

Attitudes and Experience in Adoption of Electronic Health Record
Among Nursing Personnel

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Abstract

A cross-sectional study was conducted among 134 nursing personnel to explore attitudes and experience in adopting electronic health record, evaluate preliminary psychometric properties of Electronic Health Record Benefits (EHR-Benefits) scale and investigate the predictors of electronic health record benefits and avoidance of computer use. Most participants used a computer in accessing patient records and clinical documentation and were confident in using them. The accessibility of computers and slow connection to the network were rated as barriers to using computers. Principal component factor analysis resulted in a 5-item (EHR-Benefits) scale with Cronbach's alpha of 0.86. Simultaneous multiple regression models showed that the predictors explained 29.7% and 42.7% of the variance in perceived benefits of electronic health record and computer-use avoidance, respectively. Following two years of experience in using electronic health record, the majority of nursing personnel had positive attitudes and confidence in using computerized charting.

Keywords: information technology, attitudes, barriers, electronic health record

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Introduction

The impetus for adopting health information technology into our nursing practice was initiated by health policy legislation. Politicians and various health experts viewed electronic health record (EHR) as an essential tool in improving the health and healthcare of Americans, and as tools in improving the efficiency of the US healthcare system (Blumenthal, 2009). President Bush said “By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care” (Bush, 2004). This enormous vision of digitalizing US healthcare was swiftly carried on by President Barack Obama when he signed into law the American Recovery and Reinvestment Act of 2009 (ARRA) to revive our declining economy and healthcare system ("HITECH Act Enforcement Interim Final Rule," 2009; "ARRA" 2009); this act allocated 19 billion dollars in an immense effort to accelerate the adoption of healthcare information technology and EHRs (Steinbrook, 2009).

There are huge challenges and obstacles in digitalizing healthcare (Blumenthal, 2009) and adopting computers into the workflow of healthcare providers is a complex process fraught with potential problems (Banet, et. al, 2006). At this time, there are about 90 certified EHR vendors in the United States (Bean, 2010) which requires technical compatibility and interoperability to realize full potential (Christensen & Remler, 2009). The Alliance for Nursing Informatics (ANI) (2009) recognized that nurses form the biggest task force and front line caregivers in the healthcare arena and are critical to the success of health information technology (Lang, 2006). Experts suggested that key competencies for nurses in using information technology include computer skills and knowledge to perform basic desktop software (Halley, Seinsmeier, & Brokel, 2009).

However, there are varying degrees of computer proficiency demonstrated among health care providers (Kunz, 2010). Furthermore, a pilot study of graduating nursing students viewed informatics training as encroachment on clinical time (Fetter, 2008).

Background

The common terms of Health Information Technology (HIT) used in several literature sources included electronic health record (EHR), electronic medical record (EMR) or electronic patient record (EPR) (Cherry, Carter, Owen, & Lockhart, 2008). Healthcare Information and Management Systems Society (HIMSS) define electronic health record (EHR) as a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. The functionalities of EHR are point of care documentation of nursing assessment and interventions, results management (e.g. lab and x-ray results, diagnostic test results), clinical access of patient information (e.g. history and physical, operative reports, consults) and, electronic medication administration.

The overall adoption of EHR demonstrated considerable barriers among nurses like “too many work demands’, slowness and lack of computers” (Eley, Fallon, Soar, Buikstra & Hegney, 2007; Lee, 2007). Moreover, nurses’ age was also positively correlated with several barriers including IT knowledge and confidence in use of computers (Eley, et al., 2007; Lee, Mills, Bausell & Lu, 2008). Nurses viewed EHR as dehumanizing patient care (Huryk, 2010) and also complained that they spend about 13% to 28% of their time documenting care (Technology Informatics Guiding Education Reform, 2007). This increased the quality and completeness of documentation; however, excessive time spent documenting took away time spent from much needed patient care and interferes with workflow (Gugerty et al., 2007; Simon, et al., 2006; DePhillips, 2007).

Several studies and expert opinions identified financial cost as a primary barrier to the adoption of EHR (Anderson, 2007; Boonstra & Broekhuis, 2010; Cherry, et al., 2008; DePhillips, 2007; Christensen & Remler, 2009; DesRoches et al., 2008). However, the passage of ARRA provided substantial government funding and incentives which doubled adoption rate from 16 % to 35% in the last 2 years (Charles, Furukawa, & Hufstader, 2012; U. S. Department of Health and Human Services [HHS.gov], 2012). Many other barriers include the complexity of electronic medical records (Boonstra and Broekhuis, 2010; Whittaker, Aufdenkamp, & Tinley, 2009), lack of technical knowledge and support and, lack of time to train and be efficient with technology (Beiter, Sorscher, Henderson, & Talen, 2008; Simon, et al., 2006).

In contrast, a few perceived benefits of using EHRs were also reported. A study of urban hospitals in Texas showed promising benefits of EHR, wherein - automation of hospital's information system may be associated with reductions in mortality, complications and cost (Amarasingham, Platinga, West, Gaskin, & Powe, 2009). More perceived benefits included data accessibility, improved quality and safety measurement, increased functionalities and remote access abilities of EHR (Yoon-Flanery, et al. 2008). A few studies also identified significant improvement in the quality of nursing documentation (Whittaker, Aufdenkamp, & Tinley, 2009; Gunningberg, Dahm, & Ehrenberg, 2009). Interestingly, a recent systematic review of literature in the use of electronic documentation by nurses to improve patient outcomes remains unclear and research gaps remain in the areas of quality, outcomes, and process (Kelley, Brandon, & Docherty, 2011).

