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Attitudes and Beliefs of Registered Nurses About the Process of Changing to an Electronic Medical Record in a Community Hospital: A Mixed Method Investigation

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ATTITUDES ANDBELIEFS OF REGISTERED NURSES
ABOUT THE PROCESS OF CHANGING TO AN ELECTRONIC MEDICAL RECORD
IN A COMMUNITY HOSPITAL: A MIXED METHOD INVESTIGATION

Presented in Partial Fulfillment of the
Requirements for the Degree
Doctor of Nursing Practice

By

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The Graduate School

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2014

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Copyright

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2014

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Abstract

The change from paper charting systems to electronic medical records (EMR) is a daunting task. Many hospitals today are undergoing this process. Kotter's Change Model informs us that the process must be guided by sound principles and lead by an engaged, focused team of dedicated employees. The studied hospital is a small hospital in rural Ohio that initiated this change in late 2012. Their computer charting initiative launched the EPIC program for EMR use throughout the facility. Nursing staff was challenged to learn and eventually become proficient in its use. Because nurses are the largest care provider group in any hospital, their ability to learn, change and adopt new care integration and documentation methods must be supported and enhanced. Benner's Novice to Expert Model of Skill Acquisition in nursing has direct application in this transition. The purpose of this mixed-method, longitudinal study is to examine the attitudes and beliefs of nurses undergoing the change from a paper documentation system to a computer based system through the lens of Benner's Novice to Expert Model. Nurses must accept the change to electronic medical records but they must also increase their skill level. Important factors for successful transition to electronic charting include usefulness of the software, methods of implementation as well as length of time after making the change.

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A MIXED METHOD INVESTIGATION

Introduction

Whatever name one gives it, electronic medical record (EMR) or health information technology (HIT) or electronic health record (EHR) is an omnipresent topic in healthcare today. With the passage of the Affordable Care Act, healthcare providers can no longer ignore the push toward EMR utilization.

Supporters of HIT argue that, if broadly implemented in a meaningful way, it may prove invaluable in addressing such challenging and complex issues as steadily rising health care costs, an increasingly large uninsured population with inadequate access to care, and problems with patient safety and quality of care. (McBride, Delaney & Tietze, 2012, p.36).

In 2009, the American Recovery and Reinvestment Act (ARRA) was passed with the "HITECH Act to specifically incentivize health organizations and providers to become 'meaningful users' of EHRs. These incentives will come in the form of increased reimbursement rates from the Centers for Medicaid and Medicare Services (CMS) and ultimately will result in payment penalties to the healthcare organization if adoption of an EHR is not obtained by January 2015" (McGonigle & Mastrian, 2012, p.286). Utilization of an EMR is no longer a choice, it is a requirement.

The facility studied is a small hospital in rural Ohio that initiated this change in late 2012. Their electronic recording initiative launched the computer software EPIC program for EMR use throughout the facility. Connie Saxton, RN, MSN is rural director of information

technology and explained that “EPIC has a standard platform and the hospital was given the opportunity to customize this platform based on our own best practices and protocols. (C. Saxton, personal communication, October 8, 2013).

Leading a hospital through the change from paper records to EMR is challenging. “Implementation experiences in hospitals have been varied and sometimes negative...and the hospital environment is not a particularly favourable terrain for such changes” (Boyer, Samuelian, Fieschi, & Lancon, 2010, p. 223). Change theories give insight into the process of change as well as the best ways to maximize successful transitions. Kotter’s model for leading change (Gupta, 2011, p.141) delineates eight stages: establish a sense of urgency, creating coalitions, developing a vision, communicating the vision, empowering employees for innovation, generating short term wins, consolidate gains to produce more innovation, anchoring the new innovation the business culture. The change leaders at the facility aligned their efforts with Kotter’s model as a structured process for planning, implementing and evaluating this transition.

Background/Significance of the Problem

The hospital is a member of a much larger health system. At the system level, beginning in May of 2010, a thirty-five member Nursing Informatics Committee and a forty five member Medical Informatics Committee had already been established with the goal of standardizing language within EPIC. Many sessions were conducted with employees and providers that made decisions about workflow, data use and content. (C. Saxton, personal communication October 8, 2013). Representatives were sent from nursing, medicine, pharmacy, billing and records to collaborative builds which were used to align the EPIC computer software with the corporate and clinical system.

More than two years ago, a hospital wide team was assembled to lead the change guided by Kotter’s model. Members of the hospital team included representatives from

various hospital departments including nursing as well as a physician champion. Hospital representatives were intricately involved in the change process and management at both the system level and the local level. A sense of urgency was established due to changes being anticipated as a result of the Affordable Care Act. The hospital's vision and strategy (Appendix A) were established, as well as a time line (Appendix A) for initiation; which indicated ninety day, sixty day and thirty day countdowns to implementation. Frequent communications were published including letters to employees over several months explaining the team's efforts.

Customers and patients were kept abreast of the project through various written publications dispersed to the community at large. Additionally, large free standing posters explaining the change and the timing were placed throughout the hospital. These posters briefly explained the change to computer based charting and asked for understanding and patience from the public during the implementation. Hospital employees were empowered for action via multiple education classes for nurses, physicians, nurse practitioners and physician assistants affected by the change. Local physicians using the facility were also included in classes for use of the new system.

Short-term gains became clear with the completion of the formal education piece in September 2012. The employees successfully met the challenges of the go-live date of October 7, 2012. As the system was used, early gains were consolidated and these gains produced more change in practice patterns and generated more questions and innovations. Super users and other information technology specialists were available on the units as resources. Finally, as the initial year continued, the new EPIC system became anchored in the institution's culture.

Any change is challenging, but even more so at a small rural hospital with limited resources. Scheduling of nurses for training on the new EMR was difficult. In small

hospitals, limited nursing staff must be carefully scheduled to maximize education possibilities and to meet safe staffing levels. Some nurses volunteered to be trained early to be super users and subsequently assisted with the initial training of their peers and other hospital employees. Already tight nursing budgets were stretched to meet education and patient care needs. Therefore, this nursing education piece had to be efficient and effective and of value to the nursing staff.

Because nurses are the largest care provider group in any hospital, their ability to learn, change and adopt new care integration and documentation methods must be supported and enhanced. Benner's From Novice to Expert model, developed in the early 1980s, has direct application in this transition. Benner delineates five stages of skill acquisition: novice, advanced beginner, competent, proficient, and expert. (Butts & Rich, 2011). (Appendix B). Institution of the new EMR forced this group of nurses to relearn, refocus and utilize newly-acquired computer charting skills to change workflow and documentation methods. "Even the information technology (IT) discipline has used Benner's framework to illuminate challenges and opportunities throughout implementation of clinical decision support systems (CDSS) in nursing" (Butts & Rich, 2011, p.486).

Problem Statement

Making the change from paper record keeping to computer based record keeping is fraught with challenges. These challenges may include learning the new computer software, changing workflow and incorporating the new charting modality into daily practice. Nurses must successfully navigate this process to acceptance and mastery in order to assure safe, quality patient care and maximize the financial stability of the institution now and in the future.

According to Carayon et al (2011), there are several factors that affect nurses' acceptance of EHR: "implementation method, technology usability, and usefulness" (p.813).

Literature review revealed that nurses “accept” the change from paper charting to computer charting. Benner’s Model can be utilized to evaluate this acceptance more fully. Because the change to computer based health records has been mandated and will directly influence insurance payment and financial reimbursement issues, nurses must become highly proficient in the use of these technologies. “Nurses have for generations changed practice and adapted to new demands such as rising acuity, new treatments, and prevention of adverse events” (Hamer & Cipriano, 2013, p.19). Professional nurses are fluid individuals that embrace necessary changes for their daily practice. “Nurses spend more time with patients than any other health care provider and thus have the opportunity to play crucial roles in the implementing and achieving meaningful use of EHRs” (McBride, Delaney, & Tietze, 2012, p.41).

Purpose

The purpose of this mixed-method, longitudinal study is three fold: (1) to evaluate the implementation process from the nurses’ perspective, (2) to determine the ease of use of the new software, and (3) to evaluate the change in nurse self-efficacy using Benner’s scale over the first year of implementation.

Project Implementation

Design

The use of both quantitative and qualitative methods in one study has proven valuable. “One argument for blending qualitative and quantitative data in a study is that they are complementary; they represent words and numbers, the two fundamental languages of human communication....In a **triangulated design**, both qualitative and quantitative methods are used to capture the same phenomenon, with a focus on convergence and increased validity” (Polit & Beck, 2004, p.275). In the current study, both quantitative data and qualitative data was collected and examined. The survey questions

and focus group questions directly relate to each other and the qualitative data was used to enhance and clarify the quantitative data and vice versa. "By using multiple methods, researchers can allow each method to do what it does best, with the possibility of avoiding the limitations of a single approach" (Polit & Beck, 2004, p.274).

This study was conducted longitudinally from December 2012 to December 2013. "Nurses had more positive opinion of HER's one year after implementation than they did three months afterward..." (McBride, Delaney, & Tietze, 2012, p.37). Therefore, a longitudinal, triangulated mixed-method design is applicable.

Objectives

According to Carayon, et al, (2011) usefulness and usability of EMR's as well as the manner in which the technology is implemented can affect full acceptance of new technology. Survey items examined perceived usefulness and ease of use for the EPIC system. Plus, two items asked for a personal evaluation of the participants' level of expertise per Benner's scale (See Appendix B). "Factors that appear to affect nurses' opinions are the HER's usability and perceived usefulness, as well as the length of time since implementation.... (McBride, et al., 2012, p.37). Study objectives include (1) an assessment of system implementation; (2) ease of use; and (3) nurses' assessment of self-identification on Benner's scale. (Appendix C) All questions in each survey were evaluated at four months post system go-live; six months post initiation and one year after initiation.

Methodology

A thirteen item questionnaire was developed to meet the objectives of the study (Appendix C). Four demographic questions were followed by nine survey questions. Objective number one was measured using survey questions number 2, 3, 4, 5, and 7.

Objective two was measured using survey questions 1 and 6. Objective three was measured by using survey questions 8 and 9.

Included nursing staff was solicited via scheduled unit meetings to complete the questionnaire relating to their perceptions regarding the change to EMR. (Appendix C). The questionnaire is divided between demographic questions and survey questions. The demographic questions could yield relevant information compared to the survey questions especially if gender, years' experience as a nurse or years' experience with computer charting impacted results.

