ELECTRONIC HEALTH RECORDS DOCUMENTATION IN NURSING:
NURSES’ PERCEPTIONS, ATTITUDES AND PREFERENCES

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Chapter I

Introduction

The use of computers in the health care industry is becoming the standard. The intent of initiating computerized documentation systems in acute care hospitals is to improve efficiency, safety and quality of patient care (Jha, DesRoches, Campbell, Donelan, Rao, Ferris, Shields, Rosenbaum, & Blumenthal, 2009; Poissant, Pereira, Tamblyn, & Kawasumi, 2005). The Nationwide Health Information Network (NHIN, n.d.) is in position to ensure that a secure, national health information infrastructure is developed. The American Recovery and Reinvestment Act of 2009 invested $19 billion to enhance the possibility of such an infrastructure. Medicare and Medicaid incentive payments are available to providers, including hospitals, to increase the use of electronic medical records (EMR) based upon the Recovery Act. Many governmental agencies are involved in ensuring the implementation of EMR in the United States (US) (Pazinski, 2009).

In order for this initiative to be successful it is important to evaluate factors that affect the use of EMR. Many issues impact the implementation and utilization of EMR in health care organizations, including challenges to nurses. In the 1980s there was dramatic growth in development of computerized documentation systems intended to assist nurses (Burkes, 1991). According to Lee (2004), nurses represent the largest technology user group in health care organizations. Nurses have become accustomed to using computers to enter orders and access laboratory results. Nurses are focused on patient care, and the integration of computers as documentation tools has proven challenging (Lee, 2004). Nurses must become proficient in more
aspects of technology use while maintaining competent levels of patient care. Factors affecting nurses’ proficiency in technology include both organizational and behavioral issues (Moody, Slocumb, Berg, & Jackson, 2004). Organizational issues may include lack of end user input, design issues, educational, hardware, and software concerns (Darbyshire, 2004; Lee, 2006, 2008; Moody et al., 2004). Behavioral issues may be attributed to attitude, perception, and satisfaction toward information technology, specifically computerized documentation systems (Darbyshire, 2004; Likourezos, Chalfin, Murphy, Sommer, Darcy, & Davidson, 2004; Moody et al., 2004; Lee, Lee, Lin, & Chang, 2005; McLane, 2005; Smith, Smith, Krugman, & Oman, 2005). Recognition of factors that attribute to successful implementation of EMRs continues to be important areas of research due to the initiative to improve the health and well-being of all Americans through use of a national health information network.

Background and Significance

Information technology systems were introduced to the healthcare arena in the 1960s to support financial and administrative functions. Subsequently, the use of computers expanded to include order entry and laboratory results for patients (Smith et al., 2005). As computerization continued to grow in the hospital setting, programs to assist nurses in charting and care planning were developed. Discovering methods to increase use and effectiveness of technology is an opportunity for nursing research. Nurses’ acceptance of computer technology became integral to successful system implementation. Early studies evaluated nurses’ attitudes toward computers in relation to years of education and years of nursing. Results revealed nurses with more education had more favorable attitudes toward computers. Nurses who had worked longer also had a more favorable attitude toward computers (Brodt & Stronge, 1986). Burkes (1991) studied nurses’ attitudes toward computers in order to identify variables affecting attitude. The study results contrasted variables of Brodt and Stronge regarding educational background, time as a nurse, and favorable attitudes toward computers. Smith et al. (2005) noted there were no demographic variables to identify nurses with a predisposition to a positive attitude toward computers.
Other studies focused on nurses’ perceptions of computer use. Darbyshire’s (2004) qualitative study found nurses perceived an inability to capture the essence of nursing with computerized documentation. In contrast, Lee (2006) found nurses’ knowledge, experience, and judgments were enhanced through computer technology. Lee (2008) studied nurses’ perceptions of a nursing information system one year post implementation and found dissatisfaction with hardware, software, and interpersonal relationships. Likourezos, Chalfin, Murphy, Sommer, Darcy, and Davidson (2004) studied nurse and physician satisfaction with electronic medical record systems in an emergency department. Perceptions differed between professions, with nurses reporting greater satisfaction in regard to task completion. Moody et al. (2004) studied nurses’ attitudes and perceived effects of computerized documentation on patient care. The study revealed positive perceptions regarding decreased work load and improved quality of documentation. In contrast, nurses also reported environmental and system barriers.

Perception of confidence was studied in relation to nurses and computer acceptance. Ammenwerth, Mansmann, Iller, and Eichstadter (2003) found nurses’ self-confidence in regard to computer use affected acceptance of computers. Eley, Fallon, Soar, Buikstra, and Hegney (2008) found nurses’ confidence levels in use of technology were lower than expected, especially in relation to software applications.

The reality of a national health information network may be a challenge. Jha et al. (2009) surveyed members of the American Hospital Association and found only 1.5% of all US hospitals had a comprehensive medical record system in place and an additional 7.6% had basic systems. Implementation barriers included capital concerns and maintenance costs. In addition to these findings, it is imperative to remember nurses make up the majority of technology users in health care organizations. Nurses’ perceptions are essential in determining success of computerization in healthcare. An important area of nursing research will involve efforts to discover methods to meet nurses’ needs in relation to computer use.
Statement of Problem

Computerized documentation systems continue to expand in all areas of health care industry. Implementation of an EMR may be overwhelming to the organization and staff involved. Moody et al (2004) stated evaluation of the user’s preferences and functionality of the system may improve acceptance of EMR.

Purpose of the Study

The purpose of this study is to evaluate nurses: (a) preferences for electronic documentation of clinical data, and (b) perception of problems or barriers with EMR. This is a replication of the Moody et al. (2004) study.

Research Questions

1. What are nurses’ perceptions about the current EMR system, including satisfaction with its functionality and the most frequent problems, barriers and sources of frustration?
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?
4. Are nurses’ attitudes related to demographic factors such as age, perceived expertise with computers, shift worked and years of nursing experience (Moody et al., 2004)?

Conceptual Framework

The conceptual components to be evaluated in this study include attitude and perception of the nurse and usability of computerized documentation systems. In this study attitude is an individual’s personal view about computerized documentation systems. Attitude is considered one of the things that influence the potential for adaptation to the system and the quality of the results (Rohn, 2009). Perception is an interpretation of sensory information. All senses are involved in perception, though the intensity and physical impact of the stimulus are important factors. Individual past experience and motivation have an impact on perception (The Columbia Encyclopedia, 2008). Usability testing will be used to assess the functionality of information technology. Usability testing
is utilized to determine preferences and is considered a tool in evaluating problems, user performance, and satisfaction in order to increase acceptance of information technology (Moody et al., 2004).

Definition of Terms

Attitude: Attitude is defined as the manner, disposition, feeling, or position in regards to something (Dictionary.com, n.d.). Attitude may be attributed to problems encountered when implementing an EMR. Nurses with computer skills and knowledge combined with a positive attitude toward computers and software, benefit the health care environment when implementing EMR (Moody et al., 2004).

Perception: Perception is defined as the act of apprehending by means of the senses or of the mind; cognition and understanding (Dictionary.com, n.d.). Perception is the interpretation of sensory information. All senses are involved in perception, though intensity and physical impact of the stimulus are factors. Individual past experience and motivation have an impact on perception (The Columbia Encyclopedia, 2008). Perception will be evaluated in regards to the current EMR systems functionality, problems, barriers, and sources of frustration (Moody et al., 2004).

Limitations

Generalization to all areas of nursing will be limited due to the small sample population representation from the local emergency department. The study will also be limited by use of one web based EMR. The study will focus on nurses’ perceptions and will not include physician or ancillary personnel who also interact with the EMR.

Assumptions

It is assumed by evaluating usability of an EMR, nurses’ perceptions in regards to the system will be determined. It is assumed that the nurses’ will complete the questionnaire in an honest manner. Attitude related to the EMR will be determined by these answers. It is assumed that nurses will have positive perceptions about EMR. It is assumed that nurses will prefer to document at the bedside. It is assumed nurses with more education will have a more positive attitude toward EMR. It is assumed nurses with less experience as a nurse will have a more positive attitude toward EMR. It is
also assumed nurses with perceived expertise with computers will have a positive attitude toward EMR. It is assumed that shift worked will have no impact on attitude toward EMR.

Summary

Implementation of computerized documentation systems is a reality in the health care industry. A national network has been established to ensure an infrastructure for a national health information system is developed. Funding has been invested by the government to ensure implementation of such a system. Despite this initiative, transition to a paperless health record has proven to be a challenge. In order to improve acceptance of EMRs, it is important to assess users’ needs, perceptions, and preferences associated with EMR use. Nurses are the largest user group of EMR in hospital settings. The purpose of this study is to evaluate nurses’: (a) preferences for electronic documentation of clinical data, and (b) perception of problems or barriers with EMR. This will be a replication of the study by Moody et al. (2004). Findings will be used to identify nurses’ preferences regarding EMR and to develop strategies to decrease problems/barriers associated with lack of acceptance.
Chapter II

Literature Review

According to the Agency for Healthcare Research and Quality (AHRQ) (2007), widespread adoption of an electronic medical record (EMR) has shown to be an effective method to improve quality, safety, and efficiency of care in health care agencies if implemented successfully. Successful implementation is the concern. Over the past 30 years nearly every sector of the American economy has successfully implemented methods using information technology to improve productivity and efficiency. American hospitals are being compelled to implement a health information infrastructure that connects health care providers to consumers. The Nationwide Health Information Network (NHIN) has been developed in an effort to achieve this goal (Health Information Technology, n.d.). One of the main goals of this program is to increase efficiency while at the same time improve health care quality. Nursing has an important impact on data that are entered into the patient’s electronic medical record (EMR) in all healthcare settings. It is important to evaluate nurses’ perceptions of use of EMR in order to determine and decrease barriers to acceptance of this information technology. The goal of this study is to evaluate nurses’ preferences when using an EMR to document data and perception of barriers or problems with EMR’s.

