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Facilitating Adoption of an Electronic Documentation System

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Best practice recommends the integration of clinical documentation into the hospital electronic health record to support safe, efficient, and timely patient care. A major barrier to successful adoption and optimization of computerized documentation systems is user satisfaction. The purpose of this descriptive, performance improvement initiative was to implement and evaluate user satisfaction with an electronic documentation system to facilitate successful adoption. The Clinical Procedure Flowsheets application was implemented in a geriatric extended care unit of a large healthcare system. Rogers' Diffusion of Innovation and Davis' Technology Acceptance Model were used to guide system adoption and improve user experience of the innovation. The Perceived Usefulness and Perceived Ease of Use questionnaire was distributed to 24 nursing staff working in the unit 9 weeks after implementation. Results indicated that respondents perceived the Clinical Procedure Flowsheets as easy to use and useful in accomplishing their documentation tasks. The overall mean satisfaction score of 72.17 (SD, 12.13) implied a strong level of user acceptance. The positive perception of the nursing staff in the geriatric extended care unit suggests a high probability of system use that can enhance the documentation of patient care. Further research is recommended to evaluate factors related to system adoption and user satisfaction.

KEY WORDS: Documentation system, User acceptance, User satisfaction

In 1999, the Institute of Medicine (IOM)[1] report highlighted the issue of patient safety and quality of care in the United States. The report revealed that approximately 98 000 people die annually because of preventable medical errors. The IOM called for a drastic change to improve the delivery of care and made recommendations that propelled the use of technology in the healthcare arena. These proposals led to several federal initiatives and mandates, as well as financial incentives to facilitate the nationwide adoption of health information technology. However, even with the tremendous progress in the implementation of electronic health record (EHR) systems, many healthcare institutions still use both paper and electronic documentation.[2–4]

Healthcare providers' reluctance to transition to a computerized documentation system has been cited as a major barrier in realizing the full potential of a robust EHR.[5,6] Challenges in using and maintaining a hybrid patient record (paper and electronic) include, retrieval and accessibility of information[2,3]; legibility of documentation[4]; missing, inconsistent, and incomplete information[2,4,7–9]; timeliness of integration into data stored electronically; and communication breakdown among providers,[2,3] all of which can adversely affect patient care. Clinical documentation is a fundamental component of care delivery processes.[10] Best practice recommends the integration of electronic documentation into the hospital EHR system.[2,8]

The benefits of a robust EHR have been widely documented. In a systematic review of the literature, Nguyen et al[9] found that EHRs improved the quality, accuracy, timeliness, and availability of clinical documentation. Evidence suggests that user satisfaction improves use of EHRs, thereby increasing consistency and completeness of clinical documentation.[9,11–14] Usability and usefulness are key factors that promote user satisfaction and contribute to the success or failure of system implementation. Therefore, it is vital to take into account user perceptions of the EHR for a successful implementation. The EHR system must be acceptable to the users to improve utilization and benefit patient care.

The purpose of this project was to pilot-test an electronic documentation system in a long-term care unit and evaluate user satisfaction. User acceptance of the technology is fundamental to successful implementation. It was anticipated that the adoption of an electronic documentation system would increase user satisfaction and ensure appropriate and consistent utilization.

THEORETICAL FRAMEWORK

Rogers' Diffusion of Innovation (DOI) is widely used as a theoretical framework in many studies involving system

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implementation.[15,16] According to Rogers,[17,18] the decision process to adopt a new technology involves five steps: knowledge, persuasion, decision, implementation, and confirmation. The innovation decision process is designed to inform and promote understanding of the benefits of technology to reduce uncertainty and promote adoption. Rogers[17,18] theorized that the rate of adoption is determined by the attributes of the innovation. Technology that is perceived to be better, consistent with the stakeholders' existing values and needs, simple to use, can be tested for a limited time, and provides visible results is more likely to be adopted. The theory was selected to guide the adoption of an electronic documentation system for this project. The model was used to drive the process of adoption, as well as affect user perceptions of the innovation.

Davis'[19] Technology Acceptance Model (TAM) provides a theoretical foundation that explains the relationship between users' perception and adoption of technology. The theory proposes two factors that lead to technology adoption, perceived usefulness, and perceived ease of use. According to Davis,[19] perceived usefulness is the individual's belief that the system improves job performance, and perceived ease of use is the belief that the use of technology is stress free. Both concepts are consistent and support the DOI premise that user perceptions of the technology predict acceptance or rejection of the innovation. User perceptions of system usefulness have been determined to greatly influence user satisfaction.[11,20] Therefore, both frameworks were used concomitantly to guide the adoption of innovation and improve the user experience to enhance satisfaction.