Because the study was longitudinal, data was collected three times during the first year of implementation: at four months, at six months and at one year. The first data collection was originally planned for mid-December 2012, but per the request of the involved nurse managers, the initial data collection took place in January 2013. The second data collection took place in March of 2013. The final data collection took place during October 2013 at one year post implementation.

Three focus groups were conducted independently of the unit meetings and questionnaire completion. (Appendix D). Timing for each group was approximately two weeks after the survey collections were complete; except for the third focus group which was conducted December 3, 2013. All focus group recordings were transcribed by an individual with no association with the studied institution. Transcripts were examined to establish recurring themes and the results were reviewed with individuals via participant feedback within the affected departments for confirmability and clarity. Themes were then compared with questionnaire results for triangulation of results. "Methodological triangulation has been found to be beneficial in providing confirmation of findings, more comprehensive data, increased validity and enhanced understanding of the studied phenomenon..." (Bekhet & Zausniewski, 2012, p. 40). The quantitative and qualitative data

evaluations were completed independently; subsequently, the two data types were compared. By utilizing triangulation of method, data can be examined in the “widest possible manner and subjected to critical scrutiny instead of simply accepting findings from one methodological paradigm” (Williamson, 2005, p.17).

Protection of Human Subjects

Institutional review board approval was gained from both Otterbein University and the studied hospital before data collection began. Both IRB's included waivers for collection of signed consent forms. All data was reported only in the aggregate. Additionally, questionnaires were stored in locked areas away from the study site and transcription was carried out by personnel with no relation to the hospital or university. No compensation was offered for participation. However, results were shared at the conclusion of the study. Individuals remained anonymous as results are reported as aggregate data only.

Sample

The entire registered nursing staff was considered for participation in this study. This group numbered approximately one hundred twenty individuals and represented departments including emergency, intensive care, medical-surgical, obstetrics and surgery. Upon further examination, both the obstetrics and surgery departments were excluded from the study because these units were already using a computer charting system and were not making a change directly from paper charting to computer charting. The included departments were emergency, medical-surgical and intensive care; the number of registered nurses as potential participants was sixty individuals. Percent of participation in the first data collection was twenty two percent, second collection twenty five percent, and third collection forty-two percent.

Participants were recruited during department specific unit meetings in January 2013, March 2013, and October 2013. After discussion with the nurse managers involved,

the decision was made to use paper questionnaires for this study. Three focus groups of five self-selected nurse volunteers were conducted at approximately the same time as the data collections. The purpose of these groups was to elucidate common themes surrounding the change from paper charting to computer charting and compare those themes to data collected from the questionnaire. Each focus group contained different individuals; every focus group volunteer had an opportunity to complete surveys. Because the surveys were anonymous, there was no way to track whether or not a focus group member had participated in the survey portion of the study. Focus groups were conducted away from any clinical areas in the hospital in private meeting rooms. No names were identified in any recordings. Recordings were destroyed after transcription and review.

Budget

The budget for this study was minimal with expenses for printing media totaling less than \$250.00. Transportation expenses to and from meetings for data collection totaled less than \$100.00. Transcription services were donated as was assistance with statistical analysis.

Data Analysis

Quantitative

Information was assessed with a questionnaire as repeated measures of the convenience sample of nurses through the study period. Questionnaire and focus group script was evaluated for face and content validity by registered nurses at a hospital not associated with and at a considerable geographic distance from the hospital studied. Descriptive statistics quantified questionnaire responses over time. Basic demographic data were sought via the questionnaire and included in this evaluation. The software package Minitab was utilized to calculate analysis of variance, Tukey grouping and significance.

First data collection took place at scheduled unit meetings in January of 2013, four months after the change to EMR. A brief presentation/explanation with (Power Point) slides was offered before the actual collection took place. The presentation contained introductions of the researcher, explanation of the study and well as review of confidentiality measures. There were two meeting times for both the emergency departments and medical /surgical departments and one time for the intensive care department. Second data collection (six months after implementation) in March of 2013 was similar in pattern but did not include the introductory Power Point. The final data collection took place in October of 2013, one year post EMR initiation.

Qualitative

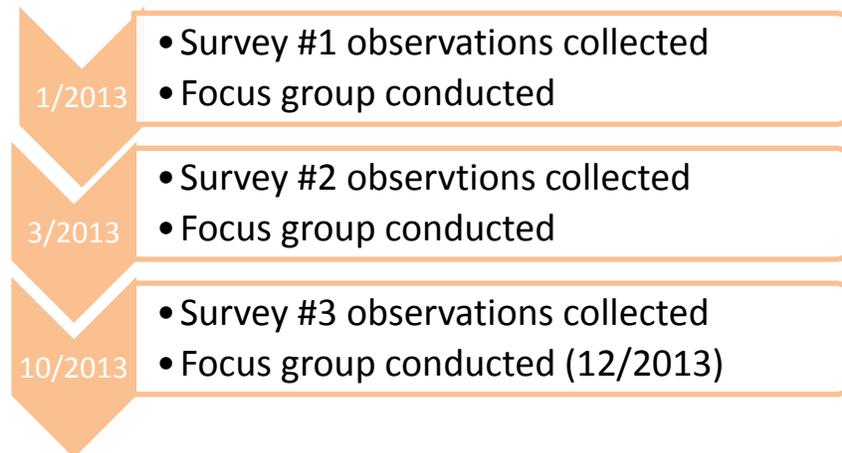
The focus group data were examined using the Colaizzi method for phenomenological study. This method involved seven steps: read/transcribe all subjects' descriptions, extract significant statements, formulate meanings, organize meaning into clusters/themes, organize into description of the phenomenon, formulate unequivocal identification statement, final validating step (Polit & Beck, 2004, p.585). The phenomenon examined in this study is the change from a paper charting record to a computer record through the lens of Benner's Model. "One of the most significant nursing studies conducted with the phenomenological method was performed by Benner...the phenomenon explored was the experience of clinical practice" (Burns & Grove, 2005, p.559).

Focus group conversations were transcribed and repeatedly examined iteratively starting at the word level to discern common themes. These themes were then validated by review with study participants (Burns & Grove, 2005, p.558). The information thus obtained and validated was compared to the questionnaire data. Polit and Beck (2004) state:

In studies with a component design, the qualitative and

quantitative aspects are implemented as discrete components of the overall inquiry, and remain distinct during data collection and analysis. Combining the qualitative and quantitative components occurs during the interpretation and reporting phases of the project (p.279).

Timeline



Outcomes and Analysis

Results (Quantitative)

Data analysis began by assigning nominal numbers to the answer options included in the questionnaire. This assignment makes conducting statistical analysis simpler. All survey questions (Appendix C) are similar to Likert-type scales. The numbers assigned are 1 (strongly agree), 2 (agree), 3 (neutral), 4 (disagree) through 5 (strongly disagree) for survey questions one through seven. For survey questions number eight and nine, the numbers one through five correspond with Benner's five levels of skill acquisition. The demographic question asking about number of years as a licensed professional nurse; six categories were necessary.

Data from each respondent in each data collection was entered onto an Excel spreadsheet. This raw data were entered into Minitab Program for further evaluation. Additionally, an analysis of variance was performed using the Tukey method to compare the results over time and assess statistical significance. In consultation with Dr. William Harper, statistician; the confidence interval was set to eighty percent (implying $p \leq 0.20$ for statistical significance) due to the studies' small sample size.

For the following information, each question is written directly above the corresponding pie chart. A key to the colors and assigned written categories with numerical designations also precedes the pie chart. Each chart shows three separate pie diagrams that correspond to data collection one, two and three. After each pie chart is a brief delineation of the results of the descriptive statistics and the report of analysis of variance and statistical significance.

Demographic Questions

Figure 1. How many years have you been a licensed nurse?

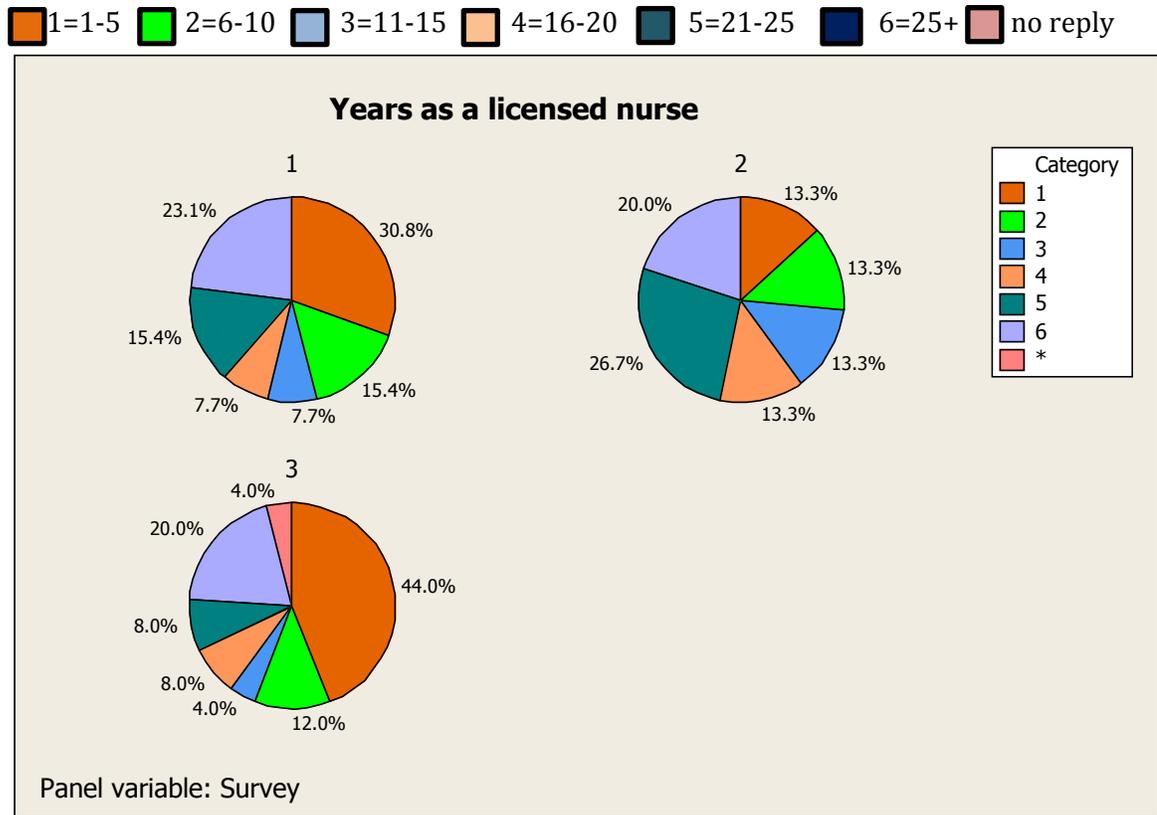


Table 1. Demographic Question one grouping information using Tukey Method and 80% confidence

p = 0.302

Survey	N	Mean	Grouping
2	15	3.867	A
1	13	3.308	A
3	25	2.833	A

Means that do not share a letter are significantly different at $\alpha = 0.20$.