Methods

Aims of the study

The aims of this study were to: (a) explore the attitudes and experience in adopting electronic health record (EHR) among nursing personnel after utilizing technology for more than two years; (b) evaluate psychometric properties of the Electronic Health Record Benefits (EHR-Benefits) scale; and (c) identify the predictors of perceived benefits of EHR and computer-use avoidance

Study Design

A cross-sectional study design was used in this study.

Sample and setting

This study was conducted in a 301-bed acute care community hospital located in southern California. At the time of the study, all nursing departments were fully engaged in electronic health record. For the past two years, most aspects of documentation were done via computerized entry by both licensed and non-licensed nursing personnel.

Registered nurses (licensed nursing personnel) and patient care partners (non-licensed nursing personnel) working in different nursing units were recruited during several staff meetings from December 2011 to February 2012. The nursing staff working at Labor and Delivery and Behavioral Health Units were excluded from this study due to their use of different software and limited access to electronic health record.

Instruments

The 26 item survey questionnaire (Appendix A) used in this study was derived from the original 78-question survey questionnaire with permission to fit the purpose of the current study (Appendix B). The original 78-question survey questionnaire was

developed by a panel of experts from Australian government representatives, healthcare and nursing organizations. It underwent several iterations to ensure clarity and comprehension (Eley et al., 2008). The 26-question survey used in the current study covered perceptions, attitudes and experience in adopting electronic health record and computer charting, knowledge of current health information technology initiatives, barriers to use of computer, and technical/management support. The attitudes toward adopting electronic health record consists of 6 items with Likert-type response, ranging from strongly disagree (1) to strongly agree (5).

Procedures

An Institutional Review Board approval was obtained from Point Loma Nazarene University (Appendix C). Flyers were distributed and posted in all nursing departments two months prior to start of survey (Appendix D). During the staff meeting at each unit, all nursing personnel were invited to participate in the study (Appendix E). A survey packet that included introductory letter, 26-question survey questionnaire and demographic questionnaire (Appendix F) were distributed to all nursing personnel during staff meetings. Waiver of Consent documentation was requested since this study presented no more than minimal risk to subjects (Appendix G). The subjects' completion of the research instruments indicated their consent to participate in the study.

Data analysis

Quantitative data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 20 (SPSS Inc., New York, USA). Descriptive statistics of frequency, percentage, mean and standard deviation were performed to summarize the sample characteristics, attitudes and experience in adopting electronic health record.

The psychometric properties of the six items covering the attitudes toward adopting electronic health record were evaluated. Principal component factor analysis with varimax rotation was performed to determine the factor structure of the six items. The criteria for interpreting factors were item-factor loadings of ≥ 0.40 and an eigenvalue greater than 1.0 (Nunnally & Bernstein, 1994). The resulting scale was named EHR-Benefits and Cronbach's alphas were calculated to determine the internal consistency reliabilities of the scale.

To identify the potential predictors of EHR benefits and avoidance of using a computer, bivariate Pearson's correlation analyses were first performed among dependent variables, sample characteristics, and confidence in and barriers to computer use. In this study, dependent variables were EHR benefits and avoidance of using computer. Those variables with statistically significant correlations with the dependent variables were selected as the potential predictors and entered into simultaneous multiple regression procedures to identify the predictors for EHR benefits and avoidance of using a computer. The significance level was set at $p < 0.05$ for all data analyses.

Results

Sample characteristics

A total of 134 out of 305 nursing personnel in the targeted nursing units completed the survey (44% response rate). The sample characteristics of participants are shown in Table 1. The majorities were Asian/Pacific Islanders, females, and staff nurses, with a mean age of 40 years and 11.9 mean years of nursing experience. About half of the participants had bachelor or graduate degree in nursing (47.8%) and worked in either medical-surgical or telemetry units (52.1%).

Experience in adopting EHR and computer charting

Most of the participants were confident in using the computer, email and windows operating system (Figure 1). About one-third were confident in using databases (36.4%) and evidence-based practice resources (34.4%). Most of the participants use information technology primarily for accessing patient records, bed management, patient assessment/documentation and care planning. The top three barriers to computer use were accessibility of computers, not enough computers and slow connection to the network (Figure 2). In contrast, age, discouragement by others, lack of encouragement by management, and attitudes of information technology (IT) staff were the lowest rated barriers.

Table 1 Sample characteristics (N=134)

Variables	<i>n</i> (%)
Age, mean (range), year	40 (21-67)
Gender	
Female	106 (79.1)
Male	26 (19.4)
Ethnicity	
Asian/Pacific Islanders	97 (72.4)
White	14 (10.4)
Hispanic	12 (9.0)
Black	5 (3.7)
Other	4 (2.9)
Education	
High school graduate	8 (6.0)
Certificate	21 (15.7)
Associate degree in nursing	36 (26.9)
Bachelor of Science in nursing	60 (44.8)
Graduate in nursing	4 (3.0)
Nursing position (change it to RN, LVN and PCP)	
Staff nurse	72 (53.7)
Charge nurse	20 (14.9)
Patient care partner	31 (23.1)
Other	9 (6.6)
Unit location	
Medical-surgical	27 (20.1)
Telemetry	43 (32.1)
Intensive care unit	10 (7.5)
Emergency department	19 (14.2)
Rehabilitation unit	24 (17.9)
Same day surgery	8 (5.9)
Years of experience in nursing, Mean \pm SD (range)	11.9 \pm 11.7 (0-45)

Note: Values are expressed as *n* (%) unless otherwise indicated. Percentage may not add up to 100% because of the missing data or rounding.

