WILL THEY ADOPT?
EFFECTS OF PRIVACY AND ACCURACY

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ABSTRACT

National policy decisions about reducing the cost of health care are fueling the movement of patient-care information systems into hospitals and doctors' offices. Will health care workers willingly adopt these systems? We investigated whether accuracy and privacy issues affect self-efficacy and attitudes towards a patient-care information system just prior to adoption in a regional hospital. We surveyed the nurses, doctors, clinicians and technicians and found that the largest predictor of attitudes towards the system was the perception of data accuracy. The perceptions of accuracy of both the data and the system also influenced the workers' self-efficacy, or confidence, that the worker can use the system. In an environment where inaccuracy can literally be a life-or-death matter, a focus on accuracy may help the hospital and the nation achieve successful health care systems. Privacy concerns did not have a significant association with either self-efficacy or attitudes towards the system.

Keywords: adoption, privacy, accuracy, self-efficacy, attitudes, medical record systems, computerized patient records

INTRODUCTION

With the introduction of an information system into an organization, the question of whether employees will adopt the system arises. Self-efficacy is defined as a user's confidence that he or she has the ability to use an information system and has been shown to have a strong influence on an individual's decision to adopt an information system [9]. In health care policy legislation, the Health Insurance Portability Act (HIPAA) directed the U.S. Department of Health and Human Services to establish national standards to protect the privacy of medical records and establish the accuracy of these records [28]. Thus, investigating whether accuracy and privacy issues are connected to adoption decisions is important in the health care field, especially given that privacy of patient data is mandated by law and inaccurate data may cause harm to patients.

The purpose of this study was to determine if the system's ability to ensure perceived accuracy and privacy might influence health care workers' attitudes towards the system, their self-efficacy about using the system, and thus their eventual acceptance of the system. This relationship is depicted in Figure 1. It seems plausible that health care workers that might have previously otherwise resisted patient-care systems might now express positive attitudes toward information systems that aided in meeting legal requirements for accuracy and privacy and thus increase their propensity to accept the new systems.

REVIEW OF LITERATURE

Accuracy

In the health care field, inaccurate data can compromise a patient's health or life. The concern for accuracy is one of the factors behind the push to adopt computerized patient record systems [6]. From this perspective, accuracy refers to the collection of complete and correct patient documentation. Previous research measured the effects of a computerized documentation system on the quality of nursing documentation and patient satisfaction [40]. Measurements taken before implementation of the system and at 6 month intervals after implementation showed a statistically significant increase in compliance with documentation standards [40]. These findings were consistent with the results of an earlier

Figure 1. Research Model
of these studies examine whether a potential loss of personal privacy affects intentions to use [30, 46, 33, 47]. For example, two recent studies investigated the intentions to use m-commerce. The first found that privacy concerns were the second strongest influence on perceived consequences of using m-commerce (after cost) [30]. The perceived consequences had a strong influence on attitudes towards, and intention to adopt m-commerce [30]. The second study also found a strong association between privacy concerns and intentions to adopt [46]. These findings hold true in arenas beyond m-commerce. A survey of undergraduate students found that concerns for privacy strongly influenced the student’s behavioral intentions [33]. Unlike that type of research we examine whether the prospect of protecting patient privacy influences the intention of a health care worker to use an information system.

**Self-Efficacy**

Self-efficacy with an information system refers to the individual’s confidence that he or she can use the information system [9]. The concept of self-efficacy theorizes that there are two forces that guide behavior: 1) expectations relating to outcomes of the behavior, and 2) beliefs about one’s ability to perform that behavior [5]. This latter force, the beliefs about one’s ability to perform the behavior, is called self-efficacy [9]. An individual’s reactions to an information technology would be affected by that individual’s self-efficacy or confidence that they could use the technology. Computer self-efficacy, which is widely used in the IS literature and which we have used in this study, can be measured with a 10-item construct [10].

Research has shown that self-efficacy has strong influences on many aspects of an individual’s adoption of information systems. Self-efficacy has been shown to have affects on attitudes towards computer systems including ease-of-use and usefulness [10, 49] and on behaviors such as system use [19] early adoption [2] and continuance of use [7]. It was found not to have a strong influence on web usability criteria [43].

