

Experiences with electronic health records: Early adopters in long-term care facilities

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Abstract:

Background: Electronic health records (EHRs) are becoming a required technology across the health care sector. Long-term care (LTC) facilities have lagged other settings in adopting health information technologies but represent an area where significant care coordination benefits might be realized. Nevertheless, managers face many of the same challenges implementing EHRs that exist in other environments when implementing enterprise-wide systems.

Purposes: This study was conducted to provide a description of the early users' experiences with EHRs in LTC facilities.

Methodology: Semistructured interviews were conducted. The 10 sites were all the "freestanding" LTC facilities using an EHR as of July 2008 in Texas. The interview respondents included administrators, nursing managers, nurses, certified nurse aides, and other system users. Semistructured interviews across multiple stakeholders were used to assess constructs critical to EHR adoption and implementation.

Findings: The LTC facility employees who work with EHR systems on a daily basis were positive about their experiences. In particular, operational improvements were achieved through increased access to resident information, cost avoidance, increased documentation accuracy, and implementation of evidence-based practices.

Practice Implications: Overall, administrators believed that the systems improved care quality and employee satisfaction and were cost effective and that the EHR made a positive return on investment. Electronic documentation led to both increases in charge capture related to resource utilization group documentation, significant savings in pharmacy waste, and reductions in nursing overtime as medical record management became more automated. Quality improvement

came from computer-aided monitoring of the certified nurse aide's attendance to residents' activities of daily living.

Keywords:

healthcare management | electronic health records | long-term care facilities | health information technology | skilled nursing facilities | technology adoption

Article:

Health information technology (HIT) holds great promise for improving health care quality and safety and reducing the costs of providing care in long-term care (LTC) facilities. Numerous empirical studies conducted in other health settings support the view that health information technology can assist health care providers to reduce errors, improve safety and quality, and decrease costs (Ash & Bates, 2005; Ford, Menachemi, Peterson, & Huerta, 2009; Menachemi, Ford, Beitsch, & Brooks, 2007). Whereas hospitals and medical groups are implementing electronic health record (EHR) systems at a brisk pace, LTC settings, specifically licensed nursing facilities, have been slower to adopt such technologies. Barriers to the implementation of EHRs in licensed nursing facilities include costs, training, complex implementation processes, and the lack of evidence that such systems can deliver the promised benefits (Cherry, Carter, Owen, & Lockhart, 2008).

The purpose of this study was to investigate LTC facilities' EHR adoption, implementation, and use experiences. In particular, this study provides an overview of the experiences, challenges, and benefits of EHR use in LTC facilities and addresses the health policy implications related to wider EHR adoption. Semistructured interviews were conducted with employees, residents, and families at 10 facilities identified as having an EHR in July 2008. The 10 participating facilities represent the majority of freestanding LTC facilities that have adopted EHRs in Texas. Structured elements of the survey dealt with topics surrounding system cost, ease of use, impacts on quality, and regulatory compliance. Systematic analyses of the interviews were conducted to explore how varying adoption and implementation strategies had influenced the acceptance of EHR technology by end-users.

The results of this study have implications for health policy makers, LTC facility administrators, and researchers. For health policy makers, LTC funding represents a major portion of most states' Medicaid expenses. If implementing EHR systems proves an effective strategy for controlling cost and improving quality, promoting adoption should become a health policy priority. The same reasoning holds true for LTC facility owners and managers. Quality and cost control are essential given new pay-for-performance incentives linked to quality coupled with a

general downward trend in reimbursement rates. Lastly, for researchers, having longitudinal activity-of-daily-living (ADL) health outcome data on a significant population presents huge opportunities to conduct data-driven comparative effectiveness research (CER; Committee on Comparative Effectiveness Research Prioritization, Forthcoming).

Background

The LTC industry lags other health care settings in EHR adoption; however, there is evidence that EHRs hold the potential to significantly improve the quality of care for nursing home residents (Curtis, Gillon, & Malmrose, 2007). The Institute of Medicine (2003) reports that successful EHR systems will improve patient safety, support delivery of effective patient care, facilitate management of chronic conditions, and improve efficiency across all care settings. The most often cited keys to gaining the full benefit of technology in health care are interoperability and integration among clinical systems, decision support, and physician usage (Zaroukian & Sierra, 2006).