In each data collection the brown color indicated the percentage of nurses with one to five years' experience as a licensed nurse. The green indicates those nurses with six to ten years of experience. Darker blue indicates eleven to fifteen years of experience. Peach

color shows percent of nurses with sixteen to twenty years' experience. Blue green indicates those nurses with twenty-one to twenty-five years' experience. Finally pale blue indicates those nurses with twenty-five or more years' experience. The small pale pink percentage (4%) in data collection number three indicates a no reply response to this question.

Tukey grouping is an analysis that is performed after the analysis of variance (ANOVA). The ANOVA tells us that certain means/groups differ. The Tukey grouping allows us to determine *which* groups are different. It also helps us to determine which groups differ significantly. Each set of data collections above are given a symbol. In this case letters are used: A and/or B. So, as stated above "means that do not share a letter are not significantly different from one another" (Minitab, 2014). There is no statistically significant difference between each of the three data collections on the measure of years of experience as a licensed nurse.

Figure 2. What is your age? (Years)

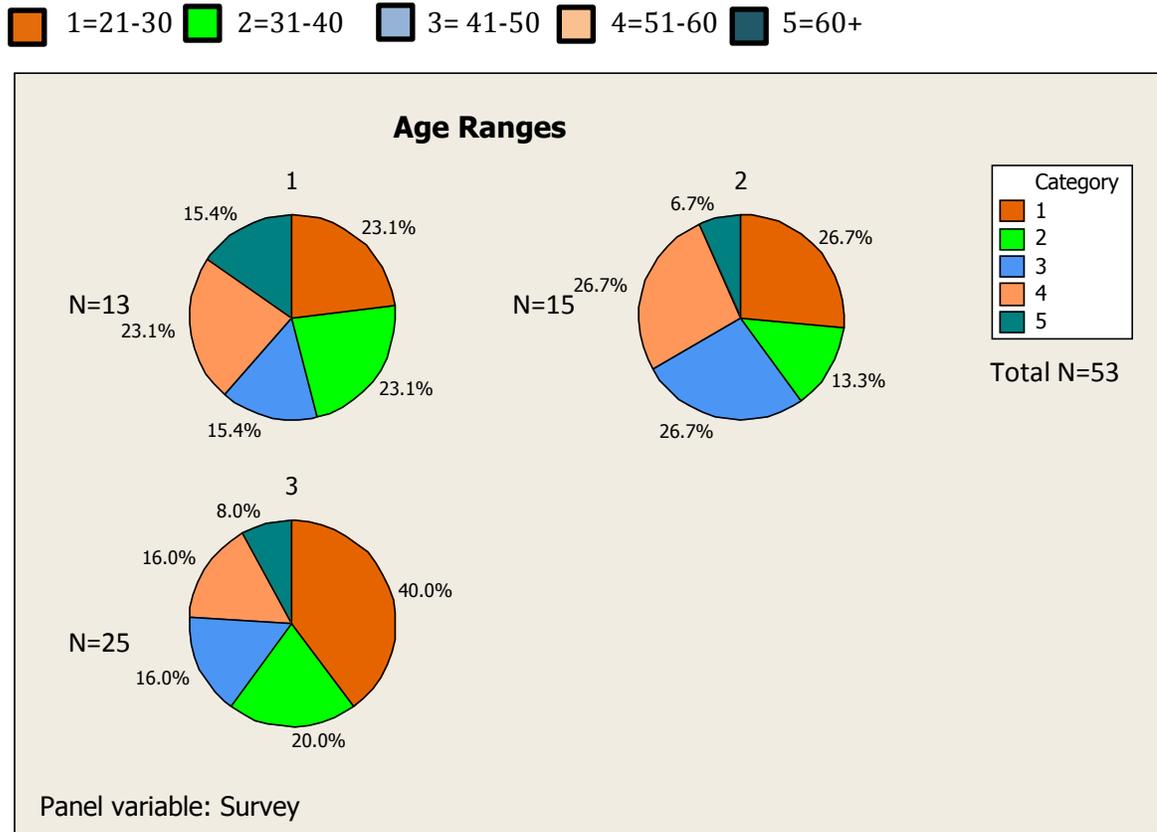


Table 2. Demographic question of age grouping information using Tukey Method and 80% confidence

P = 0.496

Survey	N	Mean	Grouping
1	13	2.864	A
2	15	2.733	A
3	25	2.320	A

Means that do not share a letter are significantly different at $\alpha - 0.20$.

This pie chart shows age ranges for the three data collections. Brown indicates age range from twenty-one to thirty; corresponding percentages are 23.1%, 26.7% and 40%. Green indicates the age range from thirty-one to forty; 23.1%, 13.3%, 20%. Blue indicates age range from forty-one to fifty; 15.4%, 26.7%, 16%. Peach indicate age range fifty-one to

sixty; 23.1%, 26.7%, 16%. Blue green indicates age range sixty years and above; 15.4%, 6.7%, 8%. Even though there was a staff turnover between collection two and three, there was no statistically significance ($p=0.469$) in ages between each collection group. Again, note the Tukey grouping shows only one shared letter. These calculated means share the same letter so they are not significantly different from each other.

Figure 3. Demographic question: How much experience with EMR in the past?

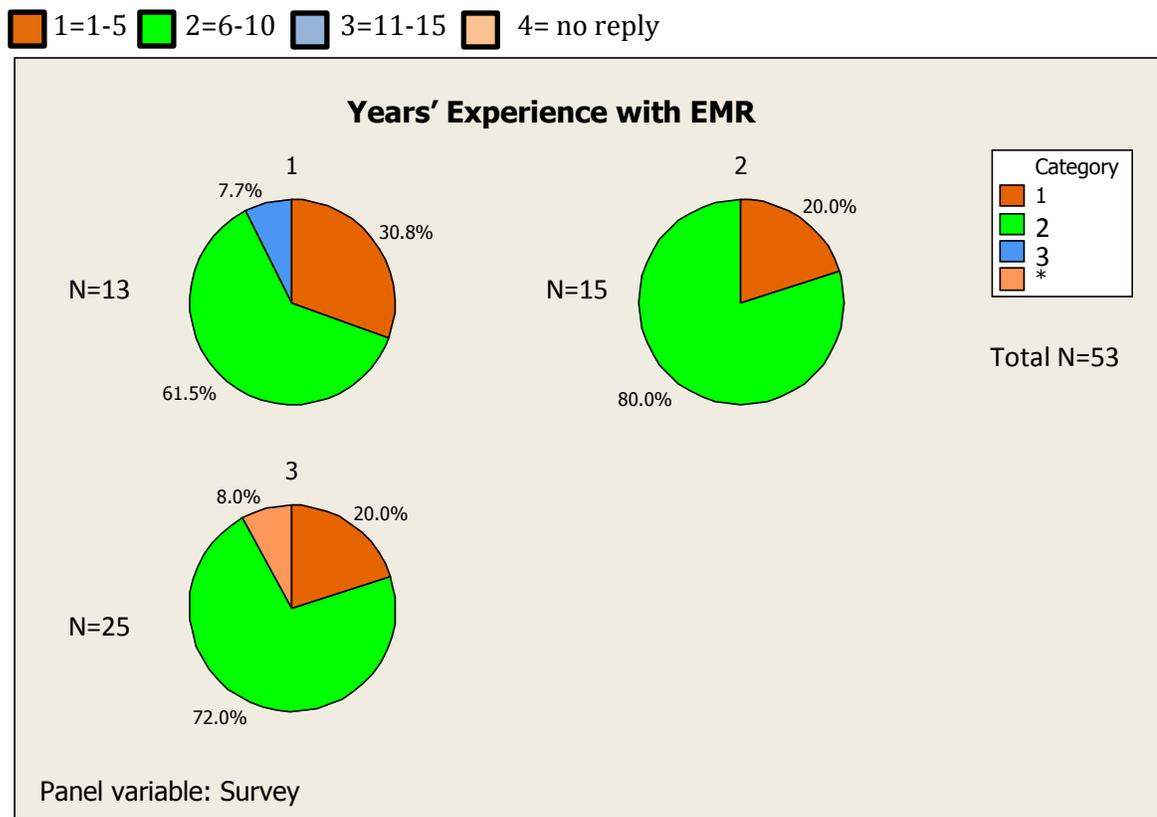


Table 3. Demographic question years' experience with EMR grouping information using Tukey Method and 80% confidence

P = 0.944

Survey	N	Mean	Grouping
1	13	1.846	A
2	15	1.800	A
3	25	1.783	A

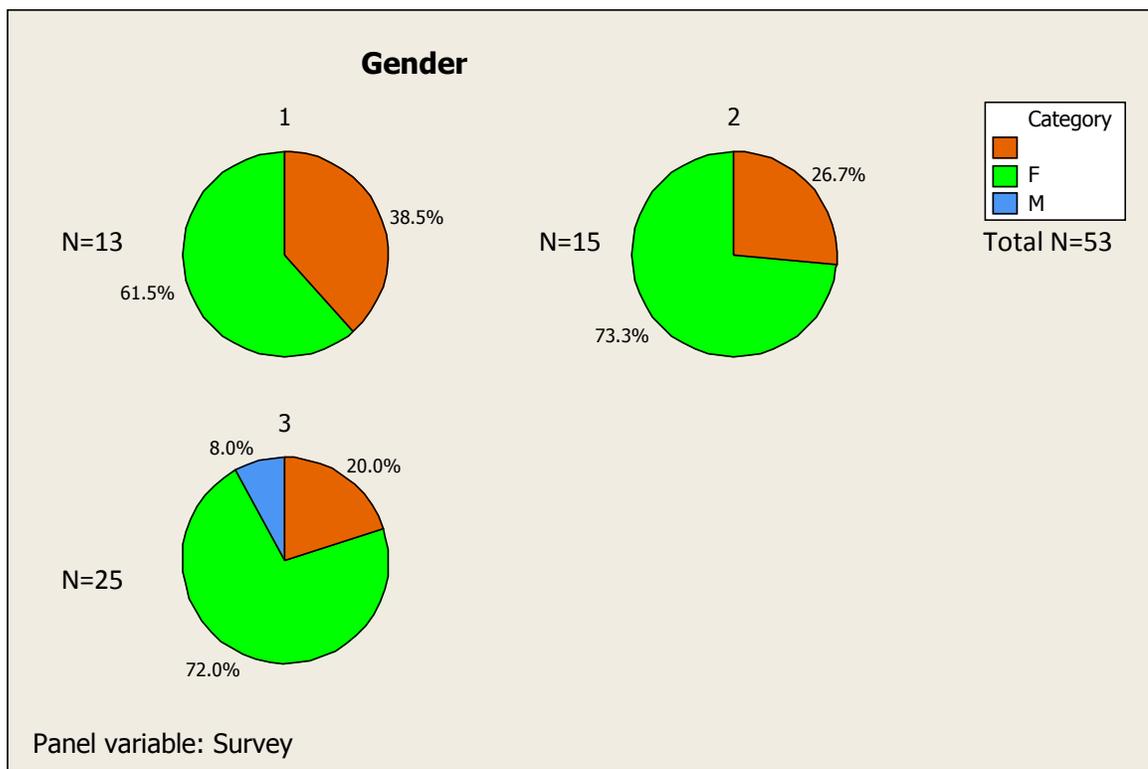
Means that do not share a letter are significantly different at $\alpha - 0.20$.

