Electronic Health Records Documentation in Nursing: Nurses' Perceptions, Attitudes, and Preferences

Linda E. Moody, PhD, MPH, FAAN; Elaine Slocumb, PhD, RN; Bruce Berg, MD; Donna Jackson, MSN, RN, BC

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Abstract

A descriptive study of 100 nursing personnel at a large Magnet hospital in Southwest Florida was conducted to assess their needs, preferences, and perceptions associated with Electronic Health Record (EHR) documentation methods. Nurses' attitudes about the use of EHRs and their perceived effects on patient care were assessed. The five-item, Likert-type attitude scale explained 54% of the variance in attitude scores and demonstrated sound construct validity and internal consistency ($r = 0.77$). More than one third, 36%, perceived that EHRs had resulted in a decreased workload. The majority of nurses, 64%, preferred bedside documentation but reported that environmental and system barriers often prevent EHR charting at the bedside. Overall, 75% of nurses thought EHRs had improved the quality of documentation and 76% believed electronic charting would lead to improved safety and patient care. Nurses with expertise in computer use, 80%, had a more favorable attitude toward EHRs than those with less expertise. Results have been used to implement clinical system changes.

Background

It is estimated that by the year 2005, the majority of healthcare facilities will have implemented some type of electronic health records (EHR) and electronic documentation systems. In 2003, Tommy G. Thompson, Secretary of the Department of Health and Human Services (DHHS), asked two prestigious organizations, the Institute of Medicine and Health Level 7 (HL7), to form a national task force to design a standard for EHRs. The task force has proposed a model with standards to be used in several EHR demonstration projects. To date, the EHR model has had far-reaching impact on the entire healthcare community, ranging from large enterprises to individual practices, with many states forming advisory boards to strategize how EHRs can be implemented statewide. The Health Information and Management Systems Society has developed a definitional model that details eight attributes and essential requirements for an EHR, from the need for secure records that can be accessed in real time to records that can help support clinical trials. All healthcare agencies are expected to have EHRs in place in the near future to ensure safety and better documentation of care.[1] For many reasons, the move to a paperless healthcare record is a daunting and expensive venture for healthcare agencies, and not

everyone is enthusiastic about the use of EHRs. Thus, adoption rates have varied widely from region to region. [2] Many of the problems encountered in implementation of EHRs are both organizational and behavioral, and may be attributed to attitudes toward the use of electronic technology or failure of the implementers to seek input from potential users.[3]

One approach to increasing the acceptance of new information technology is usability testing to determine user preferences and the functionality of the system.[3] Usability testing is a subset of the field of human-computer interaction that involves applied psychology, computer science, and information science.[4] Although usability testing may take different forms, it seeks to assess the functionality of information technology such as clinical information systems, electronic documentation, and application software. It may consist of a simple assessment or include a more complex design, consisting of several phases, depending on the underlying purpose. A usability assessment is usually directed at one or more aspects of system usage, such as what are the tasks involved for the user; does the user understand how the system as a whole works; what are the end users' preferences of the methods and technologies used in the system; do changes to improve the usability of a feature or system actually do so; and, do the added changes achieve a satisfactory level of usability or do problems remain that need to be addressed?[5] The current research was aimed at determining user satisfaction with the functionality of the current system, perceived problems, barriers, and frustrations associated with the current EHR documentation system, and attitudes in general toward the use of an EHR.

Problem and Significance

The Clinical Systems Department at the study site had implemented various forms of an EHR documentation for nursing and was aware of some existing problems and issues that required attention. For example, some nursing staff were involved in dual documentation, writing on scrap paper, then transferring data to the EHR; others had reported problems of frequent downtimes and lack of adequate equipment to document nursing care at the point of care delivery. Although our study was bounded by budget constraints and a narrow timeframe, the process was viewed as vital to ensure that future modifications to the existing electronic system would be functional and serve nurse-user needs. Our study applied a method of usability assessment that was designed solely to gain direct inputs from the nurse-users, who were in the best position to provide ideas and suggestions on the usability of the current EHR system and how to improve its functionality.