To support interoperability and integration among clinical systems, standards need to be developed to address connectivity between all sectors of health care, including LTC (Derr, 2004). The Office of the National Coordinator for Health Information Technology and the Certification Commission for Health Information Technology are working to develop standards and certify EHR systems for interoperability. Standards for EHR systems designed for hospitals and physicians have been established, and about 75% of the EHR systems are certified by the Certification Commission for Health Information Technology (Lourde, 2009). However, no LTC EHRs are certified as the standards have yet to be established, but these standards are expected in 2010 (Lourde, 2009).

There is strong evidence to support the benefits gained from EHRs in acute care settings and physician practices. Such benefits include medical error prevention (Bates & Gawande, 2003), reduced lengths of stay, increased efficiency and timeliness of care, improved adherence to treatment protocols, improved continuity of care, instant availability of charts, rapid and informed response to patients' telephone questions, and accuracy and completeness of notes (Smith, Smith, Krugman, & Oman, 2005). In addition, EHRs contribute to effective disease management by allowing clinicians to gather extensive data quickly and efficiently on patient populations (Health Information Management Systems Society, 2003). Unfortunately, there is limited research available to support the benefits of EHRs in LTC settings.

The primary barriers to EHR implementation identified in the literature are acquisition costs (Ford, Menachemi, & Phillips, 2006; Hillestad et al., 2005), clinicians' resistance to change, disruptions to clinical routine (Ash & Bates, 2005), and a lack of interoperability standards (Dougherty, 2005; Hillestad et al., 2005; Middleton, Hammond, Brennan, & Cooper, 2005). Other barriers to EHR implementation include increased time for documentation (Miller & Sims, 2004; Poissant, Pereira, Tamblyn, & Kawasumi, 2005) and graphic interface issues that reduce user-friendliness, poorly designed automatic prompts, and cumbersome system navigability (Ford et al., 2006; Smith et al., 2005). The lack of EHR experts specializing in LTC is a particular barrier for this health care segment (Cherry et al., 2008; Dougherty, 2005). In addition, there has not been a rigorous comparative effectiveness evaluation of EHR's role in improving key outcomes (Poon, Cusack, & McGowan, 2009).

Methods

Study Design

A qualitative descriptive design was used with semistructured interviews and group observations in licensed nursing facilities that have adopted EHR systems forming the main data collection strategy. Facilities selected had been using the EHR for a minimum of 1 year ("users") and were considered freestanding nursing facilities (not housed within a larger acute care setting). The semistructured interviews and group observations were designed to elicit new information about the experiences, challenges, and benefits of EHR adoption, implementation, and use. In addition, specific questions were included to assess the health policy implications for EHR adoption for LTC facility regulators. Institutional review board approval was obtained prior to initiation of the study.

Data Collection Procedure

A list of licensed nursing facilities that had adopted EHR systems was obtained from the state regulatory agency. Reflective focus groups with four to six administrators and directors of nursing (DONs) were conducted in summer 2008 to gain input about the interview questions and refine questions to be used in the study. Administrators of EHR adopter facilities were contacted by telephone and e-mail to describe the study's aims and seek permission for their facility to participate. After agreeing to participate in the study, on-site visits were scheduled for approximately 6-8 hours per visit with the following schedule for face-to-face interviews: (a) 60 minutes for introductions and facility tour, (b) 45 minutes with the facility administrator, (c) 45 minutes with the DON, (d) 45 minutes with a group of assistant DONs and charge nurses, (e) 45 minutes with a group of direct care staff, (f) 45 minutes with residents and family members from the facility's Resident Council membership, and (g) 1 hour for observation on the nursing unit

during a shift change. After informed consent was obtained, interviews were conducted and were hand-recorded and tape-recorded in duplicate. Tape recordings were transcribed within 14 days and compared against hand recordings to ensure accuracy and completeness.