Majority of the nurses responded that IT and educational supports are good or excellent (64.2% - 65.6%) and the consultation by management and IT are also good or excellent (73.1%) in their workplace. In addition, the majority felt that management response to changes and suggestions by nurses to improve IT are good or excellent (60.4%).

Figure 1 Confidence in Information Technology/Computer use, % confident or very confident

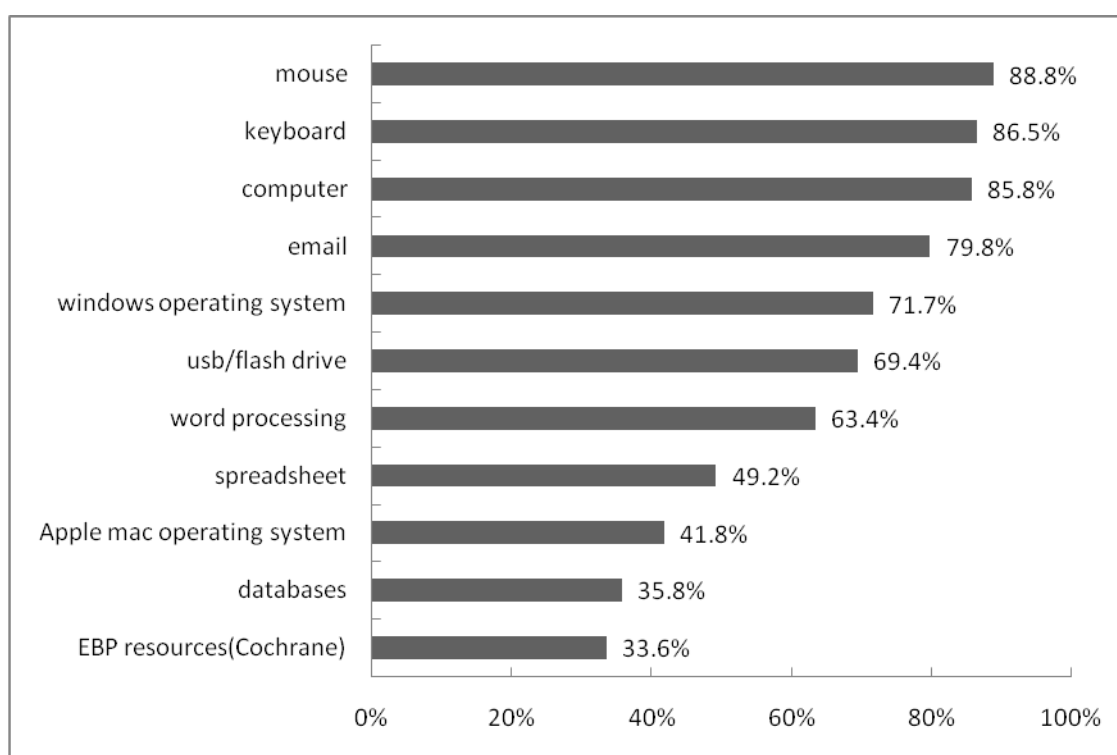
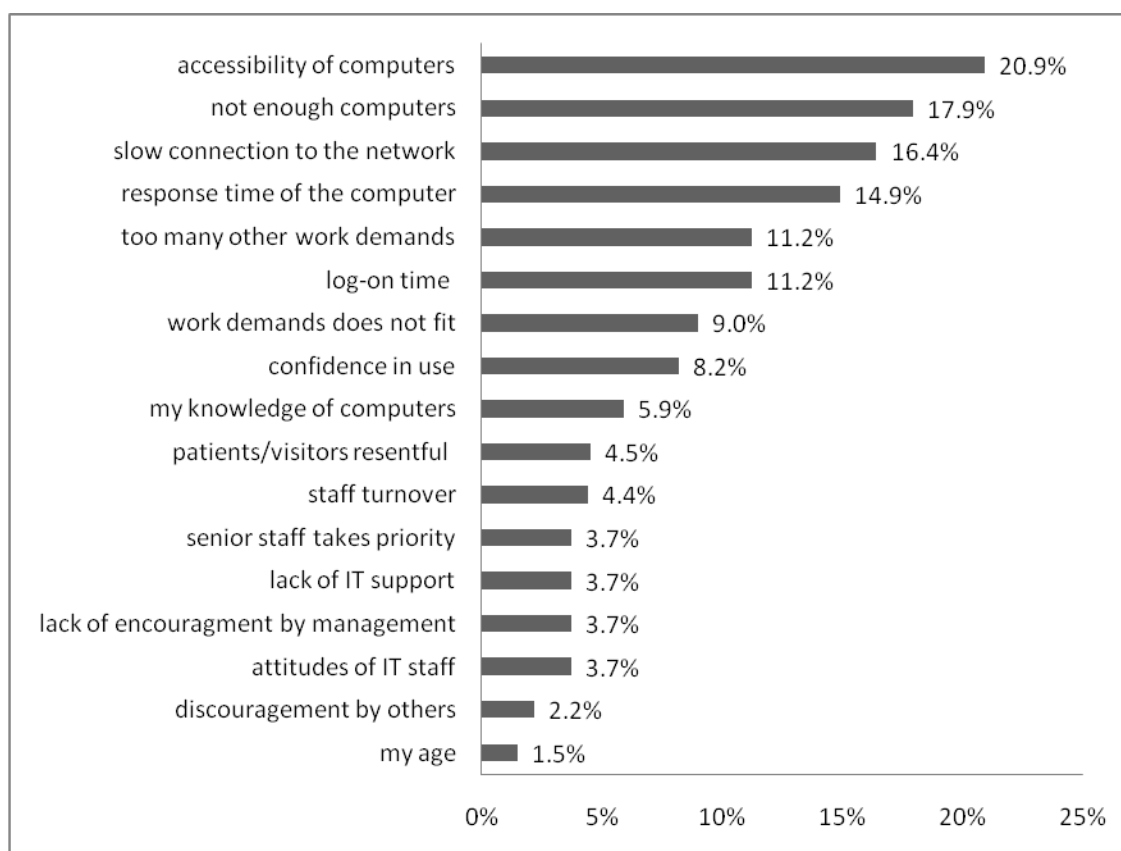