Purpose and Research Questions

The purpose of our study was to assess the functionality of the current system and identify nurses' preferences for electronic documentation methods of clinical data; perceived problems with, and barriers to, EHRs documentation; and to determine preferences for modifications to the EHR system. Results of the study would then enable clinical system staff to design future modifications to the EHR system and meet essential requirements and standards of nursing care documentation.

Specific research questions were as follows: (1) What are nurses' perceptions about the current EHR system, including satisfaction with its functionality and the most frequent problems, barriers, and sources of frustration related to EHR for nursing? (2) What methods of electronic documentation do nurses prefer, and where do they prefer to document various types of clinical data? (3) What is the disposition of nurses toward the use of the electronic system? and (4) Are nurses' attitudes related to demographic factors such as age, perceived expertise with computers, shift worked (night or day), and years of nursing experience?

A PubMed search from 1984 to 2004 revealed many studies focusing on EHR use and implementation, and a few studies that have measured attitudes toward computer use in nursing and healthcare.[6-8] Hobbs conducted a comprehensive review of the published measures of computer competence from 1990 to 2002, examining

multiple competency assessment instruments of varying quality.[9] Hobbs found little agreement regarding specific computer-focused competencies necessary for nurses but noted that there is consensus that the computer-competent nurse possesses a general knowledge and understanding of computer technology, coupled with a positive attitude toward computers and software. In addition, such a nurse is skillful in computer hardware and software use and able to grasp how such technology benefits nursing and the overall healthcare environment.

Krampf and Robinson[10] did one of the early studies of nurses' attitudes toward computers in 1984. Stockton and colleagues administered the Stronge-Brodt nurses' Attitudes Toward Computers Questionnaire to nurses before ($n = 391$) and after ($n = 265$) the implementation of a computerized patient care information system. A factor analysis of each sample was carried out with varimax rotation that identified three factors that parallel those generated in a factor analysis performed by Schwirian et al.[6] Although the Stronge-Brodt scale has been shown to have sound psychometric properties,[6,7] we needed a tool that was not as long and was better-suited to address our research questions specific to EHRs. The researchers designed a Likert-type attitude scale and data collection tools that are described in the Methods section. A copy of the instrument is shown in Figure 1.

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Usability Assessment Survey

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Introduction SMH is conducting a Usability Assessment Survey to determine the most effective ways for nursing to enter data into the electronic health record. Your thoughtful and candid responses to these questions will help us design a system that best meets the needs of nursing personnel. *Please select the one best answer and provide a brief response where indicated. All responses are anonymous.*

START HERE:

Office Use Only	B. Years in Nursing	C. Age	D. Job title:	E. Shift:
A. Unit 1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	1 2 3 4 5 6 7 8 9 0	○ RN ○ LPN ○ Nursing assistant	○ Day ○ Night

1. ○ Yes ○ No   Do you have access to a computer on your unit when you need one?
   a. If no, when does this usually occur?_____

2. ○ Yes ○ No   Do you consider yourself to be an experienced computer user?

3. ○ Yes ○ No   When you enter data into the electronic health record, do you feel confident about what you are doing?

4. ○ Yes ○ No   Do you chart on paper first and then transfer data into the computer?
   a. If yes, please explain why:_____

5. ○ Yes ○ No   Do the various types of computers (desktop, laptop, terminal) on your unit all have the same functionality (Do they accomplish the same tasks.)?
   a. If no, please explain or give an example:_____
   _____

_____

6. ○ Yes ○ No   Would you say there is help readily available when you experience problems with the computer system or data entry system?

7. ○ Yes ○ No   In your opinion, does having more than one system for data entry produce more problems and frustrations than having only one method of data entry?

8. ○ Yes ○ No   Do you have a preference for type of data entry (desktop, terminal, handheld device or PDA, or laptop)?
    a. If yes, which one do you prefer?_____
    b. Please explain why:_____

Office Use Only

9. ○ Yes ○ No   Are there frequent problems (once or more a shift) with the Information System used in your unit including downtime or problems with data entry?
    a. If yes, please explain or give an example:_____
    _____

10. ○ Yes ○ No   Would you say your hospital provides a computer-friendly environment with adequate training and backup to support the Clinical Information Systems?