Population

There were 28 facilities on the original list of adopter facilities provided by the Texas Department of Aging and Disability that oversees nursing homes. Five additional facilities were added through contacts and recommendations from other facilities, for a total of 33 facilities on the contact list. Of the 33 facilities on the contact list, 16 did not meet the inclusion criteria because they had not fully implemented an EHR system or they were part of a large acute care setting (i.e., a wing or floor within a hospital and classified as a skilled nursing facility), 4 facilities did not respond to contacts via voice mails and e-mails (facilities were eliminated after no response to six contact attempts), and 3 facilities responded to the initial contact but elected not to participate in the study. Finally, 10 facilities agreed to participate, and visits were completed (59% response rate).

The facilities that participated in this study ranged in size from 60 to 367 beds in the nursing unit. The average bed size was 145 beds. Six of the facilities had over 100 beds in the nursing unit. Six of the facilities were Continuing Care Retirement Communities. In most of the Continuing Care Retirement Communities, the EHR's use was limited to the skilled nursing units. The facilities visited were generally high quality (Table 1).

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Data Analysis

Data were analyzed by identifying and organizing recurring themes and patterns in the data transcripts, identifying the frequency of occurrence of themes and patterns, and interpreting the data to provide a description of the experiences, challenges, and benefits of EHR adoption in LTC facilities. Transcripts were then cross-validated by matching themes into specific questions and across user groups to identify a detailed pattern of recurring themes. To verify accuracy and completeness of the data, transcripts were compared against tape recordings and hand recordings by two researchers. To ensure reliability of the coding, two researchers independently reviewed the transcribed data and identified themes and patterns. The researchers then met to compare their interpretation of the data and reach agreement on final data analysis.

Findings

The major findings from the study are presented in Table 2, along with the care quality and cost control implications, which are briefly discussed here. Common themes that emerged related to role-based experiences are summarized next and detail the experiences of the various users of EHR systems in LTC settings-administrators, supervisory nurses including the DON and assistant DONs, direct care nurses, certified nurse aides (CNA), and consumers (residents and family members).

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Long-term care facilities have successfully adopted a variety of EHR technologies. Several facilities in the sample were almost completely paperless using the EMR for medication reconciliation, admission and discharge screening, and reporting to regulators. Nurses generally reported that the quality of care was neutral (no change) to improved after the implementation of the EMR. In addition, improved documentation and ease of access to patient information were definite benefits identified by the nursing staff. Certified nurse aides were adept at entering ADL information into icon-driven touch screens, often with minimal training. No facilities in the sample provided financial data, although those who discussed return on investment mentioned the EHR positively from a revenue perspective. Improved documentation regarding the level of care required by the facility's residents led to increased reimbursement rates in several facilities.

Computerized Pharmacy Administration

Although not the focus of this study, the facilities with the computerized pharmacy administration (CPA) system demonstrated accuracy and timeliness in the medication delivery. The CPA system was integrated into the EHR and provided an increased level of accountability during medication reconciliation. Significant reductions in waste were reported, not to mention the benefits gained through reducing the incidence of adverse drug events or more minor medication delivery time errors. One facility documented a \$3,000-\$4,000 monthly reduction in medication waste after implementing the system.

EHR Business Model

The typical EHR business model in the sample consisted of a software license contract on a per patient-per-day rate. This rate was mentioned as \$1/patient/day. System consistency, interoperability, and accessibility were reported as keys to better coordination of care leading to better quality. These features will ultimately lead to lower overall costs to the health system. Better cost recovery is an additional benefit to the facility.

Minimum Data Set Reporting and State Regulatory Surveys

Although the current minimum data set (MDS) reporting requirements were integrated into the EHR to some extent, opportunities exist for greater efficiency in this data collection process. Some of the reports were formatted to facilitate data entry of the various measures and nurses discussed how the MDS reporting process was less time-consuming now, specifically mentioning, "How it was easier to pull reports instead of going around to all the different charts to collect the data."

Although not currently utilized by the state of Texas, remote regulatory survey and monitoring capabilities are possible. State inspectors could prescreen facilities and conduct follow-up visits with more regularity and perhaps different work force requirements. On-site visits could be streamlined, especially if there were visit teams specifically trained in the software systems to facilitate the "always learning something new" reported by the administrators.

