

Measuring IT Sophistication in Nursing Homes

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Abstract

Objective: Little activity has occurred in nursing home (information technology) IT adoption. The purpose of this study was to describe the range of IT sophistication for resident management processes and explore the association of IT sophistication with nursing home ownership, bedsize, and regional status. **Methods:** This descriptive, exploratory, cross-sectional study used an IT sophistication survey that was adapted for nursing home environments. The survey was administered between December 2006 and August 2007. All 491 nursing homes in Missouri were invited to participate. **Results:** Of the 491 nursing homes asked to participate, 349 initially agreed to complete the survey, but only 199 (41 percent) responded. The degree of functional sophistication adopted was most related to bedsize and location; ownership and location were also factors. IT integration was mostly affected by type of ownership. **Conclusion:** Nursing home administrators have a long way to go before they will be able to achieve the goals suggested by the Institute of Medicine in their report on IT adoption.

Introduction

People who make up the oldest of the old population have more complex health care needs and a higher probability of entering a nursing home, and they are at greater risk for receiving poorer quality of care.^{1, 2, 3} There is growing recognition that a stronger information technology (IT) infrastructure is needed to address the complex health care needs of nursing home residents and the quality of care delivered in these facilities.⁴

Technologic strategies designed to improve quality of care in nursing homes must include methods to achieve valid, reliable, and timely care processes.^{5, 6} However, technology for nursing homes has been overlooked by most agencies that have advocated for its wider use.⁷ The lag in IT implementation has been attributed to such factors as significant cost of infrastructure, lack of onsite IT expertise, variable staff competency levels, and high staff turnover leading to high training costs.^{7, 8}

IT development has the potential to improve the safety, quality, and efficiency of health care in the United States.⁹ Increasing attention to errors in health care and concern for patient safety have prompted general recommendations for the development of technologies to support clinical decisionmaking, promote data standards, and develop systems that communicate with each other.¹⁰ In acute care situations, sophisticated technology that assists in diagnosis and supports chronic care management can improve clinical decisionmaking, enhance adherence to clinical guidelines, and provide increased focus on patients with chronic disease states.^{11, 12} Despite these known benefits, little activity has occurred in nursing home IT.

The purpose of this study was two-fold: (1) to describe the range of IT sophistication for resident management processes for nursing homes in Missouri; and (2) to explore the association of IT sophistication with nursing home ownership, bedsize, and regional status.

IT Sophistication

IT sophistication was derived from Nolan's Stage Theory used to evaluate computer activity and the degree of IT maturation over time.¹³ Nolan identified four stages that all organizations follow toward a point at which an information system is considered fully integrated. Nolan's four stages—initiation, expansion, formalization, and maturity—represent growth from early stages when computers were used to meet basic organizational needs to later stages and the full integration of computer applications.¹⁴ Measures of IT sophistication were developed from the early applications of Nolan's Growth Model in business firms.^{15, 16}

Recently, IT sophistication has been used to describe the diversity of technologic tools and software used to support three domains of health care, including (1) resident care, (2) clinical support, and (3) administration.^{17, 18, 19} Furthermore, three dimensions of sophistication have been defined:^{15, 17, 18}

1. Functional sophistication is the extent to which clinical processes are computerized.
2. Technological sophistication is the degree of use of different technologies in the clinical area.
3. Integration sophistication represents the level of internal and external integration among departments and clinical settings inside and outside of a facility.

Dimensions of IT sophistication in acute care have been used to compare the use of computerized systems both nationally and internationally.¹⁸ In nursing homes, the level of use in each dimension of IT sophistication is unknown. What is known is that there is diversity in technology applications in nursing homes. In March 1998, when the Health Care Financing Administration began requiring electronic transmission of the Minimum Data Set, approximately 70 percent of certified nursing home facilities in the United States were using computerized tools to transmit data; 16 percent had a computer system that needed upgrading to meet requirements for transmission; and the remaining 14 percent had no computer at all.^{20, 21}

A goal of the research described here was to develop an IT sophistication profile of Missouri nursing homes using a previously tested tool that was adapted from acute care settings for use in nursing homes. This development of IT sophistication profiles is a necessary first step toward benchmarking best practices in information system use across multiple nursing homes.

