


FEATURE

ARTICLE

The Use of Bedside Electronic Medical Record to Improve Quality of Care in Nursing Facilities

A Qualitative Analysis

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It appears that the implementation and use of a bedside electronic medical record in nursing homes can be a strategy to improve quality of care. Staff like using the bedside electronic medical record and believe it is beneficial. Information gleaned from this qualitative evaluation of four nursing homes that implemented complete electronic medical records and participated in a larger evaluation of the use of an electronic medical record will be useful to other nursing homes as they consider implementing bedside computing technology. Nursing home owners and administrators must be prepared to undertake a major change requiring many months of planning to successfully implement. Direct care staff will need support as they learn to use the equipment, especially for the first 6 to 12 months after implementation. There should be a careful plan for continuing education opportunities so that staff learn to properly use the software and can benefit from the technology. After 12 to 24 months, almost no one wants to return to the era of paper charting.

KEY WORDS

Electronic medical record • Nursing homes •
 Staff satisfaction • Technology

Nursing homes have a long history of quality problems,¹ as well as a long regulatory history attempting to correct these problems.^{2,3} For the past several years, the Centers for Medicare & Medicaid Services (CMS) has invested heavily in quality improvement efforts in nursing homes through quality improvement organizations^{2,4} and cooperative groups such as Advancing Excellence.⁵ Despite these initiatives, marked improvement in quality of care has not been realized on a national level, and other options are being pursued. One option appears to be the implementation of clinical information systems to enhance quality of care in nursing homes.

Primary uses of clinical information systems are described by an Institute of Medicine (IOM) report as assisting in the delivery, support, and management of patient care; assisting in administrative and financial matters; and assisting in patient self-management.⁶ Within that report, projections were made describing the expected levels of sophistication for clinical information systems in nursing homes. For exam-

ple, by 2010, the IOM projects that nursing homes should have capabilities to use multimedia support for images and scanned forms, such as resident consents. By the year 2007, nursing homes were to have implemented rules-based alerts and preventive reminders to support resident care.

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The application of a bedside electronic medical record (EMR) to collect daily measures of resident care and outcomes in nursing facilities has potential to improve the efficiency and effectiveness of care in nursing homes. Using innovative bedside EMR could provide a care model that moves toward a fuller implementation of national mandates and better quality of care in nursing homes. A larger parent study implemented an intervention designed to test the unique and combined contributions of bedside technology toward improving the care of nursing facility residents. This is a report of the qualitative findings in four nursing facilities that participated in the larger evaluation.⁷

■ BACKGROUND

Bedside Technology Evaluated

The bedside technology implemented in this study is a system developed by Optimus EMR (OEMR) of Irvine, CA, that represents a shift from manual to digital input and through which nursing staffs and management in long-term-care facilities have instant access to more real-time information. The OEMR's goal is to make clinical documentation of care efficient and accurate. The system automates several manual processes, including the preparation of minimum data set (MDS) forms. This potentially time-saving element uses the data collected during routine care. Furthermore, accurate reporting of the services provided should result in correct reimbursement rates. Using the OEMR also potentially allows facilities to strengthen medical record compliance, thereby minimizing potential fines, penalties, and malpractice issues.

Microchips (iButtons), radio frequency, infrared, PDAs, and wireless technology are integrated through the company's proprietary software. Data that are collected, either at the point of care or entered on a personal computer, automatically populate all appropriate sections in the EMR and the MDS. Of particular importance to clinical staff, the OEMR offers a total electronic charting system (including physician orders, medication administration, and treatment records), which streamlines the assessment and documentation process, providing features that ensure efficiency and accuracy in the recording of assessments and data collection. The system uses handheld PDAs that enable the clinician to collect data at the bedside. The system allows for accountability, verification of caregiver activities, and bi-directional alerts and messages through the use of microchips (iButtons) that are located on each resident's bracelet and on the caregiver's ID badge.