Figure 2 Barriers to computer use, % frequently or always



Attitudes toward Electronic Health Record (EHR)

Most of the participants reported that they were kept aware of general information technology development within their workplace (73.9%) and the adoption of national EHR will be beneficial to healthcare (90.3%).

A majority of the participants responded favorably to the five of six items related to their attitudes toward use of EHR (Table 2). The item, “learning about computer is essential for nurses...” had the highest mean score (4.60 out of 5.00). In contrast, the mean score of one item written in a negative direction, “I avoid using computer whenever I can” was the lowest (1.95).

Electronic Health Record Benefits (EHR-Benefits) scale

The principal component factor analysis of the six items resulted in one-factor solution consisting of 5 items and accounted for 54.37% of the total variance with an eigenvalue of 3.26. The factor loadings of these five items ranged from 0.66 to 0.90 (Table 2) and this factor was named as “EHR-Benefits” scale. The internal consistency reliability of EHR-Benefits scale was Cronbach’s alpha of 0.86. The single item, “I avoid using computer whenever I can” was excluded from the EHR-Benefits scale and was considered as a single-item variable representing a negative attitude toward computer charting.

Table 2 Mean (\pm SD) Scores of EHR benefits items and factor loadings

Variables	M (\pm SD)	Factor loading
Learning about computer is essential for nurses working in today’s health service.	4.60 (\pm 0.78)	0.66
The EHR that I use in my workplace reduces errors in patient data.	3.81 (\pm 1.03)	0.82
My use of EHR reduces duplication of data entry and storage.	3.72 (\pm 1.15)	0.78
The use of EHR in my workplace made my job easier.	4.01 (\pm 0.96)	0.90
EHR improved my access to information.	4.16 (\pm 0.91)	0.84

Note. EHR, Electronic Health Record; Possible range, 1 (strongly disagree) to 5 (strongly agree)

Predictor variables of EHR benefits and avoidance of using computer

The bivariate correlation procedures showed that having confidence in using Email, databases, spreadsheet and EBP resources are positively correlated with EHR benefits (Table 3). In contrast, these variables had negative correlations with avoidance

of using computer. Various barriers, including my age, my knowledge of computers and my confidence in using computers, all showed positive correlations with avoidance of using computer.

The results of simultaneous multiple regression analyses predicting EHR benefits are shown in Table 4. The normality, homoscedasticity and linearity for model assumptions were met (Tabachnick & Fidell, 2007). The combination of potential predictors explained 29.7% of the variance in EHR benefits ($R^2=0.297$, $p< 0.001$). Use of computer for personal-related activities ($\beta = -0.18$; $p = 0.030$) and barrier of “discouragement by others” ($\beta = - 0.19$; $p = 0.022$) were the statistically significant predictors.

For the avoidance of using computer, the combination of potential predictors explained 42.7% of the variance ($R^2=0.427$, $p< 0.001$) (Table 5). Having confidence in EBP resources ($\beta = - 0.19$; $p = 0.030$), having confidence in using computer ($\beta = - 0.37$; $p< 0.001$), medical-surgical unit ($\beta = 0.19$; $p< 0.021$) and rehabilitation unit ($\beta = 0.17$; $p< 0.048$) were significant predictors of the avoidance of using computer.

Table 3 Bivariate Correlations

Variables	Avoidance of using computer	EHR benefits
Age	0.339**	-0.098
Associate degree	-0.199*	0.081
Medical-surgical unit	0.181*	-0.069
Emergency department	-0.211*	0.220*
Rehabilitation unit	0.207*	-0.152
Staff nurse	-0.132	0.236**
Charge nurse	-0.037	-0.227*
Years of experience in nursing	0.254**	-0.108
Use computer for personal-related activities	0.185*	-0.213*
Confidence: Using computer	-0.478**	0.267**
Confidence: EBP resources	-0.321**	0.268**
Confidence: Email	-0.364**	0.331**
Confidence: Databases	-0.348**	0.279**
Confidence: Spreadsheet	-0.247**	0.275**
Adoption of national EHR initiative beneficial	-0.071	0.189*
Knowledge of national initiatives	0.008	0.229*
Barrier: Long on time is too long.	0.108	-0.238**
Barrier: Patients/visitors resentful of me	0.178*	-0.173
Barrier: Discouragement by others	0.163	-0.189*
Barrier: My age	0.208*	-0.150
Barrier: My knowledge of computers	0.236**	-0.062
Barrier: My confidence in using computers	0.274**	-0.073
Barrier: Attitudes of IT staff	0.186*	0.040