Developing IT Sophistication in Nursing Homes

Primary uses of clinical information systems are to assist in the delivery, support, and management of patient care; assist in administrative and financial matters; and assist in patient self-management. In 2003, the Institute of Medicine (IOM) identified eight core functions for clinical information systems including:⁴

1. Storage and retrieval of health data.
2. Results management.
3. Electronic order entry.
4. Decision support.
5. Communication and connectivity.
6. Education.
7. Administrative processes.
8. Population health.

Within the IOM report,⁴ projections were made addressing the level of diversity and maturity of IT expected for each core function through 2010. These projections described the expected levels of IT sophistication for clinical information systems in nursing homes. For example, in 2010, the IOM projected that nursing homes should have capabilities to use multimedia support for images and scanned forms, such as resident consents. In 2007, nursing homes should have been implementing rules-based alerts and preventive reminders to support resident care.

Additionally diagnoses, signs and symptoms, and procedures should be structured and coded into clinical information systems to improve data quality. The significance of developing IT sophistication profiles across nursing homes is to orient researchers, policymakers, and nursing home leaders to the varying degrees of technological instruments, IT functionality, and degree of integration in each clinical domain of resident care, clinical support, and administration.

Methods

A census of all 491 nursing homes in Missouri was undertaken between December 2006 and August 2007. Initially, 349 homes agreed to participate in the study; eventually, 199/349 homes responded. The responding homes were diverse in terms of geographic location, bedsize, and ownership.

- **Location.** Responding homes were classified according to metro-urban-rural regional status, as determined by combining Beal codes into three county continuum codes for population size.²²
 - Metro status included total facilities in central, fringe, and metropolitan counties with populations of 250,000 or more.
 - Urban status included facilities that were adjacent to or not adjacent to metro areas in urban counties with populations of 2,500 to 250,000.
 - Rural status included all facilities in rural counties with populations less than 2,500, regardless of their adjacency to metro areas.
- **Bedsizes.** Nursing homes were classified into small (<60 beds), medium (60-120 beds), and large (>120 beds) homes.
- **Ownership types.** Nursing homes were designated as either investor-owned (IO) or not investor-owned (NIO).

Recruitment

An administrator for each home was asked to complete the survey or to select a site respondent who had oversight of IT functions within the nursing home facility and who had knowledge of other key IT stakeholders within the organization to complete an IT sophistication profile for the facility. Respondents received a small incentive for their participation, a strategy revealed as necessary to encourage participation in research activities.²³

Survey Instrument

Methods included a written IT sophistication profile, which had been adapted for nursing homes from a previously tested measure used in acute care hospitals.²⁴ Two options were provided for each facility to complete the sophistication measure. The first option included the completion of a paper-based sophistication tool mailed to nursing homes willing to participate. A return addressed envelope was sent with the survey and cover letter to respondents at facilities electing to complete paper versions. The second option was to complete the IT sophistication tool online. An online account was established under the name of the principal investigator at <http://freeonlinesurveys.com>. Each option was thoroughly explained in a cover letter.

Contact information for the principal investigator (PI) was made available in the event there were questions while respondents were completing the survey. To increase response rates, two followup telephone calls were made at 1-week intervals to the administrative directors and/or respondents, and subsequent mailings of the survey were sent, if needed.