Organization of Literature

The literature review covers studies associated with acceptance of and attitudes toward implementation of information technology systems in health care. The literature review includes quantitative studies to identify variables affecting acceptance of EMR. Qualitative studies are included to assist in exploration of nurses’ experiences with EMR. Research regarding impact of
EMR will help to evaluate feasibility of the national initiative to implement EMR in US hospitals.

The literature review is divided into three sections:

1. Nurses’ attitudes toward computer use
2. Nurses’ perceptions of computer systems
3. Feasibility of electronic health record implementation

**Conceptual Framework**

Concepts used for this study include attitude and perception in regard to information technology, specifically, electronic documentation systems. Attitude is defined as the manner, disposition, feeling, or position in regards to something (Dictionary.com, n.d.). Attitude is considered one of the things that influence potential for adaptation to the system and quality of results (Rohn, 2009). In this study attitudes of nurses will be measured in regard to an electronic documentation system utilized in emergency departments. Perception is defined as the act of apprehending by means of the senses or of the mind; cognition, understanding (Dictionary.com, n.d.). This study will measure nurses’ perceived effects of electronic documentation on patient care in the emergency department. Usability testing will be utilized to assess functionality of information technology. Usability testing is valuable to identify problems with the product, user performance, and satisfaction (Usability.gov, n.d.). Usability testing is utilized to determine preferences and is considered a tool in evaluating problems, user performance, and satisfaction in order to increase acceptance on information technology (Moody et al., 2004).

**Nurses’ attitudes toward computer use**

As information technology expands in health care industry it is expected that increased efficiency in nursing documentation will be an outcome. Transition from paper to computerized documentation systems has proven to be a challenge in hospitals. Several studies were conducted to assess nurses’ attitudes in relation to development of strategies to improve computerization. Computers have become an integral part of nursing. As computerization increased, transition can be facilitated by understanding nurses’ attitudes related to computers.
Brodt and Stronge (1986) conducted a study to measure attitude toward computer use in relation to educational preparation, gender, age, length of employment in the institution, length of service in nursing, shifts worked, daily interaction with computer terminal, and types of nursing units. In the study, conducted at a Midwestern hospital, 225 full time and part time nurses were surveyed (prn nurses were excluded). The sample included LPNs and RNs from ADN, Diploma and BSN programs. Eighty-five (82%) nurses completed the survey.

The Stronge and Brodt questionnaire was used to measure nurses’ attitudes toward computers in relation to other variables. The tool consisted of 20 questions with a low score of 20 and high score of 100, a high score indicating a more positive attitude. Junior and senior nursing students and faculty at Marycrest College in Iowa evaluated the tool for reliability and validity in a pilot study. A Spearman-Brown correlation for internal consistency was .90 (Brodt & Stronge, 1986).

Attitudes toward computers in relation to educational background were analyzed using a one-way analysis of variance (ANOVA). There were significant differences (p<0.001) between and among the four groups. Analysis revealed an overall F ratio significance at the p<0.001 level with the means of each group as follows: LPN, 63.90; ADN, 72; Diploma, 72.92 and BSN, 74.29. Further analysis revealed a significant difference between the LPN’s and any level of RN, with any level RN having a more favorable attitude toward computer use. No statistically significant differences were found among age groups (<30, 30-39, 40-49, ≥50). No statistically significant differences were found among years of employment (<10, 11-20, 21-30, ≥31). Length of service in years as a nurse (<10, 11-20, 21-30, >31) did reveal a significant difference between respondents who had worked less than 10 years and individuals who had worked longer than 21 years or more. Nurses who had worked as a nurse longer than 21 years had a more favorable attitude toward computer use. The ANOVA revealed a significant difference (p<0.01) with further analysis determining the mean of each group: <10 years, 68.81; 11-20 years, 70.22; 21-30 years, 76.29, and 31 years, 77.5. No significant difference was found between shifts worked (Brodt & Stronge, 1986).
The nurses were also evaluated according to work location (OB, OR, Psych, Med-Surg, Rehab-Peds, Critical Care, and Administration). An ANOVA revealed a significant difference in nurses’ attitudes among work locations. The overall F ratio was significant at p<0.001 with the means of the groups as follows: OB, 73.35; OR 72.11; Psych, 73.65; Med-Surg, 66.36; Rehab-Peds, 75.28; Critical Care, 66.61; and Administration, 77.71. Further analysis revealed a significant difference between Med-Surg and Rehab-Peds with Rehab-Peds nurses having the more favorable attitude toward computer use. There were also significant differences between Med-Surg and Administration with Administration having more favorable attitudes (Brodt & Strong, 1986).

Brodt and Strong (1986) concluded nurses’ attitudes toward computers varied by education, level of practice, and years of nursing practice. Attitudes did not vary by age of the nurse, years of employment, or shift worked.

Burkes (1991) discussed the increase in computer use in health care facilities. Burkes believed that by evaluating nurses’ attitudes toward computers, predictions could be made regarding nurses’ reactions to computerization. The purpose of the study was to measure nurses’ computer attitudes and identify variables relating to attitudes utilizing Vroom’s Expectancy Theory as a framework. Vroom’s Theory explained that “satisfaction (preference for an outcome) x beliefs (expectation that using computerized programs will lead to the preferred outcome) = motivation” and the ultimate choice for or rejection of an act (Burkes, 1991, 193).

The study was conducted at LDS hospital in Salt Lake City, Utah, and included 133 full or part time Intensive Care nurses. Head or assistant head nurses, supervisors, and clinical specialists were excluded. The response rate was 42% (n=56) (Burkes, 1991).

Burkes designed a knowledge, satisfaction, and motivation survey. The beliefs and part of the demographic data section of the tool consisted of an adaptation of the Stronge-Brodt questionnaire. The questionnaire consisted of five sections: (a) knowledge, (b) satisfaction, (c) beliefs, (d) motivation, and (e) individual characteristics relating to computer use in nursing. The knowledge scale contained 12 statements with true, false, and uncertain answer possibilities. The beliefs scale
contained 18 statements with responses varying from strongly agree, agree, uncertain, disagree, and strongly disagree. The acceptance and satisfaction scales had 21 statements using the same responses as the beliefs scale. The motivation scale had 17 statements using the same responses as the belief, acceptance, and satisfaction scales. The individual and demographic scale evaluated 13 computer functions including charting, scheduling medications, word processing or programming, and number of months the respondent had known how to use the various computer functions. Highest nursing degree, year of graduation, months worked as a nurse, years at organization, present job title, shift, and employment status were also obtained in the individual and demographic scale. The tool was validated using four nurses from the nursing information systems steering committee with 95% agreement among reviewers. Tool reliability was measured for internal consistency using Cronbach’s alpha coefficient and the split half technique. Adjustments were made to the beliefs section of the tool to increase the alpha coefficient from a range of -.396 to .655 to a range of .534 to .655. The knowledge section had an alpha coefficient of .360. Burkes stated the low alpha coefficient may be attributable to the majority of study respondents answering “uncertain” responses for some of the knowledge questions. The “uncertain” response was left in place to determine nurses’ computer-use knowledge deficits (Burkes, 1991).

Results were tested using Pearson correlation coefficient to study relationships between variables. Correlation of nurses’ computer use attitudes after using computers showed significant relationships in regards to Vroom’s expectancy theory. Interpretation of data confirmed the model Burkes proposed based upon Vroom’s theory regarding positive correlation with computer use satisfaction to positive computer beliefs ($r = 0.783$, $p <0.001$) and greater computer use motivation ($r = 0.598$, $p <0.01$). In addition, the more positive computer use beliefs correlated with greater computer use motivation ($r = 0.651$, $p <0.01$). No significant correlation was found between age and computer use satisfaction, beliefs, and motivation. These findings were in agreement with Brodt and Stronge's results (Burkes, 1991).
In contrast to the study by Brodt and Stronge, no significant correlation was found between educational level and computer use attitude. There was no significant correlation with computer experience and computer use satisfaction, beliefs, and motivation (Burkes, 1991).

No significant correlation was found among beliefs and motivation in regard to time working as a nurse; however there was a significant negative correlation ($r=-0.239$, $p<0.05$) between time working as a nurse and satisfaction with computer use. Also, a significant correlation was found between computer use knowledge and computer use satisfaction, beliefs, and motivation ($r=0.229$, $p<0.05$) (Burkes, 1991).

Burkes (1991) concluded computer use satisfaction did relate to knowledge, beliefs, and motivation. Age, experience, and education level were not factors in computer use satisfaction.

McLane (2005, 85) defined an electronic medical record (EMR) as one or more computerized clinical information systems that collects, stores and displays patient information. Successful implementation of an EMR was dependent on staff acceptance. The purpose of this pilot study was to evaluate personal experience of staff regarding computer-use, attitudes about computer-use in a clinical setting, and perception of value of computer support in clinical documentation of all nursing staff.

Staff on a 52-bed blood and bone marrow transplant (BMT) unit were surveyed at the University of Texas M.D. Anderson Cancer Center. One hundred thirty-two staff members (registered nurses, licensed vocational nurses, nursing assistants, unit clerks, clinical nurse specialist and managers) were surveyed. Forty-four surveys were returned with a response rate of 33.3% (McLane, 2005).

The survey was adapted from a tool used by Gardner and Lundsgaarde in a study to measure attitudes of physicians and nurses using a clinical information system at LDS Hospital in Salt Lake City, Utah in 1989 and 1990. The initial tool contained 51 fixed choice Likert-type questions. For the pilot study, the tool was adapted to include 14 questions focused on computer-use in the clinical setting (McLane, 2005). The first seven questions related to general opinions or perceptions regarding
computer-use in the clinical setting. The last seven questions focused on expectations commonly found in EMR systems. Cronbach’s alpha for internal consistency was .91. The tool also had four questions relating to experience and five to demographic information.

Fifty-two percent of respondents reported no prior experience with an EMR. Eighty-one percent had a computer at home, and 56% used the computer to conduct personal affairs. Eighty-one percent used internet at least once per week. Seventy percent had concerns for patient confidentiality issues with EMR. Twenty-seven percent believed computer-use was boring and repetitive. Twenty-three percent believed nursing workload would increase with implementation of EMR. The majority of staff (93%) believed computers contributed to practice by supporting improvements in care.