REVIEW OF THE LITERATURE

The proliferation of technology in healthcare has resulted in a large body of research and knowledge on how to realize the potential of technology to improve healthcare quality and patient safety. The literature yields adequate studies addressing implementation of clinical information systems (CISs) and user satisfaction. These studies provide data that may facilitate successful adoption of electronic documentation systems.

The overall goal of EHRs is to improve the quality of patient care, but this cannot be achieved without understanding the factors that affect successful adoption of technology in clinical practice. Lau et al[21] and Nguyen et al[9] conducted systematic reviews of evidence, and results indicated that EHRs have the potential to improve care quality and clinical documentation. Investigators agreed that EHRs improved the availability and accuracy of patient data, as well as access to information. However, to realize these benefits, optimized use of EHRs is paramount. Studies have shown that user satisfaction with technology is tied to its consistent use.[10,12,14,22,23]

Evidence pertaining to user satisfaction and attitude, both before and after implementation of EHRs, has been evaluated to validate the significance of this performance improvement initiative and support its intended outcomes. Jin et al[22] and Chow et al[12] used a postsurvey design to evaluate user attitudes and satisfaction after transition to an electronic documentation system. Jin and colleagues[22] found that users were more satisfied and preferred the automated system to handwritten paper records. On the other hand, Chow et al[12] found that nurses' attitudes and levels of satisfaction were strongly associated with perceived ease of use and usability of the system. In other words, nurses tend to have a positive attitude toward, and higher level of satisfaction with, systems that are easy to use and are useful to their work. Chow et al[12] concluded that perceived usefulness is an important predictor of nurses' satisfaction with technology. These findings are significant and provide insight on factors that affect user attitudes and satisfaction with CISs.

Kirkendall et al[24] and Yeh et al[14] both compared nurses' satisfaction before and after implementation of an electronic documentation system. Both studies confirmed that nurses were more satisfied with computerized documentation. In addition, Yeh et al[14] reported that the use of a computerized documentation system significantly improved organization, consistency, and completeness of nursing documentation. Tubaishat and associates[10] echoed these findings in their retrospective review of both paper and electronic medical records. They found that electronic records presented a more complete and accurate documentation of pressure ulcer data compared with paper records. Carayon et al[23] assessed critical care nurses' acceptance of an EHR at 3 and 12 months after implementation; Hadji and colleagues[25] conducted a longitudinal study of CIS use and satisfaction over a 14-year period after implementation. Findings from these studies supported the conclusion that EHR usability and ease of use predicted system acceptance. Both studies revealed that the overall acceptance and perceived usefulness of the system progressively and significantly increased over time.

Most of these investigations are descriptive in nature and not considered the criterion standard of evidence, but nonetheless vital in generating knowledge that can guide practice and improve adoption of technology in healthcare. Overall, the evidence is clear and supports adoption of electronic documentation systems to improve accuracy, completeness, and access to patient care data and information.[9,10,14,21] However, successful adoption correlates to user acceptance of the technology, as well as its perceived usefulness and perceived ease of use .[9,11,12,23,25] The evidence confirms that acceptance of technology and user satisfaction determine system use.[11,23,25] Appropriate and consistent use of an electronic documentation system is crucial to realize the potential of technology in improving quality of care and patient safety.

METHODS

Design, Setting, and Sample

This project was a performance improvement initiative involving the implementation of the Clinical Procedure (CP) Flowsheets to automate the documentation of residents' activities of daily living. A descriptive survey design was used to evaluate user perceptions of the innovation. The setting was a 25-bed geriatric extended care (GEC) unit in a 727-bed hospital network system located in the northeastern part of the United States. The facility provides comprehensive inpatient and outpatient healthcare services to approximately 54 783 patients annually. Nursing documentation is integral to care delivery in this facility, but continued use of paper flow sheets affects the availability and accessibility of patient care data. A convenience sample of 24 nursing staff, including registered nurses, licensed practical nurses and nursing assistants working in the GEC unit, were recruited to complete a postimplementation survey for the project.

The CP Flowsheets module has been a component of the organization's information system infrastructure since 2011, but had not been implemented because of administrative issues. This application is an electronic representation of the traditional paper flow sheets that allows point-and-click documentation and displays patient care data in row and column format. If used consistently and appropriately, clinicians can easily view totals, such as intakes and outputs, and analyze trends and patterns in patient data, which is vital in making clinical decisions. Thus, it is more than a documentation tool; it also provides the ability to view cumulative data necessary to facilitate data-driven assessment and care planning.

