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(AMCIS)

December 2007

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LESSONS LEARNED IN HEALTH CARE: FOUR IS CASE STUDIES

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Abstract

Much attention has been paid recently to the need for information systems research in healthcare. Premiere IS journals have called for research addressing the interoperability, implementation, adoption, diffusion and clinical data standards needs of our ailing US health care system.

Because of the IS community has much to offer the unique healthcare environment, collaborative research is a necessity; however the dynamic and often times guarded nature of health care organizations make conducting theoretical and applied research a complicated and slow-going process; yet always rewarding.

The Purpose of this research report is threefold: (1) to provide an overview of current and ongoing information systems research in health care; (2) to present case examples from a variety of health care and IS research that demonstrate diverse methods, approaches and objectives for conducting IS research in the health care environment; and (3) to present challenges and lessons learned from these four care research cases.

Keywords: Healthcare, WLAN, Cognitive Mapping, Action Research, UCIA, Nursing, Handheld, Mobile

Background

Today, there is growing enthusiasm for conducting information systems and information technology related research within the health care arena. This enthusiasm stems from the many national, regional, and local calls for public and private collaborations to improve the quality and efficiency of the United States' healthcare system. Various IS research endeavors investigate the implementation process as well as the social and organizational impacts of such areas as computerized physician order entry (CPOE), electronic medical records (EMR), mobile health care, disaster management and data recovery to name a few.

The following four case studies highlight the different types of IS research currently underway and the diverse strategies used to investigate the IS phenomenon in the unique and dynamic environment of health care. The healthcare organizations and health care practitioners represented in this report are from a broad national landscape across a varied healthcare spectrum: local public, private integrated, state, and federal health care systems. These early adopters have formed partnerships and collaborations with academics to help achieve their IS goals and subsequently meet the national objectives of increased efficiency and overall improved quality of health care services.

Case I. Mobile Information Communication Technologies and Healthcare

Project Description

An increasing number of hospitals are responding by implementing mobile computer systems to resolve problems resulting from antiquated manual methods of documenting information regarding patient care. Such systems can help reduce caregiver error, streamline convoluted processes, and ease hospital staff workloads by providing ready access to current, comprehensive patient information. At the same time, mobile units —, which interface with a central medical database — enable hospital staff to record test results, diagnoses, medications and treatments quickly and easily as they are providing care. In contrast, caretakers typically have been required to handwrite notes quickly or enter information into a computer later on, both error-prone and labor-intensive procedures.

Industry analyst Gartner Healthcare reported that in 2002, less than one-third of all U.S. hospitals had operational mobile local area networks (WLANs) in at least one department and this percentage is expected to increase rapidly with 802.11g and others standards that offer wider coverage and increases bandwidth. WLAN vendors will continue to target hospitals, which tend to have highly decentralized operations, large mobile workforces with great utility for computing at the point of care.

Despite this escalating momentum, there has been relatively little academic examination of caretakers' practical, hands-on experiences with mobile information communication technologies amongst nursing personnel who perform the bulk of documentation of any medical intervention for patients. This case study attempts to address that gap by exploring the efficacy, efficiency, and issues of WLAN implementations — including system acceptance, task-technology fit, and use and performance impacts — at three U.S. hospitals. The goal is to provide insights, based on in-depth interviews, from the perspective of nurses, organizational managers, and information systems professionals directly involved in implementation processes.

Participating hospitals in Phase I ranged from 124 to nearly 500 beds. All are public entities in the Southeastern U.S., although each has different medical specialties and serves a different type of patient base. Phase 1 of the research was conducted between November 2002 and March 2004 and entailed a cross case analysis of the implementations of mobile information communication technologies. Phase II began in 2006 and is still undergoing in which novel relationships between constructs uncovered in Phase I are being quantitatively analyzed to substantiate an enrichment of the Task-Technology Fit Model (Goodhue and Thompson, 1995).