The IT Sophistication survey used in this study has been rigorously tested and validated in other health care settings. Cronbach's alpha for functional, technologic, and integration dimensions and for overall sophistication was found to have a high internal consistency (≥ 0.89). Construct validity was measured using correlations between functional and technologic sophistication in the survey's patient care and clinical support dimensions. Correlations were significant, ranging from 0.77 to 0.84, respectively ($P < 0.001$). Finally, concurrent validity was evaluated for the functional, technologic, and integration dimensions in relation to six variables: (1) IT maturity, (2) annual budget, (3) number of IT staff, (4) IT management, (5) educational level, and (6) IT tenure.^{17, 18}

Data Management

After each paper-based measure was received, the PI and research assistant performed a double-data-entry process using Microsoft Excel[®] 2003 to ensure accuracy of the dataset. Uncertainties and discrepancies in data entry were resolved by agreement between the two independent reviewers. The research staff did not manipulate the facilities' online entries.

Analysis: IT Sophistication Measures

Descriptive methods were used to evaluate the range and distribution of IT sophistication in nursing homes. The clinical IT sophistication domains (resident management and care activities, clinical support, and administrative activities) and their subsections, the three conceptual

dimensions of IT sophistication (functional, technologic sophistication, and level of integration) were evaluated. Findings from the resident care management processes as reported by respondents are discussed in this paper. Resident care management in this study consisted of clinical IT applications that involved admission, discharge, and transfer of nursing home residents and covers systems that track medical records in the facility.

It should be emphasized that descriptive methods are appropriate for this study, but inferential methods are not. Since every nursing home in Missouri was contacted, the study was actually a census. As in any survey, there may be bias in the results, since nonresponders may differ from responders.

Functional sophistication measures identified nursing homes that used computer-based applications to complete specific resident care management processes. Functional sophistication was measured using a binary approach. A score of “1” was assigned for each computerized process used, and a score of “0” was given otherwise. Technologic sophistication explores the extent of technology use in resident care management. The level of sophistication was measured on a 0-to-9 scale, where 0 represents “not available,” and 1 through 8 represent “barely used” to “extensively used,” respectively; respondents could choose 9 if they were unsure. Finally, each clinical subsection had questions evaluating the level of internal and external integration of the IT systems used by the facility. Integration was measured using a 1-to-7 scale ranging from “not at all” to “very much.”¹⁷

To describe the range and distribution of IT sophistication in nursing homes, the analytic approach included a descriptive analysis of the organizational characteristics of the 199 responding nursing homes, based on ownership, bedsize, and location. Percentages for nursing home respondents having specific computerized processes for resident care management are reported. Specifically, survey respondents indicated if computerization was used for resident care management processes related to admissions, discharges, transfers, waiting list management, or bed availability, or whether none were computerized. Cramer’s V was calculated as a measure of the association between IT sophistication for resident care management and the characteristics of ownership, bedsize, and location (Table 2).

To further explore the association of IT sophistication with nursing home ownership, bedsize, and regional status, means are reported which describe the extent of use of technologies and integration level of technology use in resident management processes (Table 3 and Table 4). This part of the survey asked respondents to rate the degree of use of electronic tracking systems for medical records and resident identification, scanning of medical records, and centralized scheduling. The means procedure was used to describe differences between degree of IT sophistication for these resident management processes and ownership, bedsize, and geographic location. A statistic η^2 (eta squared), which determines the proportion of variation accounted for by the differences among the groups, was calculated.

Table 1. Number (%) of resident management processes computerized

Location	Bedsizes	Investor-owned	Not investor-owned	Total
Resident admissions				
Metro	<60			3 (4.5)
	60-120			38 (56.7)
	>120			26 (38.8)
		40 (59.7)	27 (40.3)	67 (100.0)
Rural	<60			2 (9.5)
	60-120			18 (85.7)
	>120			1 (4.8)
		8 (38.1)	13 (61.9)	21 (100.0)
Urban	<60			7 (14.9)
	60-120			35 (74.5)
	>120			5 (10.6)
		32 (68.1)	15 (31.9)	47 (100.0)
Resident discharges				
Metro	<60			3 (5.3)
	60-120			33 (57.9)
	>120			21 (36.8)
		35 (61.4)	22 (38.6)	57 (100.0)
Rural	<60			2 (10.0)
	60-120			17 (85.0)
	>120			1 (5.0)
		7 (35.0)	13 (65.0)	20 (100.0)
Urban	<60			4 (10.3)
	60-120			30 (76.9)
	>120			5 (12.8)
		27 (69.2)	12 (30.8)	39 (100.0)
Resident transfers				
Metro	<60			3 (6.0)
	60-120			29 (58.0)
	>120			18 (36.0)
		31 (62.0)	19 (38.0)	50 (100.0)
Rural	<60			1 (7.7)
	60-120			11 (84.6)
	>120			1 (7.7)
		4 (30.8)	9 (69.2)	13 (100.0)