In an overall assessment of computer-related anxiety for nurses and clerical workers, self-efficacy was included as a factor [23]. The paper reported that nurses had poorer scores on all of the psychological variables that were thought to have some association with computer avoidance and use. This included more negative attitudes and a lower self-efficacy [23].

In a study of hospital personnel’s adoption of a computer-based medical information system (CBMIS), management support and ease-of-use were shown to have significant effects on self-efficacy [25]. Self-efficacy was shown to have an effect on the staff’s job satisfaction. Since job satisfaction is strongly linked to employee turnover [27], this is of major concern for hospital management. In a second study that emphasized user satisfaction, the same authors indicated that the end-user’s sense of self-efficacy and outcome expectancy had a direct, meaningful and positive impact on end-user satisfaction with the CBMIS [24].

In a qualitative two-year study of factors that affect user acceptance of computer-based nursing documentation, researchers found two influencing factors: previous acceptance of the nursing process and the previous amount of self-confidence, a similar measure to self-efficacy [4].

Many variables have been shown to influence an individual’s self-efficacy including gender, age, educational level, computer ownership, computer experience, professional orientation, training, organizational support, management support, encouragement, and computer attitudes [36, 42]. In a study of college students, use of
one technology increased self-efficacy in other technologies; for example, requiring the students to use e-mail to communicate with professors was found to increase self-efficacy in word processing and use of CD-ROM databases [18]. Based upon this research, we expect that computer usage and attitudes will have significant effects on health care workers’ beliefs about their ability to use an information system.

In a study looking at the introduction of a patient care record system, several factors were found to influence nurses’ self-efficacy [17]. Any familiarity with technology including home computers or VCRs was associated with higher self-efficacy. Additionally, self-assessed expertise in e-mail, Internet or word processing was associated with nurses having a higher self-efficacy towards the information system [17].

Using a survey of undergraduate students about privacy concerns and the student’s self-efficacy towards using computers in general, one of the few studies to examine this relationship, found significant relationships between four privacy concerns and computer self-efficacy [51]. The four concerns were 1) whether the student was bothered when a company asked for personal information; 2) whether organizations should be sure personal information stored in a database was checked for accuracy; 3) whether organizations should protect personal information stored in a database; and 4) whether organizations should sell or share personal information in a database [51]. This research strongly suggests that accuracy and privacy may influence self-efficacy. Of these four concerns, our current study captures concern (2) as accuracy of data and captures concerns (3) and (4) in privacy concerns about patient data.

Current theory distinguishes two different self-efficacy constructs: general self-efficacy and task-specific self-efficacy [1]. Most research uses the former construct, while our research uses the latter.

Attitude

The attitude (i.e. predisposition to respond in a consistently favorable or unfavorable manner) adopted regarding computer systems, incorporates what they know or believe about them, how much they like or dislike them, and how they routinely act or behave regarding them [3]. Attitude has long been used as a determinant for a user’s intention to use or adopt an information system or a software package. For example, the Technology Acceptance Model (TAM) [12, 13] related perceived ease of use and usefulness to attitude to predict actual system use. In health care, researchers have found a significant relationship with perceived ease of use and usefulness to attitude [15, 16]. In addition, a recent study in the health care sector found that attitude was strongly associated with IT usage intentions [7].

Type of System

Hospitals can have many different types of systems [31]. The type of system we refer to in this research is a system that automates patient medical records. Many names are used for this type of system, examples include; electronic medical record, patients’ information system [31], computerized patient record (CPR) system [31, 44], hospital documentation system [39], and e-medical records [29]. We use computerized patient record (CPR) system, as that conveys the concept that patients’ medical records are being automated and used for patient care.

RESEARCH MODEL

This research investigates whether perceptions of the privacy and accuracy available in the system might influence attitudes towards the system and self-efficacy about using the system and thus the eventual use of the system as shown in Figure 1. It seems plausible that health care workers, such as those working in a hospital setting, that might have otherwise resisted patient-care systems, may now recognize the usefulness of the systems for meeting accuracy and confidentiality legal requirements. While the model does not show usage, the implication is that the variables would predict acceptance of the technology and hence usage. Research supports this prediction [19].