The Phase I case study focused on the practical implications of deploying WLANs to help transform hospitals into safer, more efficient, and more effective institutions. Research include overviews of mobile technology and federal regulatory mandates; actual research findings; and recommendations WLAN implementation and use in patient registration, ongoing charting and medication administration. The findings demonstrate that mobile computing can strengthen ties between patients and caregivers by allowing more time for conversation, among other significant benefits. At the same time, WLANs are not without meaningful adoption and usage issues. Phase II quantitatively assesses some of the human drives uncovered that contribute to perceptions of task-technology fit and novel dimensions of fit that are salient in mobile computing.

Challenges and Lessons Learned

For Phase I, one of the main challenges was establishing an interview schedule that was convenient as well as timely enough to enable analysis for of the data and prepare a publication submission. The primary challenge was gaining access to nurses to collect interview data while they are on shift. The secondary issue was where and how to conduct the interview, which is most likely occurred somewhere on the hospital floor amidst nurses performing patient care. It was beneficial to schedule with the nurse managers of each of the units I entered to determine nurses' availability and a potential schedule for the interview sessions, which typically lasted no longer than 20 minutes. Gaining approval to do observations was also greatly beneficial to determine workflow processes and the interaction with the technology under study especially when the interview times are extremely constrained. Another challenge was the extensive IRB process especially in Veteran or military healthcare organizations that nearly severely hindered the ability to gather timely data.

The lessons learned from Phase I are as follows:
- Mobile computing
  - provides nurses with essential information at the point of care.
  - helps nurses create comprehensive, readily accessible records.
  - increases in value when systems support "exception charting" to facilitate detailed record-keeping, reduce charting time and enhance readability.
- System usability and performance
  - are influenced by task environments, such as the frequency and nature of distractions, state of patient consciousness, and rate of patient turnover.
  - benefit from certain hardware characteristics, such as computer cart mobility and multiple-use features. However, they suffer from others, such as inadequate battery life for mobile devices or poor software design.
- Mobile-driven processes
  - reduce nurses' charting time and anxiety, enabling them to stay longer with patients and chart on multiple patients simultaneously.
  - may be impeded by nurses' lack of typing skills and how recent the professional training is conducted, or technology aversion.
- User performance benefits
  - reduced time required to validate questionable drug prescriptions and medical interventions, which can delay patient care
  - greater ability for hospitals to defend against accusations of, and liability for, negligent care

Recommendations provided to managerial personnel at the healthcare organizations are as follows:
- Nursing education programs should integrate electronic patient care documentation into existing curricula immediately.
- Hospital management should use technology as a recruiting and retention tool.
- Hospitals management should create a culture, including a nurse vision statement, emphasizing the benefits of nurses' involvement in technology.
- Hospital IT departments should support development and/or adaptation of wearable devices and multi-function mobile carts by manufacturers to support mobile use.
- Hospital IT departments should physically integrate documentation devices (e.g., scanning, label and document printing) to support ease of use.
- Hospital management should extend mobile use to other tasks that are location-, time-, identity-, or inter-dependent, and/or are highly information-intensive.
- Hospital management should institute thorough mobile training for nurses prior to introducing the technology.
- Hospital management should incorporate automated patient and medication identification to ensure nurses are charting on the correct patient.

Hospitals that embrace mobile information communication systems can increase patient safety across a wide range of caregivers, departments, and responsibilities. By collecting and delivering vital information when and where it has needed most — at the point of care — hospitals streamline inefficient processes and reduce life-threatening consequences of serious caregiver errors.