Table 1. Number (%) of resident management processes computerized (continued)

Location	Bed size	Investor-owned	Not investor-owned	Total
Urban	<60			2 (6.9)
	60-120			24 (82.8)
	>120			3 (10.3)
		19 (65.5)	10 (34.5)	29 (100.0)
Waiting list management				
Metro	60-120			8 (44.4)
	>120			10 (55.6)
		7 (38.9)	11 (61.1)	18 (100.0)
Rural	60-120			3 (100.0)
		3 (100.0)	3 (100.0)	
Urban	<60			2 (16.7)
	60-120			9 (75.0)
	>120			1 (8.3)
		4 (33.3)	8 (66.7)	12 (100.0)
Bed availability estimation				
Metro	60-120			18 (60.0)
	>120			12 (40.0)
		16 (53.3)	14 (46.7)	30 (100.0)
Rural	<60			1 (14.3)
	60-120			5 (71.4)
	>120			1 (14.3)
		3 (42.9)	4 (57.1)	7 (100.0)
Urban	<60			3 (15.8)
	60-120			14 (73.7)
	>120			2 (10.5)
		11 (57.9)	8 (42.1)	19 (100.0)
None are computerized				
Metro	<60			3 (23.1)
	60-120			7 (53.8)
	>120			3 (23.1)
		9 (69.2)	4 (30.8)	13 (100.0)
Rural	60-120			6 (100.0)
		3 (50.0)	3 (50.0)	6 (100.0)
Urban	60-120			14 (70.0)
	>120			6 (30.0)
		16 (80.0)	4 (20.0)	20 (100.0)

Table 2. Comparison of IT sophistication for resident management processes by ownership, bedsize, and location

Variables	Bedsizes x location^a	Ownership x location^a	Bedsizes x ownership^a
Resident admissions	0.265	0.200	0.131
Resident discharges	0.230	0.239	0.090
Resident transfers	0.220	0.232	0.152
Waiting list management	0.415	0.230	0.319
Bed availability estimation	0.287	0.091	0.194
None are computerized	0.341	0.233	0.267

^a Cramer's V

Table 3. Extent of technology use in resident management processes by ownership, bedsize, and location

Variables	Ownership		Bedsizes			Location		
	IO (N=113)	NIO (N=65)	<60 (N=14)	60-120 (N=123)	>120 (N=41)	Metro (N=83)	Rural (N=28)	Urban (N=67)
Electronic tracking of medical records	2.63	3.31	1.64	3.13	2.54	2.66	3.07	3.06
Electronic tracking of resident identification	3.81	4.14	3.36	3.85	4.39	3.63	4.32	4.15
Scanning of medical records	1.28	1.62	1.00	1.51	1.22	1.39	1.31	1.46
Centralized scheduling	1.72	2.91	2.21	2.19	2.02	1.99	2.32	2.28

IO = investor-owned

NIO = not investor-owned

Table 4. Extent of integration among resident management systems

Variables	Ownership		Bedsizes			Location		
	IO (N=112)	NIO (N=67)	<60 (N=15)	60-120 (N=124)	>120 (N=40)	Metro (N=82)	Rural (N=29)	Urban (N=68)
Resident management systems (admissions, scheduling, resources availability)	3.00	3.93	3.40	3.28	3.53	3.48	3.14	3.28
Resident management systems, et al, computerized systems (lab, pharm, HR, finance)	3.29	4.06	3.40	3.65	3.43	3.73	3.52	3.41

HR = human resources; IO = investor-owned; NIO = not investor-owned; n = number.