Procedures

This project was approved by the institutional review board of the host organization for a non–human-subjects research. The CP Flowsheets application was introduced to the GEC chief nurse, nurse managers, attending physician, and nursing staff to kick off the project. A demonstration of the features and functions of the documentation system was conducted immediately after the introduction, emphasizing the benefits of the system, ease of use, and usability. The purpose and anticipated outcomes of the initiative, implementation plan, and project timeline were discussed after the demonstration. This project required active involvement of the Information Technology department and was coordinated with the department the same week as the project introduction. Information Technology facilitated system installation, testing, setup, and user access.

End-user training commenced on the fifth week of project implementation. Several end-user training sessions were conducted in a 5-day period to cover all shifts. Assistance was provided to all participants who required individualized attention. During training sessions, informaticists were able to meticulously highlight and demonstrate all features and functions of the application and how it could affect the documentation of care. Handouts and training materials with screenshots and instructions on basic navigation and application functions were provided as a reference guide during training sessions. Testing of the application was facilitated on test accounts 5 days before the system was made operational ("go live") to ensure optimum system performance.

System go live was scheduled at the beginning of the sixth week of the implementation process in coordination and with the concurrence of the chief nurse. Two nurse informaticists were on site to provide point-of-care support during the first 3 weeks of system operation. They also continued to provide one-to-one training with staff members who were having difficulty navigating the system. Survey questionnaires were administered 9 weeks after implementation. Respondents were given 5 days to complete and return the questionnaires.

All appropriate measures were taken to protect the anonymity of the sample population. No personal identifiers were collected.

Data Collection

Data were collected using an instrument, perceived usefulness and perceived ease of use, developed by Davis.[19] The instrument has been evaluated as a measure of end-user acceptance of information technology and its effectiveness in predicting system adoption. Davis'[19] TAM theorizes that perceived ease of use is a fundamental precursor to perceived usefulness and both constructs predict system acceptance and utilization. The instrument has strong psychometric properties with a Cronbach's α reliability of .98 (perceived usefulness) and .94 (perceived ease of use) and has been tested for convergent, discriminant, and factorial validity.[19] The tool contains 12 items, six for each subscale, rated on a 7-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7). The total score for all items in each subscale ranges from 6 to 42, with higher scores indicating stronger agreement with each concept. The total score for both subscales has a range of 12 to 84, with higher scores indicating greater satisfaction with the technology.

The wording on the questionnaire was slightly modified to fit the CP Flowsheets context. Demographic characteristics with no identifying data were collected and included in the survey. Questions on demographics include position, number of years in the current position, number of years using EHRs, and age range. Questionnaires were directly distributed to the staff on the unit in paper-and-pencil format 9 weeks after implementation. Participation in completing

the questionnaire was voluntary, noting the purpose and relevance of the postadoption evaluation.

Data Analysis

Descriptive statistics were used primarily to analyze the demographic data and assess participant satisfaction with the CP Flowsheets module. Before analysis, data were manually entered into a spreadsheet program (Excel 2010; Microsoft, Redmond, WA) and reviewed for missing items and outliers. Frequencies and percentages were used to describe the demographic characteristics of the sample. Measures of central tendency (mean, median, mode), standard deviation, variance, and range were used to evaluate responses to the concepts of perceived usefulness, perceived ease of use, and overall satisfaction. The summative score of each subscale, as well as the overall score, was calculated, and the mean score was computed. Satisfaction scores were plotted in a graphical format to examine the spread of data, symmetry of the distribution or lack of it, and skewness and for obvious atypical values. Z-scores were also calculated to determine outliers and delineate its relationship to the mean.

RESULTS

Data were collected from 24 users of the CP Flowsheets application, with a response rate of 100%. Missing demographic information (age range, years of experience in the current position, and years of experience in using EHRs) were noted in 11 of 24 questionnaires. However, these had no direct impact on the survey results, since all perceived usefulness and perceived ease of use questions were completed. Taking into account missing demographic data, calculation of percentages and mean was based on the total number of those who responded to the question, rather than the total samples. Survey participants consisted of 10 RNs (42%), 13 nursing assistants (54%), and one licensed practical nurse (4%). Respondents were 50 to 60 years old (46%), 40 to 49 years old (26%), and 29 to 39 years old (26%). The age groups of 40 and older made up 72% of the survey participants. The average years of experience in the current position was 9.82 (SD, 7.92) and 7.84 (SD, 5.94) in relation to experience using the EHR (see Table 1).