Pearson’s product moment correlations were used to determine if relationships between responses were present. No statistically significant correlations were found in relation to years of practice or previous experience with EMR (McLane, 2005).

McLane concluded that only about half the subjects had personal experience in computer-use; attitudes about computer-use in a clinical setting varied with both positive and negative responses; and staff valued computer support in clinical documentation. The data were used to make decisions regarding implementation process and focused communication regarding advantages, benefits, and limitations of EMR (McLane, 2005).

Smith et al. (2005) reviewed literature regarding nurses’ attitudes toward computerized documentation systems related to age, education level, and previous computer knowledge and found equivocal results. A quasi-experimental design was utilized to study impact of on-line documentation on staff attitudes, completeness of documentation, and time needed for documentation. Research questions included: 1) What is the difference in nurse scores on the nurses’ attitude toward computerization questionnaire, pre and post implementation? 2) What is the difference in charting time pre and post implementation? 3) Is charting more complete post implementation (Smith et al.)?

Nurses’ computerization attitudes were measured pre and post implementation using the Stronge and Brodt Nurses’ Attitudes toward Computerization Questionnaire. The tool consisted of a
20 item Likert type 1 – 5 rating scale with a score range of 20 to 100. The higher the score the more positive the attitude. Five domains were explored: (a) patient care, (b) benefit to institution, (c) job threat, (d) legal aspects, and (e) capability of computers. Reliability of the tool was reported with Cronbach’s $\alpha$ of .92 (Smith et al., 2005). The tool was distributed to a convenience sample of 46 registered nurses (RN) on two units of an academic hospital in the Western United States (US). Surveys were distributed one month prior to computerization and one year post implementation. Response rate pre-implementation included 26 (58%) RNs, and 35 (78%) RNs post implementation. The majority of RNs had worked in nursing between one and five years, were bachelors prepared, females between ages 20 and 30, and had variable experience with computers. No significant demographic differences were found. Chronbach’s $\alpha$ was .916. There were statistically significant differences in nurses’ attitudes pre and post computerization. Attitudes were more negative post computerization as evidenced by a decline in mean attitude score from 70.4 to 61.4 ($p = 0.004$). Four areas showed the most significant decline post computerization: (a) Computers make nurses’ jobs easier ($p \leq .001$), (b) Computers save steps and increase efficiency ($p = .002$), (c) Increased computer usage allows nurses’ more time for patient care ($p = .002$) and (d) A computer increases costs by increasing the nurses’ workload ($p = .002$) (Smith et al.).

The investigator developed observation tool was used to determine documentation time of nursing care. The observation measure was piloted and validated for the following frequently performed nursing activities: medication preparation and administration, direct patient interaction, information review (computer and paper), communication with care team members, documentation, and personal breaks. Documentation was broken down to include charting patient care on paper nursing flow sheet or electronically using Nursing Intervention Classification (NIC) screens. Observations were conducted by trained observers who had inter rater reliability verified to ensure consistency. Observations were completed one to four months prior to computerization and one year post implementation. A convenience sample of RN’s (82) were observed for two hour periods at times chosen to reflect documentation times. The times were matched pre and post implementation.
Documentation completeness was determined by presence or absence of patient care elements of eight core NIC interventions. Core NIC interventions were those that applied to all patients including: pain, falls, physical and skin assessments, vital signs, hygiene, teaching, and discharge planning. A stratified sampling method was used by selecting every fourth patient for a 31 day period from a list of discharged patients by diagnosis related groups on each of the two units. Pre-computerization, 60 charts were audited. Post computerization, 81 charts were audited. Eight NIC categories reviewed contained 81 documentation elements. Of the 81 elements, 28 (34%) were more complete post computerization, including pain assessment, safety surveillance, teaching, skin surveillance, neurologic assessment, and discharge planning. Forty nine (60%) were unchanged and 5 (5%) were less complete. Significant items that were less complete included pain reassessment and physician notification of pain outcomes. Time nurses spent on documenting showed no statistical difference between pre-computerization (25.1 minutes) and post computerization (30.2 minutes). No statistical significance (p = .15) was found in data revealing direct patient care decreased from 40.4 minutes pre-computerization to 35.5 minutes post computerization. Nurses on the pulmonary unit took significantly longer to document than nurses on the orthopedic/neuroscience unit during both samplings (p = .002) (Smith et al., 2005).

Smith et al. (2005) were challenged to find the source of frustration in regard to the decrease in attitudes toward computerization post implementation. A focus group was convened to investigate if frustration was a result of the technical system or the new NIC documentation framework. Findings from the focus group revealed dissatisfaction was related to challenges with system navigation, lack of automatic prompts, system response time, and problems viewing the overall picture of care. The researchers concluded negative findings in regards to nurses’ attitudes to computerization were used to improve and refine the technical system. Work focused on improving implementation strategies. Positive findings of more complete documentation in some areas and no significant change in charting time reflected a benefit to computerized nursing documentation systems.
Nurses’ perceptions of computer systems

As technology continues to increase in daily nursing practice, the need to evaluate nurses’ perceptions of affects of technology on patient care is identified. Understanding how nurses view the documentation process affects development of computer technology and educational programs. A variety of studies have been completed to assess nurses’ perceptions including satisfaction, efficiency, confidence, and acceptance in use of computerized documentation systems.

Nursing documentation is an important aspect of the patient’s clinical picture and is a factor in communication among health care team members regarding patient care. Ammenwerth et al. (2003) studied how acceptance of computers in general and in nursing, and acceptance of the nursing process are correlated with user acceptance and changes over time with a computerized documentation system.

A prospective intervention study was undertaken between August, 1998 (pre-test on the first ward), and October, 2001 (post-test on the last ward). The study took into account adaptation to technology takes time. The study was conducted with three time measurements: three months before introduction of computerized documentation system, three months after introduction, and nine months post introduction. The intervention is the introduction of a computerized documentation system on four nursing wards: ward A – psychiatric unit, ward B – psychiatric unit, ward C – pediatric unit, children under two years of age and ward D – dermatology unit. The computerized documentation system was used for all nursing care processes (Ammenwerth et al., 2003).

The tool was developed using validated questionnaires gleaned from other researchers based on acceptance of nursing process, acceptance of computers, acceptance of computers in nursing, and acceptance of computer based nursing documentation systems. A pre-test was conducted with eight users to ensure understandability. The authors believed the reliability and validity of the tool was sufficient based on return rate (80%) and results of the questionnaires pointing in the same direction (Ammenwerth et al., 2003).
The tool was distributed to all nurses (70) on designated wards prior to implementation, during, and post implementation of the computerized nursing documentation system. Cronbach’s alpha reliability co-efficients for acceptance of nursing process were 0.86, acceptance of computers 0.78, and 0.90 for acceptance of computers in nursing. Fifty six (80%) nurses participated in the study answered at least one questionnaire. The return ratio for the three questionnaires included; first – 82%, second – 86.5%, and third – 90.2%. Overall, 119 questionnaires were returned. Due to high fluctuation in staff, only 23 nurses answered all three questionnaires and 17 nurses answered two questionnaires. In addition to the questionnaires, three to four nurses from each ward participated in audiotaped interviews at about the same time of administration of the third questionnaire. On ward B, no three month post intervention questionnaire was distributed due to organizational issues. Eight nurses from ward B completed the pre intervention and nine month post intervention questionnaires. Twenty three nurses from wards A, C, and D completed all three questionnaires. Data analysis included a total of 31 nurses who answered all questionnaires available to them to avoid bias from staff changes. Scores from questionnaires were compared in regards to the following: (a) changes within a unit over time, (b) differences between units at fixed time points in the study, and (c) correlations. Audiotaped grouped interviews, which lasted one hour, were transcribed and analyzed using qualitative content analysis based on Mayring. Acceptance and factors influencing acceptance were taken into account (Ammenwerth et al., 2003).

Eighteen items from the questionnaire were evaluated to determine the extent of change in user acceptance of nursing process over time before, during, and after introduction of a computer based nursing documentation system. The questionnaire used a Likert scale (1 = minimum, 4 = maximum acceptance) for a mean acceptance score. Data were stable on ward A (median acceptance scores: pre introduction- 3.0, during introduction- 3.0, post introduction – 3.2), ward B (median acceptance scores: pre introduction – 3.0, post introduction – 3.3), and ward D (median acceptance scores: pre introduction – 2.9, during introduction – 3.1, post introduction 3.1). A heavy decrease in acceptance was seen in ward C (median acceptance scores: pre introduction - 2.9,
during introduction – 2.1, and post introduction – 2.6). The Friedman test showed significant differences in the 3 scores on ward C. The Wilcoxon test was used and significant differences were found between the first and second questionnaires (p < 0.01) and between the second and third questionnaires (p<0.05). The computer based nursing documentation system had no effect, or a negative effect, on acceptance of the nursing process (Ammenwerth et al., 2003).

Nineteen items from the questionnaire, using a Likert scale (1 = minimum, 4 = maximum acceptance), were used to determine to what extent there was a change in user acceptance of computers in general before, during, and post introduction of a computerized nursing documentation system. Findings were consistent showing introduction of a computerized nursing documentation system did not have a measurable influence on general acceptance of computers. The following data were reported: ward A (median acceptance score: pre introduction – 3.1, during introduction 3.1, and post introduction – 3.0), ward B (median acceptance score: pre introduction – 3.2, post introduction – 3.0), ward C (median acceptance score: pre introduction score – 2.7, during introduction- 2.6, and post introduction – 2.6), and ward D (median acceptance score: pre introduction – 3.1, during introduction – 3.0, and post introduction – 3.2) (Ammenwerth et al., 2003).