1 ○○○○
2 ○○○○
3 ○○○○
4 ○○○○
5 ○○○○
6 ○○○○
7 ○○○○
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B. Please provide brief responses.

1. As you see it, what are some of the **barriers** to nurses being able to enter patient data into the electronic health record in a timely and efficient manner?

2. Please check **any other** problems with laptops, desktops, or other devices. *Check all that apply.*

    ○ cannot locate laptop or personal digital assistant (PDA-Palm, etc.)

    ○ no mouse or pointing device,

    ○ no power cord, dead batteries, or no power source available

    ○ room too crowded,

    ○ too many interruptions,

    ○ other (Please describe) _____

3. What is your **one biggest source of frustration** when it comes to computers and electronic health records?

4. Where would you prefer to enter the following clinical data? *Fill the circle in column A, B, or C.*

	a. Prefer Bedside	b. Prefer Nurses' Station	c. Prefer Other Site (Specify)
1. Vital signs	○	○	○
2. Medications	○	○	○
3. Admission Assessment Data	○	○	○

3. Admission Assessment Data	O	O	O
4. Progress Notes	O	O	O
5. Ongoing Assessment Data	O	O	O
6. Other data (specify)	O	O	O

C. Please indicate whether you agree or disagree with the following statements by circling one number "1" for Strongly Disagree to "5" for Strongly Agree.

Strongly Disagree — Strongly Agree

O 1	O 2	O 3	O 4	O 5	1. Use of electronic health records are more of a help than a hindrance to patient care.
O 1	O 2	O 3	O 4	O 5	2. Use of computerized charting has helped to improve documentation of the clinical record.
O 1	O 2	O 3	O 4	O 5	3. Electronic health records pose less of a threat to the patient's privacy than do paper records.
O 1	O 2	O 3	O 4	O 5	4. Computerized charting has decreased the workload of nurses and other personnel.
O 1	O 2	O 3	O 4	O 5	5. In time, the use of electronic health records will lead to improved patient care.

Please use the back of this page for additional comments, thank you.

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Figure 1. A copy of the instrument used to measure nurses' disposition to electronic health records.

Methods

Design and Sample

The research study was a descriptive, cross-sectional design to assess functionality, needs and preferences, and attitudes of 100 nursing personnel (RNs, licensed practical nurses, and nursing assistants) toward the use of the EHR. The survey was conducted at a large Magnet hospital located in a metropolitan area of southwest Florida. Twenty-three clinical units that currently use some form of electronic documentation were included in the study. The sampling method was convenience sampling of all nursing personnel with access to the clinical documentation system from the 23 units.

Development of the Study Measure

The Clinical Systems Department warned the researchers that any questionnaires used with the nursing staff would need to be brief because their time was very limited on the clinical units. Therefore, the research team's goal was to develop a questionnaire and attitude scale that was parsimonious and would take no more than 5 minutes to complete. The investigator-developed instrument was constructed using the procedure recommended by Waltz et al.[11] First, a blueprint was developed using the research questions to identify the key domains for the data collection tool and the attitude scale. Relevant items were developed for each domain. To assess content validity of the instrument, three nursing informatics experts who were members of AMIA were identified and asked to rate the relevancy of each scale item to its respective domain. The experts were all certified in nursing informatics and had experience implementing EHRs systems. Using Waltz et al's procedure for

assessing interrater agreement of experts,[11] the results indicated that the content validity index of the scale was high ($\kappa = 0.94$). The instrument was designed for all levels of nursing personnel who use one or more methods of electronic documentation (bedside, mainframe at nurses' station, PC desktop, notebook, notebook on cart, etc). This approach incorporated both objective and subjective measures on the questionnaire to assess attitudes and opinions of the users about the functionality of the hospital's current EHR system. The questionnaire included a fixed-choice format for these sections: demographics, EHR documentation preferences, perceived functionality, and barriers to, and sources of frustration in, using EHRs. Two open-ended questions asked respondents to identify key barriers and frustrations and their overall assessment of functionality of the EHR system. Nurses' disposition to the EHR was assessed with a five-item Likert-type attitude scale with five response categories. The instrument is self-administered using paper and pencil and takes 5 to 10 minutes to complete (Figure 1). For the attitude scale, scores for each of the five items are summed for a total score. Total attitude score may range from 5 to 25, with a high score indicating positive acceptance or disposition toward the use of EHRs, and a lower score, more negative disposition toward EHRs.