Prior research with hospital nurses has shown that self-efficacy and attitudes towards an information system are closely related [17]. In this study, we predict that the attitudes of all health care workers towards the information system will be influenced by the workers’ self-efficacy about the information system.

Hypothesis 1: Self-efficacy about the information system will influence attitudes towards the information system. (Self-efficacy → Attitudes)

No prior work has been done on the relationship between perceived accuracy of records and self-efficacy or information systems attitudes. Research has shown that concerns about errors in databases are associated with computer self-efficacy [51]. It seems likely that if a health care worker sees computer records as more accurate than paper records, that a health care worker is likely to have a more positive attitude towards the information systems.

Output quality has been shown to be strongly associated with perceived usefulness of an information system and with behavioral intentions to adopt [50]. For CPR systems, perceived accuracy of records is a strong part of how useful the system is perceived to be [6].

Thus we hypothesize a relationship between perceived accuracy and attitudes. We also hypothesize that the same relationship may be influenced by a health care worker’s self-efficacy about the information system.

Hypothesis 2a: Perceptions of the accuracy of an information system influences self-efficacy with the system (Accuracy → Self-efficacy).

Hypothesis 2b: Perceptions of the accuracy of an information system influences attitudes towards the system (Accuracy → Attitudes).

Hypothesis 2c: Perceptions of the accuracy of an information system influences attitudes towards the system in an indirect relationship through self-efficacy. (Accuracy → Self-efficacy → Attitudes).

Many recent studies have shown that concerns for privacy have a strong influence on attitudes towards and intention to adopt information systems [30, 33]. These studies used personal privacy concerns, i.e., the potential users’ concern about their own privacy. Would these concerns extend to a potential user’s concern about their patients’ privacy?

Privacy concerns are associated with higher computer self-efficacy [51]. A preliminary study with only nursing staff showed
that perceived confidentiality of computerized patient records had a strong influence on information system self-efficacy [35]. In that study, nurses who saw computer records as more confidential than paper records also had higher self-efficacy. With an improved measure of privacy, we expect this relationship to hold true for all health care workers. Similarly, we expect that health care workers that are focused on the privacy of computer records will have more positive attitudes towards the information system than those who are not focused on privacy. This relationship may be influenced by self-efficacy about the information system so we have hypotheses for both direct and indirect effects.

Hypothesis 3a: Perceptions of the privacy of an information system influences self-efficacy with the system (Privacy → Self-efficacy).

Hypothesis 3b: Perceptions of the privacy of an information system influences attitudes towards the system (Privacy → Attitudes).

Hypothesis 3c: Perceptions of the privacy of an information system influences attitudes towards the system in an indirect relationship through self-efficacy. (Privacy → Self-efficacy → Attitudes).

METHODOLOGY

Setting

The survey was conducted at a 255-bed regional hospital center just before the implementation of a new hospital-wide CPR system. All of the health care workers at the hospital were aware that a new CPR system was being installed. Within thirty days of the survey being distributed, the new system would go “online” in most of the administrative and clinical units. The remaining units would “go live” about 60 days after that. Hospital administration prepared the workers by offering periodic training sessions. The staff was kept abreast of the implementation timetable via information distributed from managers and printed in a hospital-wide newsletter.

The Instrument

Data were collected via a written survey to measure the variables shown in Figure 1. The instrument had 40 items and took about 5 minutes to complete (relevant items are listed in the appendix). The instrument began with demographic items which identified the job title/position, sex, age, level of education, and full or part time employment of the respondents. These demographic variables have been shown to influence acceptance of patient-care systems [17].

The measurements for perceptions of privacy and accuracy were based upon a preliminary study [38]. Improvements were made to these constructs to increase their reliability and validity. The measures asked for degree of agreement/disagreement with items such as “If I were the patient, I would feel my computerized patient record was protected or secure from unauthorized use” and “It is easy to make data entry errors (keyboard, mouse, etc.) when using a computerized system.”