Nineteen items from the questionnaire using a Likert scale (1 = minimum and 4 = maximum acceptance) were used to determine to what extent there was a change in user acceptance of computers in nursing before, during, and after introduction of a computer based nursing documentation system. The data were stable on ward A (median acceptance score: pre introduction – 2.8, during introduction-2.7, and post introduction – 3.1), ward B (median acceptance score: pre introduction – 3.1 and post introduction – 3.4), and ward D (median acceptance score: pre introduction – 2.6, during introduction – 2.1, and post introduction – 2.6). Again, ward C scores declined during the second introduction phase (median acceptance score: preintroduction – 2.6, during introduction 2.1, and post introduction – 2.6), then rose again to the initial level. The Wilcoxon test showed significant difference (p < 0.01) between the second and third questionnaires (Ammenwerth et al., 2003).
The second and third questionnaires asked the question, “Do you want to continue working with the computerized documentation system for nursing process documentation?” Data were analyzed based on a Likert scale (1 = absolutely no and 4 = absolutely yes). Mean values and standard deviation included: ward A (N = 5, during introduction - 2.8 and ± 1.1, post introduction – 3.4 and ± 0.6), ward B (N = 14, during introduction -no data, post introduction, 3.6 and ± 0.5), ward C, (N = 6, during introduction – 2.2 and ± 1.3, post introduction – 2.3 and ± 1.2), and ward D (N = 8, during introduction – 3.3 and ± 0.5 and post introduction – 3.8 and ± 0.5). Overall, acceptance scores were high on all wards except ward C, for which scores were low during introduction and remained low post introduction (Ammenwerth et al., 2003).

Questions were analyzed to determine acceptance and factors that influenced acceptance. The question asked “Does the nursing documentation system save time?” Data were analyzed on a Likert scale (1= absolutely no to 4 = absolutely yes). Mean values and standard deviations included: ward A (N = 7, during introduction – 3.1, ± 0.4, post introduction – 3.0, ±1.0), ward B (N = 14, during introduction – no data, post introduction – 3.1, ±1.0), ward C (N = 9, during introduction – 1.2, ± 0.4, post introduction – 2.0, ± 0.7), and ward D (N = 9, during introduction, 1.7, ±0.9 and post introduction, 2.2, ± 1.1). The question “Does the nursing documentation system make documentation easier?” was analyzed using the same scale. The mean values and standard deviation include: ward A (N = 7, during introduction – 2.3, ± 1.0, post introduction – 3.4, ± .08), ward B (N = 14, during introduction – no data, post introduction – 3.6, ± 0.5), ward C (N = 8, during introduction – 1.6, ± 0.7, post introduction – 2.6, ± 1.2), and ward D (N = 9, during introduction – 3.1 ± 1.2 and post introduction – 3.3, ± 0.7). Again, the nurses on all wards except ward C had a favorable acceptance to the computerized documentation system. Spearman’s correlation index was used to analyze correlation among acceptance scores (Ammenwerth et al., 2003).

No correlation was found between years of experience with computers and acceptance of the nursing process or overall acceptance of computerized nursing documentation systems during introduction. However, a positive correlation was found between years of experience with computers
and acceptance of computers in general ($r = .5$), and acceptance of computers in nursing ($r = .45$) in the first questionnaire. A positive correlation was also found between overall acceptance of computized nursing documentation systems and acceptance of nursing process ($r = .55$), acceptance of computers in general ($r = .43$), and acceptance of computers in nursing ($r = .54$) after introduction in the third questionnaire (Ammenwerth et al., 2003).

Data were similar on all units except ward C. The question that arises is why the difference? Introduction of the computer based system, training, and support was organized similarly on all four units. Researchers found one important precondition between wards C and D. Nursing process had only been partially documented prior to implementation of the computerized system on both units. The computerized documentation system forced complete documentation of all steps of the nursing process. Despite this, ward D accepted the computerized documentation system more than ward C. The qualitative focus groups helped determine further differences. Ward C was a pediatric ward where documentation of nursing tasks were carried out 24 hours per day. The overall amount of documentation was higher on ward C than D. Ward C also had the highest amount of patient fluctuation, as well as a requirement of a medical history and care plan for each patient. In addition, nurses in ward C were in an older age group (age of participants - 49% younger than 29 years, 27% between 30 and 30 years, and 24% older than 40 years of age). This may account for less exposure to theory and practice of nursing process or less eagerness to adapt to new methods of documentation. In addition to these findings, qualitative interviews revealed that each ward had key super users. Ward C had only one or two super users in comparison to at least three on the other wards. Ward C’s super users were not as active as those on other wards. During the introduction phase, work load was high on ward C due to staff shortage. Finally, prior to computerization, all documentation on ward C occurred at the bedside. During and post implementation, it was found that no mobile computers were available, which led to double documentation on scraps of paper at the bedside and then into the computer (Ammenwerth et al., 2003).
Ammenwerth et al. (2003) concluded previous documentation practices, patient volume, age of nursing staff, and number and availability of super users were key factors in acceptance of computerized documentation systems in the study. Previous computer knowledge and acceptance of nursing process also influenced acceptance of computerized nursing documentation systems.

As more and more hospitals implement some type of electronic health record (EHR) it is important to discover ways to enhance acceptance. One way to improve acceptance is to utilize usability testing to determine user preference and functionality of the system (Moody et al., 2004). This involves evaluating various aspects of the system such as tasks, user understanding of the system and user preferences of technologies. The purpose of this study was to determine user satisfaction with functionality, perceived problems, barriers, and general attitude with the EHR (Moody et al.).

The study took place at a large Magnet hospital in Florida. Twenty-three clinical units that used EHR were included in the study. Researchers recruited 120 nursing personnel (Registered Nurses, Licensed Practical Nurses and Nursing Assistants). One hundred twenty questionnaires were distributed with 103 (83%) returned. The majority of respondents (98%) were white females with mean age of 43.26 years. The sample was nearly equal in numbers working day shift (N = 47) and night shift (N = 43). Average years worked were 15.6 years, and 80% of respondents identified themselves as experienced computer users (Moody et al. 2004).

The Usability Assessment Survey (UAS) was used to measure the most effective ways for nurses to enter data into EHR. The instrument used objective and subjective measures to assess attitudes, opinions, preferences, perceived functionality, and barriers in using EHR. The UAS used a Likert scale with 1 = strongly disagree and 5 = strongly agree to rate the following statements: 1) Use of electronic health records are more a help than a hindrance to patient care, 2) Use of computerized charting has helped to improve documentation of the clinical record, 3) Electronic health records pose less of a threat to patient privacy than do paper records, 4) Computerized charting has decreased the workload of nurses and other personnel, and in time, 5) The use of EHR will lead to improved patient care. A higher score indicated a positive acceptance toward the EHR. The survey contained fixed
choice questions regarding demographics, EHR documentation preferences, perceived functionality, barriers, and sources of frustration. There were two open-ended questions to identify key barriers, frustrations, and overall assessment of functionality of the EHR system (Moody et al., 2004).

To assess validity of the tool, three nursing informatics experts were asked to rate relevancy of each scale item to its domain. Psychometric properties of the instrument were evaluated using item analysis and Cronbach’s alpha for internal reliability was moderately high (r = .77). A bivariate correlation matrix was constructed to examine inter item correlations of the five items on the scale. Results revealed correlations that were 0.3 or higher. The Kaiser-Mayer-Olkins sampling adequacy index was .72, meeting the criteria to justify sufficient sample size for factor analysis. The factor analysis confirmed construct validity of the scale (Moody et al., 2004).

The first research question evaluated was: What are nurses’ perceptions about the current EHR system, including satisfaction with functionality and the most frequent problems, barriers, and sources of frustration related to the EHR for nursing? Results from the study revealed that 96% of respondents were confident using EHR, 99% believed help was readily available, and 85% believed work environment was friendly. Eighty-one percent of respondents indicated computer access was available for EHR use, but only 44% believed the system was optimally functional. Sixty-six percent believe there were problems with the software or system (Moody et al., 2004).

The second question asked: What methods of electronic documentation do nurses prefer, and where do they prefer to document various types of clinical data? More than 54% of respondents report interruptions while documenting patient care and 44% indicated the room was too crowded. Fifty-four percent of respondents indicated they used duplicate charting, due to inconvenience of HER, by documenting on scraps of paper (Moody et al., 2004).

The third question was: What is the disposition of nurses toward the use of an electronic system? Sixty-six percent believed the software or system had problems. Overall, 81% of respondents believed EHR was more help than hindrance and 75% believed it improved documentation (Moody et al., 2004).
The fourth question was: Are nurses’ attitudes to EHR related to demographic factors such as age, perceived experience with computers, shift worked (day shift or night shift), and years of nursing experience? Bivariate correlation revealed a weak but positive correlation between age and scores on the EHR attitude scale ($r = -.24$, $p = .01$, $af = 90$). There was an inverse relationship between age and total score. Older nurses tended to have a less positive attitude toward EHR. No correlation was found between years of nursing and attitude scale or between shifts worked. There was a significant difference ($t = 2.38$, $p = .01$, $af = 1.98$) in mean scores on attitude score between experienced ($M = 19.64$) and less experienced ($M = 17.21$) users. Experienced users felt more favorable to EHR (Moody et al., 2004).

Moody et al. concluded that the nurses were satisfied with use of EHR and its impact on documentation. Years in nursing and shift worked had no correlation to attitude (Moody et al., 2004, 344).

Use of an EMR in the hospital setting is intended to support clinical staff in documentation and data processing. The potential to improve data collection and quality also exist. It is important to evaluate user satisfaction with EMR systems to determine impact on work load and quality of care. Likourezos et al. (2004) conducted a study to measure clinicians’ computer background, experience, satisfaction with perceptions of and concerns about EMR during clinical use in the emergency department.

The study was conducted in a large urban teaching hospital. A 57 item questionnaire was developed from questionnaires used in past studies. These questionnaires had been tested with physicians and were found reliable with high content and construct validity. The tool included three sections; (a) clinician demographics with date responses of < 1 year entered as 0.5 years, (b) clinician computer background and experiences excluding EMR with coding as no = 0 and yes = 1, and (c) questions about perceptions regarding EMR use and concerns for impact on quality. A 4 point Likert scale was used: strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD). Data were
categorized into groups: SA and A = group A code = 1 and D and SD = group B code = 0 (Likourezos et al., 2004).