Results

Respondent Characteristics

When initially contacted, 349 of 491 (71.1 percent) of all Missouri nursing homes indicated they would complete the survey; 199 (41 percent) actually completed the survey. Total NIO facilities had a higher response rate (50.3 percent) than IO facilities (34.6 percent). All homes that initially agreed to participate were given the option of completing an online survey or a paper survey; 59.3 percent completed online surveys, and 40.7 percent completed paper surveys.

Characteristics of the facilities responding to the survey were representative of nursing homes in Missouri and across the United States:

- In Missouri, nearly 45 percent of the IO and NIO nursing home facilities are located in metropolitan areas; 24 percent of NIO homes and 13 percent of IO homes are located in rural designated areas.
- The distribution of nursing homes by ownership and licensed bedsize is also very uneven. Of 491 facilities in Missouri, 70 percent are IO facilities, and 30 percent are NIO facilities, including nonprofit and government-owned facilities.
- The majority of NIO facilities with 60 to 120 licensed beds are located in metro-urban areas. This compares to very few larger and smaller NIO facilities located in rural county designations.
- Although the majority of IO facilities range between 60 and 120 beds, these are located mostly in urban regions. Very small and very large IO facilities are generally not found in rurally designated areas.
- These statistics are also representative of nursing homes across the United States; 65.2 percent of nursing homes are investor-owned, and 34.8 percent are not investor-owned.²⁵ In the United States, 26.7 percent of nursing homes fall into the small category, 44.2 percent are medium-sized, and 29.1 percent are larger facilities.

Range Distribution and Relationship of IT Sophistication to Ownership, Bedsize, and Location

Table 1 organizes the percentages of resident management processes in these Missouri nursing homes that are computerized; the sample is stratified by ownership, bedsize, and location. For each home, respondents indicated whether computerization was present for resident admissions, discharges, transfers, waiting list management, and/or bed availability, or whether none of these have been computerized. Table 2 compares the level of IT sophistication reported for resident management processes to ownership, bedsize, and location.

Resident admissions. The majority of homes that had computerized resident admission processes were located in medium-sized facilities with 60 to 120 beds in metropolitan (56.7 percent) and urban locations (74.5 percent) (Table 1). A higher percentage of IO homes with computerized resident admission processes are located in urban and metropolitan areas. In contrast to more populated areas, nearly two-thirds of rural Missouri nursing homes with computerized resident admissions are NIO.

Among 12 respondents from 18 smaller homes with less than 60 residents, 66 percent indicated that they had a computerized system for resident admissions. Respondents from 32/43 (74.4 percent) of larger homes with more than 120 residents used technology for the same process. When comparing reported IT sophistication levels for resident admissions (Table 2) with ownership, bedsize, and location, the association between facilities comparing bedsize and location was weak (Cramer's $V = 0.265$).

Resident discharges. Nursing home location appears to be a common variable for determining relationships in use of technology for resident discharges. When bedsize and location are compared, a small relationship (Cramer's $V = 0.230$) is found among facilities. Similarly, when ownership and area are compared, the relationships are small (Cramer's $V = 0.239$) (Table 2). The majority of homes that use technology for resident discharges are IO facilities with between 60 and 120 beds and are located in metropolitan regions (Table 1). In rural regions, 17 of 29 respondents (59 percent) had incorporated technology into their resident discharge procedures. Most homes (85 percent) were of medium size (60-120 beds), with fewer smaller and larger homes (15 percent) using technology for this same process.

Resident transfers. When comparing the use of technology during resident transfers, no substantial relationships were detected among facilities stratified by ownership, bedsize, and location (Table 2). Again a majority of homes (62 percent) using technology for resident transfers were IO, located in metropolitan areas (54 percent), and had 60 to 120 beds (72 percent). In rural regions, 11 of 29 (38 percent) of medium-sized facilities (60 to 120 beds) that completed surveys had technology for transferring residents between locations. Additionally, in urban regions, only 40 percent of the facilities reported use of technology for this type of activity.