Self-efficacy was measured using an already developed measure [10] calculated from ten items scored on a 10-point Likert scale ranging from 1 = Not at all Confident to 10 = Totally Confident. We calculated the self-efficacy score by adding the ten items together giving a range from 10 to 100; a higher score indicates a higher level of self-efficacy [10]. A sample item was: “I could complete the job using the <name omitted> system if there was no one around to tell me what to do as I go”.

Attitude was measured with an already developed measure [12] using five items adjusted to refer to the overall attitude toward the new computerized patient record system [12]. A typical item was “All things considered, my using the new patient care system is good/bad”.

The survey was approved by both the university’s and the hospital’s Institutional Review Boards.

Data Collection Procedures

The survey was conducted at the hospital just before the implementation of the new CPR system. Over 1,080 surveys were distributed via inner office mail to all health care workers (doctors, nurses, clinicians, etc.) prior to implementation. All received an addressed envelope that contained 1) a cover letter that solicited the respondents’ cooperation and assured anonymity, 2) the survey instrument, 3) an entry form for a drawing used as an enticement ($100 gift certificate), and 4) a return envelope. Respondents were given eight days to complete and return the survey to collection boxes located in each unit.

Four hundred and twenty five surveys were returned before the drawing deadline for a response rate of 39%. There were ten individuals that received multiple surveys because some clinical personnel worked in two or more units and had two or more inner office mail addresses. These duplicates were not counted. Six surveys were completed incorrectly and discarded. Five of the 425 drawing-entries were selected randomly for the gift certificates. The survey data were recoded to maintain consistent positive and negative value. Item responses for multi-item variables were summed to form the factor values. SPSS, version 15 was used for the data analysis.

Reliability and Validity of the Data

The eight day response time, flexible work week, and 24/7 scheduling prevented the research team from determining when the survey was received by each health care worker or returned. For this reason we were unable to determine non-response bias.

The privacy and accuracy multi-item measures originated from issues identified in the literature. For content and construct validity these items were reviewed by eight critical care nurses that had previously implemented CPR systems. A pilot study was conducted at a regional medical center that had recently implemented a CPR system [38]. Eighty five registered or licensed nurses completed the survey. Factor analysis of the pilot study data identified the multi-item factors for privacy and accuracy. Reliability of the pilot was reached with Cronbach alphas of .81 and .82, respectfully. The other multi-item measures, efficacy and attitude, were taken from the literature [10, 12].

Privacy and accuracy items were modified slightly from the pilot study to maintain content validity. Construct validity for this research project was examined with factorial analysis. Based on the literature review, each of the three multi-item factors (i.e., accuracy, self-efficacy, and attitude) was predicted to form one distinct construct [54, 10, 12]. Privacy was predicted to form three factors; privacy breach, recognition of privacy, and patients’
perceptions of the privacy of computerized records [38]. Using Principal Component Analysis with varimax rotation the 35 items divided into eight multi-item factors. These factor loadings are shown in Table 1.

As expected, the five attitude items (ATT) loaded on one factor. Reliability analysis was done with using Cronbach’s Alpha. The Alpha score was .966 indicating excellent internal consistency. In testing the construct validity of self-efficacy (EFF), nine of the ten items loaded on two distinct factors and one item (If I had a lot of time to complete the job for which the software was provided) did not load and was discarded. This indicates that nine of the ten items were two separate measures of self-efficacy. While most prior research reports uni-dimensionality of the self-efficacy construct, this finding is consistent with prior research [1]. For reliability analysis, the Cronbach’s Alpha score for the combined self-efficacy measure was .893 indicating excellent internal consistency.