Technology in Healthcare

Relevant research evaluating the use and effect of sophisticated technology in nursing homes is becoming an

important focal point in the literature. Changing societal demographics, increased complexity of healthcare knowledge, and increased shortages of healthcare staff have led healthcare strategists to recommend redesign options that incorporate technology into healthcare practices.⁸ How technology is shaped affects the acceptance levels within an organization.⁸ Recent studies investigated the adoption of new technologies in nursing homes during the periods when implementation was just beginning.^{9,10} Common themes that affected implementation of advanced technology in nursing homes included (1) the perception and cognitive abilities of people interacting with the technology, (2) change management, (3) the ability of staff to work with the system, (4) competence levels, and (5) connectedness.⁹

Computerized nursing documentation systems can help nurses improve work practices and resident outcomes. Technology has improved computer charting, care planning, information accessibility, decision making, and perceptions of information security in acute care settings.¹¹⁻¹⁶ Computerized clinical documentation systems make a difference in quality of documentation after implementation of an integrated point of care system on hospital nursing units.¹⁷ The researchers indicated that there was a 13% increase in compliance with the Joint Commission accreditation requirements during the study. In a similar study, improvements were measured in 11 of the Joint Commission accreditation requirements (34%) for nursing documentation using technology.¹⁴

Few resources are available on the use and effectiveness of computerized records in nursing homes.¹⁸ Computer use in nursing homes has generally been limited to business applications and management of the federally required MDS.¹⁹ In contrast, research on computer use in nursing homes identified some facilities in one state using highly sophisticated computerized systems to manage care, including applications for electronic tracking of resident identification, electronic systems for discharge and transferring residents, and clinical decision support systems used to create opportunities for earlier intervention when resident problems arise.^{9,20-22} However, it is likely that widespread use of these sophisticated systems in nursing homes actually is limited.

■ EVALUATION DESIGN

This study was part of a larger four-group evaluation comparing nursing homes with and without technology.^{7,23} The nursing homes implemented a bedside EMR developed by Optimus EMR, Inc, formerly OneTouch Technologies Corporation. Sites were voluntarily recruited. The study was reviewed and approved by the university's Health Sciences Institutional Review Board prior to initiation.

Table 1**Characteristics of Study Participant Nursing Homes**

Group	Facility	No. of Beds	Ownership	Baseline Quarter (Q)
1 Intervention	1A	240	Not for profit	Q4 2003
	1B	180	Government	Q3 2003
	1C	98	For profit	Q1 2004
	1D	150	Not for profit	Q3 2004
		668 Total beds		

Intervention Group Recruitment

A stratified purposive approach was used to recruit the intervention sites that were broadly similar to the range of nursing homes in the state. Three facilities from urban and one from rural areas were recruited. Additionally, a mix of for-profit, not-for-profit, and governmental facilities were represented. Staffing across facilities was similar as were resident characteristics at recruitment. Table 1 displays the characteristics of intervention facilities in one central US state recruited for the evaluation. Because facilities entered the study during different periods, they have different baseline data dates. As an incentive for participation, facilities implementing the OEMR received partial financial support from CMS in purchasing the OEMR hardware, software, and ongoing technical support.

Data Collection Procedures

As a part of the evaluation activities, qualitative interviews, observations, and focus groups were conducted in all intervention facilities after 6 months of implementation of the bedside EMR to gather feedback from nursing home clinical and administrative staff on EMR. They were repeated 12 to 18 months after implementation. Additional interviews were conducted in two facilities that reached 24 months after implementation during the evaluation period.

The qualitative data collection specifically addressed these research questions:

1. Is quality of care provided to nursing home residents improved through the use of bedside EMR?

2. If care is improved, what specific elements of care are improved, and what are the mechanisms for improvement?
3. How does the use of bedside EMR affect the reliability and accuracy of nursing home quality measures?
4. What is the impact of bedside EMR to collect daily measures of resident care on the nursing personnel delivering care?

Employees were voluntarily recruited to participate in the interviews, observations, and focus groups. However, every effort was made to recruit employees with potentially diverse opinions of the EMR to obtain a balanced view of the impact of implementing the technology. Employee job classification of participants was recorded and reported in aggregate; those with fewer than six in a classification were combined with a similar classification to protect identity. No individual employee-identifying information was collected. Table 2 summarizes the focus group participants and some facility characteristics.