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; EBP, evidence-based practice; EHR, electronic health record; IT, information technology

Table 4 Simultaneous multiple regression predicting EHR benefits

Predictor	EHR benefits	
	β	p
Staff nurse	0.16	0.088
Use computer for personal-related activities	-0.18	0.030*
Knowledge of national initiatives	0.16	0.071
Barrier: Long on time is too long	-0.14	0.090
Barrier: Discouragement by others	-0.19	0.022*
R^2	0.297 $F_{13,120} = 3.906^{***}$	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 5 Simultaneous multiple regression predicting avoidance of using computer

Predictor	avoidance of using computer	
	β	p
Associate degree	-0.17	0.075
Medical-surgical unit	0.19	0.021*
Rehabilitation unit	0.17	0.048*
Confidence: Using computer	-0.37	< 0.001***
Confidence: EBP resources	-0.19	0.030*
Barrier: Patients/visitors resentful of me	0.15	0.058
R^2	0.427 $F_{15,118} = 5.863^{***}$	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Discussions

The current study examined the nursing staff's attitudes and experiences with EHR two years following initial adoption. Participants in this study have been required to use EHR for all documentations and they strongly viewed EHR as a positive way to reduce errors and duplications in patient data entry and storage, improve documentations, and make the job easier. Using a computer was also viewed as essential in today's healthcare system and provided improved access to information. However, barriers to successful EHR adoption, such as poor system design, slowness of IT system and not enough computers, were found to be similar to those identified in previous studies (Eley, et al., 2008; Lee, 2007; Gugerty, 2007; Moody, Slocumb, Berg, & Jackson, 2004). The problem of poor system design identified by nurses in this and many studies suggest an overarching need to involve these front-line users in the design of EHR.

Preliminary psychometric testing of 6 items assessing attitudes toward adopting EHR resulted in a 5-item EHR-Benefits scale, showed satisfactory internal consistency reliability. This scale takes only a few minutes to complete and may be useful for quickly assessing healthcare providers' attitudes toward benefits of electronic health records. One item that is related to avoidance of computer use did not have sufficient factor loading to be included in the EHR-Benefits scale, but may be useful as a single-item question for assessing attitude toward computer use.

Utilizing these two variables, EHR-Benefits scale scores and the single-item computer-use avoidance scores as dependent variables, the combination of potential predictors explained relatively large fractions of variance in dependent variables, 29.7% and 42.7%, respectively. Interestingly, the statistically significant predictors for the

EHR-Benefits were both negative predictors, including use of computer for personal-related activities and barrier of “discouragement by others”. In contrast, working in medical-surgical and rehabilitation units were significant positive predictors of computer-use avoidance, whereas having confidence in EBP resources or in using computers were negative predictors of computer-use avoidance. In another words, levels of confidence in either EBP resources or in using computers predicted avoidance of using a computer. This may impact the quality and completeness of nursing documentation and may not capture the essence of EHR benefits like embedded safety alerts and triggers in e-mars and computerized physician entry (CPOE), updated critical results and point of care documentations that are all important in the provision of a safe and quality patient care.

Moody, et al., (2004) said nurses with expertise in computer use had a more favorable attitude toward EHRs than those with less expertise. Positive attitude toward use of computer is influenced by level of education and increased computer experience (Kaya, 2011; Kivuti & Chepcirchir, 2011; Huryk, 2010; Alquaraini, Alhashem, Shah, & Chowdhury, 2007). Moreover, the study done by Alquaraini, et al., (2007) showed a statistically significant positive attitude of nurses towards computer use which could be attributed to previous computer use and higher education. Despite very positive results relating higher education and positive attitude in computer use, bachelor and master degree in nursing which is characteristic of almost half of the respondents surprisingly did not emerge as one of the predictors of EHR benefit. Thus, the implication that higher education is beneficial to engender use of EHR is inconclusive and needs further study.

Management also supports changes and suggestions by nurses to improve information technology. Other studies also identified support at the state regulatory,

management, and clinical level as facilitating the adoption of EHR; these are achieved through the implementation of individualized teaching, training programs and support, government assistance with implementation costs and inclusion of nurses in selecting desired software (Cherry, et al., 2008, Yoon-Flannery, et al 2008; Bassendowski et al., 2011; Haughom, Kriz, & McMillan, 2011). However, analysis of data pertaining to support did not show further significant result to identify this as a predictor to EHR benefits.

Limitations

The current study had several limitations. First, the study participants were predominantly Asian/Pacific islanders, which may limit generalizability of the study findings. Second, the self-reporting response of this questionnaire may have caused overestimation of the positive responses. Third, the results of this cross-sectional study should not be taken as cause-and-effect relationships. Finally, the EHR-Benefits scale needs to have further psychometric testing to further validate the scale and confirm the internal consistency reliability.

Conclusions

Majority of nurses use EHR technology primarily for point of care clinical documentation and interventions, assessing results, bed management, and EBP resources. Despite an accelerated diffusion of computerization in nursing practice mandated by federal legislation, the results of this study showed that the majority of the nursing personnel had positive attitudes and confidence in using computerized charting after two years of electronic health records adoption. The EHR-Benefits scale can quickly assess

healthcare providers' attitudes toward benefits of electronic health records, but further studies are needed to confirm the study findings.