Research Design and Data Collection Methodology

The philosophical assumption is a post-positivist paradigm (Guba and Lincoln, 1994) for which it is assumed that a reality exists but that it might be imperfectly understood because of the numerous contributing factors to any phenomenon. I sought to understand as much as possible of the phenomenon to theorize about it. In this spirit, I elected to use an intensive case study methodology for Phase I that allows in case and cross case analysis, the use of existing theory to explain relationships and themes, as well as, allow emergent theory to arise from analysis of the data (Eisenhardt, 1989). I also applied open, axial, and selective coding to build a perspective for the phenomenon (see figure 1) from which a research model (see figure 2) was gleaned - quantitatively assess within Phase II. Table 1 details the data collection for Phase I.
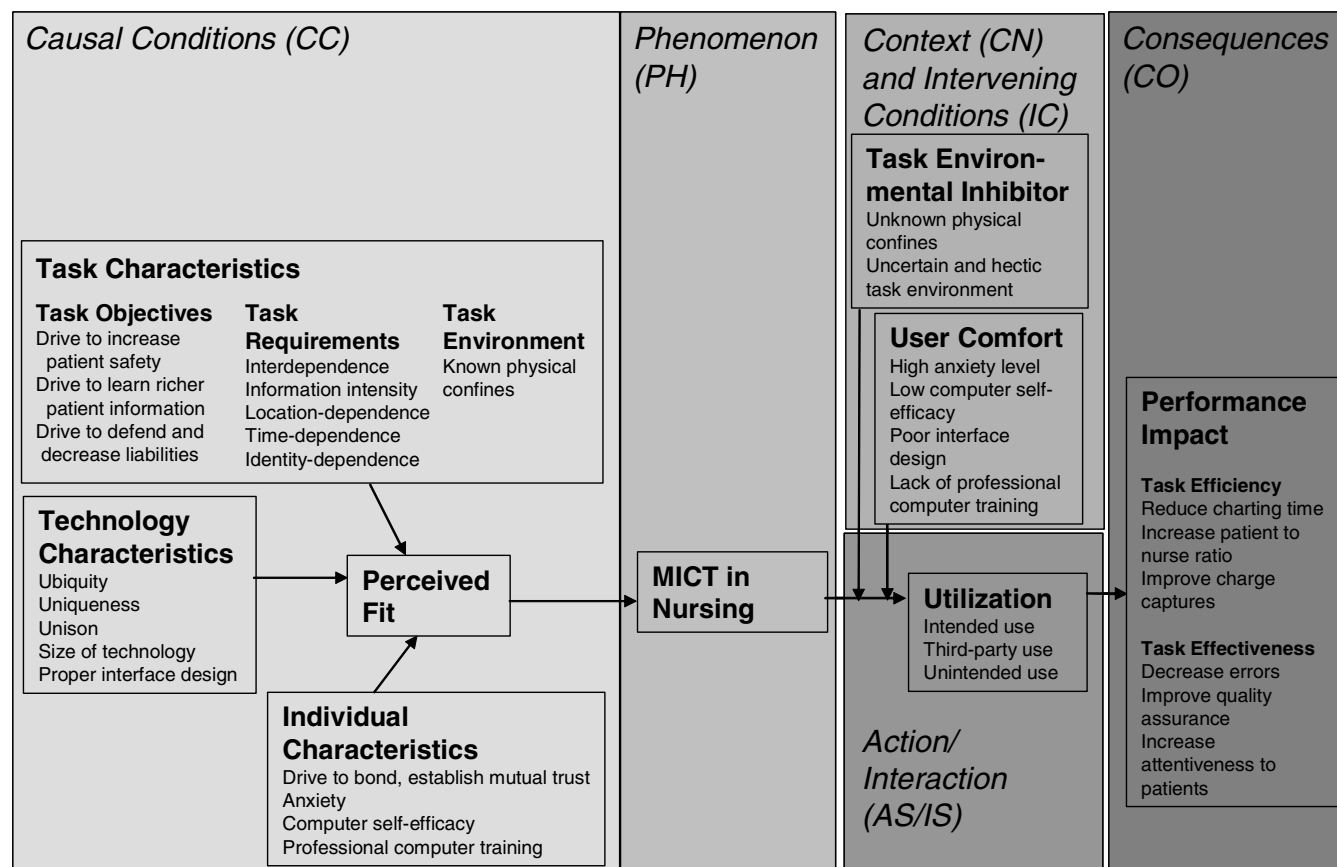