Observational qualitative data of the process of using the bedside technology were collected at the same intervals: 6 to 12 and 12 to 8 months for all three shifts in group 1 facilities. Before the conclusion of the study, two of the four group 1 facilities passed 24 months of implementation, which allowed some data to be collected about staff perceptions at 2 years after implementation. All qualitative data were collected using observations, field interviews, and focus groups. Information was recorded using both field notes and tape recordings. These data provide insights into the use of staff time for technology and care. Observations verified the accuracy of the quantitative data of

Table 2**Focus Group and Selected Facility Characteristics**

	Facilities			
	A	B	C	D
Total no. of focus groups	6	5	5	6
No. of administrators	8	5	4	6
No. of RNs/licensed practice nurses	14	6	7	8
No. of certified nursing assistants	19	12	19	12
Total no. of staff participating	41	23	30	26
Facility size, no. of beds	240	180	98	150
Ownership	Nonprofit	Government	For profit	Non profit

staff time spent with residents, being captured in the EMR. Additionally, the observations were valuable in understanding and interpreting focus group and interview data.

Data Analysis

The analysis was conducted for study homes through an extensive review of focus group transcripts and audiotapes, field notes from on-site observations, and individual staff interviews. It was important to include the 24-month observations and interviews to examine for improvements or declines that may occur later after implementation. These data sources were reviewed to identify emerging themes specific to staff perceptions of the impact of bedside EMR on resident care, as well as indicators of staff satisfaction and dissatisfaction with the implementation of technology.

All focus group discussions were audiotaped and transcribed. The written transcripts were reviewed by four members of the research team to ensure validity of the results. Guided by the research questions, a content analysis was conducted to identify emerging themes from the data.²⁴ Field notes for the on-site observations and staff interviews were also reviewed for additional inclusion in the emerging themes. Using this approach, themes of implementation, resident care, technology, documentation, equipment, and evaluation emerged from the data.

These emerging themes were formatted into tables that delineated content of the theme specific to the categories of staff who perceived the issues: administrative staff, licensed nurses, and nonlicensed staff. Krueger's²⁵ process for data analysis using focus groups was utilized for this portion of the evaluation. The tables were very helpful in discussing the themes and accurately identifying the category of staff who perceived the issue. The tables also helped to identify issues that all staff identified or just some that staff thought were of concern.

Using this approach, themes of resident care, technology, implementation, documentation, equipment, and evaluation are supported by the data. A discussion of these themes follows, and research questions are answered within the themes that emerged in this qualitative analysis.

RESULTS

Implementation

Two issues emerged related to the implementation phase. It was recommended by two study homes that several systems be reviewed prior to the selection of the system, so that the one that best suits their situation could be selected. All advised that questions should be asked so that vendor accountability and facility responsibilities are very clearly

delineated as the system is implemented. It was noted that any product will have limitations. Staff should be aware of these limitations and lower their expectations that major changes will be made to the system upon request.

Another issue that emerged was training of staff. The need to offer ongoing training, refresher training, and training specific to individual learning needs was consistently identified as important. Developing and using mentors were identified as beneficial and a valuable resource. Although the vendor helped with some implementation issues, based on the interviews, it appears that more training and on-site support are needed to assist staff through the implementation change process (research question 4).

It is important to be clear about roles and responsibilities of staff in the implementation phase. Facility staff should have a stronger understanding for what they will be accountable in the implementation phase (such as hardware purchases, server capabilities, contracts with the vendor for staff education, ongoing information technology [IT] support, equipment breakage, and equipment access).

Resident Care

Communication

Communication about resident care was reported as improved using bedside EMR. In particular, licensed staff noted better communication with physicians since information was retrieved more readily through the use of electronic records. Follow-up care was perceived as being better because of easier access of this information (research question 1). Certified staff (certified nursing assistants and certified medication technicians) desired more communication from the nurses about resident care, and they expressed their belief that technology could facilitate that communication. It appears that a mechanism for improvement in care is improved communication facilitated by bedside EMR (research question 2).