Accuracy was measured with ten items. During factor analysis five of the ten items loaded into one factor that is easily identified as the accuracy of the data (ACCDATA) within the system (i.e., complete, descriptive, timely, quality, and correct). Four of the accuracy items loaded into a second factor that emphasized the system and how the system would or could prevent the accurate entry of data (ACCSYS). These four items dealt with forced selection from a menu, possibility of data entry errors, reduced individualization of patient records, and ability to chart as descriptively as necessary. One item, a measure related to hospital accreditation, did not load and was discarded. The five-item accuracy of data factor had a Cronbach’s Alpha of .834 indicating excellent internal consistency. The four-item accuracy of the system factor had a Cronbach’s Alpha of .617 indicating acceptable internal consistency for exploratory research. In summary, the users identified two accuracy factors when utilizing a patient care system in a hospital setting. One factor is directed to the accuracy of the existing data within the system (ACCDATA). The second factor identifies the difficulties that users may experience with an information system that interferes with the completion of daily work activities, such as preventing the proper entry of data (ACCSYS).

The ten privacy items loaded into three factors, similar to a prior study [35]. Four items loaded into a “recognition of privacy” factor and two items each loaded into a “patients’ perceptions of

<table>
<thead>
<tr>
<th>Item</th>
<th>ATT</th>
<th>EFF1</th>
<th>ACCDAT</th>
<th>EFF2</th>
<th>PRIVACY</th>
<th>ACCSYS</th>
<th>PRIV1*</th>
<th>PRIV2*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorable/Unfavorable</td>
<td>.875</td>
<td>.766</td>
<td>.665</td>
<td>.770</td>
<td>.754</td>
<td>.701</td>
<td>.594</td>
<td></td>
</tr>
<tr>
<td>Wise/Foolish</td>
<td>.860</td>
<td>.731</td>
<td>.728</td>
<td>.665</td>
<td>.701</td>
<td>.594</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive/Negative</td>
<td>.854</td>
<td>.728</td>
<td>.665</td>
<td>.512</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Beneficial/Harmful</td>
<td>.854</td>
<td>.665</td>
<td>.512</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Good/Bad</td>
<td>.825</td>
<td>.665</td>
<td>.512</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Helped me get started</td>
<td>.908</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Showed me how</td>
<td>.863</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call someone for help</td>
<td>.854</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Used similar package</td>
<td>.809</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Saw someone else use</td>
<td>.622</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Built in help facility</td>
<td>.572</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>More complete</td>
<td></td>
<td>.766</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As descriptive/needed</td>
<td></td>
<td>.731</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Timely manner</td>
<td></td>
<td>.728</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Quality will improve</td>
<td></td>
<td>.665</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easily correct errors</td>
<td></td>
<td>.512</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Had never used before</td>
<td></td>
<td>.865</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Only reference manual</td>
<td></td>
<td>.821</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No one around</td>
<td></td>
<td>.801</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print outs are conf.</td>
<td></td>
<td>.780</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search nonpatient data</td>
<td></td>
<td>.742</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copies are conf.</td>
<td></td>
<td>.701</td>
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<tr>
<td>Paper chart is conf.</td>
<td></td>
<td>.668</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>System not individual</td>
<td></td>
<td>.702</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make data entry errors</td>
<td></td>
<td>.679</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forced menu selection</td>
<td></td>
<td>.646</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chart descriptively</td>
<td></td>
<td>.555</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient feels paper sec.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.754</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient feels sys. sec</td>
<td></td>
<td></td>
<td></td>
<td>.615</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Nonpatient comp data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.701</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonpatient paper data</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.594</td>
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</tbody>
</table>

ATT — Cronbach’s Alpha = .966
EFF1 and EFF2 combined — Cronbach’s Alpha = .893
ACCDAT — Cronbach’s Alpha = .834
ACCSYS — Cronbach’s Alpha = .617
PRIVACY — Cronbach’s Alpha = .705
PRIV1 and PRIV2 are not reliable measures
the privacy of computerized records” and “privacy breech” factor. Only the recognition of privacy factor was determined to be reliable with a Cronbach’s Alpha of .705 and will be used further (PRIVACY). The two two-item privacy factors did not reach acceptable reliability with Cronbach’s Alpha scores of .416 and .126.

RESULTS

Demographic Characteristics

Demographic characteristics of the hospital workers that completed the survey are presented in Table 2. The response rate of the respondents closely mirrored the actual population of the hospital in relation to four of the five demographic variables gathered. Only age was not aligned. The majority of the respondents worked full time (74%) and were female (88%).