Role-Based Experiences

Administrators

Facility administrators consistently reported advantages in three distinct areas. First, immediate access to medical records allowed both nursing and nonnursing staff (administrator, pharmacist, dietitian, social worker, etc.) to access resident records without wasting valuable time looking for paper charts ("more staff have better access to better data"). Medical record security and the Health Insurance Portability and Accountability Act of 1996 compliance were maintained by system features that allowed for defined levels of password-protected access to resident data for different staff categories. Administrators reported that staff members were able to provide better information to resident families and better care to residents because of immediate access to computerized records. In addition, administrators reported faster response to incidents or changes in a resident's condition as a result of real-time reporting. For example, if a resident developed a fever or a skin issue, the response to increased monitoring or treatment was significantly faster through the EHR notification than through the previous paper system and end-of-shift notifications between staff. Administrators reported that quicker response to resident health

changes helps reduce overall care expenses as early interventions provide savings over the costs of potential later consequences, such as hospitalization.

Second, the EHR system provided for improved consistency, accuracy, and quality of documentation ("fewer holes in documentation from a caregiver standpoint"). Nurses document resident health assessments and event monitoring (i.e., falls, fever, etc.) on computerized templates based on standard guidelines. Administrators viewed the assessment and event documentation templates as a mechanism to guide nurses to more thorough documentation as well as serving as a continuing education feature to help nurses become more adept at physical assessments and event monitoring ("guided templates improve observation skills, which in turn provides for better care for the residents"). Another significant result of improved documentation was providing evidence to support higher resource utilization group levels for increased reimbursement.

Third, administrators reported that the EHR system contributed to improve employee satisfaction and staff retention ("the facility is viewed as more modern and more attractive to potential new staff"). Administrators reported that nurses had an elevated perception of working in an LTC facility because of the advanced use of technology and preferred working in a facility with an EHR system. According to administrators' observations, nurse aides also adapted quickly to the use of technology and had an improved sense of job importance because of new skills using computerized technology to document resident care. Administrators themselves also exhibited pride in their accomplishments as an EHR leader-one administrator commented that he was "more proud of being a nursing home administrator than any time in the last 15 years."

The primary disadvantages reported by administrators were related to technology problems and maintenance issues. Internet outages, system downtime, and computer glitches were reported as creating frustration for staff who depend on 24/7 access to computerized documentation systems. In some facilities, the administrator served as the information technology (IT) support for the facility, which was reported as time-consuming and frustrating. This is not an ideal situation for the administrator, as their expertise in IT matters was often learned on the job and took time away from facility oversight. However, none expressed a desire to hire an IT person full-time because the IT burden was generally manageable, yet still a distraction. Overall, administrators agreed that advantages strongly outweighed disadvantages and that it was absolutely a positive decision to implement the EHR system.

DONs and Charge Nurses

Nurses in supervisory positions who participated in the interviews were overwhelmingly positive about the EHR system and would be very opposed to going back to the "precomputer" days. The primary advantages consistently reported by nurses in supervisory positions included statements related to the following areas: (a) immediate access to records for any authorized staff member, (b) more consistent and legible documentation, (c) more thorough assessments with assessment templates that guide nurses through body systems for documentation and to help nurses improve observations skills, and (d) streamlined method for processing physician orders with fewer steps and fewer opportunities to make an error. Importantly, the nurse supervisor's ability to monitor residents' changing conditions on an ongoing, real-time basis improved. This improvement is because supervisors receive alerts regarding out-of-range vital signs and new resident events (i.e., infection, fall, skin issues, fever, etc.). Furthermore, the nurse supervisor's ability to track and trend quality indicators such as weight changes, infections, and falls and use the data as part of the facility's ongoing quality improvement program was enhanced through the information accessible in the EHR.

In terms of supervision, the nurse supervisor had an increased ability to monitor staff and complete chart audits in very timely manner, as well as the increased ability to easily monitor nurse aide activities. The nurse aides were able to become more responsible and accountable for their work because of computerized documentation.

Nurse supervisors generally believed that the EHR system allowed direct care staff to spend more time with residents and less time in documentation ("...gave the nurses more time on the floor since the paperwork went faster"). Some supervisors also reported a decrease in overtime that they believed to be related to less time spent in documentation activities. In contrast, some direct care staff reported that they had less time with residents because of the amount of time the computerized documentation required. Nurse supervisors reported that the EHR system helped with nurse recruitment and retention ("the computer is a good selling tool when trying to hire a good nurse"). One nurse supervisor reported that the EHR system helped to attract younger and more qualified nurses.