Clinical Information

Residents' clinical information was easier to access and considered more comprehensive. Both administrative and licensed staff remarked that a clearer picture of the resident's clinical status emerged through the use of standardized, comprehensive documentation. The ability to trend clinical problems was seen by licensed and certified staff as beneficial in managing residents' conditions (research question 1). The trending was perceived as leading to improved follow-up. It appears that another specific mechanism for improved care is the more accessible and comprehensive clinical information provided by bedside EMR (research question 2).

Overall, both administrative and licensed staff in all four homes noted general improvement in resident care

(research question 1). Licensed and certified staff believed that the care was safer through the use of the electronic medication administration record (eMAR) system (research question 2). In particular, it was noted that eMAR facilitated a faster and safer medication pass. Others remarked that they were able to think more about their resident interventions through the use of bedside EMR (research question 4).

However, all direct care staff in each of the four study homes expressed concern that there was limited time to spend with residents and that the required documentation and time spent in managing the technology limited the amount of time actually spent with residents. This concern was commonly expressed during the 6 to 12 months of implementation. Participants noted that eventually more time might be spent with the resident, since much documentation occurs at the bedside.

Documentation

Time Factor

Many of the comments made by staff indicated that the system required time to operate and manage (research question 4). The licensed and certified staff across all four homes perceived documentation as too time consuming. Certified staff commented that the implementation of technology and bedside charting created expectations of daily documentation, which was perceived as a burden and too time consuming, and that it, ultimately, took time away from residents. Some also viewed daily documentation, such as care needs of the resident, as a waste of time, since residents' conditions do not change every day.

Licensed staff commented that the assessments were often too limited or too lengthy to use. Licensed staff in three homes discussed using shortcuts with documentation. Rather than documenting based on the assessments, staff used a system of quick notes, which is narrative text with easier access and a more flexible format, but does not transfer to other parts of the clinical record, as the system is designed to do with the documentation. Administrative staff indicated concerns that this type of documentation is not consistent or standardized, and it does not populate reports for trending or locating specific information.

There were other problems identified. The system is designed for documentation immediately after care is provided. This was inconsistently done. Some licensed and certified staff discussed documenting at the end of their shifts, although they recognized documenting as care was provided is the preferred method. It appears that the time taken to operate and manage the EMR system and the inconsistent use of the system by the nursing personnel have an impact on them as they deliver care (research question 4).

System/Structure Issues

There were system/structure issues and concerns that also emerged from the data. Licensed staff and certified staff from the four homes mentioned that paper-based systems were still being utilized by staff. Sometimes, using paper created a double documentation system. Information placed in daily logs, communication sheets, and handwritten physician's orders would need to be transferred into the electronic record. This practice creates more problems, since the information was inconsistently transferred. Some also preferred the paper-based method of care planning, stating that computerized systems of care planning were too cumbersome. These multiple systems have potential to negatively affect the reliability and accuracy of the nursing home quality measures (research question 3).

Paper-based systems were also used as a backup when the computer system "went down." Information then had to be manually entered into the system later, and sometimes the information was not entered. Licensed staff responsible for the MDS were concerned that this created an extra burden for them, since they had to review both paper and computer when completing the MDS and care planning (research question 4). Finally, certified staff viewed the iButton as inconvenient and bothersome to the residents (research question 1); iButtons were placed in multiple locations to facilitate the documentation. Sometimes, residents were not near their iButtons, or even in the same room with it, although the system is designed to be used with an iButton to be worn by residents. Failure to locate iButtons as designed creates situations where staff are forced to search for iButtons, delay or miss documentation, and have incorrect times for care delivered because of automatic date-time stamps in the system. These issues have an impact on the staff delivering care (research question 4).

Monitor Function

There were two opposite issues expressed related to the ability to monitor staff activity through documentation. Licensed and certified staff expressed concern that they could be watched by the monitoring of their documentation. On the other side, certified staff in two of the study homes saw the monitoring as a positive addition, since when reviewing the documentation the nurses would know that the staff completed their assigned work (research question 2). In particular, certified staff in one nursing home recognized daily documentation as positive, since their documentation would be accurately recorded and recognized. It appears that documentation has potential to reinforce the performance of assigned work, which can be a mechanism to improve care (research question 2). Clearly, documentation and the structure of documentation appear to have an impact on the staff delivering care (research question 4).