Waiting list management. Table 2 illustrates a medium relationship (Cramer's $V = 0.415$) between homes stratified by bedsize and location that reported using technology for waiting list management. Most of the homes using technology for this purpose were NIO, located in metropolitan regions, and had more than 120 beds. Only 3 of 15 homes (20 percent) from rural medium sized facilities responded to this question on the survey. Rural small and large facilities did not respond (Table 1).

Bed availability estimation. A small relationship (Cramer's $V = 0.287$) was found when comparing frequency of IT sophistication for bed availability estimation in facilities with differing bedsize and locations (Table 2). The majority of homes using IT for this process were IO medium-sized facilities (60-120 beds) located in metropolitan areas. Similarly, 64 percent of medium-sized, urban facilities reported using technology to estimate bed availability.

Computerization availability. A medium relationship (Cramer's $V = 0.341$) was found for technology use in facilities with different bedsizes and locations. Most respondents reporting no computerization for resident care management were from IO, medium-sized (60-120 beds), urban facilities. Similarly, six of nine (67 percent) of IO, medium-sized facilities reported having no technology for resident care management.

Extent of Technology Use in Resident Management Systems

This analysis compared the extent to which technology is used for resident management systems by facilities that responded to the survey. Table 3 provides some details of the findings. In relationship to the electronic tracking of medical records, medium-sized NIO facilities in rural or urban regions reported greater use of technology for this purpose than other facilities. Regarding the electronic tracking of resident identification, large NIO facilities with more than 120 beds that were located in rural and urban regions reported use of technology to a greater extent to identify residents. Most of the respondents reported very little to no ability to scan medical records. Finally, most facilities also reported use of centralized scheduling to a very low degree; those that do use it are NIO small-sized facilities (<60 beds) in rural areas. The means for level of IT sophistication were compared across facilities that reported having centralized scheduling systems; η^2 was found to be 0.062, which means the proportion of variation in technology use accounted for by differences in the mean between IO and NIO groups using centralized scheduling systems was 6.2 percent.

Integration of Technology in Resident Management Systems

In the final analysis, the extent of integration among resident management systems within the facilities was determined. The range across all facilities in resident management systems associated with admissions, scheduling, and resources was 3.00 to 3.53. Resident management systems were more thoroughly integrated in large NIO facilities (>120 beds) located in metropolitan areas. Differences in the means between facilities with different ownership were found. No substantial differences were found for bedsize and location ($\eta^2 = 0.037$; 3.7 percent of the variability in integration level can be explained by ownership types).

The range of integration for resident management systems and other computerized systems (i.e., laboratory, pharmacy, human resources, and finance) in all stratified facilities was 3.29 to 4.06. The widest range of means occurs between the two ownership types ($\eta^2 = 0.031$; 3.1 percent of the difference in technology integration could be accounted for by ownership types). There were no considerable differences in facilities with different bedsize or locations (Table 4).

Discussion

This study describes the results of a survey of nursing home IT sophistication conducted in the State of Missouri. Overall response rates (41 percent) for this study appear to be adequate for both mailed and electronic survey methods.²⁶ The online survey method was more efficient without sacrificing survey response rates. Functional sophistication related to resident care management processes differed across nursing homes, depending on identified characteristics. Functional sophistication in admission processes appeared to be lowest in NIO metropolitan locations with a medium bedsize (60-120 beds). Conversely, larger NIO nursing homes (>120 beds), though smaller in number, had a higher percentage of technology usage.

Although rarely reported, nearly half of the respondents from small and large rural nursing homes indicated they had some level of technology related to admission processes. These findings were confirmed by the comparable relationships found among IT sophistication

variables with bedsize and location. It is important to note that although few homes had a high level of functional sophistication, those that did so were beginning to integrate it into the resident management systems on a more regular basis.