Reports regarding the time required to admit a new resident was mixed, with some nurses reporting that new admissions were much easier and quicker and others reporting that admissions took much longer because of the EHR system. Nurse supervisors also had mixed reports about

time to complete resident care plans, with some reporting improvement and some reporting longer time to complete care plans using the EHR system. Nursing supervisors in the facilities with the CPA systems reported that the medication packaging allowed for a significant timesaving through improved workflows and better quality control.

The one disadvantage that the nurse supervisors consistently reported was the difficulties encountered when the system was "down" due to technical problems. Although all facilities had plans in place to use paper charting during system downtimes, nurses reported that "when the system goes down, all work stops-everyone seems lost without the computer." Many nursing supervisors reported that downtime was more prevalent in the weeks right after the installation. However, over time, the outages were limited to the overnight hours and related to system updates by design. Most said that they received e-mail notifications of scheduled updates so they were able to plan around the outages. Given the location of the facilities, in the heart of tornado alley and often in the path of the aftermath of hurricanes, the facilities all had extensive plans for weather-related emergencies (including power outages) and times when the Internet-based systems could be out of service due to weather.

Finally, one consistent message heard from the nursing supervisors was the desire to have regular meetings with the system designers and/or vendor representatives. The nurses believe that they have much to offer in regard to potential improvements to the system; they also believe that they may not be using the system to its fullest potential and would appreciate additional training from system experts. In addition to meeting with the vendors, the nurse supervisors felt that user group meetings would be beneficial, as there were possible "tricks" to make the system work better to their advantage that others had discovered and they also wanted to know how to do their job more efficiently. Given the distance between many of the facilities, these user group meetings could be facilitated through Web-based meeting applications.

Direct Care Nurses

In every facility visited, direct care nurses consistently expressed a positive experience with the EHR system. These nurses described many benefits during the focus groups relating to information content and accessibility. For example, several noted how information on residents, including diagnosis and demographics, is now more readily available. Not to mention, nurses' notes and notes by other disciplines are much easier to read, reducing the time needed to decipher poor handwriting and the potential for error. Alerts regarding specific resident events such as weight change or out-of-range vital signs allow nurses to respond more quickly to a change in the resident's condition. In one nurse's words, "we are able to be more proactive to

address residents' problems." Additional information on falls, infections, and other resident events is also more readily available, which increases a nurse's awareness of the patient condition and allows for better care. Physician orders are easier to process because the order is written only once and is automatically sent to the pharmacy and to the medication administration record or the treatment administration record, reducing the potential for errors.

Time savings were often mentioned as a benefit. Not only were nurses spending less time after their shift documenting what happened, but also the time spent looking for "missing" charts was eliminated because the information was in the computer and at their fingertips. In addition, records required to transfer residents out of the facility (i.e., to the hospital or physician's office) can be prepared with just a few clicks on the computer, which decreases the time and complexity spent on this task.

Interviews with direct care nurses revealed inconsistencies in four areas identified as recurring themes-time with residents, care plans, new admissions, and resident and family response. About half the nurses reported that they had more time to spend with residents because of less time charting, and about half reported no change or an increase in time required for charting. About half the nurses reported that care plans were easier to originate and maintain; about half of the respondents reported that care plans were more difficult to complete and maintain. About half the nurses reported that the admission process was quicker and easier with the EHR system, and about half reported that the admission process took longer than using paper records. About half the nurses reported that residents and family members did not notice the change to computers, and about half reported that residents and family members sometimes have a misconception that the staff members are "always on the computer" or "playing on the computer."

Direct care nurses were consistent in their reports regarding the challenging aspects of EHR usage. New nurses are often overwhelmed with learning the new EHR system on top of the details related to the new facility and resident requirements. Some new staff quit working at the facility within the first week, never to return, due to information overload. When the system "goes down," work almost completely stops or is much more difficult. Learning to use the keyboard and to type was very difficult for some nurses, as some had no previous computer experience. Despite acknowledging the disadvantages with the EMR system, nurses generally reported that "even with the problems, there are bigger advantages."