Likourezos et al. (2004) hypothesized that: 1) Most clinicians would be satisfied with EMR, 2) Computer background, experience, and amount of time using EMR would positively correlate with EMR satisfaction, and 3) Nurse and physician satisfaction and perception of EMR would differ due to different clinical duties. One hundred fifteen clinicians (37 physicians, 78 nurses) were eligible to participate. Each physician received a packet including an introduction letter with instructions for completing and returning the questionnaire in a self addressed, stamped envelope, in his or her office mailbox. Packets were given to nurses with his or her paycheck or personally handed out by the nurse manager. Respondents were given one month to return the survey. Overall participation rate was 38.3% (95% CI, 29.4-47.2%) with 62% (23) physicians and 26.9% (21) nurses responding. The majority of clinicians were white/non hispanic (53.5%) and female (58.1%), with a median age 38 years (range: 28-60). The median number of years worked in emergency department (ED) was five years (range: 0.5-21). English was the primary language (88.6%). Significant demographic differences between nurses and physicians included: more female nurses (p <0.001), non white (p <0.01), older (p<0.05), and worked longer in ED (p = 0.068) when compared to physician respondents (Likourezos et al.).

All respondents reported computer use other than EMR. More physician respondents reported use of internet (p <0.05) and daily computer use (p < 0.05). All respondents reported they were trained and used EMR to enter data and view patient data. Eighty seven percent of physicians and 85.7% of nurses used the ED EMR daily (p = 1.000); other respondents used EMR several times per week. Similarly, physicians (81.8%) and nurses (85%) reported access to EMR any place in the clinical setting. Thirteen clinicians (six physicians, seven nurses) used EMR for medical advice, seven clinicians (two physicians, five nurses) used it for educational purposes. Both groups reported ease in data entry (p = 1.000), accessing data (p=.348), and reading text on the screen (p=1.000). Both groups found it confusing to follow screen sequence for EMR (p = .967). Nurses (61.9%)
reported they were able to complete work faster. The opposite was found in the physician report (21.7%) (p < .05). Both groups reported improvement in ability to monitor patient progress (65% nurses, 81.8% physicians, p = 0.298). Respondents (43.9%) reported no improvement in quality of care related to EMR. Most nurses (71.4%) perceived patient information was more confidential with EMR than with paper. This perception was not seen in physician respondents where only 45% perceived information as more confidential (p = .084). Comments from respondents included concerns about “down time,” “logging off between sessions,” “amount of time it takes to log on,” “amount of time it takes to enter an order,” and spending “more time in front of computer than with patients.” Both groups (75%) reported EMR use in the ED functioned properly most of the time, and nurses (77.8%) and physicians (91.3%) would like all clinicians to computerize medical records (Likourezos et al., 2004).

Likourezos et al. (2004), found clinicians perceived EMR as helpful in daily work. Nurses perceived improvement in work efficiency. Neither group reported an improvement in quality of patient care. Physician respondents expressed concerns regarding confidentiality of EMR.

It is important to examine nurses’ experiences with computerized documentation systems (Darbyshire, 2004). The purpose of this phenomenocological study was to describe nurses and midwives experiences using computerized patient information systems (CPIS) and what it means to patient care and nursing practice. The intent of Darbyshire’s qualititative study was to gain deeper understanding of nurses’ and midwives’ experiences using CPIS. The research question was “What are nurses’ and midwives’ experiences of using CPIS in everyday clinical practice (Darbyshire, 2004, 18)?”

The study was conducted in 25 different public and private hospitals and community areas in Southern and Eastern Australia. The 53 participants were nurses or midwives from a variety of clinical backgrounds including: medical-surgical wards, midwifery, child health, mental health, anesthesitics, clinical support, emergency theaters, intensive care, and community areas. All participants had current experience using a variety of CPIS (Darbyshire, 2004).
Thirteen focus group interviews were held. Data collection consisted of interviews lasting 45 – 90 minutes. The interview began with focused but roomy questions about what type of CPIS was used and then became more focused to specific aspects of system usage. Interviews were tape recorded, transcribed, and checked for accuracy. Data collection and initial analysis were concurrent to identify themes. Methods were used to establish analytic trustworthiness and ensure comments were from a variety of participants (Darbyshire, 2004).

Two themes emerged in analysis of the data collected in the interviews. The first theme was “CPIS as beneficial and valuable.” There were a few participants who believed that CPIS was beneficial to practice. The main benefits described were reduction of administrative or repetitive tasks and improved legibility of notes (Darbyshire, 2004, 19). The advantage regarding patient care was not clearly expressed but seemed to involve nurses having more time at the bedside. “CPIS as irrelevant, useless or sinister” was the second, most overwhelming theme. Clinicians were critical of CPIS in relation to handling clinical information. CPIS was noted to be difficult and time consuming and unable to capture real nursing care.

Darbyshire (2004) concluded that many end-users of CPIS are discontent with the systems, but with good reason. Promised improvements have not been realized and clinicians have little influence on the systems. More education and training is not the answer, but engaging clinicians in development of technology to ensure needs of the end users are met may improve perception of CPIS and the impact on patient care and nursing practice.

While many variables have been studied in relation to nurses’ attitudes toward computer use, efficiency of computer use in nursing practice has been less explored. In order to explore the relationship between efficient computer use and nurses’ daily practice, Lee et al. (2005), developed a model to evaluate the efficient use of computerized documentation systems. The purpose of this study was to test the model influencing use of a computerized nursing care planning system. The model addressed efficiency among hospital clinical nurses (Lee et al., 2005, 171).
This study was a secondary analysis of data from a previous study to establish reliability and validity of a tool used to evaluate computerized nursing care plans. This study was conducted in Taiwan in April, 2002. Of 738 nurses who answered the questionnaire, 612 (84%) were clinical nurses. Criteria for participation in the study included having worked on the unit for at least six months (Lee et al. 2005).

The scale contained three major categories: (a) demographic variables including age, education, and nursing experience; (b) computer experience variables including number of computer skills, computer knowledge, and usage pressure; and (c) technology factors including the following six categories of patient care, measured by: care plans, patient education, nursing interventions, nursing diagnoses, and nursing assessments; nursing efficiency, measured by: charting time, time with patients, data communication time, and work efficiency; professionalism, measured by: patient centered care, and problem-solving skills, usage benefit, measured by: nursing research, nursing content, and data checking; education/training measured by: training methods, learning time, and being a super user; and usability measured by: charting error correction, functionality, data accuracy, screen displays, and contrasting colors. Each item was rated from 1 (strongly disagree) to 4 (strongly agree). Reliability and validity were reported by Lee (2004) in previous work.

The demographic variables evaluated included nurses’ age (20-25, 55.6%; 26-30, 38.4%; 31-35, 4.6%; 36-40, .8%; 41-45, .2%) (Lee et al., 2005). There were no data for nurses over 45 years of age, which is significant if applying data to the United States healthcare system. Educational level was evaluated with the following variables; high school diploma, .7%; associate degree, 77.8%; baccalaureate degree, 21.4%, and 0.2% with a masters degree. Years of experience was evaluated with: less than 1 year, 11.6%; one to 2 years, 26.8%; 3 to 4 years, 29.9%; 5 to 10 years, 29.2 %; eleven to 15 years; 0.6 %, 16 to 20 years, .2%; 21 to 25 years, .2%). There was no category for nurses with more than 25 years of experience (Lee et al., 2005).

Nurses were rated on the number of computer skills with 73.6% of respondents reporting skills with two to four computer applications. Nurses (74%) rated average to above average in
computer knowledge and 73% rated usage pressures from zero to one. Usage outcomes were also evaluated where low usage was considered a positive outcome (more efficient use). Respondents (71%) rated time spent using the computerized nursing care plan (CNCP) at one or less hours per day (Lee et al., 2005).

Correlation and binary logistic regression analysis were applied to examine relationships among variables. The following variables were significantly correlated with daily use of the CNCP: self rated computer knowledge level ($r = 0.08, p = 0.048$); number of usage pressure scores ($r = 0.17, p = 0.000$); patient care ($r = 0.09, p = 0.021$); nursing efficiency ($r = -0.14, p = 0.000$); education/training ($r = -0.25, p = 0.000$); and usability ($r = -0.142, p = 0.000$). Results indicated nurses who had less computer knowledge, less computer usage pressure, and perceived more technology characteristics in patient care, nursing efficiency, usability, and education/training spent less time using the CNCP each day (Lee et al., 2005, 173).

Lee et al. (2005) concluded that younger nurses spent less time using CNCP and nursing experience had no effect. One unexpected finding was nurses who had more experience with computers spent more time using the system.

The purpose of Lee’s (2006) qualitative, exploratory study, *Nurses’ perception of their documentation experiences in a computerized nursing care planning (CNCP) system*, was to explore how content design affects nurses’ perception of the documentation experience (Lee, 2006). Research was conducted on three respiratory units at a medical center in Taiwan. Twenty nurses who had worked on the unit at least six months were purposively recruited based on willingness to discuss CNCP. Two of the 20 had less than one year of experience, seven had one to three years, three had four to five years and the rest had worked six to ten years. Eight were between 20 and 25 years of age, 11 were between 31-35 years of age. Half were college graduates and the rest had associates degrees. Anonymity was assured by using code numbers to identify the interview transcripts (Lee).