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Appendix A

NURSES AND INFORMATION TECHNOLOGY SURVEY

INFORMATION TECHNOLOGY (IT)/COMPUTER BACKGROUND					
1. Do you use computer at all (at any location) for personal related activities?					
<ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No 					
2. Indicate how much you agree with the following statements?					
	Very Confident	Confident	A little Confident	Not confident	Don't know
Computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mouse.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Keyboard.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
USB/Flash Drive.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Word Processing.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spreadsheet.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Databases.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Evidence Base Practice Resources (Cochrane Library).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Email.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windows Operating System.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Apple Mac Operating System.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Indicate how much you agree with the following?					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I avoid using computer whenever I can.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Learning about computers is essential for nurses working in today's health service.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The EHR that I use in my workplace reduces errors in patient data.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My use of EHR reduces duplication of data entry and storage.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The use of EHR in my workplace made my job easier.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EHR improved my access to information.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Rank what you believe is the main driving force for the adoption of EHR in your workplace? (If you believe that there are more than one, rank them 1, 2,....6, with 1 being the main one)

- Patient Care
- Income Generation
- Office Administration
- Patient /Client Administration
- Saving Money
- None of the Above
- Don't Know

YOUR ACCESS AND USE OF COMPUTER, INTERNET AND INTRANET

5. How often do you use computer for ANY work related purposes in these locations?

	Never	Less than once a week	More than once a week	Several times a week	Once a day	More than once a day
Home.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Own work computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shared work computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work library.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local library.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet Café.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other(Specify) _____						

6. At which location do you use the following for work related purposes?

	Never	Less than once a week	More than once a week	Several times a week	Once a day	More than once a day
Home.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Own work computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shared work computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work library.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Local library.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet Café.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (Specify)_____						

7. If you use your home computer for work-related activities what sort of work do you do at home?

- Professional Development/Education
- Clinical Care
- Patient Care
- Administration
- Research
- Communication
- Other _____
- I don't use computer for work related purposes

8. Do you have personal email address at work?

- Yes
- No, because I am not allowed an address
- I am allowed an address but I do not use it

9. Regardless of whether you use it or not, do your facility have intranet and or internet?

<p>Intranet</p> <ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Don't know 	<p>Internet</p> <ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Don't know
--	--

10. Where do you access internet or intranet at work?

- Your workstation
- Director's office
- Personal mobile device
- Computer on wheels
- Work library
- Other _____
- I have no access

11. For what purposes do you use the internet/intranet?

- Clinical use (pharmacology, policies and procedure)
- Patient/ client management
- Administration
- Other _____

12. Do you require user name and password to access the internet/intranet?

- Yes
- No

Uses of Information Technology

13. How often do you use a computer for the following work- related purposes?

Patient /Client Management

	Never	Rarely	Occasionally	Frequently	Always
Accessing Patient Records.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appointment Scheduling.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bed Management (admission/transfer/discharge).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Patient assessment and documentation.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Clinical Use

	Never	Rarely	Occasionally	Frequently	Always
Clinical documentation (VSS, I & O's, etc.).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Assessment.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Care Planning.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interventions (Falls, blood transfusions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medication Management (administration, and /or supply)...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessing Results (laboratory, radiology, pathology).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ordering (medications, diagnostic test, referrals).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessing evidence base practice (resources, pharmacology).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessing policies and procedure.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Administration

	Never	Rarely	Occasionally	Frequently	Always
Administrative reporting.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Appointment Scheduling.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Staff Management (scheduling, staffing, evaluations).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Development of policies and procedures.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Finance (Billing, expenses, productivity).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Patient/Client Complains.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recruitment/Hiring.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

YOUR KNOWLEDGE OF CURRENT HEALTH INFORMATION TECHNOLOGY (IT) INITIATIVES

14. I am kept aware of general IT developments within my workplace?

Strongly agree Agree Disagree Strongly Disagree No Opinion

15. I believe that the adoption of national electronic health record initiative will be beneficial to healthcare?

Strongly agree Agree Disagree Strongly Disagree No Opinion

16. How would you rate your knowledge of health initiatives in your State?

Excellent Good Average Poor Very Poor

BARRIERS TO YOUR USE OF COMPUTER

17. Do any of the items listed below restrict your use of computer in your workplace?

	Never	Rarely	Sometimes	Very often	Always
Not enough computers.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessibility of computers I need to use.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Log on time is too long.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Slow connections to the network.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Response time of the computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Work demands does not fit working in front of computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Patients/Visitors resentful of me at the computer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
More senior staff takes priority.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Discouragement by others in my workplace.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Too many other work demands.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My age.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My knowledge of computers.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My confidence in using computers.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of Information technology support.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of encouragement by management.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Attitudes of Information Technology Staff.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Staff Turnover.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others _____ _____					

TECHNICAL SUPPORT

18. Does your organization have a policy in place if there are problems with the computer system?

- Yes
- No
- I don't know

19. Who offers IT support?

- In-house
- Outside contractors
- I don't know

20. What level of technical support is provided from Monday to Friday?

- Limited to day hours (9-5)
- 12 hours days
- 24 hours
- On call
- I don't know

21. What level of technical support is provided on weekends?

- Limited to day hours (9-5)
- 12 hours days
- 24 hours
- On call
- I don't know

22. I believe that the IT support in my workplace is...

Excellent Good Fair Poor Awful Don't know

MANAGEMENT ATTITUDES AND SUPPORT

23. How would you rate the extent of consultation by management and your in house IT support services to ensure the computers and applications in your workplace are most suited to your needs a nurse?