Certified Nurse Aides

Certified nurse aides who participated in the interviews almost exclusively used a point-of-care system with touch-screen technology to document residents' ADLs and intake and output. Computer kiosks were located in unit hallways near resident rooms and dining areas, allowing CNAs to chart immediately after, or very close to, the time care is given. As seen in previous user groups, the CNAs consistently reported a positive experience with the EHR system. Benefits to computer documentation described by CNAs included more legible documentation (i.e., the paper records got "really messy") and more accurate and thorough documentation ("The managers can tell if you're just hitting buttons so you have to read carefully and answer all the questions").

Perhaps, the most interesting feeling expressed by most CNAs was that they believed that managers had a greater respect for CNAs because the managers cared enough to give them computers for their work-and their work was important enough to be documented in the computer. The CNAs demonstrated great pride in displaying their use of the computer system to the research team.

A second important issue discussed by CNAs was the need for more information about the residents they care for. Generally, kiosks provide only very limited information about the resident, such as the resident's diagnoses. Certified nurse aides indicated that they would value more complete information about the residents, particularly if the information was accompanied with additional explanations (i.e., more details about the resident's illness).

The challenges and negative aspects of using EHR systems discussed by CNAs included difficulty in learning to use the computer; however, most CNAs reported that they began to feel comfortable using the computer after about 1-2 weeks. Over half the CNAs reported that computer documentation took more time, leaving them less time to spend with residents; just under half reported that computer documentation saved them time, allowing them to spend more time with residents. Most CNAs mentioned that residents and family members sometimes made comments about them "playing" on the computer instead of working.

Consumers (Facility Residents and Family Members)

Residents' and family members' reactions to the EHR systems varied from positive and supportive to more negative. Their observations as consumers provide an interesting perspective

on EHR adoption. On the positive side, residents were consistently supportive of computerized medical records by acknowledging this trend as a "wave of the future," "much more efficient," and "necessary." Residents and family members generally acknowledged that staff could find and track medical information more easily and provide answers to questions more quickly. One participant described the situation of getting information "out of the computer" that allowed her to change from a name brand to a generic medication and saving almost \$700 per month. In most participating facilities, at least one resident commented on the convenience and quality of printed medical records that are provided when they go for a medical appointment outside the facility. Another positive perspective from residents and family members is that the staff is overburdened with paperwork and the computer allows them to more easily do their work.

On the negative side, many residents suggested that there was a trade-off in care because staff are working on the computer and not tending to resident care. Some residents commented on less personal contact since the implementation of the computer system and observations that "there is always someone with their face in the computer" not paying attention to residents' needs. Residents and family members also expressed concern with the accuracy of their medical record information. However, there was no concern about the privacy and security of records. From a health care system perspective, one resident remarked that "there are still holes in the system" because his information is in the computer at the nursing facility but when he goes to an outside appointment, he still has to spend a lot of time filling out forms with the same information that is already "in the computer" at the facility.

Practice Implications

Long-term care facility employees who work with EHR systems on a daily basis and participated in this study were overwhelmingly positive about their experience with the EHR and reported many more benefits than challenges. In general, facility employees reported improved care quality, increased employee satisfaction, and financial benefits in excess of system costs and that they intend to continue using the technology. State governments have a particularly strong stake in the successful operation of LTC facilities because they have primary regulatory oversight for LTC facilities and Medicaid is the primary payer for LTC services.

Potential benefits of widespread EHR use for the state government are decreased expenditures through cost avoidance, improved facility oversight, and development of evidence-based practices. Cost avoidance may be related to reduced medication expenditures through waste

avoidance (especially in facilities where the automated pharmacy system is used), the ability to proactively respond to a resident's change in condition and thus avoid costly hospitalizations, and increased quality and efficiency in care documentation. Improved facility oversight may result from more complete and uniform care documentation along with medical record information that is immediately available in real time and remotely accessible. Finally, EHRs will provide the data to help establish evidence-based practices in the facilities and improved data reporting will provide compelling population-level outcome and forecast data.

Despite the advantages of EHR adoption for the LTC facilities and state governments, the systems are not costless. Potential costs of widespread EHR adoption are one-time expenses for hardware, software, and training to promote adoption, implementation, and meaningful use. Ongoing expenses include ongoing software licensing fees, continual training for newly hired caregivers, information technology support, Internet access, and hardware maintenance, repair, and replacement. For facilities operating in a low-profitability mode, as the case for most facilities in Texas, the costs of adopting an EHR system is prohibitive. The likelihood of widespread diffusion in the near term (3 to 5 years) without well-designed health policy initiatives and programs is low.