The range of years with experience with EMR is one through fifteen only. No one reported more than fifteen years' experience with EMR. The fourth category was no reply for this question. No significant differences are noted between the surveys ($p=0.944$).

Again, the Tukey grouping shows only one letter.

Figure 4. Gender:

■ No reply
 ■ Female
 ■ Male



The majority of respondents were female (green) 61.5%, 73.3%, 72%; with only two males (blue) 8% in collection three. The brown color indicates no response to this question (38.5%, 26.7%, and 20%).

Survey Questions

Figure 5. Survey Question 1: The change to EMR is challenging but manageable.

1= strongly agree 2= agree 3=neutral 4=disagree 5=strongly disagree

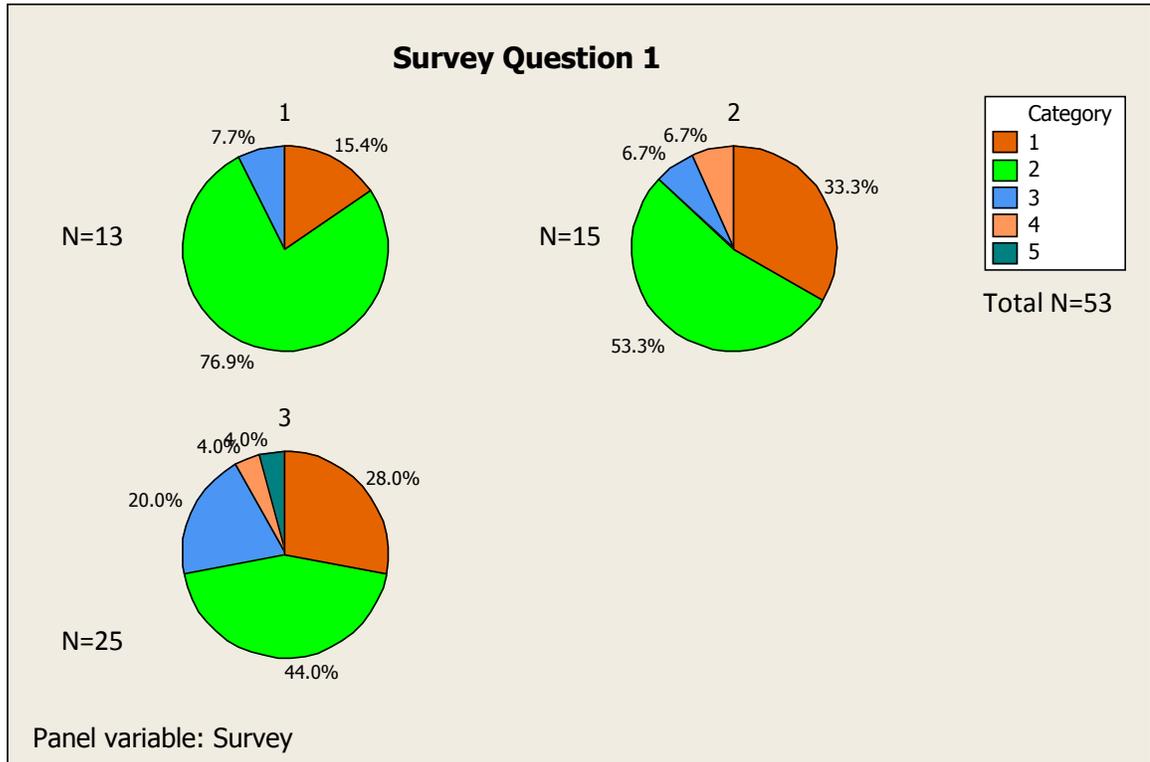


Table 5. Survey Question 1 grouping information using Tukey Method and 80.0% Confidence

P=0.627

Survey	N	Mean	Grouping
3	25	2.120	A
1	13	1.923	A
2	15	1.867	A

Means that do not share a letter are significantly different at $\alpha - 0.20$.

This question showed some interesting trends over the year. The initial findings showed that ninety-two percent of respondents either agreed (2, green) or agreed strongly (1, orange) that the change to EMR was challenging but manageable. That percent was

down to eighty-seven by six months post change. By one year, only seventy-two percent agreed the change as challenging but manageable. Because time from change to EMR is cited as one factor in nurse acceptance, this finding would seem to disagree with prior research noted by McBride, Delaney, & Tietze (2012). However, the hospital experienced a significant staff turnover in the departments studied and this turnover of staff could explain this finding.

The means across the three survey times did not vary by much. Across the one year study time, at each data collection, a majority of nurses felt that the change from paper to EMR was challenging but manageable. Although, the percent of agreement dropped per each data collection, the change was not significant.

Figure 6. Survey question 2: I found updates informative in keeping me aware of process/progress.

■ 1= strongly agree
 ■ 2= agree
 ■ 3=neutral
 ■ 4=disagree
 ■ 5=strongly disagree

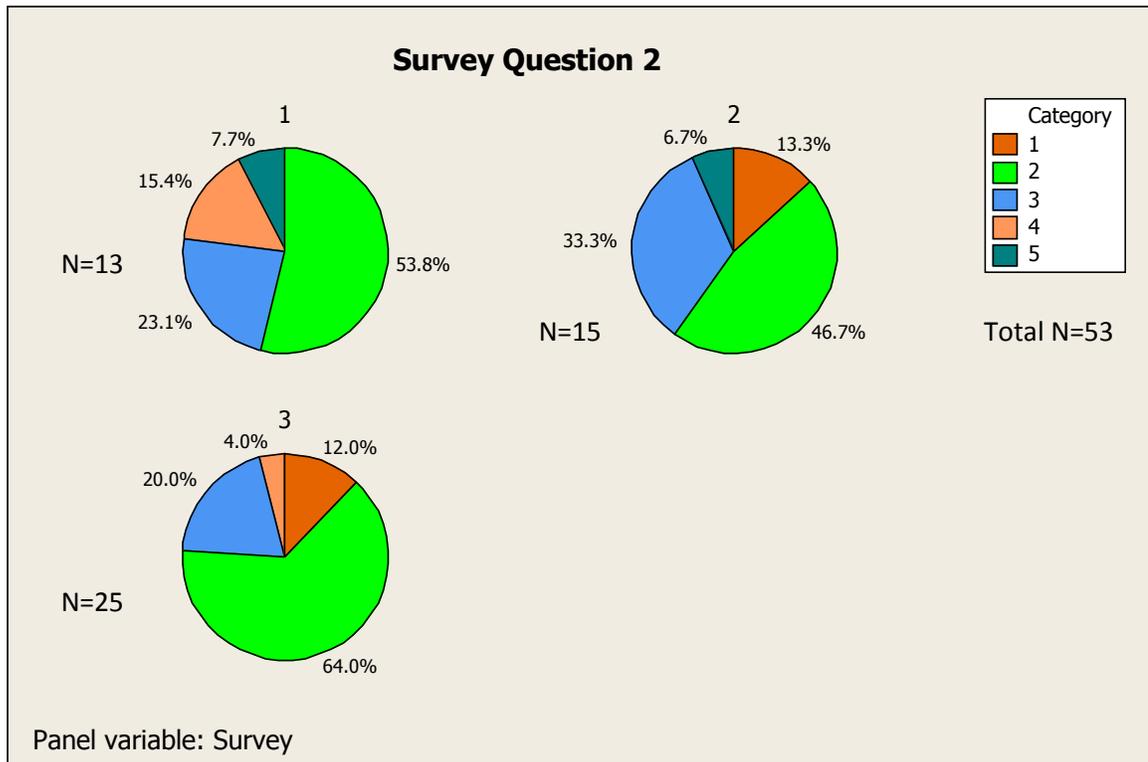


Table 6. Survey Question 2 grouping information using Tukey Method and 80% confidence

P = 0.129

Survey	N	Mean	Grouping
1	13	2.769	A
2	15	2.400	AB
3	25	2.160	B

Means that do not share a letter are significantly different at $\alpha = 0.20$.

This question regarding the adequacy of updates during the change process is interesting. At the first data collection almost fifty four percent of the respondents agreed with the statement that updates were adequate; no one strongly agreed. Plus, almost 8 % strongly disagreed that updates were adequate. At the six month post change measure, the percentages of agree and strongly disagree are very similar. However, we see 13% now report that they strongly agree that updates were adequate. By one year post implementation, no respondent strongly disagreed that updates were adequate. If we combine the agree and strongly agree responses we see 54% agree that updates were adequate in the first collection, 60% for collection two, and 78% for collection three. Therefore, adequacy of updates of the change process was rated higher over time. This difference is significant ($p=0.129$) at the eighty percent confidence level.

Figure 7. Survey Question 3: Education received was well organized with attainable goals.