Psychometric Properties of the Attitude Scale. Psychometric properties of the instrument were assessed using item analysis and Cronbach's α (for internal consistency reliability). Inter-item correlational analysis and factor analysis were used to assess factor structure and construct validity of the attitude scale.[12] Scores on the five-item attitude scale were summed to yield a total attitude score toward the use of EHRs. Total scores ranged from 8 to 25 ($M = 19.14$, SD = 4.06). Cronbach's coefficient alpha, which was used to assess internal consistency reliability of the five-item attitude scale, was found to be moderately high ($r = 0.77$). A bivariate correlation matrix was constructed to examine inter-item correlations of the five items on the scale. Results revealed several inter-item correlations that were 0.3 or higher, and the Kaiser-Mayer-Olkin Sampling Adequacy index was 0.72, thus meeting the criteria needed to justify that the sample size was sufficient to proceed with a factor analysis of the attitude scale.[12] To assess construct validity, a principal components factor analysis with varimax rotation was done to determine the factor structure and assess whether the attitude scale was unidimensional as theorized. Results of the factor analysis confirmed the construct validity of the scale. As theorized by the developer, the attitude scale was found to be unidimensional since all five items had significantly high loadings on one factor, Disposition Toward EHRs. Eigenvalues of the five items ranged from 0.62 to 0.84. Fifty-four percent of the variance in the total attitude score was explained by the five items, indicating that the scale has good construct validity.[12]

Procedure

After receiving approval from the hospital and university institutional review boards, a convenience sample of nurses from the day and night shift was invited from the 23 units who were actively using some form of EHR documentation. Participants were assured that responses would be anonymous and only summary data would be used. Written and verbal instructions were provided to each nurse who volunteered to participate. Three graduate students in nursing distributed the 120 questionnaires onsite for nurses on the 23 units to complete over a 2-week period and return anonymously to the Clinical Systems Department.

Data Analysis

Descriptive statistics were used to analyze all items on the questionnaire. All statistical analyses were done with the statistical software program, SPSS.[13] Content analysis, as recommended by Denzin and Lincoln,[14] was used for the open-ended questions. Independent *t* tests were used to examine differences in scores on the attitude scale between night-shift and day-shift personnel and between experienced and nonexperienced computer users. Bivariate correlations were used to examine the relationship of attitudes toward the EHR and selected demographic factors.

Results

The Sample and the Current EHR Environment

Of the 120 questionnaires distributed, 103 were returned. Three questionnaires were discarded owing to excessive missing data (>30%), leaving 100 that were usable and yielding a response rate of 83%. The majority of the 100 nursing respondents (98%) were white and female, and mean age was 43.26 (range = 21-61 years). The sample was about equal in number for personnel working day shifts (n = 47) and those working night shifts (n = 43). Nursing personnel indicated they had worked in nursing, on average, 15.6 years. Table 1 depicts nurse-respondents' perceived expertise in using EHRs: a large percentage, 80%, identified themselves as experienced computer users.

Perceptions of the Current Electronic Health System

The purpose of the first research question was to determine perceived functionality, problems, barriers, and frustrations with the current EHR system (Table 1). Of the sample, 96% indicated they were confident when using EHRs; almost all, 99%, reported that help was always available; and 85% felt they worked in a user-friendly environment. While 81% indicated that computer access was available for EHR use, only 44% thought the current system was optimally functional, and 61% indicated frustration with the multiple EHR documentation systems. Software and system problems were reported by 61%. More than half, 54%, of the respondents reported interruptions while documenting patient care. Another major obstacle to the use of EHRs at the bedside was that patient rooms were reported to be too crowded and there were too many disruptions (Table 1). About 54% of respondents indicated they were using duplicate methods of clinical documentation. Because it was inconvenient to use EHRs at the bedside, they often recorded on work sheet, scrap paper, or paper towel, and then transferred that to the electronic chart. In terms of support provided by the Clinical Systems Department, nurses indicated that both day- and night-shift nursing staff were satisfied overall with the support provided to them when problems were encountered.