Excellent Good Fair Poor Awful Don't know

24. How would you rate the support and recognition that is offered by your employees with respect to health and safety issues with using computers in your workplace?

Excellent Good Fair Poor Awful Don't know

25. How would you rate the educational support provided by management to improve your IT knowledge?

Excellent Good Fair Poor Awful Don't know

26. How would you rate the response of management to changes and suggestions by nurses to improve information technology at your workplace?

Excellent Good Fair Poor Awful Don't know

Appendix B

Copy of email to use survey questionnaire



Vivien Lim <vblim2010@pointloma.edu>

Survey Questionnaire

Robert Eley <Robert.Eley@usq.edu.au>
 To: Vivien Lim <vblim2010@pointloma.edu>

Mon, Nov 22, 2010 at 5:58 PM

Dear Vivien

Attached is the questionnaire that we used for the study. Please note that the survey was developed in a software called Teleform which enables responses to be scanned directly into a computer for cleaning before analysis in SPSS. The attached document therefore contains images not text so you won't be able to cut and paste directly unless you use an Adobe programme that allows images to be converted to text.

In our survey we only asked a couple of questions related to electronic health records. The responses to those two questions were that whilst the vast majority agreed that there would be a benefit to using EHR very few were informed about progress in that direction.

You are welcome to use our research however please acknowledge your source in any publications. We would certainly like to receive any publications that you produce.

For your information here are the four papers that resulted from the survey

- Hegney, D., Eley, R., Buikstra, E., Fallon, T., Soar, J., Gilmore, V. 2006. Australian nurses access and attitudes to information technology--a national survey. *Studies in health technology and informatics* 122:688-692
- Eley R, Soar J, Buikstra E, Fallon T, and Hegney, D. 2008. Barriers to the use of information and computer technology by Australia's nurses: a national survey. *Journal of Clinical Nursing* 18:1151-1158.
- Eley R, Soar J, Buikstra E, Fallon T, and Hegney, D. 2008. The status of training and education in information technology of Australian nurses: a national survey. *Journal of Clinical Nursing*, 17, 2758–2767
- Eley R, Fallon T, Soar J, Buikstra E and Hegney, D. 2008. Nurses' confidence and experience in using information technology. *Australian Journal of Advanced Nursing* 25(3) 23-35
- Eley R, Buikstra, E, Fallon T, Soar J and Hegney, D. 2009. Attitudes of Australian nurses to information technology in the workplace: a national survey *Computers, Informatics, Nursing*. 27(2) 114-121

Get back to me if you have any questions and good luck with your work

Regards

Rob Eley

Rob Eley, BSc, MSc, PhD, CBiol, MSB.

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CRICOS Provider No. 00244B (QLD), 02225M (NSW)

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Appendix C

Approval Letter

**PLNU IRB
Expedited Review
955****Wednesday, November 16th, 2011****PI: Vivien Lim****Additional Investigators: N/A****Faculty Advisor: Son Chae Kim, Ph.D.; Deana Nobel, Ph.D.****Title: Nurses' Perception, Attitudes and Experience in Adopting Computerized Charting and Electronic Health Record.**

The research proposal was reviewed and verified as Expedited under category 7 and has been approved in accordance with PLNU's IRB and federal requirements pertaining to human subjects protections within the **Federal Law 45 CFR 46.101 b**. Your project will be subject to approval for one year from the November 16, 2011 date of approval. After completion of your study or by November 16, 2012, you must submit a summary of your project or a request for continuation to the IRB. If any changes to your study are planned or you require additional time to complete your project, please notify the IRB chair.

For questions related to this correspondence, please contact the IRB Chair, Ross A. Oakes Mueller, Ph.D., at the contact information below. To access the IRB to request a review for a modification or renewal of your protocol, or to access relevant policies and guidelines related to the involvement of human subjects in research, please visit the PLNU IRB web site.

Best wishes on your study,

Ross A. Oakes Mueller, Ph.D.
Associate Professor
Department of Psychology
IRB Chair

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San Diego, CA 92106
619.849.2905
RossOakesMueller@pointloma.edu



Appendix D

Recruitment Flyer

Appendix C

Paradise Valley Hospital Nurses are invited to participate
in a research study on:

Nurses' Perception, Attitudes and Experience in Adopting Computerized Charting and Electronic Health Record

- **Who:** Vivien B. Lim RN, B SN is conducting a study on Nurses' Perception, Attitudes and Experience in Adopting Computerized Charting and Electronic Health Record
- **Where:** Paradise Valley Hospital (all units)
- **What:** You will complete a survey that will ask questions about your perception, attitudes and experience with computerized charting and electronic health record.
- **When:** The study will be on the first 2 weeks of December 2011. The survey should take only 20 minutes of your time.
- **How:** If you need additional information, please contact the following:
Vivien B. Lim at 619-504-5274 or PLNU Research Advisors
 - Dr. Son Chae Kim at 619-849-7146
 - Dr. Deana Noble at 619-849-2361

Appendix E

Actual Script for Subject Recruitment

Dear Nurses,

My name is Vivien B. Lim, RN, BSN, a registered nurse with this hospital and also a student enrolled in the Master of Science in Nursing at Point Loma Nazarene University. The purpose of this study is to explore nurses' perception, attitudes and experience with the adoption of computerized charting and electronic health record.