Accuracy and Errors

Concerns emerged related to errors and accuracy. All stakeholders in each of the four study homes had concerns about documentation. There was general reporting that data would be entered into the system and not be able to be located later. Reasons for the missing documentation were linked to inability to “hot sync” information, staff forgetting to document, and the continued use of paper systems. Additional errors were noted to be related to staff documenting at the end of the shift, instead of ongoing as care was provided. There were also observations that some certified staff documented care before it was provided. Administrative staff in one study home pointed out the concern of illiterate staff not being able to navigate the computer system and handheld devices. This was particularly problematic with non-English-speaking staff using technology systems. Administrative and licensed staff responsible for the MDS process were concerned about the accuracy of the MDS, because certified staff did not understand certain terms, such as extensive assistance, toileting, and so on (research question 3). Some of the administrative and licensed staff set up routines to review documentation to ensure accuracy (research question 4). These issues can have an impact on the reliability and accuracy of the data used to generate the quality measures (question 3).

All groups across all four study homes discussed the underutilization of alerts and messages. Although certified staff recognized the value in relation to directing care, there was inconsistent use of alerts and messages across all groups in all four homes, which could affect accuracy.

Overall, improvement with documentation was noted. All stakeholders in each of the four homes demonstrated improved satisfaction with documentation systems at 6 and 12 months. Certified staff believed that documentation was accurate, and at 24 months, administrative and licensed staff believed that the accuracy of documentation had improved (research question 3) and that documentation time had decreased (research question 4). All stakeholders concluded that documentation had improved in legibility and was more easily accessible. Licensed staff in three of the four study homes recognized that standardized assessments and documentation were beneficial (research question 1). Some licensed staff commented that the assessments caused them to think about what to assess and that it helped them identify problems that they might not have otherwise found. Using and documenting the standardized assessments that are a part of the system are likely mechanisms for improving care (research question 2).

Equipment

All stakeholders in all groups across all study homes identified concerns about the equipment. Concerns identified

included slow servers, hardware not working, the whole system “going down,” equipment breaking, and availability and access to the equipment. Research observations validated these concerns. In particular, the system was often slow, including time to change screens, which was compounded by the fact that staff had to change screens multiple times to document. Some problems encountered with the equipment were related to licensed staff and certified staff attempting to troubleshoot problems on their own, dropping the PDAs, and not reporting equipment problems in a timely manner. On the positive side, it was observed that staff, particularly certified staff, appeared to be proficient in the use of the equipment. These equipment issues have an impact on the staff and the delivery of care (research question 4).

Technology

The positive impact of the bedside EMR was recognized early in the study and was consistently reported throughout the study. All stakeholders in all four homes noted improved satisfaction with technology between 6 and 12 months (research question 4). At 24 months, stakeholders in the study homes expressed excitement about the technology and stated that their jobs were now becoming easier with the use of bedside EMR. However, all stakeholders commented that the technology could be frustrating when it did not work. In particular, administrative staff voiced concerns about response time and follow-up by the software vendor. This same group identified the need for IT support, either in-house or by contract. After-hours support, both nights and weekends, was of particular concern for staff. These issues have an impact on the staff and the delivery of care (research question 4).

Additionally, nursing home owners, administrators, and other staff, as well as policy makers, need to be aware of ongoing hardware and software costs, as well as ongoing staff support and the constant need for orientation of new staff to the system. It appears that nursing home staff did not realize the ongoing need for staffing to support bedside EMR and budgeting for updates to keep the technology up-to-date and efficient. These are not insurmountable issues, but they must be considered by regulators, technology vendors, and nursing home owners and staff. Not planning for the needed software and hardware updates and staffing support can have an adverse impact on the staff and care delivery that become dependent on the bedside EMR to work (research question 4). Additionally, failing to deal with these issues has potential to reverse care improvements that are gained from using the bedside EMR (research question 2), as well as the reliability and accuracy of the nursing home quality measures (research question 3).