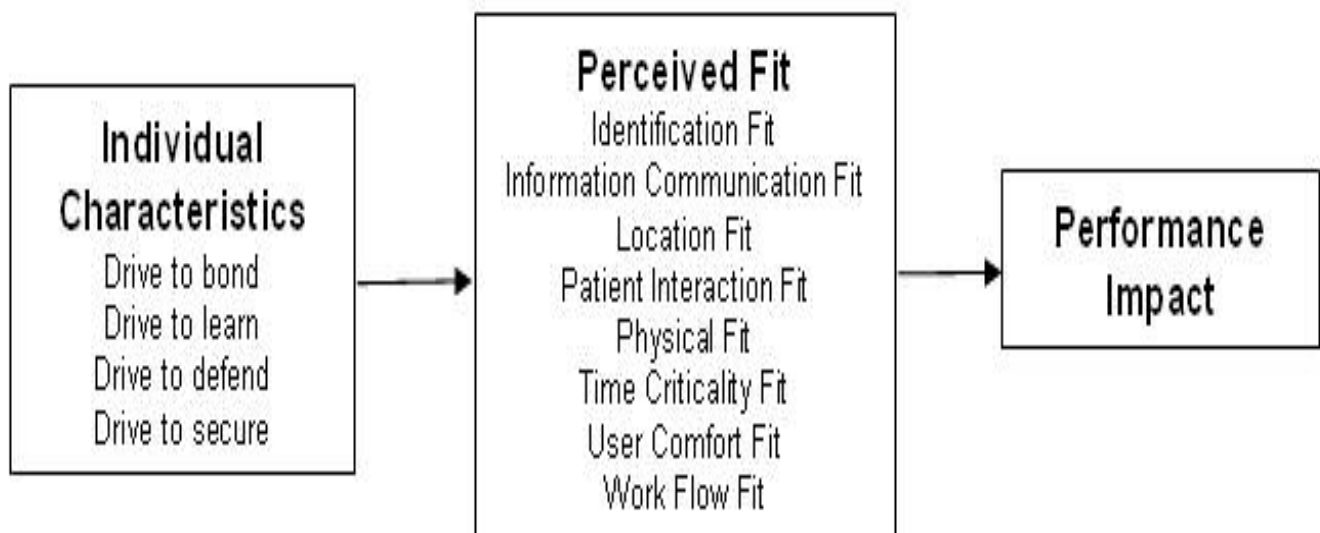**Figure 1 Interpretation of Nurse Perspective (Selective Coding Results)**

Figure 2. Research Model for Quantitative Analysis

Table 1. Data Collection Summary

Setting	Task	Interviewees, Observations, and Archival Materials
1 Hospital A: Emergency Department ED)	Patient registration and triage	**Interviews**: 1 CIO, 6 Organizational Managers, 3 IS Personnel, 3 of 6 triage nurses, 2 of 6 registration personnel **Observations**: 6 of 6 triage nurses, 6 of 6 registration personnel **Archival material:** one 20 page project proposal description
2 Hospital B: Post Anesthesia Care Unit (PACU)	Electronic charting of unconscious Patients	**Interviews:** 1 Director of MIS, 1 Director of Perioperative Services who was also a registered nurse practicing in ACU and PACU at alternating times, 8 of 13 PACU nurses **Observations:** 13 of 13 PACU nurses **Archival material**: One 6 paged checklist for patient assessment, three sample historical manual charts, one 10 page ad-hoc user manual in PACU
3 Hospital B: Ambulatory Care Unit (ACU)	Electronic charting of conscious patients	**Interviews:** 1 Director of MIS, 1 Director of Perioperative Services who was also a registered nurse practicing in ACU and PACU at alternating times, 8 of 22 ACU nurses **Observations:** 22 of 22 ACU nurses **Archival material**: one 110 page systems requirements specification with interspersed focus group meeting notes, one two-paged checklist for patient assessment, three sample historical manual charts
4 Hospital C: Regular Floor Unit	Medication administration	**Interviews:** 1 Director of Nursing Informatics, 5 Nursing Informatics Specialists dual-hatted as practicing nurses in the same hospital using the same technology as the floor nurses, 4 of 10 floor nurses **Observations:** 10 of 10 floor nurses **Archival material:** three 100+ page implementation specification manuals, one 10 page end-user manual that included system screen shots, and one nursing informatics training curriculum for the system

Phase II is being conducted under the same premises of post-positivism but applies quantitative data collection via a survey and partial least squares as an analysis technique.

Recommendations for future Research

Future research entails testing the research model in Figure 2 in other industries besides healthcare that have high utility for information at the point of work to gain generalizability. Additionally, I would like to present the research to vendors who provide mobile information communication devices to the healthcare industry to ascertain the likelihood of this model being incorporated into the technology design principles.