The job title and positions of the respondents were provided by the administration of the hospital. All of those working in the job titles provided would be interacting daily with the new CPR system. Registered nurses (30%), clerical specialists (11%), patient care technician (9%), and licensed practical nurses (9%) represented the largest responding samples in the survey as they represent the largest working populations in the hospital. All other clinical position had representation in the sample, including physicians, pharmacists, therapists, technicians, and social workers.

The level of education for the sample population was highly educated. Over forty percent of those responding had a bachelor’s degree or higher and an additional seventeen percent had associates degrees. Twenty-four percent had some college beyond high school. Fourteen percent had a minimum of a high school diploma. Just over one percent of the respondents did not graduate from high school.

The age distribution of the respondents was evenly distributed over the four lower age ranges with roughly 20%-26% in each of the age ranges of 20-29, 30-39, 40-49 and 50-59. The age range for over 60 had only 5% of the respondents. This did not fit the hospital population, but signaled that older workers may be self-selecting not to complete a survey concerning computer technology in the workplace.

Hypothesized Model

Regression analyses were performed on the attitude (ATT), efficacy (EFF), accuracy (ACCDAT and ACCSYS), and privacy (PRIVACY) variables. Table 3 contains the results of the ordinary least squares (OLS) regression applied to the hypothesized path analysis model. Figure 2 shows the results of the regression analysis.

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Title/Position</td>
<td></td>
</tr>
<tr>
<td>Physician Manager</td>
<td>13 (3.1)</td>
</tr>
<tr>
<td>Attending nurse</td>
<td>5 (1.2)</td>
</tr>
<tr>
<td>Registered Nurse</td>
<td>128 (30.1)</td>
</tr>
<tr>
<td>Licensed Practical Nurse</td>
<td>39 (9.2)</td>
</tr>
<tr>
<td>Patient care technician</td>
<td>41 (9.5)</td>
</tr>
<tr>
<td>Patient care assistant</td>
<td>19 (4.5)</td>
</tr>
<tr>
<td>Clerical specialist</td>
<td>49 (11.5)</td>
</tr>
<tr>
<td>Administrative assistant</td>
<td>12 (2.8)</td>
</tr>
<tr>
<td>Respiratory therapist</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Therapists*</td>
<td>19 (4.5)</td>
</tr>
<tr>
<td>Lab Tech</td>
<td>12 (2.8)</td>
</tr>
<tr>
<td>Radiology Tech</td>
<td>17 (4.0)</td>
</tr>
<tr>
<td>Pharmacist</td>
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<tr>
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<tr>
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<td>Case Manger</td>
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<td>Social Worker</td>
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<td>30-39</td>
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<td>60 or over</td>
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(*Therapists category included Physical, Occupational and Recreational)

<table>
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<tr>
<th>Table 3: Results of the Model Regression Tests</th>
<th>R²</th>
<th>Independent Variable</th>
<th>B</th>
<th>S.E. (b)</th>
<th>Beta</th>
<th>t-Statistic</th>
<th>Significance Level</th>
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<td>EFF</td>
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<td>Constant</td>
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<td>.040</td>
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<td>.054</td>
<td>.044</td>
<td>.152</td>
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<td>.044</td>
<td>.043</td>
<td>.112</td>
<td>1.854</td>
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</table>

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Direct Effects

As can be seen in Table 3, self-efficacy about using the CPR system had a significant direct effect on the hospital workers attitudes towards the system (.218) as predicted in hypothesis 1. Since the perceptions of accuracy items loaded into two distinct factors, one involving the accuracy of the data (ACCDAT) and a second involving the accuracy of the interaction with the system (ACCSYS) we examined both variables and their relationship to self-efficacy and attitude. As predicted in hypothesis 2a and 2b, the accuracy of the data (ACCDAT) had an expected effect on self-efficacy (.257) and an even stronger effect on attitude (.507). Both data accuracy effects were highly significant.

The system accuracy variable (ACCSYS) also had a significant, but weak, expected effect on both self-efficacy (.177) and attitude (.152). Again, this was hypothesized in 2a and 2b, though the scale of the influence of the system accuracy variable was below expectations.