1= strongly agree 2= agree 3=neutral 4=disagree 5=strongly disagree

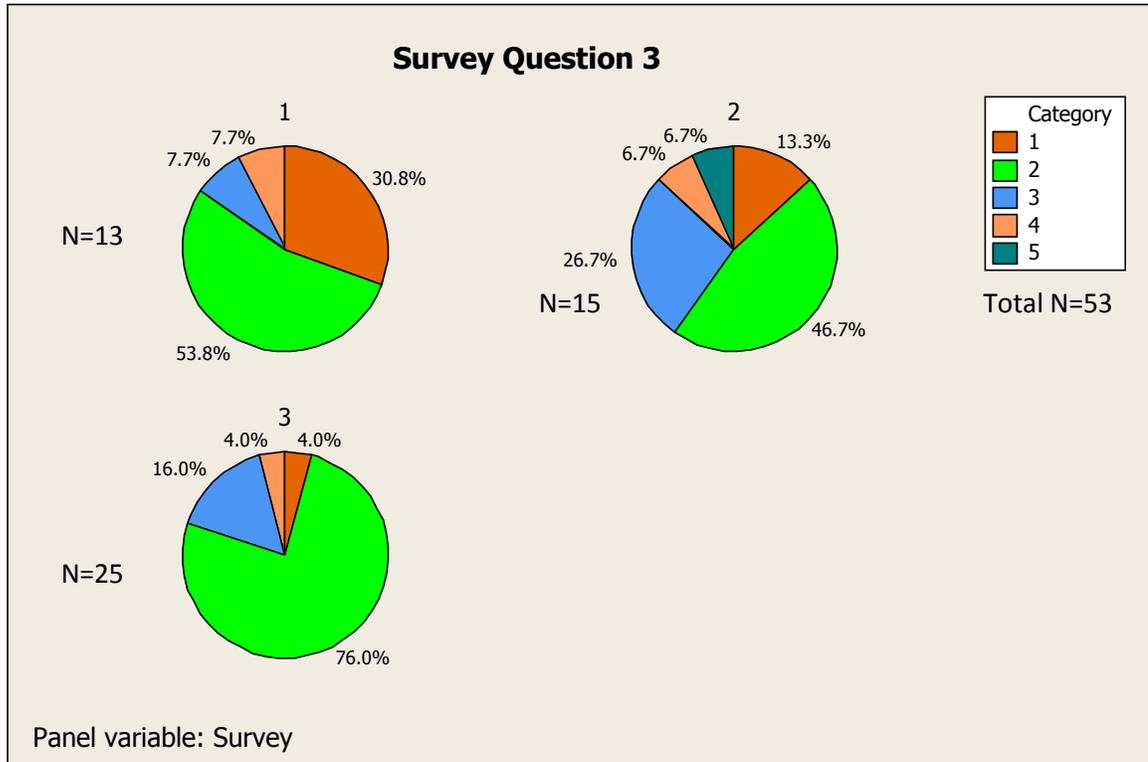


Table 7. Survey Question 3 grouping information using Tukey Method and 80% confidence

P = 0.217

Survey	N	Mean	Grouping
2	15	2.467	A
3	25	2.200	AB
1	13	1.923	B

Means that do not share a letter are significantly different at $\alpha - 0.20$.

On the question of whether the education received was well organized the results appear to be rather consistent. Four months after the change, 85% of the respondents either agreed or strongly agreed that the education was well organized with attainable

goals. At that time only 7.7% disagreed and no one strongly disagreed with this statement. By six months post change, the total of respondents who agreed or strongly agreed was down to 60% and now 6.7% strongly disagreed that the education was adequate. At one year post change, 80% either agreed or strongly agreed that education was well organized and again there were no respondents who strongly disagreed with this statement. Despite this, the result is not significant ($p=0.217$).

Figure 8. Survey Question 4: I received enough ongoing support to meet my needs.

1= strongly agree 2= agree 3=neutral 4=disagree 5=strongly disagree

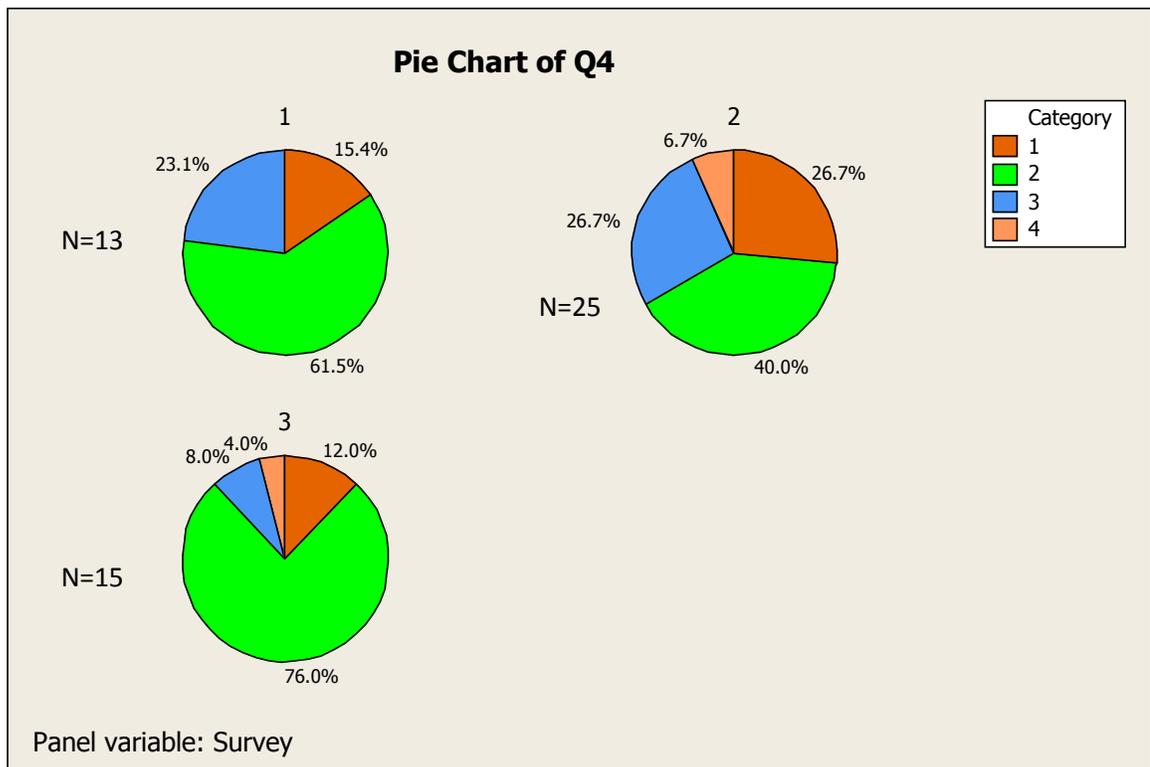


Table 8. Survey Question 4 grouping information using Tukey Method and 80% confidence
 P = 0.923

Survey	N	Mean	Grouping
2	15	2.133	A
1	13	2.077	A
3	25	2.040	A

Means that do not share a letter are significantly different at $\alpha = 0.20$.

Because, no one responded strongly disagree to this item there are only four categories reported. Nurses in each data collection felt that they were provided enough support during the change process. By combining the agree and strongly agree categories for each collection we see that 76.9%, 66.7%, and 88% of respondents respectively felt that the ongoing support was adequate. No one disagreed that support was adequate except in data collection two 6.7% disagreed that support was adequate. By the last collection the disagrees had dropped to 4%; and those who chose neutral had dropped from 26.7% to 8%. Although, it is good news that the majority of nurses felt that they were provided with adequate support, the changes in the means of each collection is not statistically significant ($p=0.923$).

Figure 9. Survey Question 5: I had opportunities to provide input into the EMR transition process.

1= strongly agree 2= agree 3=neutral 4=disagree 5=strongly disagree

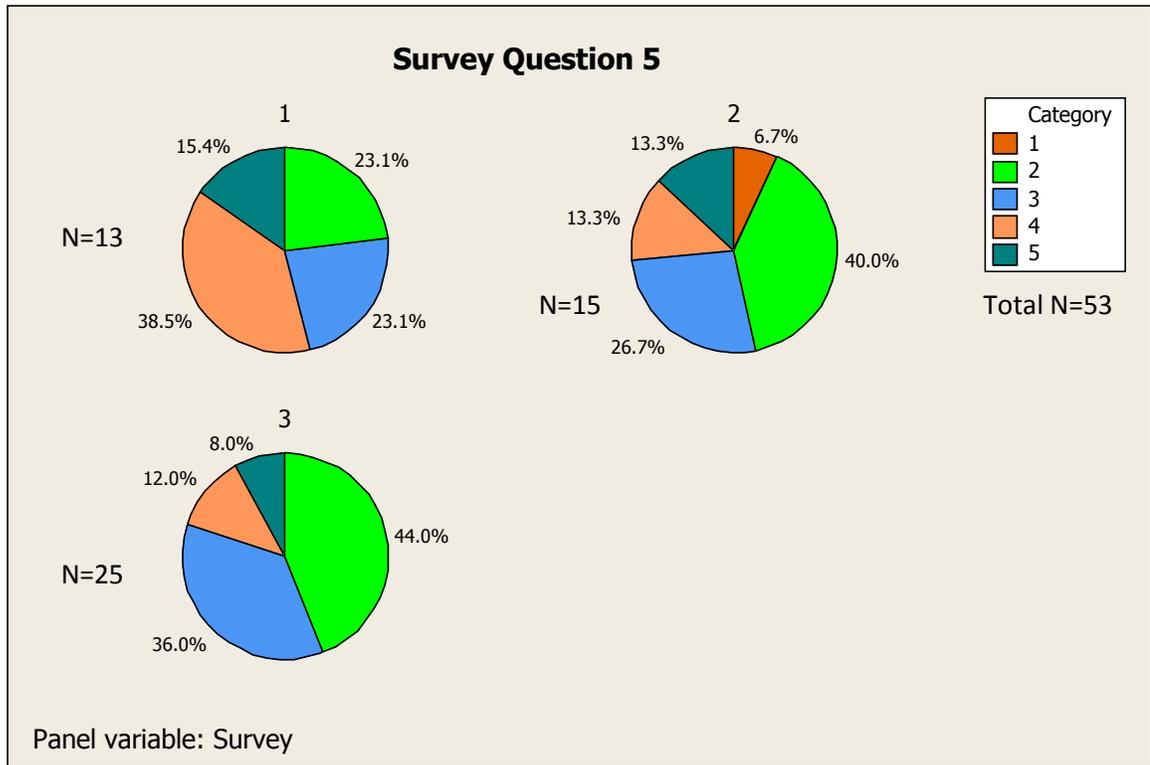


Table 9. Survey Question 5 grouping information using Tukey Method and 80% confidence

P = 0.195

Survey	N	Mean	Grouping
1	13	3.462	A
2	15	2.867	AB
3	25	2.840	B

Means that do not share a letter are significantly different at $\alpha = 0.20$.