DISCUSSION

This qualitative analysis of the use of bedside EMR on resident care revealed important information about the staff experience of learning to use this technology. From the data collected, staff experienced a major change as they implemented the technology. By 12 months after implementation, when staff had experienced the majority of the change impact, benefits could be seen. Overall, administrative and licensed staff perceived that documentation time decreased, accuracy increased, accessing resident information was faster, trending resident condition information was beneficial, and assessment and communication about residents and their condition improved. Although some nursing assistant staff perceived that documentation improved and was more reflective of the care provided, others continued to be concerned with the time-intensiveness of the documentation. Other benefits of bedside EMR include an increased awareness of resident needs and nurses holding nursing assistants accountable for the care they deliver that are to be captured in the EMR.

The qualitative data were also helpful to understand why some aspects of resident care and communication improved when using the bedside EMR, while others did not. Some ideas seem to be basic reinforcement of the work that is expected from a knowledgeable nurse or nursing assistant in long-term care. Watching nursing staff use the system, one can speculate about how staff interactions with residents are influenced by charting prompts that outline and reinforce correct care actions. Both nursing assistants and nurses are confronted with charting screens that display practice information. These screens prompt and set expectations for such elements as activities of daily living and many other clinical practices that are outlined in the nursing assessment tools in the system. Assessment tools outline important clinical problems, such as cardiovascular or respiratory symptoms, as well as appropriate interventions to consider. The clinical information that is collected by staff electronically populates the items in the MDS assessment instrument so that the items reflect the care and outcomes of care. Such reinforcement of clinical practices in the bedside EMR software appears to have the potential to result in improvements of resident care delivery.

Clearly, the content of the assessment templates and screen prompts must be clinically up-to-date with best practice information. The bedside EMR can reinforce the practices that “should” be occurring, reminding staff of what course of action or further assessment should take place in given situations. Both the vendor and the nursing home staff have responsibility for ensuring the best practice information and that prompts are accurate and up-to-date. This will be a challenge in some nursing home settings where clinical expertise is often limited. There are sources that are available from excellent organizations dedicated to disseminating the latest evidence-based clinical guidelines

such as the American Medical Directors Association (<http://www.amda.com/>), the John A. Hartford Foundation (<http://www.jhartfound.org/>), the Quality Improvement Program for Missouri (<http://www.nursinghomehelp.org/>), the University of Iowa College of Nursing Gerontological Interventions Research Center (http://www.nursing.uiowa.edu/consumers_patients/evidence_based.htm), and others.

However, the staff members using the bedside EMR were not fully supportive of its wholesale improvement of care. Some raised concerns about time spent in documentation, intermittent problems with equipment, and the need to disturb residents to touch their iButtons. Despite these concerns, the impact of technology on resident care was strongly positive. When asked if they would like to go back to paper charting, the overwhelming response of direct care and administrative staff using the system was, “No!” They explained that they would keep the technology, but they would like it to work consistently. Nearly everyone had an idea for improvement.

Many of the negative comments from the staff about the bedside EMR provide much information that could guide system design and workflow analysis to improve efficiencies of the system and streamline the work of the staff. The usefulness of staff insights should be tapped by vendors as well as nursing home administrative staff. Involving staff in systematic and ongoing feedback for continued improvement of the technology and its usefulness to improve care quality could have major impacts on improving costs of care. Other studies have confirmed that better quality of care costs less and saves major dollars in care costs.^{26,27}

CONCLUSION

Based on this limited study of nursing facilities, it appears that there is benefit from a quality-of-care perspective from the implementation and use of bedside EMR in nursing homes. From this qualitative evaluation, information obtained may be useful to other nursing homes as they consider implementing bedside EMR. Administrators need to be prepared to undertake a major change that will take many months of planning to successfully implement. Direct care staff will need support as they learn to use the equipment, especially for the first 6 to 12 months after implementation. There needs to be a careful plan for continuing education opportunities so that the staff learn to properly use the software and can benefit from the technology. It appears that proficient use of the technology will ultimately result in better resident care. There is one very telling conclusion: although most staff members have ideas for improvement of the technology, after 12 to 24 months almost no one wants to return to the era of paper charting.

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