I am inviting you to participate in this study by answering this questionnaire related to the adoption of computerized charting and electronic health record. Your participation in this research is completely voluntary and you may refuse to participate or withdraw at any time during the process of answering the questionnaire without any penalty or negative repercussions. If you consent to participate in this study, you will complete a research packet containing a demographic form and survey questionnaire. The research packet will take approximately 15-20 minutes to complete.

Participation in this study does not involve any risk for physical or emotional harm from answering demographic data and study questionnaire. Data collected will be anonymous and confidential. Your individual responses will be aggregated with the responses of other nurses and reported only in the aggregate form.

Thank you for your time and consideration of this study.

Sincerely,

Vivien B. Lim

Appendix F

DEMOGRAPHIC FORM INFORMATION TECHNOLOGY

Directions: These questions concern the backgrounds of those who respond to this survey. As with all answers to this survey, your responses will be kept confidential. Please check the appropriate answer or fill in the blank.

1. Sex <input type="checkbox"/> Male <input type="checkbox"/> Female
2. Age _____ Years
1. What best describes your Ethnic Group? <ul style="list-style-type: none"> <input type="radio"/> Hispanic <input type="radio"/> Black (non-Hispanic) <input type="radio"/> White (non-Hispanic) <input type="radio"/> Asian/Pacific Islander <input type="radio"/> Multi-Ethnic <input type="radio"/> Other _____
3. Shift <input type="checkbox"/> Day Shift <input type="checkbox"/> Evening Shift <input type="checkbox"/> Night Shift
4. <i>What is your highest earned degree?</i> <ul style="list-style-type: none"> <input type="radio"/> High School Graduate/GED <input type="radio"/> Certificate <input type="radio"/> Associate Degree Nursing <input type="radio"/> Bachelor of Science in Nursing <input type="radio"/> Graduate in Nursing
5. <i>What unit in the hospital do you work?</i> <ul style="list-style-type: none"> <input type="radio"/> Medical – Surgical <input type="radio"/> Telemetry <input type="radio"/> Intensive Care Unit <input type="radio"/> Emergency Department <input type="radio"/> Labor and Delivery <input type="radio"/> Same Day Surgery <input type="radio"/> Post Anesthesia Care Unit <input type="radio"/> Operating Room <input type="radio"/> Rehabilitation Unit <input type="radio"/> Behavioral Health Unit <input type="radio"/> GI Lab <input type="radio"/> Cardiac Cath Lab
6. <i>How would you describe your main role in nursing?</i> <ul style="list-style-type: none"> <input type="radio"/> Staff RN <input type="radio"/> Charge Nurse <input type="radio"/> Director <input type="radio"/> Patient Care Partner <input type="radio"/> Other _____
7. <i>How many years of experience do you have in nursing?</i> _____ YEARS

Appendix G

Nurses' Perception, Attitudes and Experience in Adopting Computerized Charting and Electronic Health Record

Introductory Letter to Potential Student Research Participants

Dear Nurses,

My name is Vivien B. Lim, RN, BSN, a registered nurse with this hospital and also a student enrolled in the Master of Science in Nursing at Point Loma Nazarene University. The purpose of this study is to explore nurses' perception, attitudes and experience with the adoption of computerized charting and electronic health record. You have been asked to take part in this research study because you are an employee of Paradise Valley Hospital, the setting of this study.

Many experts expressed the considerable challenges in the application of computer charting and electronic health record (Blumenthal, 2009, Steinbrook, 2009). Banet, et al, (2007) also claims that the introducing computer into the workflow of healthcare providers is a complex process fraught with potential problems. Therefore, exploring the experiences of nurses in adopting this technology can help identify barriers to engender its adoption. Understanding the perception of nurses in the use of computer in their practice can help interpret the phenomenon of adopting technology and its effect on nursing practice (Lee, 2006). In this regard, any developments to enhance EHR and computer charting as a direct benefit from researches such as this can impact future designs that are a better fit to our unique nursing workflow. Thus, your participation can contribute to helping future generation nurses and to raising the bar of our profession.

Participation in this study does not involve any risk for physical or emotional harm. Your individual responses to the demographic form and study questionnaire will be anonymous. To maintain the confidentiality of your individual responses, your demographic data and study questionnaire responses will be kept in a secure and locked area and will not be available to anyone not directly involved in this study's data collection or analysis. Your individual responses will be aggregated with the responses of other nurses and reported only in the aggregate form. No personal identifying information will be reported.

If you consent to participate in this study, you will complete a research packet containing a demographic form and one questionnaire. The research packet will take approximately 15-20 minutes to complete. Your completion of the research packet indicates your willingness to participate. Your participation in this research is completely voluntary and you may refuse to participate at any time without any penalty or negative repercussions.

We hope that you will be willing to participate in this study. Your consent to participate in the study is implied if you elect to complete the questionnaires and return them to the study investigator. If you have any questions or research-related problems, you may reach me at 619-504-5274 or my faculty advisors, Dr. Deana Noble at 619-849-2361 and Dr. Son Chae Kim at 619-849-7146. If you have any questions about your rights as a participant in this study or to report research-related problems, you may contact Institutional Review Board at Point Loma Nazarene University at 619-849-2710

If you decline to participate, you do not need to do anything further.

Thank you for your time and consideration of this study.

Sincerely,

Vivien B. Lim, RN, BSN