Health Policy Implications

In light of strong support for EHR systems from the LTC facility level, potential advantages for state governments, and the national initiative to promote the use of EHRs across all health care settings, several health policy initiatives would be appropriate based on the results of this study. First, LTC leaders, in collaboration with state governments, should consider establishing a set of "best practice" implementation guidelines, including strategies to evaluate EHR business models and vendor contracts to assist facilities who are considering EHR adoption. The best practice guidelines should also include a set of sample policies to support and guide EHR adoption; such sample policies could be used as a guide with respect to key issues such as equipment maintenance, Internet access, protected health information and system security, and ongoing quality improvement (Table 3).

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Second, LTC professional organizations and industry leaders should offer continuing nursing education programs to give supervisory and frontline nurses first-hand experiences with EHRs to help promote adoption. Third, vendors and LTC industry leaders should collaborate to institute regular meetings with vender representatives and user groups (i.e., DONs and charge nurses) to

identify potential system improvements, provide advanced training to the group, and provide an opportunity for the group members to network and learn from each other.

Finally, state governments need to design programs to promote adoption that include financial incentives with related quality criteria as a condition of participation. Such an approach would help increase the likelihood of programmatic success, increase the pace of technology adoption, and promote continual improvement in care quality and safety for residents of LTC facilities.

Study Limitations

The generalizability of the study is limited because of the small sample size and the geographic location of the facilities all being in a single state. Relatively few LTC facilities have implemented an EHR in this state; therefore, sample population is small. In addition, the facilities assessed may not be representative of all LTC facilities because they tended to be above average in terms of both size and quality and were on the forefront of leading technology implementation in the LTC industry.

Future Research

The research team identified multiple areas of future study to indicate the value of technology to improve resident outcomes and organizational effectiveness and efficiency in the LTC setting. First, this study explored EHR use in a single state; multistate research is necessary for increased generalizability. Second, the use of CPA systems should be fully explored as facilities currently using pharmacy dispensing machines report significant reductions in both medication errors and waste. Questions that need to be explored include the impact of CPA on the safety and accuracy of medication administration, staff efficiencies, and medication costs. The status of technology adoption at the state level should be detailed through an annual survey to determine the status of technology adoption intentions and timeframes among LTC facilities. Another very important opportunity is to explore how the EHR database combined with the MDS data can be used as a rich data repository for research around evidence-based practices in the LTC setting.

Finally, the impact of EHR systems on organizational effectiveness, efficiencies, and care quality needs to be further explored. Elements of study to consider include staff turnover and retention rates, resident and family satisfaction scores, aggregate hospitalization rates, overall costs of providing services, and LTC quality indicator data.

Conclusions

The benefits of EHR adoption most frequently reported by LTC facility employees can be grouped in several categories. From an information standpoint, benefits include immediate access to the residents' records; improved administrative oversight allowing for ease of monitoring residents' changing condition and proactive response to residents' problems; and improved quality, consistency, and accuracy of documentation. Employee benefits include improved staff satisfaction and retention, especially among CNAs who feel more valued because of having computers to use in their work, and easier work processes such as completing physicians' orders and preparing records for resident transfers outside the facility. Quality and patient care improvements include the ability to track and trend quality data and complete quality audits in a timely manner.

The challenges reported by participants were primarily related to the technology and new employee training. Participants reported that work was difficult to accomplish when the computers and/or Internet were "down," and the cost of maintaining and upgrading computer hardware was also an issue. Participants also reported that good training and ongoing support are essential for new employees, as well as allowing them time to adjust to computer charting. Despite these challenges, the participants agreed that they would not want to return to paper charting or precomputer days.

On the basis of the results of this study, the research team identified several important health policy issues that should be considered to promote the successful adoption of EHRs. Recommended policy issues relate to promoting best practices for adoption and implementation processes, establishing sound organizational policies related to EHR use, employee training, ongoing support to address EHR system improvements, and financial incentives coupled with quality criteria to promote adoption.

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