The mean score for perceived usefulness was 35.88 (SD, 6.42), indicating that respondents perceived the CP Flowsheets module as useful in performing their documentation tasks. The mean score for perceived ease of use was 36.29 (SD, 6.03), slightly higher than perceived usefulness, suggesting that users perceived the system as easy to use. The overall mean satisfaction rating was 72.17 (SD, 12.13), denoting a good level of satisfaction and acceptance of the CP Flowsheets module (see Table 2). The data distribution was negatively skewed at −1.54, closely clustered around the mean but with outliers on the left tail (Figure 1). Calculation of z-scores revealed two atypical observations with scores of −2.73 and −2.24; all others fell within ±0 to 1 SD. Converting the observations into standardized scores made it easier to delineate outliers.

Table 1. Demographic Data (N = 24)

Descriptive Variable	Total Sample, n (%)	Mean (SD)
Position		
RN	10 (42)	
Licensed practical nurse	1 (4)	
Nursing assistant	13 (54)	
Age, y		
29–39	5 (26)	
40–49	5 (26)	
50–60	9 (46)	
Years of experience in the current position		9.82 (7.92)
Years of experience using EHR		7.84 (5.94)

Missing values include age (n = 5), years of experience in the current position (n = 5), and years of experience in using EHR (n = 7).

DISCUSSION

This performance improvement project was conducted in one of the GEC units in a large hospital system with the nursing staff on the unit as users of an electronic documentation system and survey participants. The intent of the survey was to determine the likelihood of system use by measuring participants' satisfaction with the CP Flowsheets application. The TAM framework suggests that system use is influenced by user acceptance of the technology. The overall mean score of 72.17 (SD, 12.13) on a scale for which 84 is the highest score (perceived usefulness and perceived ease of use combined) denotes users' satisfaction and acceptance of CP Flowsheets as an automated tool to document the Residents' Activities of Daily Living. Davis[17,18] pointed out that perceived ease of use is an antecedent to perceived usefulness. This premise was confirmed by the survey results indicating that users' positive perceptions of the system's ease of use resulted in their agreement on its usefulness. Analysis of the data distribution revealed closely clustered data, with 87.5% of the participants falling within ±1 SD away from the mean. This further validated and strengthened the findings that the vast majority of the participants were satisfied in using the CP Flowsheets module.

A positive attitude toward health information technology provides a sense of confidence that system implementation can lead to its intended outcome. It is crucial that direct care providers accept and optimize the use of an electronic documentation system to fulfill its intended purpose. In this age of technological advancement, the use of an automated system is a major component of care delivery processes. A vast majority of providers rely on electronic health information

Table 2. Perceived Usefulness, Perceived Ease of Use, and Overall Satisfaction With CP Flowsheet (N = 24)

Variable	Mean (SD)	Median	Mode	Range
Perceived Usefulness	35.88 (6.42)	36	42	6–42
Perceived Ease of Use	36.29 (6.03)	36	36	6–42
Overall satisfaction	72.17 (12.13)	72.50	72	12–84

systems to communicate and gather data, manage and report information, and use clinical decision support tools to improve patient care. Clinicians require documentation tools that allow them to perform efficiently and effectively. An electronic documentation system with all the built-in functions and features relevant for providing clinical care will be useful to clinicians. Ease of use is important for providers who are busy taking care of patients and need to efficiently manage their time in an often chaotic clinical setting. A system that is easy to navigate and allows point-and-click documentation is often preferred over a system that requires free text documentation and entails more cognitive effort. Therefore, user satisfaction with a clinical system is paramount if the goal is the optimum and comprehensive use of the technology to benefit patient care.

Even with the majority of respondents expressing satisfaction with the CP Flowsheets application, 8% of the total respondents perceived the system as less than useful and not as easy to use. This is worth exploring to understand other factors or elements that might have influenced user satisfaction but were not considered in this project. Outliers could be due to many factors, such as user level of computer literacy, resistance to change, issues with system design, and the limited time provided to get acquainted with the CP Flowsheets application. Furthermore, the characteristics of respondents are factors that cannot be overlooked. Kuo et al[26] investigated certain personality traits that could influence acceptance of technology. Their findings suggested that optimism, innovativeness, insecurity, and discomfort are highly associated with perceived ease of use, whereas perceived usefulness is significantly influenced by optimism or a positive attitude toward technology. These variables can be easily observed but are hard to control and manipulate. Nevertheless, familiarity or repetitive use of the application, peer influence, or an organizational mandate can influence perception and acceptance. Thus, it is beneficial to reevaluate user satisfaction after a longer period of system use. Overall, outliers did not affect the positive results of the survey.