Since one of the documented factors in EMR acceptance is having the opportunity to give input in the change process, these results seem a bit disheartening. In the first data

collection, almost fifty four percent of the nurses surveyed felt that they did not have opportunities to provide input during the change process. In the second data collection, this percent was down to 26.7%. By one year after change 20% of nurses felt that they did not have adequate input opportunities. Comparing data collection one and three, neither group agreed strongly that nurses had opportunities to give input to the change process. The Tukey grouping shows us letter A for collection one and letter B for collection three. Comparison of the means of data collection one and data collection three shows a significant difference at the eighty percent confidence level, $p = 0.195$. Therefore, more nurses felt that they had opportunities to give input for the change process in data collection three than in either collection one or two. However, the difference between collections two and three is not statistically significant.

Figure 10. Survey Question 6: The EPIC system is user friendly.

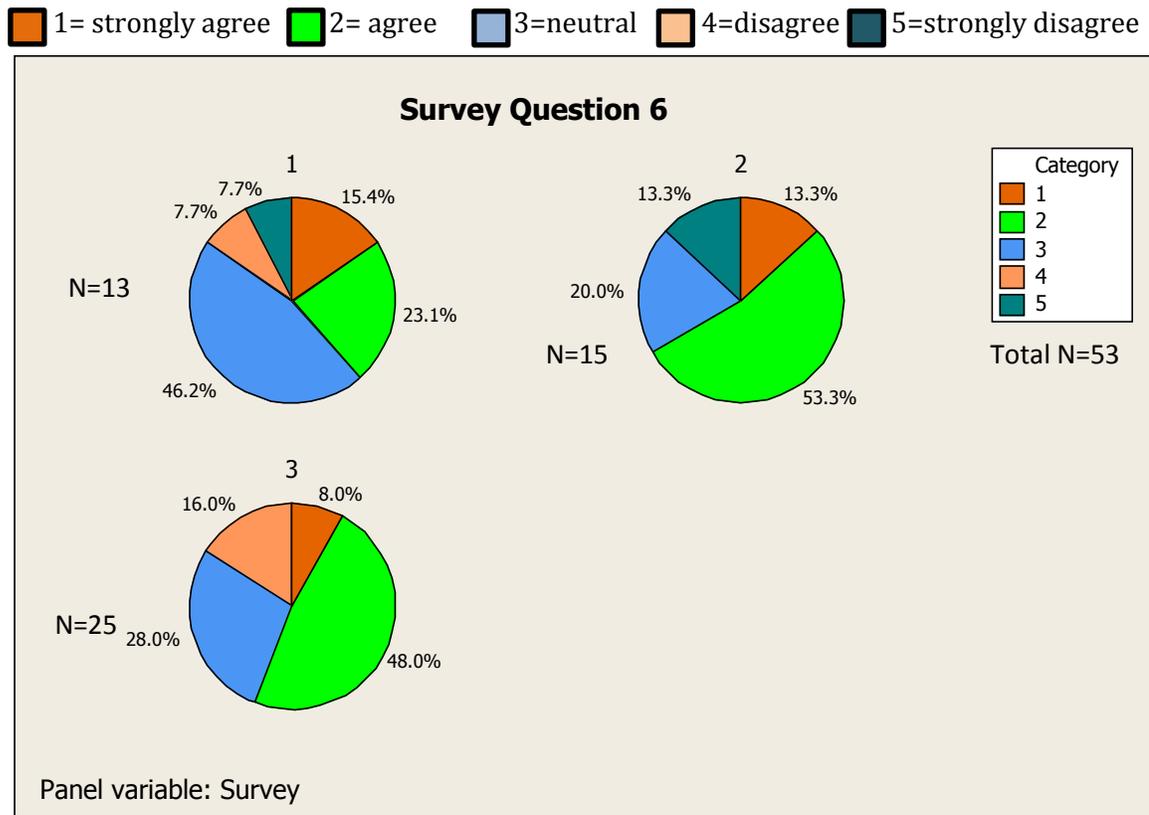


Table 10. Survey Question 6 grouping information using Tukey Method and 80% confidence

P = 0.832

Survey	N	Mean	Grouping
1	13	2.692	A
3	25	2.520	A
2	15	2.467	A

Means that do not share a letter are significantly different at $\alpha = 0.20$.

Nurses' assessment of the EPIC software as user friendly does increase over the year's assessment. Four months after initiation only a total of 39% of those responding agreed or agreed strongly. By the six month mark, 67% were in that combined category. In one year, 56% either agreed or strongly agreed that the system was user friendly. This decrease may be explained by the staff turnover during this time frame with more new

employees being introduced to and trained in the system. In the first data collection, nearly 8 percent strongly disagreed with that statement. But, no one strongly disagreed in either the second or third collection. Although these results vary, the differences are not significant, $p=0.832$ and the Tukey grouping reflected his result.

Figure 11. Survey Question 7: I accept the use of EMR as part of my daily job function.

■ 1= strongly agree
 ■ 2= agree
 ■ 3=neutral
 ■ 4=disagree
 ■ 5=strongly disagree

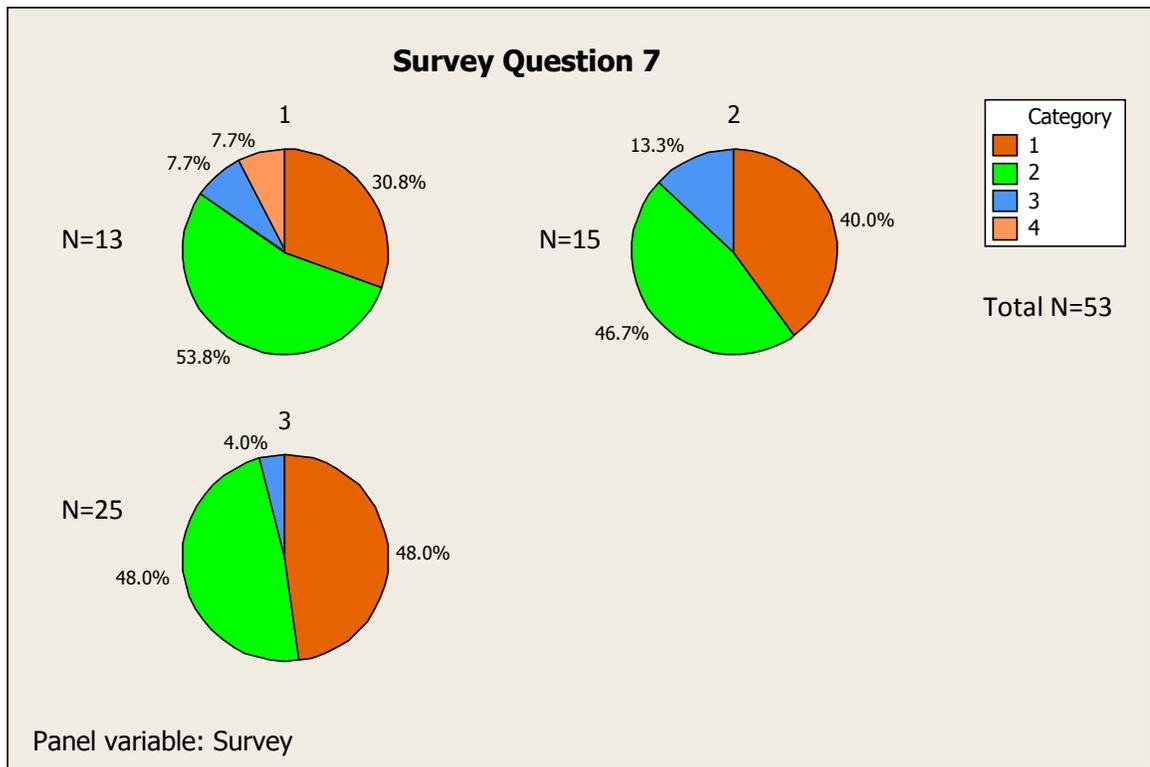


Table 11. Survey Question 7 grouping information using Tukey Method and 80% confidence
 P = 0.310

Survey	N	Mean	Grouping
1	13	1.923	A
2	15	1.733	A
3	25	1.560	A

Means that do not share a letter are significantly different at $\alpha - 0.20$.

Note that in this pie chart the strongly disagree category is not even seen. Nurses accept the use of EMR as expected. At four months post adoption, a full 85% of nurses responded either agree or strongly agree that they accept the use of EMR. Additionally, only 7.7 % disagreed and no one strongly disagreed. By six months, this has risen slightly to 87 %. At one year post change, 96% of nurses accept use of EMR and not one nurse either disagreed or strongly disagreed with this statement. Nurses are a very adaptable and accepting group and this result is not surprising. The means of the three data collections were not significantly different at the eighty percent confidence level, $p=0.310$.

Figure 12. Survey Question 8: Which best describes your use of the paper charting system?