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Case II. Implementing CPOE: Assumptions and Expectations of Key Stakeholder Groups

Project Description

CPOE (Computerized Physician Order Entry) systems enable a patient's care provider to enter orders for drug therapy, diagnostic tests, and requests for consultations, which are then transmitted to the appropriate department or individual to be carried out. They also incorporate clinical decision support functions such as computerized reminders, prompts and advice regarding issues such as drug selection, doses, interactions, drug allergies and the need for corollary orders (Kaushal et al. 2003). While the benefits of CPOE systems can include significant improvements in patient safety and increased efficiency, adoption of CPOE by hospitals has been slow. A survey by The Leapfrog Group at the end of 2004, for example.
 (http://www.leapfroggroup.org/media/file/Leapfrog-Survey_Release-11-16-04.pdf) found that only 4% of hospitals had fully implemented CPOE, however another 16% planned to implement it by 2006.

Implementation of CPOE in clinical settings is not always successful. Adoption and initial implementation by hospitals is only the first step in utilizing these systems to enhance the quality and efficiency of patient care. In many situations, physician use of CPOE is not (and cannot be) mandatory. In these cases, then, adoption by individual physicians is a critical issue. Major changes to workflow, skepticism concerning evidence based medicine (EBM) approaches; concerns about the time required for training and use are among the many different concerns that have been voiced. In addition to encountering possible physician resistance to CPOE, the implementation of these systems bring with them all of the challenges encountered in implementing any large enterprise-wide system. Potentially, every major stakeholder group (pharmacists, nurses, administrators, physicians, etc.) is impacted by the implementation of CPOE. The purpose of the study described in this section is to understand how the assumptions, expectations, and values of key stakeholder groups may influence the successful implementation of CPOE systems.

Research Design and Data Collection Methodology

For the research, we are employing an action research methodology (Baskerville and Myers 2004), a social cognition approach based on the concept of technological frames (Orlikowski and Gash 1994), and group cognitive mapping techniques. The case study is an in-progress is a CPOE implementation at a large regional medical center. The system is being introduced in a staged approach to different departments/specialties, with initial implementations in orthopedic surgery and the emergency room. An internal CPOE Team of medical, technical and support staff are managing the rollout of the system.

An action research methodology was chosen because of its potential to increase the practical relevance of the research through the combination of two important goals within the study – aiming to solve current problems and expanding scientific knowledge (Baskerville and Myers 2004). As described by Baskerville and Myers (2004) the methodology involves a two-step process, a diagnostic phase in which the researchers collaborate with the participating subjects followed by a therapeutic stage where solutions are applied and evaluated.

The study is currently in the diagnostic phase of the research. For this phase, we are using cognitive mapping to capture the technological frames of the CPOE system of key stakeholder groups (e.g., physicians, nurses, pharmacists, IT staff, and hospital administrators). Technological frames are defined as "the assumptions, expectations, and knowledge they [organization members] use to understand technology in organizations. This includes not only the nature and role of the technology itself, but the specific conditions, applications and consequences of that technology in particular contexts." (Orlikowski and Gash, 1994, p. 178). The main premise of technological framework theory, as articulated by Orlikowski and Gash (1994) and others, is that People develop different mental models about technology somewhat independently from the technology's material properties. It is important to understand these different interpretations of technology because people shape their actions towards the technology based on these interpretations. Differences (in congruencies, misaligned expectations, etc.) among the technological frameworks of key stakeholders can lead to difficulties in the implementation of technology, in this case the hospital's CPOE system.
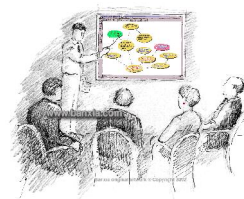

