopted select computerized capabilities (eg, clinical notes, orders for prescriptions) to care for the type of residents they serve, which require

Table 3. Multivariate Logistic Regression Results Predicting Residential Care Communities That Used Any EHR System: United States, 2012

	OR	95% CI
Organizational characteristics		
Ownership status, %***		
For profit	0.83	0.61-1.12
Nonprofit or government	1.00	
Chain affiliation, %***		
Yes	2.24	1.63-3.07
No	1.00	
Owned by other organization(s) or part of a CCRC %***		
Yes	1.60	1.19-2.15
No	1.00	
Facility size, %***		
Small (4-10 beds)	1.00	
Medium (11-25 beds)	1.33	0.82-2.15
Large (26-100 beds)	2.16	1.35-3.44
Extra large (over 100 beds)	1.81	1.01-3.25
Years in operation (%)		
<10 years	1.05	0.75-1.46
≥10 years	1.00	
Occupancy	1.01	1.00-1.02
Staffing (every 1 hour increase)		
RN employee HPRD	1.17	0.93-1.48
LPN/LVN employee HPRD	1.16	0.77-1.74
Aide employee HPRD	1.04	0.97-1.11
Geographic location		
MSA status, %		
MSA	1.19	0.88-1.61
Non-MSA	1.00	
Census region, %***		
Northeast	0.53	0.36-0.79
Midwest	1.00	
South	0.50	0.33-0.77
West	0.61	0.42-0.90

(continued)

smaller financial investment and easier adjustments to changes in work flow than adopting an EHR system.

Limitations

A few of the study's limitations are worth noting. First, due to the cross-sectional nature of the survey, causal inference should not be drawn from the findings. Second, there was a low overall response rate of 55.4%. The potential for bias is unknown; however, given that a higher proportion of extra-large RCCs were excluded from the study due to missing data than smaller sized RCCs, there could be a slight underestimate of communities using any EHRs. Lastly, although the sampling design used in the NSLTCP allows state-level estimation, reliable estimates could not be presented for all 50 states and the District of Columbia because of low response rates in some states. Yet, to the best of our knowledge, this study is the first to provide estimates for the use of any type of EHR system among RCCs at the geographic level that is smaller than the Census region.

CONCLUSIONS

The study's findings suggest that overall, it is the RCCs that are larger, chain-affiliated, multi-level providers (eg, CCRCs), located in the Midwest region, that are more likely to use any type of EHR system. There is growing evidence that EHR use facilitates communication and care coordination, especially during care transition across settings. This study used the latest, nationally representative data on RCCs to fill current gaps in the literature. The study results indicate that about 20.2% of RCCs used EHRs in 2012—a much lower prevalence than what has been reported in studies examining eligible providers under the financial incentives offered in the HITECH Act, which for office-based physicians was about 71.8%.³⁰

As RCCs serve increasingly less healthy and more disabled residents, improved communication and effective care coordination among RCC staff and across different

Table 3. Multivariate Logistic Regression Results Predicting Residential Care Communities That Used Any EHR Systems: United States, 2012 (continued)

	OR	95% CI
Resident case-mix (every 1% increase)		
Non-Hispanic white, %***	1.00	1.00-1.01
Female, %	1.01	1.00-1.01
Aged 85 or older, %	1.00	1.00-1.01
Medicaid paying for some or all of long-term care services in previous 30 days, %	1.00	1.00-1.01
Diagnosis with dementia, %	1.00	0.99-1.01
Needing any assistance with eating, %	1.00	0.99-1.01
Needing any assistance with bathing, %	0.99	0.99-1.00
RCC providing assistance with medication management, %	1.00	1.00-1.01
Treated in hospital ED in previous 90 days, %	1.00	0.99-1.01
Discharged from overnight hospital stay in previous 90 days, %	1.01	1.00-1.03
CCRC indicates continuing care retirement community; ED, emergency department; EHR, electronic health record; HPRD, hour per resident day; LPN/LVN, licensed practical/vocational nurse; MSA, metropolitan statistical area; RCC, residential care community; RN, registered nurse. Source: CDC/NCHS, National Study of Long-Term Care Providers, 2012.		

care settings are critical, especially during care transitions. It will become increasingly important to monitor RCCs' use of EHR systems and their capabilities to exchange standardized clinical information with other providers. The estimates presented in this study can be used to establish a baseline for monitoring trends in EHR use among RCCs.

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