1=novice 2=advanced beginner 3=competent 4=proficient 5=expert

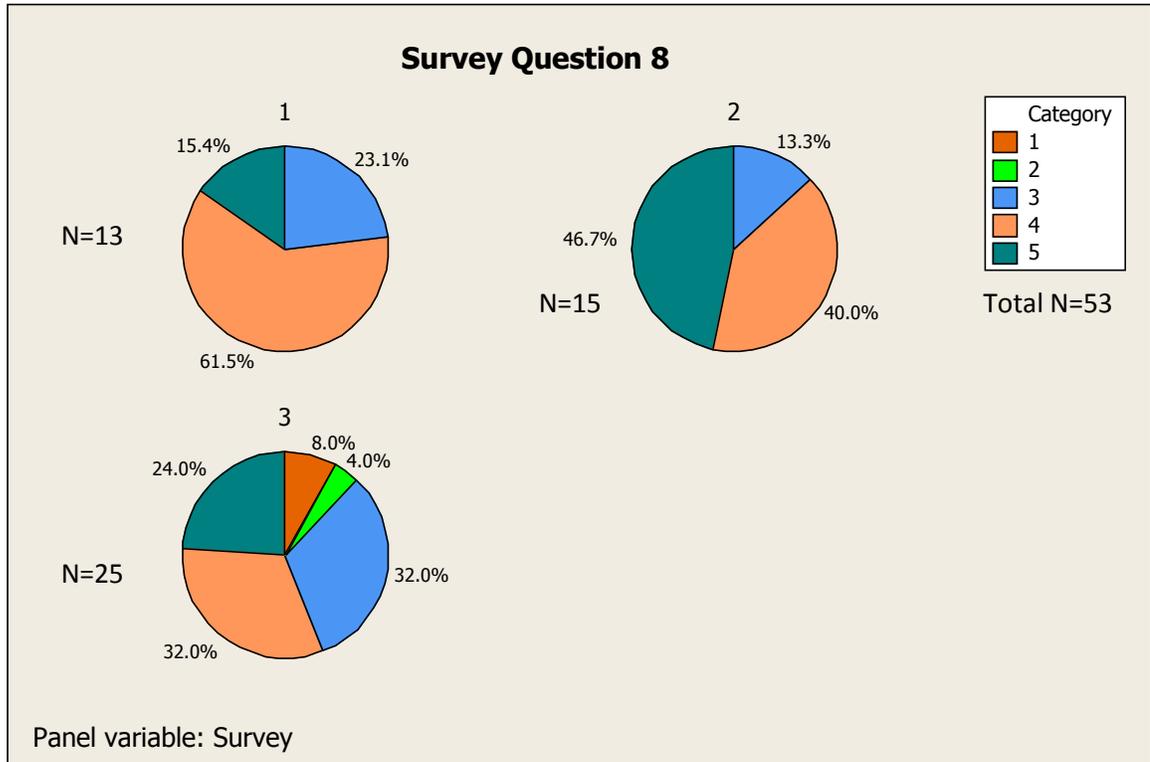


Table 12. Survey Question 8 grouping information using Tukey Method and 80% confidence

P = 0.067

Survey	N	Mean	Grouping
2	15	4.333	A
1	13	3.923	AB
3	25	3.600	B

Means that do not share a letter are significantly different at $\alpha - 0.20$.

Nurses' evaluation of their level of efficiency with paper charting is evaluated via the use of Benner's Model for nursing skill acquisition. Respondents were provided with Benner's definitions as per Appendix B with every questionnaire for each data collection. In

data collection one, nurses rated themselves as competent 23.1%, proficient 61.5%, and expert 15.4%. In data collection two, nurses again rated themselves as competent through expert. However, significantly more nurses rated themselves as expert with paper charts. At one year post EMR initiation, some nurses rate themselves as novice and advanced beginner with paper charts (12%). Significance (p=0.067) was noted between the means of collection two and three. Please remember that there was a significant staff turnover between the six month and one year data collection. However, the majority of nurses 88% still felt that they were competent to expert with paper charting.

Figure 13. Survey Question 9: Which best describes your use of the EPIC/EMR system?

1=novice
 2=advanced beginner
 3=competent
 4=proficient
 5=expert

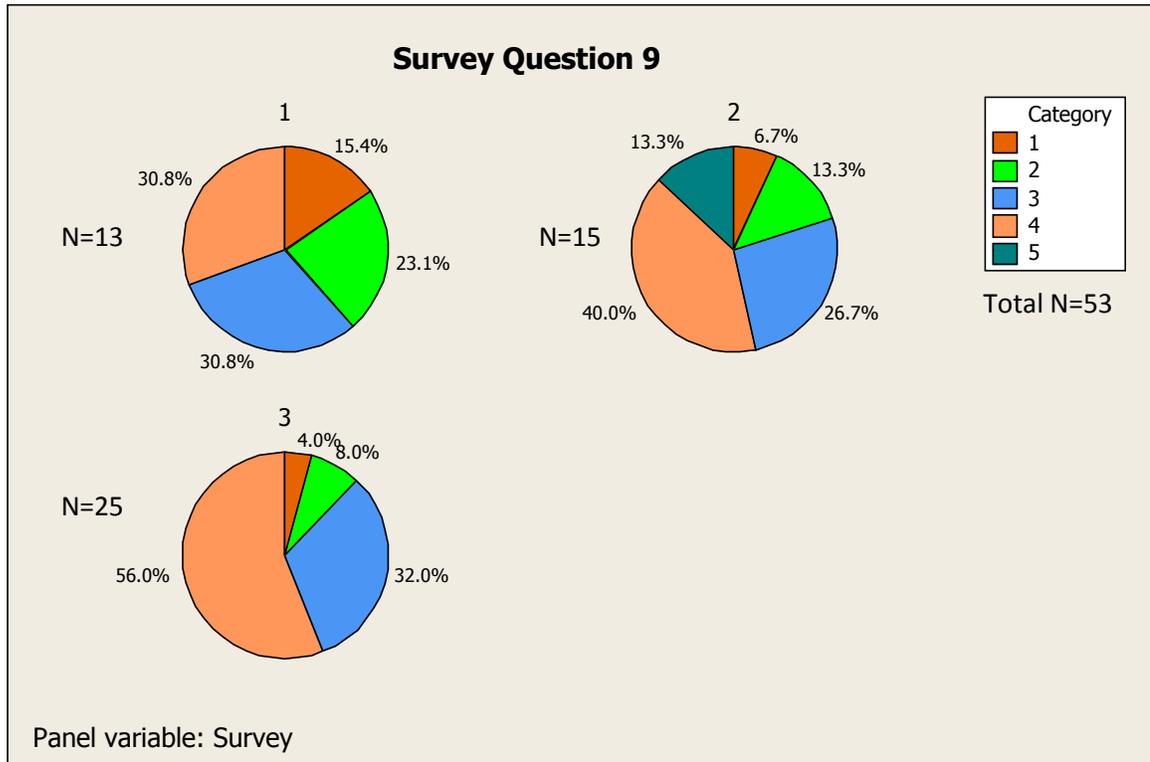


Table 13. Survey Question 9 grouping information using Tukey Method and 80% confidence
P = 0.141

Survey	N	Mean	Grouping
3	25	3.400	A
2	15	3.400	AB
1	13	2.769	B

Means that do not share a letter are significantly different at $\alpha - 0.20$.

With this question, nurses were asked to rate their skill level using the new EMR by using the categories per Benner's Model. In the first data collection, four of the five levels are represented: novice 15.4%, advanced beginner 23.1%, competent 30.8%, and proficient 30.8%. By the second data collection, 13.3% of nurses felt that they were expert in EMR use. However, by the one year mark, no nurses rated themselves as expert but 88% rated themselves from competent to proficient. The reason that survey three is significantly different than survey one is due to sample size (note its mean is 3.4 which is the same as survey two. The different means of collection one and three were statistically significant ($p=0.141$) at the eighty percent confidence level, indicating that the nurses' perception of their skill level with EMR had progressed on Benner's Scale over the year.

Let us now examine the number of years as a license nurse responses measured against survey question eight: Which best describes your use of the *paper* charting system?

Table 14. Survey Question 8 vs years nurse grouping information using Tukey Method and 80% confidence
P = 0.002

Years Nurse	N	Mean	Grouping
6	11	4.545	A
3	4	4.500	A
4	5	4.200	A
5	8	4.125	A
2	7	3.857	AB
1	17	3.176	B

Means that do not share a letter are significantly different at $\alpha - 0.20$.

There are statistical significant ($p=0.002$) differences between group one (one to five years) and groups 3 (eleven to fifteen), 4 (sixteen to twenty), 5 (twenty-one to twenty five), and 6 (twenty six plus). The mean score for the nurses with more than 25 years' experience is 4.545 as compared to the mean score for nurses with one to five years' experience at 3.176. Nurses with more experience ranked themselves higher on Benner's Scale with respect to their paper charting skills.

Question nine asks; which best describes your use of the EPIC/EMR system? This question was compared to years of nursing experience.

Table 15. Survey Question 9 vs years nurse grouping information using Tukey Method and 80% confidence

P = 0.001

Years Nurse	N	Mean	Grouping
3	4	4.250	A
4	5	3.800	A
2	7	3.714	A
1	17	3.353	A
5	8	3.125	AB
6	11	2.273	B

Means that do not share a letter are significantly different at $\alpha - 0.20$.

The more experienced nurses' (25+ years – selection 6) mean of 2.273 is less than nurses in all ranges from one through twenty and the difference is significant $p = 0.001$. So, nurses with more experience rated themselves lower on Benner's scale for skills related to EMR use.

Study objective number one assessed EMR system implementation. Nurses felt that the pre-implementation education and updates during implementation were adequate but neither of these demonstrated statistically significant differences over time. A majority of nurses reported that they received good ongoing support through the change; there were

no significant differences between the survey times. Although there was a statistically difference in response between survey collection one and three regarding the opportunity to give input, the majority of nurses felt that they did not have adequate opportunities to give input throughout the change process.

Study objective number two asked nurses to rate the friendliness/ ease of use of the new EMR system. A majority of nurses at each collection described the change as challenging but manageable and reported that the new system was user friendly. However, although some change was noted over the study period, none of the results showed statistical significance.

Study objective number three was each nurse's assessment of his/her skill level with both paper charting and computer charting. The data shows that eighty eight percent rated themselves as least competent with paper charting. There is a statistically significant difference between data collection two and three. However, this might be explained by the fact that there was a significant staff turnover during this time. Additionally, examine the pie chart for age ranges and it is obvious that the age ranges changed between data collection two and three. When examining the number of years as a licensed nurse plotted against the nurse's assessment on Benner's scale, we find some statistical significance. The most experienced nurses ranked themselves higher on Benner's scale with respect to their paper charting skills than did the least experienced nurses. Similarly, if we examine the number of years as a licensed nurse against the Benner scale ranking, nurses rated themselves higher on the scale over the year. The more experienced nurses ranked themselves lower on Benner's scale overall than the less experienced nurses in self-assessment of EMR competency.

Results (Qualitative)

Each focus group interview was transcribed by an individual not associated with the studied institution. The transcription was examined by comparison listening to the matching audio tapes to assure accuracy. Transcriptions were then analyzed using Colaizzi (Polit & Beck, 2004, p.585) phenomenological method. Significant statements were extracted and meanings were formulated. Three themes were noted: advantages of EMR outweigh paper, progress on Benner's scale from competent to expert regardless of age or experience, and desire to continue paper charting/stay with EMR in the future. These themes are displayed in Table 16 with supporting statements that follows.