Figure 1. Banxia Decision Explorer Software

Challenges and Lessons Learned

To elicit the technological frames of key stakeholder groups involved in or affected by the implementation of the CPOE system we are conducting facilitated group sessions with each group. Group cognitive mapping techniques are being used to discover the shared "construct system" used by the group to make sense of reality (Eden 1988). Cognitive maps are graphical representations of this construct system and are comprised of brief text representations of concepts linked by arrows that describe explanations (in arrows) and consequences (out arrows). Four group sessions have been conducted to date (CPOE Implementation Team, Nursing Administration, Physician Leaders, and Physician Executives). Session data to be included in the analysis includes main concepts/relationships (from group maps), raw input (from individual brainstorming) and transcripts of group discussions. Main concepts from three of the sessions are shown in Table 1. While some concepts appear on more than one map, the detailed input and discussion reveals key differences in how stakeholders may view that issue. For example, money/resources is a concept on each map, however the primary concern for the CPOE Implementation Team and Nursing Administration was having enough money for computers for adequate access to the system; for the Physician Group, a primary money issue was the ability to provide monetary incentives for physician use.

Table 1. Main Concepts – CPOE Success – by Stakeholder Group

CPOE Team	Nursing Administrators	Physician Leaders
• Physician characteristics/resistance to change	• Education	• Support/education
• The talent/implementation team	• Resources	• Personnel
• Teamwork/communication	• Participation	• Infrastructure
• Workflow	• Support	• Feedback
• $$$	• Processes	• Software
• Training and adoption	• Buy-in	• Maintenance & utility (design flexibility)
• Quality value (value proposition)	• Physician incentives	• Hardware (speed/time)
• Access	• Ease of use	• Data reports
• Time		• $$$
• Attitude		
• Content & protocol/knowledge/order sets		
• Hospital leadership		

Our greatest challenge in conducting this type of action research has been aligning the extremely busy schedules of practicing physicians. We have learned to be patient and flexible when requesting physicians to give of their valuable time to participate in our studies. Time is money! We have also learned that reciprocity is very important for maintaining positive and ongoing research partnerships in healthcare. Academics must be aware that health care professionals appreciate feedback regarding the research findings, suggestions for performance improvements and guidance regarding best practices. It is not prudent as a researcher to enter a health care research partnership with the objective of acquiring data and writing a paper for an IS publication. The perceptive and contentious academic will also provide timely professional feedback to affect the business processes and best practices immediately. It is important to note that health care organizations that expedite process improvements save lives.

Project Status

The research team plans to conduct four more group sessions with stakeholder groups throughout the summer of 2007. We also expect to have completed our analysis and developed recommendations for the hospital administration concerning intervention strategies to address in congruencies and misalignments that could impede the successful deployment of the CPOE system. The AMCIS conference presentation will include a report on the status of the project and preliminary findings.

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Case III. Why Do Organization Adopt Health Care Information Technology?

Project Description

A preliminary study into the reasons for health care IT adoption was conducted at an urban teaching hospital with a medical school and dental affiliation to investigate non-monetary factors that affect information technology adoption in clinical health care. 578 full-time attending physicians; 300 who are also faculty members of the Medical School staff the hospital. This teaching Hospital has 504 beds and more than 19,000 admissions, 2,700 births, and 229,300 outpatient visits annually.

This pilot study was conducted to determine the level of acceptance, resistance, and change associated with the introduction of Information Technology (IT) into Operating Departments in Hospitals/Healthcare Organizations and to discover the kinds of structural problems that may develop in the transition and, particularly, the ways these problems are defined and managed. This University was in the process of undertaking a 3-year roll out of IT applications for their Hospital.

These findings were also discussed in detail regarding the identification of barriers to IT adoption (Hare et al. 2006).

Research Design and Data Collection Methodology

Method: The study examined results from questionnaires for the analysis. All participants in the study signed consent forms prior to completing the Questionnaire. The tools associated with this research were as follows:

Questionnaires – respondents are anonymous. The questionnaire does not have names or other identifying information.

Consent Form – participation is voluntary and participants can refuse to participate, or may discontinue participating at any time, without penalty, and without coercion.

Sample: Urban teaching hospital and medical school employees comprise the sample population for data collection. The Pilot was conducted in the fall of 2003 with 18 participants from a medical practice in the Ambulatory Care Division of the complex. The participants are adults who voluntarily agreed to complete the questionnaire. The composition of the participants ranged from department clerks to the medical director of the practice.