Functional sophistication in discharge processes appeared to be less advanced in large and small NIO facilities located in rural and urban areas. More than half of the facilities in rural regions had used technology to assist in discharge activities. Functional sophistication appeared to play a smaller role in patient transfers than in discharge processes in this sample.

Technology may play an important role in identifying and tracking clinical services used by residents living in remote locations. Location appeared to play an important role in the variability of technology use in discharge processes. For example, telemedicine technologies had been extensively used to reach Missouri residents living in rural locations.

The extent of technologic sophistication and integration achieved by the nursing homes in this sample appeared to be affected mostly by ownership of the facilities. Facilities that are NIO tended to have higher levels of technologic sophistication and also to have significantly higher levels of integration of those systems into resident management processes. One possible reason for this difference might be that technology is very costly at the initiation of implementation. IO facilities might be under more pressure to turn higher profits and therefore may be less willing to bear the initial costs of technology implementation. NIO facilities, on the other hand, may have a different set of incentives to measure success and therefore might be more willing to invest in technology that is predicted to lower costs over the long run.

Implications for IT Sophistication in Nursing Homes

Advantages of IT sophistication. Computerized nursing documentation systems assist nursing professionals to make a significant, positive impact in work practices and resident outcomes. Technology has improved computer charting, care planning, information accessibility, and perception of information security in acute care settings.^{27, 28, 29, 30} Computerized clinical documentation systems can make a difference in the quality of documentation after implementation of an integrated point-of-care system on hospital nursing units.³¹ There was a 13 percent increase in compliance with Joint Commission accreditation requirements during this study. In a similar study, improvements were noted in 11 (34 percent) of Joint Commission accreditation requirements for nursing documentation using technology.³⁰ In other advanced IT research, clinical decision support systems were shown to significantly improve clinical practice when integrated into clinical workflow; systems provided automated reminders to clinical staff; and recommendations associated with computer-based systems were made at the time and location of decisionmaking.^{11, 32}

Few resources are available on the use and effectiveness of computerized records in nursing homes.⁷ Abbott³³ suggested that computer use in nursing homes has generally been limited to business applications and management of the federally required Minimum Data Set. In contrast, research on computer implementation in nursing homes identified some facilities using highly sophisticated computerized systems to manage care.^{34, 35, 36, 37, 38} However, we have limited knowledge about the extent to which nursing homes are using these sophisticated systems.

Barriers to IT sophistication. Key obstacles recognized for preventing widespread development of nursing home IT include a lack of funding, ill-defined standards, insufficient data transfer between care settings, frequent lack of willingness of long-term care markets to invest in electronic records, and the absence of clear legal definitions.³⁹ The current economic state of nursing homes plays a large role in the development of IT.⁴⁰ Current economic barriers include an increasingly disabled nursing home population, staffing problems, rising wages, and State budget shortfalls.^{41, 42, 43}

Limitations

A limitation of this study is the possibility of bias due to the failure of many nursing homes to participate. One concern might be that homes with lower IT sophistication may be reluctant to participate in the survey process. Thus, the true rate of IT use by nursing homes in the State might be lower than it appears based on the results of this study.

Conclusion

The original instrument and key concepts of IT sophistication have been extensively studied in acute care settings. Until this study, the level of IT sophistication had not been evaluated in nursing homes settings. Nursing home administrators in the State of Missouri have a long way to go before they will be able to achieve the goals suggested by the IOM report,⁴ which addresses the level of diversity and maturity of IT expected of nursing homes by the year 2010.

The promise of sophisticated IT lies in its ability to transform and achieve certain foundational aims, including safety, effectiveness, patient/family centeredness, timeliness, efficiency, equity, and connectedness.^{4, 44} Identification of the current level of IT sophistication in nursing homes will facilitate recognition of more sophisticated nursing homes for further study and disseminate lessons learned from early adopters. This information can then be used as a benchmark to identify best practices in IT use to guide development, new implementations, and quality improvement initiatives.²⁰

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