Interviews with open-ended questions lasted 30-45 minutes and were conducted in a private room on the unit at convenient times for participants. The interviews were transcribed and each
participant was asked to verify content for accuracy. Transcripts were then analyzed and coded by nursing experts in chart audit and qualitative research. Transcripts were compared, grouped into categories and then concepts, and themes were documented (Lee, 2006). Three major themes emerged regarding nurses’ perception of how CNCP content influenced the documentation process: (a) reference list to aid memory- CNCP was utilized as an aid when making nursing diagnosis; (b) learning tool for patient care-nurses increased knowledge based on content from CNCP; and (c) vehicle for applying judgment to modify care plan content-existing knowledge was applied to revise or develop priority for patient problems (Lee). When applying findings to information processing theory, which proposes human’s have a limited capacity for processing information in long term memory, CNCP can be used to aid the nurse as a learning tool, reference aid and a vehicle to revise the care plan (Lee).

As computer use in nursing becomes more prevalent it is important to determine nurses’ confidence levels when using a variety of information technology. Eley, Fallon, Soar, Buikstra, and Hegney (2008) conducted a study to determine nurses’ experience and confidence in use of computers and information technology in relation to age, length of time in nursing, and level of job (Eley et al.).

The study was conducted in Australia in July, 2005. The sample included financial members of the Australian Nursing Federation (10,000 members), and included assistants in nursing (AIN), enrolled nurses (EN), and registered nurses levels 1-5 (RN 1-5). The questionnaire was mailed to 2,500 nurses in each Australian geographic region including: metropolitan, inner and outer regional, and rural/remote areas. Four thousand thirty three (43%) members completed the questionnaire (Eley et al. 2008).

The qualitative section of the tool was developed using data from key stake holder interviews and focus groups. Modifications followed recommendations of a project steering group and two pilot studies. The tool consisted of 78 questions to assess areas of access, use, barriers, training, and technical support in regards to information technology(IT). “IT was clarified to mean computer based
systems or applications assisting in management and processing of information to support health care delivery” (Eley et al., 2008, 25-26). The tool used Likert scales, yes/no responses, and areas for additional comments. Confidence levels were measured as: very confident, confident, little confident, and not confident. Computer use levels were measured using: never = 0, rarely = 1, occasionally = 2, frequently = 3, and always = 4. Each question was analyzed on the basis of all responses and by age of nurse, length of time in nursing, and job level (Eley et al.).

Eighty-six percent of respondents used computers for work. Experience with hardware and software applications ranged from 90% for word processing to 64% for reference tools. Experience and confidence in use of information technology were determined by describing level of experience and confidence using a variety of hardware and software applications. Similar trends were seen with high level of experience (90%) using common applications (mouse, computer, keyboard, internet, word processing, email, and windows operating system). Confidence levels using these applications were above 60%. Less than 70% of respondents had experience using presentation software, USB drives, computer based reference tools, and statistical software of Apple/Mac operating systems. Confidence levels for these applications were less than 30%. Number of years worked did not impact work related purposes of computers, t(4088) = 1.93, but age was a factor with younger (M= 47.8) respondents using computers for work more than older workers (M = 44.9), t(4107)=6.74, p <0.001. Job level affected work related computer use with 64% of AIN/EN’s using computers compared to 90.6% of RN level 1-2 and 95.4% of RN level 3-5. Younger nurses used computers more often for patient management purposes (patient records, bed management, theatre, clinical purposes, poisons, results, ordering, assessing policies/procedures, evidence based practice, and continuing education). Older nurses used computers more for consultation, administrative reporting, developing policy and procedures, complaints, and accreditation. Increasing age and years working as a nurse were associated with decreasing frequency of use of many of the system applications. Increasing age and years worked also decreased confidence in use of patient monitoring, diagnostic result access, evidence based research, and information access systems (Eley et al., 2008).
Eley et al. (2008) concluded that engagement by nurses in Australia with computers was lower than expected. Experience and confidence in all but basic computer use was lower than desired. Age did seem to have a positive aspect in regards to increased experience and confidence levels.

Lee (2008) also explored nurses’ experiences with a nursing information system. The purpose of the study was to report experiences nurses encountered during the first year after implementation of a nursing information system. Understanding nurses perceptions and identification of issues encountered can determine the effects on nursing practice and system adoption (Lee, 2008).

The descriptive, qualitative study was conducted on four surgical units of an 800 bed teaching hospital in Northern Taiwan. The units were chosen as nursing information system (NIS) had been pilot tested on these units during design phase. Staff nurses were chosen to obtain the most in-depth feedback. The sample was recruited by announcing a need for volunteers from 90 nurses on the four units. Twenty three agreed to participate in focus groups designed to discover insight into nurses’ attitudes, beliefs, and opinions. Focus groups were chosen to decrease intimidation and increase group interaction to obtain in-depth information (Lee, 2008).

Focus groups were held weekly over a one month period, lasting 1-1.5 hours with five to six nurse volunteers at each session. The interview guide, provided during recruitment, contained four questions to solicit responses to: (a) After one year of the NIS use, what is the impact on nursing work flow, documentation process and daily practice? (b) Is there any change in the nurse-patient relationship, nurse-physician relationship and nurse-nurse relationship due to NIS use? (c) Do you have any issues that you would like to talk about? and (d) Do you have any suggestions for using this system in the future (Lee, 2008, 765)? Saturation was determined when no new information was offered by subjects, and discussion was ended. At the end of each session the following demographic data were obtained: age, educational background, nursing and computer experience. Each interview was tape recorded. Upon completion of each focus group, researchers summarized the discussion content and asked for comments. The summary became part of data analysis for data validation. Tapes were transcribed verbatim and analyzed following the Miles and Huberman proposal. Raw data
were open coded, compared and contrasted with each other, then identified concepts and themes were arranged in tables/diagrams to indicate patterns or relationships among themes. Trustworthiness of the qualitative data was ensured by applying fittingness, credibility, and auditability. Fittingness was addressed by purposeful recruitment. Credibility was enhanced by including quotes from verbatim transcription. Auditability was ensured by periodic discussion of content categorization and themes with a nursing supervisor. The nursing supervisor was a content expert in NIS (Lee).

Six themes emerged regarding what nurses encountered or were concerned about:

(a) dissatisfaction with insufficient personal computers and printers. The nurses had to compete with other care providers for computer and printer use. Other issues identified included frequent breakdown of equipment, lap tops not being connected to printers and increased time spent on charting. (b) Slow system response time. The slow response times included changing from screen to screen and log in, log out processes. Nurses were concerned about delay in care and patient safety. (c) Work flow changes related to print problems. Not every unit used computerized documentation. Issues arose when patients were transferred to other units. Nurses were required to use a seal for chart validation for both computerized and hand written documentation. This process was time consuming, and problems arose when nurses’ left their seals in the nursing stations in case errors needed to be corrected. (d) Content design. Nurses reflected the system design required them to go through many screens to get to the patient problem they required for care. Templates were available for discharge and post operative charting, but not effective for routine assessments. Nurses created work arounds by developing word files, saving them, then retrieving files and revising for each patient. (e) Decreased charting quality. Nurses’ attributed decreased charting quality to slow system response time. Nurses’ reflected they did not have time to wait on the system, and by the time the files came up they had forgotten what data needed to be documented. (f) Interpersonal relationship in the care setting. With implementation of NIS, it was found the nurses who type slower were less involved in other unit duties. Nurses felt that they had to compete with physicians for computers; courtesy was put aside.
Nurses also felt patient relationships were effected as patients believed nurses were just sitting around on the computer (Lee, 2008).

Lee (2008) concluded that by understanding issues that concern users of EMRs, strategies and policy requirements can be developed to support the end user. Provision of adequate computers, printers, and development of a network operation plan may improve documentation and nurse-nurse and nurse-physician relationships. Upgrading computer software and getting end user buy-in may improve charting quality. Encouraging communication with patients regarding documentation systems may improve nurse-patient relationships.

*Feasibility of electronic health record implementation*

As the government establishes more reasons for hospitals to implement electronic health records (EHR), it is logical to determine how many hospitals in the United States (US) have implemented some type of EHR. Jha et al. (2009) were commissioned by the office of the National Coordinator for Health Information Technology of the Department of Health and Human Services to conduct a study to measure current levels of adoption of EHR in the US. Jha et al. (2009) hypothesized that; 1) larger hospitals would have a higher prevalence of adoption of EHR than smaller hospitals, and 2) major teaching hospitals would have higher levels of adoption than non-teaching facilities and private hospitals would have higher prevalence than public hospitals. In addition to the hypotheses, researchers also sought to identify barriers to adoption and mechanisms to facilitate adoptions.

A survey was developed using prior hospital based surveys of electronic record systems or computerized provider order entry that have been utilized in the past five years. An initial draft instrument was shared with chief information officers and other hospital leaders, experts in the fields of health, information technology, survey research, and health policy. The final instrument was approved by the institutional review board of Partners HealthCare (Jha, et al., 2009).

In collaboration with the American Hospital Association (AHA), Jha et al. (2009) presented the survey tool as an information technology supplement to the association’s annual survey. The
survey was sent to hospital chief executive officers in March 2008. The survey in field period ended September, 2008. Non responding hospitals received reminder phone calls and letters. The survey contained content regarding 32 clinical functionalities of electronic record systems. Data were collected to discover if hospitals had fully implemented the functions in one or more (but not all) major clinical units, or had no implementation on any unit. The tool used a 6 point Likert type scale (1 = fully implemented across all units; 2 = fully implemented in at least one unit; 3 = beginning to implement in at least one unit; 4 = have resources to implement in the next five years; 5 = do not have resources, but considering implementation; 6 = not in place, not considering implementation). Certain functionalities were determined by the panel as necessary elements to define an EHR in the hospital setting. Concensus was reached to include 24 required functions on all major clinicial units to conclude the hospital had a comprehensive EHR. The panel determined eight functionalities that should be present on at least one major clinical unit to have the hospital be classified as having basic EHR system. The panel disagreed on two functionalities, physician notes and nursing assessment. Two definitions were developed; one included nursing assessment and physician notes, the other did not. Both functionalities were included in results. Factors that were included as possible barriers were rated on the following scale: 1 = major barrier, 2 = minor barrier, 3 = not a barrier. Suspected barriers to EHR implementation and potential policy solutions were included in the survey and were rated on the following scale: 1 = major positive impact, 2 = minor positive impact, 3 = not a barrier, 4 = minor negative impact, and 5 = major negative impact. The lower the score, the less the barrier.