Preferences for EHR Documentation

The last section of Table 1 addresses the second research question and depicts the type of patient data that nursing personnel prefer to document at the bedside, assuming that point of care documentation is possible. In order of preference, the types of patient data preferred for bedside charting were medications, vital signs, ongoing assessment data, and progress notes. Almost all respondents indicated that the current EHR system prevented documentation at the bedside because of the small patient rooms and inadequate computers (too slow and insufficient memory).

Attitudes Toward EHR

Results of the survey of nurses' attitudes about EHRs and the perceived effects on patient care and nursing workload are displayed in Table 2. Overall, a large percentage of the nursing staff held a positive view of the impact of EHRs on patient care: 81% indicated that EHR use was more of a help than hindrance to care; 75% thought it had improved documentation. Most participants, 76%, indicated they thought that in time, the EHR system would have a positive effect on improving patient care. The majority of nursing personnel, 64%, indicated they believed the EHR system had not decreased the nursing workload. More than half, 54%, perceived EHRs to be less a threat to privacy than the paper record.

To address the third research question of how demographic variables might influence attitudes toward EHRs, we first examined whether there was a significant correlation between age and attitudes toward the use of EHRs

and its effect on patient care. Mean scores of nurse-respondents for the five-item attitude scale were summed and the total mean score was correlated with mean age in years. Bivariate correlations revealed a weak but significant correlation between age and total score on the EHR Attitude Scale (r = -0.24, P = .01, df = 90). These results indicate an inverse relationship between age and total score: older nurses tended to hold a less positive attitude toward EHR documentation. Bivariate correlation between years of nursing experience and total attitude score was not found to be significant. Next, to determine whether day-shift nurses were more positive toward EHR documentation than the night-shift nurses, an independent t test was done. Results indicated no significant difference in mean total scores on the attitude scale between the day- and night-shift nursing staff (t = -1.57, P = .12, df = 1, 98). Last, an independent t test was done to determine if the more experienced computer users held a more positive attitude toward EHR documentation. Of the respondents, 80% reported they considered themselves skilled computer users. Results of the independent t test indicated a significant difference (t = 2.38, P = .01, df = 1, 98) in mean scores on the attitude scale between experienced (M = 19.64) and less-skilled computer nurse-users (M = 17.21). Thus, experienced computer users were more favorable toward the use of EHRs than less experienced users.

Content Analysis of Open-Ended Questions

Perceived barriers and problems most frequently encountered by nursing staff with the current EHR documentation systems were analyzed for major themes and frequency of responses. The most frequently mentioned barriers to use of EHRs were these: not enough space in patients' rooms to use the EHR system; having to record on paper first then transfer the data to the EHR system; too many interruptions; change of shift disruptive to documentation; electronic system too slow; distractions during physician rounds; and frequent downtimes.

Respondents were asked to identify what they perceived to be the most frustrating factor in the use of EHRs. Factors identified most often as causing frustration with the EHR documentation system were: system downtime; system speed too slow; a few *physicians*' insistence on not using computers and continuing to ask nurses or clerks to enter data for them; not enough computers; having to do duplicate entries; having to reboot often; unable to log on; and technical issues with the laptop.

Discussion

Although some of the problems with the EHR system were known prior to the study, the end-user input from nursing staff helped to better define the extent of the problems and barriers that nurses encounter when an EHR is used, their preferences for documentation, and why an EHR is difficult at times to use. The data gained from the study were also useful in determining nurse-users' specific needs and their preferences for modifications in the EHR system. Study findings served to identify which nursing units were experiencing the most problems and where the problems were with the EHR system.