Disappointingly, there was no direct significant influence of the privacy variable (PRIVACY) on either self-efficacy or attitude and hypotheses 3a and 3b could not be confirmed.

Combined Effects

The strongest significant predicted combined effect for any variable was the contribution of data accuracy (ACCDAT). The combined direct and indirect effects of data accuracy were .563 ((.357 X .218) + .507), as presented in hypothesis 2c. The influence of the combined system accuracy variable (ACCSYS) was .191 ((.177 X .218) + .152). This system accuracy effect was also predicted in hypothesis 2c, though not as strongly as expected. And finally, no significant combined effects were found for the privacy variable, though the influence of privacy was moving toward an effect on self-efficacy. Hypothesis 3c could not be confirmed.

DISCUSSION AND CONCLUSIONS

Designing Systems for Accurate Data

Health care workers’ perceptions of data accuracy had the largest direct and indirect influence on self-efficacy and attitude, explaining more than 50% of attitude about the CPR system. These findings are similar to prior research and showed a higher acceptance of a point-of-care system when standardized accuracy and quality standards were met [40]. Hospital workers recognize that the need for accurate data is a life-or-death situation in a hospital setting. Guaranteeing the accuracy of the data within an information system is vital to a successful adoption of an information system. This is also in keeping with work that showed that quality of output was strongly associated with perceived usefulness of an information system [50]. Perceived usefulness is the single largest predictor of intention to use so influencing usefulness is likely to increase adoption [50].

Healthcare workers’ perceptions of system accuracy or the ability of the system to allow an accurate interaction with the system was also a significant influence on self-efficacy and attitude, both directly and indirectly. System design issues such as 1) the prevention of data entry errors, 2) forcing users to select menu items that are not intuitive, and 3) preventing the user from entering descriptive data, are vital to the user feeling confident and positive about interacting with the information system. These three items suggest that focusing on how the system enhances the ability to provide quality of care rather than on how the system cuts costs is likely to promote adoption [39, 41].

A major priority of the nurse is to be able to provide individualized health care planning with frequent and thorough patient record charting [48, 11]. Systems that get in the way of providing this accuracy of planning will be resisted [48]. Paper patient records are viewed as providing a fuller, more individualized context than are computerized patient records [6].

Figure 2. Results of Regression Analysis

*Significance at the 0.000 level
Thus our study suggests to promote self-efficacy and enthusiastic attitudes of health care workers towards the systems, information systems analysts must design an accurate and individualized interaction with the system and that system training should emphasize this interaction.

Privacy

Privacy was not found to be a significant influence of adoption in the results of this research project. This contrasts with many studies that examine the influence of personal privacy factors on adoption [30, 46, 33, 47]. However, our results also identify a distinction between the influence of personal privacy on adoption and the influence of a patient’s privacy on adoption. Prior research places an emphasis on personal privacy. The results of this paper examine a health care worker’s concern for the patient’s privacy. The patient, in this case, is a second person, more closely related to a client or customer. This raises the question, “Does a worker’s concern for customer or client privacy influence adoption?” Our results indicate probably yes, but not significantly.

The results of this study also contrast with the other researchers that found a significant relationship between patient privacy and self-efficacy [35]. They demonstrated that users showing a lower self-efficacy or confidence with the information system also showed a lower sense of worth for the data found within the system [35]. Our current outcomes may be the result of the integration of privacy and confidentiality principles into all aspects of health and medical care since the Privacy Rule of HIPAA was enacted in 2003 [32]. Health care workers may relate trust or confidence in the accuracy of the data provided by the information system with their individual confidence in using the system, but they do not perceptually relate confidential or privacy issues to the adoption of an information system.

Limitations

There are four limitations to this study. First, this research is limited to the health and health care workers of one hospital and the adoption of one Computerized Patient Record system. The sample size is adequate for a number of the job title/position categories and there is more than sufficient representation of all education, work, and sex categories. But since the findings are from the adoption of one system, the results may need to be replicated, which provides an issue for further research. Replication in another industry where accuracy is also crucial would be another area for research.