Responses were received from 3049 (63.1%) acute care hospitals in the US. Federal hospitals and those located outside of the 50 states and District of Columbia were excluded, leaving 2952 (61%) hospitals. It was found that 1.5% (95% confidence interval, 1.1-2.0) of US hospitals had a comprehensive EHR across all major units. An additional 7.6% (95% confidence interval, 6.8-8.1) had a basic system that included physician notes and nursing assessment on at least one unit. If physician notes and nursing assessments were excluded, 10.9% of hospitals had basic EHR systems. When Veterans Administration Hositals were included in the data, the comprehensive data increased
to 2.9\% (95\% confidence interval, 2.3-3.5). The likelihood of EHR increased with the following characteristics; larger institution (≥ 400 beds)-comprehensive EHR - 2.6 ± 0.9, basic EHR – 15.9 ± 2.2 (p value < 0.001); major teaching facility-comprehensive EHR – 2.6 ± 1.1, basic EHR – 18.5 ± 2.6 (p value < 0.001); hospital system-comprehensive EHR- 2.1 ± 0.4, basic EHR- 8.4 ± 0.9 (p value 0.006); urban location-comprehensive EHR – 1.9 ± 0.5, basic EHR – 8.4 ± 0.6 (p value < 0.001); and dedicated coronary unit-comprehensive EHR – 1.9 ± 0.4, basic EHR – 9.7 ± 0.9 (p value 0.002) (Jha et al., 2009).

No relationship between ownership and EHR status were found. The most common barriers cited by hospitals with no EHR included: inadequate capital (74\%), maintenance cost concerns (44\%), unclear return on investment (32\%), resistance of physicians (36\%), and lack of staff expertise with information technology expertise (30\%). In comparison, hospitals with EHR systems (both comprehensive and basic) were less likely to cite these concerns except for resistance of physicians (34\%). Hospitals that had adopted EHR identified financial factors as having a positive effect on likelihood of adoption (82\%) and available technical support (47\%) (Jha et al., 2009).

Jha, et al. found that in more than 90\% of US hospitals basic requirements for EHR were not met. Many facilities had implemented some functionalities associated with EHR such as radiology and laboratory reporting. The larger, urban, teaching hospital had somewhat higher levels of adoption which may indicate greater availability of financial resources. Financial issues were cited as the greatest barrier. Evaluation of these factors are required if the adoption of EHR in the US is to be successful.

Conclusions

Computerization in nursing has been studied from a variety of perspectives. Results have revealed a variety of inconsistent findings. Stronge and Brodt (1986) found that RNs of any educational level had more favorable attitudes than licensed practical nurses (LPNs). Administrative nurses and nurses of older age viewed computers more favorably than other nurses. Burkes (1991) found that age, experience, and education were not variables affecting nurses’ attitudes toward
McLane (2005) found computers contributed to care by supporting improvements, but nurses reported computer use boring and repetitive, leading to an increased workload. Smith et al. (2005) reported nurses’ found computerization decreased job ease, efficiency, time available for patient care, and ultimately increased nursing workload. Lee (2006) found nurses viewed computerization as a memory aid, knowledge enhancer, and enhanced judgment to modify care plans. Likourezos et al. (2004) found that nurses perceived enhanced work and the ability to follow patient progress while using computers. Moody et al. (2004) found nurses perceived the computerized work environment friendly with help readily available and nurses were confident in computer user. Ely et al. (2008) found confidence levels were lower than expected. Years worked as a nurse had no impact on confidence but younger nurses used the computer more. Lee (2008) discovered several troublesome issues including insufficient computer availability, system response time, content problems, work flow changes, decreased charting quality, and change in interpersonal relationships. Likourezos et al. (2004) found similar results with computer screens being difficult to follow, system functionality was slow, and there were basic system issues. Darbyshire’s (2004) qualitative study revealed nurses’ perceptions of computers as irrelevant, useless, and time consuming. Ammenworth (2003) found acceptance was negatively affected by previous documentation practices, patient volume, and age of the nursing staff. Visibility of key super users had a positive effect on acceptance. Lee et al. (2005) revealed an interesting phenomenon in regards to efficiency where younger nurses spent less time using computers when compared to older nurses. Are younger nurses more efficient in computer use?

In evaluating these various studies examining nurses’ preferences, attitudes, and barriers to computerized documentation systems, one thing was clear. There was inconsistency in data regarding what variables may have a positive effect on implementation of computerized health care documentation. Consistently, age and shift worked were not variables that affected perception or attitude regarding EMR. Educational preparation, length of service as a nurse, and basic computer knowledge were variables that influenced acceptance of EMR. Further studies, both quantitative and
 qualitative, are needed to continue to explore variables that will have a positive effect on nurses’
attitudes, knowledge, and preferences in relation to positive perceptions with computerized
documentation systems.

In addition to nurses’ attitudes and perceptions, it was important to consider the current level
of readiness in the US hospital system for computerization. Jha et al. (2009) found that 90% of all US
hospitals do not meet the basic requirements to incorporate electronic documentation. This will be a
determining factor in the successful implementation of EMR.
Chapter III

Methodology and Procedures

Introduction

In today’s health care workplace, technologic change is inevitable. These changes impact work load, job demands, and interpersonal relationships (Morrison & Lindberg, 2008). The goal of electronic medical records (EMR) is to improve efficiency, safety and quality of care. To achieve these goals the system must be accepted and used by the clinicians (Poissant, Pereira, Tamblyn, & Kawasumi, 2005). The purpose of this study is to evaluate nurses’ preferences when using an EMR to document data and perception of barriers or problems with EMRs. This chapter contains information regarding methods and procedures for the study.

Research Questions:

1. What are nurses’ perceptions about the current EMR system, including satisfaction with its functionality and the most frequent problems, barriers and sources of frustration?

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?

4. Are nurses’ attitudes related to demographic factors such as age, perceived expertise with computers, shift worked and years of nursing experience (Moody et al., 2004)?
Population, Sample and Setting

The study will be conducted in three emergency departments at a multi-hospital system in Southwestern Ohio that utilize EMRs. Participants will include full, part time, and optional registered nurses working in the emergency departments who have been trained to use the computerized documentation system. The anticipated sample will consist of all registered nurses working in hospital systems emergency departments who respond to the survey (N = 200).

The study will be approved by Ball State University Institutional Review Board and the participating hospital systems’ Institutional Review Boards. There will be no risk to the nurses who agree to participate. Privacy and confidentiality of subjects will be maintained. A letter will be provided to each participant describing the purpose of the study, right to confidentiality, and volunteer status. Informed consent will be implied by completing the survey. The survey will be completed anonymously. Benefits for participants will include understanding nurses’ perceptions related to the functionality and barriers encountered when using a computerized documentation system.

Procedures

A letter will be sent to the Directors of Emergency Nursing at participating hospitals to seek permission to conduct the study. Upon receiving approval from the Institutional Review Boards, a letter and copy of the questionnaire will be sent to each department’s nurse manager. The researcher will distribute a letter explaining the research and directions to complete the questionnaire to each registered nurse. Participants will be given four weeks to return the questionnaire to a locked drop box located in each department’s employee lounge. Results will be tabulated for each of the research questions. Results will be shared with participants during staff meetings. The researcher will be available to answer any questions regarding the research at the staff meetings.

Instrumentation, reliability and validity

Moody et al.’s (2004) Usability Assessment Survey, which was developed based on literature review and recommendations based on time constraints, will be used for the study. The questionnaire
contains three sections to measure: demographic data, EMR documentation preferences, perceived functionality, and barriers to and sources of frustration to use.

Demographic data will be collected using questionnaires with fixed choice format and will include: years in nursing, age, job title, and shift worked. Two open ended questions will identify key barriers, frustrations, and overall functionality. Perception will be assessed using a 5 item Likert type attitude scale with 5 response categories, with 1 indicating strongly disagree and 5 indicating strongly agree. A high score indicates positive perception. Usability will be measured using a 10 item questionnaire utilizing Yes/No answers with areas for examples/explanation. Cronbach’s coefficient alpha was used to assess internal consistency reliability and was found to be moderately high (r= 0.77). Inter-item correlations were established using bivariate correlations matrix of 0.3 or higher. Validity was measured using a prinicpal component factor analysis with varimax rotation to determine if the attitude scale was unidimensional. Eigenvalues ranged from 0.62- 0.84. (Moody et al., 2004).

Research Design

A descriptive design will be the research design for this study to examine characteristics that impact nurses’ perceptions regarding functionality and barriers or frustrations with EMRs. Burns and Grove (2005) state that descriptive study design is used to examine characteristics and identify phenomenon of interest in a sample that can be interpreted to enhance knowledge regarding the study population.

Intended Method for Data Analysis

Bivariate correlations will be used to examine relationships between attitudes toward the EMR and demographic factors. Burns and Grove (2005) state that bivariate correlation measures the extent of linear relationship between two variables from a single sample. The nature of the relationship can be positive or negative, but cause cannot be determined. An r value indicates the degree of the linear relationship. A score of zero indicates no relationship. An r value of -1 indicates a perfect negative correlation indicating a high score on one variable is related to a low score on the
other variable. An $r$ value of +1 indicates a perfect positive linear relationship indicating a high score on one variable is related to a high score on the other variable. As the negative or positive value approaches zero the strength of the relationship decreases (Burns and Grove, 2005). Independent $t$ tests will be used to examine differences in scores on the attitude scale between day shift and night shift and level of experience. Burns and Grove (2005) state that the $t$ test is commonly used to test for significant differences between statistical measures from two samples. According to Burns and Grove (2005) the $t$ test can be used once during analysis to examine data from two samples. The significance of the $t$ statistics is calculated from the degrees of freedom.