Table 16 Qualitative themes with participant statements

Advantages of EMR outweigh paper	<p>“EMR is more efficient because we can have the chart in the room with us and chart medications as we give them and assessments”.</p> <p>“I like how we can see if the patient was here from times before and if they were in physician’s office; as long as the physician has EPIC you can see everything that was done.”</p> <p>“Paper charting was inefficient.”</p> <p>“Speed is better – don’t have to spend time trying to interpret what someone has written”.</p> <p>“Way more advantages.”</p>
Progress on Benner’s scale	<p>“In the beginning, an advanced beginner but now proficient”.</p> <p>“Probably proficient, you know, I get through it”.</p> <p>“I would have to describe my expertise as competent because I can do the screens as they come up but I am of that age that I don’t go fishing for things. I don’t look around and say ‘hey what will this do?’ and um I’m very uncomfortable doing that and I want to know what I am supposed to do on this screen and get it done and move on”.</p> <p>“I think because I have had all of the extra training I would probably say expert”.</p>
Desire to return to paper charting/stay with EMR in the future	<p>“No way. It was all doom and gloom this horrible plague of computers is coming. Within six weeks people were starting to get the hang of it, I think.”</p> <p>“I can’t imagine anybody would. I can’t think of a single person because it is just so much more efficient for our time. We are never staying after a shift anymore to get caught up on our charting”.</p> <p>“I can’t believe anybody would.”</p>

Since one of the study objectives is to examine the implementation of the new EMR, the focus group participants did comment on this aspect of the change. One nurse's comment is typical of the responses: "I just feel that I was not prepared and I think I could have been. My comfort level could have been a lot better before going live". But every focus group participant thought that the super users and the ancillary staff assigned to be on-unit help during the transition were very effective and responsive: "She took any questions or suggestions, she wrote everything down and all of that was taken to the change team and a lot of those changes, over the past year, things have changed and things have been updated".

A second objective was to ask participants to make an evaluation of their skill level with the new EMR using Benner's scale. An interesting side note was that nearly all the nurses with less than five years' experience had very little experience with paper charting and considered themselves as novices to advanced beginners with paper. However, these same nurses felt very good about their computer skills rating themselves as proficient and expert especially after one year of using the new system. When discussing experience with paper charting during a focus group, one nurse had this to say, "No, I only did it [paper charting] for a brief six month period when I first started here but at the other facility I worked at it was already switched over and even in school they didn't teach us how to chart paper-wise because it was so irrelevant".

The final objective was to examine nurses' perception of the ease of use of the new EPIC software. From the beginning nurses thought the software was user friendly; "So, at first I realized right away what a comprehensive program it was and it was much more thorough and would allow nurses to capture a lot more in their charting than when they were doing probably with paper charting". And further; "It is just point and click. Actually it does make a lot of sense the way they did it..."

Triangulation of survey results and focus group results

The type of triangulation used in this study is methodological triangulation which Burns and Grove (2005) define as “the use of two or more research methods in a single study” (p.225). The results discussed above for the survey and focus group components were compared for the purpose of confirmation and increasing validity. Examination of the objective number one regarding assessment of the implementation process of EMR (questions two, three, four and five) indicates that the two methods show agreement on several aspects. Nurses did not agree strongly that their initial education and opportunities for input were adequate. The focus groups responses echoed these findings. Nurses made statements similar to “I felt not prepared” and “Pre-EPIC courses were awful. I have figured out more on my own after go-live than they could have taught me”. However, they did report that they were satisfied with the ongoing support and updates received during the change. Support during the go-live process and adequacies of updates were rated well by participants in the survey. Adequacy of update during the change process was rated higher over time and was statistically significant. Similarly, the focus group nurses reported that ongoing support was adequate. “They were good” was one nurse’s response in the focus group when asked about on-going support. Several participants spoke to the receptiveness and effectiveness of those on-unit support persons. “She took any questions or suggestions she wrote everything down and all of that was taken the change team and a lot of those changes, over the past year, things have changed and things have been updated”.

The second objective to examine the ease of use of the program was rated by survey questions one and six. The majority of nurses surveyed rated these questions as strongly agree or agree. Focus group participants echoed this result with statements like: “Just point and click” and “I realized right away what a comprehensive program it was and it was much more thorough”. Other factors that focus group participants mentioned as making the

EMR easy to use are errors are easier to repair, and nurses receive an indication when their charting is complete via the system itself.

Objective number three involves individual nurses self-rating on Benner's scale. Eighty-eight percent of nurses rated themselves at least competent in the use of paper charts in the survey results. Focus group participants rated themselves from advanced beginner to expert. Interestingly, the nurses with less experience rated themselves lower on paper charting skills and higher on computer charting skills. Focus group statements give us a hint as to a possible explanation of this: "No, I only did it [paper charting] for a brief six month period when I first started here but at the other facility I worked at it was already switched over and even in school they didn't teach us how to chart paper-wise because it was so irrelevant". Are we possibly witnessing the beginning of the end of paper charting? Nurses' rating of their perceived skill level over time in relation to EMR use increased over the year and the results were statistically significant. Similarly, focus group participants rated themselves in a range from advanced beginner to proficient in the first group but by the third group the rankings did not include either novice or advanced beginner. The nurse participants rated themselves from competent to expert in the third group.

Conclusions, Summary & Recommendations

This study does support that nurses accept the change to EMR. "Nurses have been accepting of change and adapted to new ways of working" (Hamer & Cipriano, 2013, p.18). By the close of one year of use of the new EPIC system at the hospital, ninety-six percent of nurses accepted the change. The factors that enhance acceptance included implementation methods, usability of the software and length of time from start up. The use of Benner's scale to explore nurses' ranking of their perceived skill level showed progression on the scale over the yearlong study. This study is small and although some of its factors are in

agreement with prior work, application may be limited. The system of which the studied hospital is a part has more member hospitals that will be initiating this system. Further studies might be performed and the results compared to this one for consistency of results. The area of the survey results where nurses reported difficulties having input into the change process might be investigated more specifically. There was one anecdotal report of a hospital in the system reported to have had a very difficult time with the changeover to EMR. A retrospective study of the processes used there and in successful change facilities might yield interesting results.

Nurses in this project did accept the change to electronic medical record use. They also utilize education and support to progress along Benner's scale from advanced beginner to expert over time. They reported that the advantages of electronic charting outweigh the disadvantages and when asked whether or not they desire to return to paper charting modalities the answer is a resounding no.

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Appendix A

Clinical strategy vision:

That we are responsible for creating a human-centered system of care.

That we must systematically re-engage providers of care with the patients we serve.

That we should be gracious hosts to our patients and their families as the most vulnerable time of their lives.

We will deliver:

A system of care that is truly centered on the patient's health, life and spiritual goals.

A health system, enabled by technology, to support clinical decisions and eliminate preventable harm.

A clinical system that allows seamless access to patient information whenever – and wherever – care is delivered.

The power for the patient (and his or her caregivers) to guide and control the patient's plan of care.

Clinical change strategy vision, (2011).

Timeline of planned change to EPIC EMR

Early 2010 through early 2012 – Preliminary planning within the region with collaborative builds to standardize content and language.

May, June and July 2012 – Kick off with demonstrations and early education of super users.

August and September 2012 – Employee education including providers, nursing staff and other users. Community notification with regular updates.

October 7, 2012 – Go-live at 0200; stop using paper charts and use EPIC EMR

Appendix B

Benner's Stages Defined

Novice

Beginner with no experience
Taught general rules to perform tasks
Rules are context-free, independent of specific cases, and applies universally
Rule-governed behavior is limited and inflexible

Advanced Beginner

Demonstrates acceptable performance
Has gained prior experience in actual situations to recognize recurring meaningful components
Principles, based on experience, begin to be formulated to guide actions

Competent

Typically a nurse with 2-3 years' experience
More aware of long – term goals
Gains perspective from planning own actions based on abstract, and analytical thinking

Proficient

Perceives and understands situations as whole parts
More holistic understanding improves decision-making
Learns from experiences what to expect in certain situations and how to modify plans

Expert

No longer relies on principles, rules, or guidelines to connect situations and determine actions
Much more back ground of experience
Has intuitive grasp of clinical situations
Performance is now fluid, flexible, and highly proficient

Adapted from:

http://currentnursing.com/nursing_theory/Patricia_Benner_From_Novice_to_Expert.html

Appendix C

Survey Questions

Please select one response for each question

How many years have you been a licensed nurse?

What is your age: 21 - 30___, 31-40___, 41-50___, 51-60___, 61 +___

How much experience with electronic medical records have you had in the past?

None___, 1-5 years___, 5-10 years___, 10+ years___

Male/Female

The following questions relate to your experience with the recent EMR initiative:

1) The change to electronic medical records (EMR) is challenging but manageable.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

2) I found the updates informative in keeping me aware of the process and progress of the EMR change.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

3) The education I received was well organized with attainable goals.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

4) I received enough ongoing support to meet my needs.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

5) I had opportunities to provide input into the EMR transition process.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

6) The EPIC system is user friendly.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

7) I accept the use of EMR as part of my daily job function.

___strongly agree, ___agree, ___neutral, ___disagree, ___strongly disagree

8) Which best describes your use of the *paper* charting system?

___novice, ___advanced beginner, ___competent, ___proficient, ___expert

9) Which best describes your use of the EPIC/ EMR system?

___novice, ___advanced beginner, ___competent, ___proficient, ___expert

Please add thoughts and experiences regarding the change from paper charting to EMR

Appendix D

Focus Group Script

Script for focus group introduction

Good morning/afternoon/evening. Thank you for agreeing to participate in this focus group activity. The discussion is part of the study entitled "Attitudes and Beliefs of Registered Nurses about the Process of Changing to an Electronic Medical Record in a Community Hospital: A Mixed Method Investigation". You will be asked to respond to several questions and your replies will be recorded. These recordings will be transcribed and examined to discover common themes. Your answers are confidential and your identities will remain anonymous. All data will be reported only in the aggregate. The recordings will be stored securely in a locked office and only the researcher and transcriptionist not affiliated with the hospital will have access to the recordings. Once the data have been extracted the recordings themselves will be destroyed.

This discussion will take approximately thirty minutes of your time.

Do you have any questions?

We will now turn on the recorder and begin with the first question.

Question 1: Please describe your nursing practice/experience with paper medical records.

Question 2: What do you feel are the advantages/disadvantages of paper medical records?

Question 3: Pick one of the following descriptors that best indicate your skill level in regards to paper medical records. Novice, Beginner, Competent, Proficient, Expert

Question 3: Please describe your nursing practice/experience with electronic medical records.

Question 4: What do you feel are the advantages/disadvantages of electronic medical records?

Question 5: Pick one of the following descriptors that best indicate your skill level in regards to electronic medical records. Novice, Beginner, Competent, Proficient, Expert

Question 6: Do you have any additional thoughts that you wish to share?