Second, there are small sample sizes for a number of important medical and healthcare professions, such as physicians, managers, social workers, therapy assistants, and pharmacists. These professions are vital components of our overall health care system and there is a need to gain an understanding of their adoption attitudes.

Third, the representation for four of the five age categories was adequate, but the oldest age range, over 60, was not representative of the hospital population. We concluded that older workers self-selected to not complete the survey and this is a concern.

Finally, the three privacy measures utilized in this study did not appear to be a fully valid and reliable gauge of the privacy issues presented for this research. The “recognition of privacy” measure was valid. But “privacy breach” and “perceptions of computerized data privacy” did not reach a reliable alpha score and were not valid measures for this study. Further research into a perception of privacy measure is necessary to continue this line of research.

Conclusion

Outside pressures are moving the health care industry to quickly automate patient care record systems. In the past, health care workers may have resisted such computerized patient record systems because they were viewed as taking needed time away from patient care.

However, this study shows that a hospital that focuses on a system that enhances the accuracy of patient data and quality of care may find workers more confident in their ability to use the system and more excited about the system. Specifically, training on how the system makes the data more accurate and how the system facilitates keeping the entire process more accurate will reap high rewards in adoption of systems. In other industries where accuracy has such high stakes, similar results may be found.

In addition, concern for a patient or client’s privacy may not serve to significantly influence adoption. There appears to be two privacy constructs; first person or personal privacy, and second person privacy (i.e., privacy for the customer, client, or patient). Our findings demonstrate that second person privacy does not strongly influence efficacy or attitude, and in turn will not influence adoption. Future research that seeks to determine variables that influence adoption should distinguish between first- and second-person privacy issues.

REFERENCES


APPENDIX: Survey Items

Accuracy

1. A computerized patient care system allows me to chart as descriptively as I need to.
2. A computerized patient care system allows me to chart in a timely manner.
3. Documentation in the computerized patients’ charts seems to be more complete than with a paper documentation system.
4. Sometimes I may be forced to make a choice from a menu that will not totally agree with what I want to document.
5. The overall quality of documentation by others will improve after the new system implementation.
6. Care planning done using a system is less individualized and/or accurate for the patient.
7. It is easy to make data entry errors (keyboard, mouse, etc.) when using a computerized system.
8. I will not chart as descriptively after the implementation as I did before when using a paper patient record.
9. The information system will prompt me to chart pertinent assessments that are required by JCAHO or other facility policies.
10. The patient care system will allow me to easily correct errors that I will make while charting.

Confidentiality

11. If I was the patient, I would feel my paper patient record was protected or secure from unauthorized use.
12. With a computerized patient record it will be difficult for me to retrieve information on patients that I am not currently caring for.
13. Visitors or patient’s families can easily read confidential patient information written on various paper patient records.
14. I feel that it is not a breach of confidentiality if I read the chart of a patient I am not caring for.
15. Printouts of data from a computerized patient record that have a patient’s name or number on them, but are not part of the patient record, do not need to be considered confidential information.
16. If I was the patient, I would feel my computerized patient record was protected or secure from unauthorized use.
17. Copies of pages from a patient’s paper record are not considered confidential material.
18. With a paper patient record it will be difficult for me to read information on patients that I am not currently caring for.
19. I feel that it is not a breach of confidentiality if I look up computerized data about a patient that I am not caring for.
20. Visitors or patient’s families would easily be able to view confidential patient information on the computer screen.

Attitude

All things considered, using the new patient care system is:

21. Good Neutral Bad
22. Wise Neutral Foolish
23. Favorable Neutral Unfavorable
24. Beneficial Neutral Harmful
25. Positive Neutral Negative

Self-Efficacy

I could complete my job using the new patient care system if...

51...if there was no one around to tell me what to do as I go
52...if I had never used a package like it before
53...if I had only the software manuals for reference
54...if I had seen someone else using it before trying it myself
55...if I could call someone for help if I got stuck
56...if someone else had helped me get started
57...if I had a lot of time to complete the job for which the software was provided
58...if I had just the built-in help facility for assistance
59...if someone showed me how to do it first
60...if I had used similar packages before this one to do the same job