Summary

The focus of this chapter is the methodology and procedure for the study. The purpose of the study is to evaluate nurses’ preferences when using an EMR to document data and perception of barriers or problems with EMR’s. The study is a replication of Moody et al.’s (2004) study evaluating nurses’ perception, attitudes and preferences with electronic health records for documentation. A sample of nurses in three emergency departments from a hospital system in southwest Ohio will be used. Confidentiality and privacy of all participants will be maintained by the researcher.
References


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<th>Source</th>
<th>Problem</th>
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<tbody>
<tr>
<td>Brodt and Stronge, (1986)</td>
<td>Nurses’ attitudes toward computerization have an effect on the facilitation of the system</td>
<td>Measure nurses’ attitudes towards computerization and evaluate the attitudes in relationship to contributing variables.</td>
<td>Concept: Attitude can be measured by evaluating level of education, years of employment at facility, years of employment in the health care industry, and previous exposure to computers</td>
<td>225 Full and Part time nurses (including LPN’s, ADN’s, diploma and BSN’s)</td>
<td>Correlational quantitative</td>
<td>Investigator developed questionnaire</td>
<td>Educational background, length of service as a nurse, type of nursing unit were significant variables on attitude toward computerization</td>
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<td>Burkes (1991)</td>
<td>Evaluating nurses’ attitudes regarding computer use can help predict reactions to computerized documentation systems.</td>
<td>Measure nurses’ computer use attitudes and identify variables that relate to these attitudes.</td>
<td>Vroom’s expectancy theory</td>
<td>133 full and part time intensive care nurses</td>
<td>Descriptive Correlational quantitative survey</td>
<td>Investigator developed Knowledge, Satisfaction and Motivation Survey. The Beliefs and sections of the demographic data were modified from a version of the Stronge Brodt tool.</td>
<td>Nurses’ satisfaction, beliefs and motivational attitudes were related. Age did not correlate with any variable in the study. Educational level did not correlate with any study variable. Nurses with greater...</td>
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<td>Ammenwerth et al. (2003)</td>
<td>Documentation of the nursing process is often neglected in documentation. Can computer based documentation systems improve documentation of</td>
<td>Evaluate preconditions, and consequences to computer based nursing process documentation with an emphasis on acceptance.</td>
<td>Lewins’ field theory and Davis’ technology acceptance model.</td>
<td>31 nurses on four units of a hospital</td>
<td>Descriptive quantitative / Qualitative-grounded</td>
<td>Investigator developed questionnaire using previously validated questions for acceptance of the nursing process, acceptance of computers in nursing and acceptance of computer based nursing documentation systems administered three months prior to, during and nine months post implementation</td>
<td>Computer knowledge and previous acceptance of nursing process are significant predictors of acceptance. Task requirements and functionality of the system are important factors in user satisfaction with computerized charting. Nurses with less nursing experience indicated greater satisfaction with computerized charting.</td>
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<td>Moody et al. (2004)</td>
<td>Issues with dual documentation and usability of the electronic medical record</td>
<td>Evaluate functionality of current system and identify perceptions, barriers to and preference for modifications of system.</td>
<td>Concept: Functionality is determined by evaluating availability of computer, type of computer and confidence in computer use, available resources if problems are experienced and how often are problems experienced. Perception/Attitudes is determined by evaluating workload, sources of frustration, documentation expectations and impact on patient care.</td>
<td>120 nursing personnel (registered nurses, licensed practical nurses and nursing assistants)</td>
<td>Descriptive cross sectional design</td>
<td>Investigator developed survey to assess attitudes and opinion regarding functionality of documentation system. Fixed choice questions to assess demographics, preference, barriers and sources of frustration in use of electronic medical record use. Open ended questions to assess key barriers, frustrations and functionality.</td>
<td>Issues with computer access were identified as one of the reasons for dual documentation though 64% preferred bedside documentation. More than one third perceived the electronic medical record decreased workload. Over 75% thought documentation quality was improved and would lead to improved patient safety.</td>
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<td>Darbyshire (2004)</td>
<td>Nurses’ are using computer technology everyday in the workplace, how do nurses’ perceive the impact of the technology on practice</td>
<td>Explore nurses’ and midwives’ experiences using computerized patient information systems in everyday clinical practice.</td>
<td>Concept: Perception is explored using a qualitative approach to assess experiences of using computerized patient information systems and how they impact nursing practice and patient care.</td>
<td>53 nurses with experience using computerized information systems from a variety of backgrounds.</td>
<td>Qualitative research design using interpretive phenomenology</td>
<td>13 focus group interviews using investigator developed questions</td>
<td>Nurses with more experience had a more favorable attitude toward electronic medical records. Experiences were predominantly negative with perceived inability to capture “real nursing”, difficulty using system, nonresponsiveness of systems, irrelevance to patient care and outcomes and incompatibilities between systems.</td>
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<td>Likourezos et al. (2004)</td>
<td>Dissatisfaction with electronic medical records results in reluctance to use the system.</td>
<td>Assess physician and nurse satisfaction with an emergency department electronic medical record system. Measurement of clinicians computer background, experience, satisfaction with, perception of and concerns with an electronic medical record system. Concept: Satisfaction can be measured by evaluating system response time, time required to learn the system, user’s ability to retain the knowledge, error rate and subjective user satisfaction. Computer background, and experience with computers may also impact satisfaction.</td>
<td>153 clinicians (37 physicians, 78 nurses)</td>
<td>Descriptive quantitative</td>
<td>57 item questionnaire utilizing items from questionnaires used in previous studies.</td>
<td>Nurses and physicians favor the use of electronic medical records. Nurses reported greater satisfaction than the physicians. Both groups perceived an improvement in quality of care.</td>
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<td>Lee (2005)</td>
<td>The relationship between efficient computer and nurse’s daily practice have an effect</td>
<td>Does efficient computer use and nurse’s daily practice have an effect A model was developed to explore a variety of factors affecting nurses’ satisfaction.</td>
<td>738 nurses from inpatient nursing care units</td>
<td>Secondary data analysis from study to establish validity and reliability</td>
<td>Investigator developed 22 item Likert scale</td>
<td>Nurses’ with more education, less computer knowledge, less satisfaction.</td>
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<td>Smith et al. (2005)</td>
<td>Data is inconsistent in regards to factors that affect nurses’ attitudes</td>
<td>Does implementation of a computerized documentation system improve</td>
<td>Concept: Attitude in relation to variables including, age, prior experience with computers</td>
<td>*Convenience sample of 46 nurses took Stronge Brodt questionnaire</td>
<td>Quasi-experimental design pre and post computerization</td>
<td>*Stronge and Brodt Nurses’ (is this Brodt &amp; Stronge or Stronge &amp; Brodt?)Attitudes toward (It is Stronge and Brodt’s questionnaire)Computerization questionnaire to</td>
<td>A decrease in attitude score towards computerized documentation systems was found post usage pressure, less perceived benefit, with more training and usability regarding the system spent less time on the computerize care planning system.</td>
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<td>McLane (2005)</td>
<td>Staff acceptance and expectation to the use of electronic medical records are determinants of successful implementation</td>
<td>Explore personal experiences of staff in computer use, attitudes about use in clinical setting and perceptions of the value of computer support to clinical documentation.</td>
<td>Attitude can be impacted by ensuring staff members are involved in the design, development and implementation of electronic medical records. Ensuring that the system is viewed as usable and useful impacts attitude and satisfaction.</td>
<td>132 staff members (registered nurses, licensed vocational nurse and nursing assistants, clerical staff)</td>
<td>Pilot program prior to pre and post implementation survey</td>
<td>Adapted tool by Gardner and Lundsgaarde, 51 fixed choice Likert type questions</td>
<td>Staff held generally positive perceptions about electronic medical records, importance of bedside computer terminals and discussion regarding workflow, concerns regarding confidentiality, impact on documentation</td>
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<td>Lee (2006)</td>
<td>Does the content of a computerized nursing care plan affect nurses’ attitude and perception towards documentation?</td>
<td>Explore how the content of a clinical nursing care plan influences nurses’ perception of the documentation process.</td>
<td>Concept: Research evaluating nurses’ experiences using computerized care planning systems has found that nurses value efficient caring planning, and minimizing paper printouts. Nurses’ also perceive that using computerized systems compromise professional judgment and critical thinking. Nurses’ perception will enhance adaptation to computer use, improve quality of patient care and training programs.</td>
<td>20 purposively recruited nurses</td>
<td>Descriptive, exploratory, qualitative interviews</td>
<td>One on one Investigator developed interview</td>
<td>Three perceptions were identified: The content on the computer was used as a reference, as a learning tool and a way to apply personal judgment to modify the care plan.</td>
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<td>Lee (2008)</td>
<td>Determine major issues regarding nurses concerns when using nursing information technology</td>
<td>Explore insight into attitudes, beliefs and opinions, and experiences using nursing information technology</td>
<td>Rogers’ innovative adoption theory - users motivation is based on usage benefit, work value, ease of use, trial and error and visible outcome of use. Lewin’s change theory - revealed that nurses experience the change process of de-freezing, moving and refreezing stages when change is perceived.</td>
<td>23 nurses</td>
<td>Descriptive qualitative interviews</td>
<td>Focus groups with investigator developed interview guide</td>
<td>Six major themes emerged including dissatisfaction with insufficient number of computers, printers, slow response time, change in work flow, poor content design, decreased charting quality and impact on interpersonal relationships.</td>
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<td>Ely et al. (2008)</td>
<td>Determine current use of information technology and factors that affect nurses adoption of</td>
<td>Examine the impact of frequency of use of computer hardware and software and the confidence of</td>
<td>Concept: Confidence in use of computers by nurses has shown inconsistent results. Confidence impacts the frequency of use.</td>
<td>10,000 nurses’ of the Australian Nursing Federation</td>
<td>Mixed-method approach using quantitative and qualitative data</td>
<td>Questionnaire with 78 questions evaluating, access, use, barriers, training and technical support and qualitative data from key stake holder and focus group interviews</td>
<td>Confidence in use of technology is generally low. Experience in IT use ranged from 90% with common applications to</td>
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<td>64% for reference tools. Younger nurses and those with less time in nursing were more confident.</td>
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