Analysis: This was a triangulated study using both qualitative and quantitative analysis. Qualitatively, constant comparative analysis as described by Glaser and Strauss (1999) was used to formulate categories of response concerning work with information technology. Quantitatively, demographic data was compiled as descriptive statistics, and Likert Scales were evaluated using the statistical software package SPSS.

Statistical Analysis: Descriptive analysis was conducted with the results from the questionnaires, which were further analyzed using SPSS. The results of the descriptive analysis emphasized several categories of participant responses from a select group of questions. The instrument was comprised of 17 questions; the first eight questions capture demographic data, the next eight are Likert scales, and the last question solicits responses about the information technology they use. The findings from question 17 on the questionnaire indicate three categories of responses.

Pilot Study Findings:

The results from this pilot study showed us the significant gap in clinical processes and information technology. We were able to identify barriers to IT adoption in the form of inhibitors, defined as factors that precluded clinicians from adopting technology that could help them. The findings suggested that while subjects recognized the functional value of system data integration and

IT user-friendliness in IT solutions, additional factors like faster system response were also major implementation concerns in the clinical setting. This pointed the research towards identifying IT factors other than those usually considered by IT designers. Analysis of the literature and research study presents a framework for IT adoption in a clinical setting. It suggests that IT mobility and confidentiality are critical considerations for practitioner adoption. It also implies there is a critical "gap" between IT providers and IT users in the clinical setting, and Brown and Swartz (1989) note the importance of matching service provider and receiver perspectives to avoid gaps arising from inconsistent perceptions (Gomez et al. 2006). While mobility and confidentiality are individually common in IT, their combination (which clinical health care requires of its IT support) is not. Combining independent performance criteria such as confidentiality and mobility raises the problem of "cross-cutting requirements" (Madeira et al. 2002). These can be particularly difficult to deal with, as IT; designers must create a "synthesis of the form" across more than one dimension (Alexander, 1964). Clinical IT invokes crosscutting requirements beyond well-known functionality and usability requirements, this may explain why certain clinical IT has so far largely resisted computerization.

Challenges and Lessons Learned

The major challenge was getting into the facility to conduct the study. My first pilot took about a year to solidify a relationship with the hospital executives and physicians who ran the clinics that I had to interview for the study. The lesson I have learned is that there is a level of diplomacy and explaining the intentions that you have when conducting research at their facility; also to ensure that you will share results of the study and recommend changes when applicable.

Recommendations for future Research

- You must establish relationships with Healthcare providers that have adopted IT applications or seeking IT solutions. As stakeholders, they are able to facilitate introductions to their peers and colleagues who are open to IT solutions.
- Once relationships are established, you must foster a level of reciprocity to share the data you have collected; so that they can adopt IT applications that will bring about quality of care for their patients in their practice.

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Case VI: Handhelds for Medication Administration

Project Description

There are at least three opportunities for error in medication administration in a hospital setting. The doctor can prescribe the incorrect medication or dose, the pharmacist can misinterpret the doctor's orders or fill the prescription incorrectly, or the nurse can administer the incorrect medication, give the correct medication at the wrong time, or fail to administer the medication at all. Should any of these situations occur, the consequences are potentially devastating?

The following case briefly details the pilot implementation of a medication administration software package on a handheld computer designed to reduce errors in medication delivery by nurses in a large hospital. The software used was a Beta release from a major healthcare software developer. The first phase of the rollout involved testing the software in one unit of the hospital to determine if the software was ready for hospital-wide use. The nurses in this unit were aware that they were one of the first units in the hospital to use the device, but did not know it was a Beta version. The authors were asked to perform the *User-in-Context Iterative Assessment* (UCIA) (Sallas, Lane, Mathews, Watkins, and Wiley-Patton, 2007) after the systems requirements phase, but before the pilot implementation.