Although only 44% of the sample indicated that the current system was optimally functional, this result was expected in that the Clinical Systems Department was aware that on many units, nurses still had to chart on paper first then transfer to the EHR system (computers not available at the bedside, access to EHR system not available). In addition, this is likely the reason that 64% of respondents perceived that the nursing workload had not decreased. Our results confirm findings of previous studies[9] that have showed that nurses with more expertise with computers have a more favorable disposition toward the use of EHRs and their potential to improve patient safety and quality. Interestingly, Shumway and colleagues found that physicians and nurses were less knowledgeable about the benefits obtained from the use of an electronic clinical system than pharmacists, and more skeptical regarding the role of computer information systems in reducing costs, improving the quality of healthcare, and fitting it into their daily work routine.[8] However, their study did not have

respondents report their expertise with computers.

Results from this study were reported back to the nursing staff in the form of an internal newsletter and through staff meetings. The study findings have been used by the clinical systems staff to implement changes in the EHR system and plan purchases for new technology on the basis of user needs and preferences. Recognizing that usability assessments are iterative in nature,[15,16] another study is planned to determine if modifications to the system have improved usability. In addition, nurse-users will be asked to assess whether system changes have assisted in improving documentation, patient safety, and quality of care.

Although the five-item EHR attitude scale is unidimensional and has good internal consistency for a five-item scale, reliability could be increased by adding additional items. Using the Spearman-Brown prophecy formula,[17] adding five items to the scale would increase the reliability to 0.96. Further studies are needed to compare the instrument with the Stronge-Brodt attitude scale to assess additional psychometric properties of the EHRs scale. In addition, the study could be strengthened by using the Staggers tool[18] to assess nurses' competence with computers rather than using a one-item self-report assessment (Figure 1).

Conclusions

A descriptive study of nurse-end users of an EHR documentation system yielded important information about barriers, frustrations, needs, and preferences of nursing staff. Using a researcher-developed Likert-type scale, nurses' attitudes were found to be very positive about using EHRs to improve clinical documentation. The brief attitude scale and instrument may be useful to others who are designing similar studies to assess the functionality of EHR documentation systems. Overall, nurse-respondents perceived EHRs as having the potential to improve patient care and patient safety. The instrument was found to possess sound construct validity and reliability. A follow-up study is planned to assess effects of user-designed system changes based on results of this study.

Tables

Table 1. Nursing's Usability Assessment of EHR* System and Preferences for System Changes (*N* = 100)†

Medscape® www.medscape.com	
Assessment of the current EHR system	
Computer access usually available	81
Nurses who still chart on paper	54
Experienced in use of computers	80
Nurses who felt confident using an EHR	96
Believe current system is functional	44
Help available when needed	99
Frustrated with multiple documentation systems	61
Software or system problems	61
Computer-friendly environment	85
Cannot locate laptop to use for documentation	13
No mouse or cord available	8
Interruptions when documenting	54
Room too crowded to use the EHR system	44
Preferences for EHR documentation at bedside	
Vital signs	65
Medications	62
Ongoing assessment and progress notes	62

*EHR indicates electronic health record.
†All values are in percentage.

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Table 2. Nursing's Attitudes About EHR* Documentation and Patient Care (*N* = 100)

Medscape® www.medscape.com	
EHR Documentation and Patient Care: Scale Item	**% Agreement**
1. EHRs more a help than a hindrance to care	81
2. EHRs have improved documentation	75
3. EHRs less a threat to privacy than paper records	54
4. EHRs have decreased workload of nursing and other personnel	36
5. In time, EHRs will lead to improved patient care	76

*EHR indicates electronic health record.

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Reprint Address

Corresponding author: Linda E. Moody, PhD, MPH, FAAN, University of South Florida College of Nursing, MDC 22, 12901 Bruce B. Downs Blvd, Tampa, FL 33612 (e-mail: lmoody@hsc.usf.edu).

From the University of South Florida College of Nursing, Tampa, FL (**Drs Moody** and **Slocumb**); and the Sarasota Memorial Health Care System, Sarasota, FL (**Dr Berg** and **Ms Jackson**).