In summary, the outcome of this project has strengthened support from key stakeholders, particularly direct care providers, for the automation of all clinical documentation throughout the facility. It also provided a platform for nurses who pilot-tested the CP Flowsheets module to express their thoughts, opinions, and recommendations pertaining to system features and functions, as well as its perceived benefits. Interestingly enough, nursing is one of the largest groups of EHR users, but nurses' perceptions and input, especially those in direct-care positions, are rarely elicited. Their participation in the decision-making process is often not taken into account. Allowing end users to participate in the innovation decision process promotes a sense of ownership, inclusion, and shared governance, which can further influence perception and acceptance of CISs.

IMPLICATIONS

Understanding factors that influence acceptance of healthcare technologies is vital to optimize system use, improve patient safety, and enhance quality of care. User satisfaction is one way to evaluate acceptance of new technologies and has important implications for nursing practice, education, and research. In the practice setting, the survey tool used measured respondents' perception of the usefulness and the ease of use of the CP Flowsheets module. These two specific variables were theorized by Davis[19] as principal elements of user acceptance. Nevertheless, one cannot ignore the influence of other factors outside the purview of the technology on individual perceptions. Perception is a process that is unique to every person and is strongly influenced by individual values and beliefs, life experiences, knowledge and preconceived ideas, and motivation. These factors can certainly have a significant impact on nurse perceptions of how relevant and applicable the technology is in the practice environment or how easy it is to navigate and use the system. If prior experience with technology is unfavorable, it is likely to affect the nurse's perception of the new technology.

A key factor in satisfaction with and acceptance of the CP Flowsheets was preparation and education of the nursing staff. Although formal training sessions were provided, the addition of one-to-one sessions and point-of-care support may have influenced perceptions of usefulness and ease of use. Inadequate computer skills and lack of understanding related to workflow processes can lead to user frustration with EHRs. Frequent updates and assistance from super users and peers may also

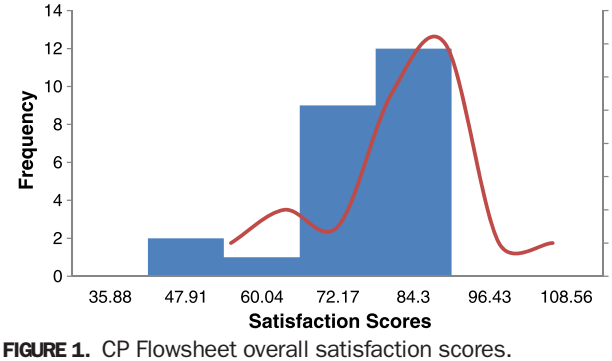

FIGURE 1. CP Flowsheet overall satisfaction scores.

be helpful. Providing a variety of learning experiences can enhance system adoption and satisfaction.

Future research should focus on continued evaluation of user satisfaction related to usefulness and ease of use along with other usability concepts. According to two studies,[27,28] the clinical environment and conditions in which the technology is implemented can affect perceptions. Additional research in this area might include exploring the sufficiency of information technology infrastructure to support system use at the point of care, effectiveness of training, availability and consistency of IT support after implementation, accessibility of information and resources, peers' opinions and thoughts, and the overall consensus on the unit.

LIMITATIONS

This project was limited to a single geriatric unit involving 24 participants, which affects the generalizability of results to other care settings. Respondents were given only 9 weeks to use and experience the features and functions of the CP Flowsheets module before the administration of the survey questionnaires. Longer use time might affect participants' perception of system usefulness and ease of use. Conscientious and consistent end-user support could have influenced the favorable response of most of the respondents to the CP Flowsheets module. Since these variables were not measured, no conclusion can be drawn as to the extent of its influence on the perception of the respondents. Furthermore, implementing the application with a larger sample size from multiple care settings could provide valuable information pertaining to system acceptance and user satisfaction. In addition, because of a small sample size and the failure to meet the assumption of normality, it was not feasible to perform a regression analysis to correlate satisfaction scores with demographic characteristics.

CONCLUSION

Clinical documentation is a key component of care delivery processes. Patient care data and information must be accessible and available at the point of care. Nurses' satisfaction with the documentation system is crucial to realize the benefits of the technology in improving care delivery. Acceptance of the automated documentation system can lead to optimum system use, thereby improving patient care documentation. The implementation of CP Flowsheets has provided for the automation of paper flow sheets, thus improving accessibility, availability, completeness, and accuracy of patient care data and information. Monitoring the actual system use will provide further confirmation of successful adoption. Future studies focusing on factors that can influence perception and acceptance of healthcare technologies could enhance understanding of the relationship between these variables and add to the existing body of knowledge.

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