Figure 1. Handheld Computer

The users were nurses on a 14-bed medical-surgical ward in a large, private medical center located in a Southern state. The level of experience for nurses on the unit ranged from 2-30 years, with a mean of 6.4 years. The hospital was a Level II trauma center with over 600 beds. The handheld computer was designed to replace one feature of an existing system of laptops on carts, which were rolled into patients' rooms to chart medication administration. The existing process required nurses to retrieve medications for a particular patient from a central computerized storage vault. Upon "pulling" the medications from the vault, the nurse would compare the medications to the list on the storage vault's computer screen to ensure they had the complete set of medications. The nurses could then make an additional check of the patient's medications by using their laptop to access the patient's electronic medical record (EMR). The nurse would then roll the laptop into the patient's room and use the attached barcode scanner to scan the patient's hospital-issued wristband. Scanning the barcode verified the patient's identity and called up the medications prescribed to the patient on the laptop. As the nurse administered the medication, each one could be checked off as administered in the EMR. When finished, the nurse would then close the process by electronically "signing" the EMR, which created a report of which medications were administered to the patient with a time stamp. After the implementation, the plan was to continue to use the laptop for general charting and other tasks, but the handheld computers would be used to document medication administration in the patients' rooms. The IT project had several initial goals: 1) increase compliance with the policy for scanning patient wristbands; 2) increased IT portability; and 3) decreased medication administration errors. The organization also expected that the nurses would adopt the handhelds rather quickly as the functionality was similar to what was being currently used on the laptops.

Research Design and Data Collection Methodology

Phase 1: Context Modeling

In this first phase, an "expert nurse" , one who was experienced and followed best practices for a task analysis was identified. We videotaped the expert nurse administering medication to a mock patient as well as performing other tasks central to her job (i.e., taking blood pressure, assessing mental status, setting up an IV). The nurse was instructed to think-aloud during the observation so that we would know what she was doing and why (Ericsson & Simon, 1993). Further, the nurse walked the researchers through the typical medication administration process from doctor's order to medication delivery. This task analysis was supplemented by observations of other nurses on the unit performing their job duties. This analysis allowed us to develop a detailed workflow and identify specific variables we hypothesized might be affected by the transition to the handheld.

Phase 2a: Baseline Assessment

Phase 1 allowed us to identify critical variables for further study. These variables were operationally defined in terms of time or count measures. For example, we measured the time durations of various tasks including the amount of time spent in a patient's room, educating a patient, giving a physical assessment, physically moving the laptop cart, doing paper work, etc.

Phase 2b: Training and Initial Use Assessment

Observers were present during training sessions and immediately after the handhelds were placed on the ward. Formal measures were not gathered at this time, but observers watched as the nurses attempted to use the new device. When the handhelds were finally implemented on the unit, not only were some nurses trying to remember how to use the program, but also were learning how to use a pen-based operating system.

Phase 3: Post-Implementation Assessment

Observers collected 20 hours of data over two weeks in the same manner as the baseline assessment phase. A second survey was administered. In addition to the survey items used in the earlier phase, this survey also included specific questions about the new handheld device, such as: "What do you like about the new handhelds?", "What don't you like?", and "What could be done to make the process of switching to the handhelds easier?" The purpose of this information was to supplement the observational data and informal conversations with the nurses.

Phase 4: Analysis

We compared data collected in the post-implementation assessment to the baseline data and found that the introduction of the medication administration software on a handheld computer did not produce changes in the primary measures. Most specific to the implementation, the number of times nurses failed to scan a patient wristband was similar at both times.

Challenges and Lessons Learned

As researchers, we were not directly involved in the decision to implement this handheld application. However, data from the assessment was provided to IT management and is currently being used to make decisions about the future of this and related technology implementations. The handheld device is also now in use hospital-wide. We expect that future implementations will benefit even more strongly from the UCIA approach because they will take advantage of its iterative nature. We have learned that an advantage of the UCIA approach is that a project is evaluated based on multiple criteria, and thus the "success" of an implementation can be judged in a more nuanced, yet realistic, way rather than if the IT is reported adopted or used. The UCIA approach provides valuable knowledge by giving health care decision makers hard data about the interaction of users, their work, the context of that work, and technology. However, because the approach is iterative, it is most useful when integrated within a larger management process.

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Conclusion

Lessons learned from these pioneering and early adopter organizations presented in this report can guide future academic-health practitioner collaborations. Vast improvements to the health care system can be achieved with the commitment from academics, leading health organizations; and continued national attention to the issues that will move healthcare into its rightful place within the 21st Century.