Comparing User Acceptance of a Computer System In Two Pediatric Offices: A Qualitative Study

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The purpose of this qualitative study was to examine user acceptance of a clinical computer system in two pediatric practices in the southeast. Data were gathered through interviews with practice and IS staff, observations in the clinical area, and review of system implementation records. Five months after implementation, Practice A continued to use the system but Practice B had quit using it because it was unacceptable to the users. The results are presented here, in relation to a conceptual framework, which was originally developed to describe the process of successful implementation of research findings into practice. Five main themes were identified relative to the differences in user acceptance at the two practices: 1) Benefits versus expense of system use varied, 2) Organizational cultures differed, 3) IS staff's relationship with practices differed, 4) Post-implementation experiences differed, and 5) Transfer of technology from the academic center to private practice proved challenging in Practice B. The findings indicate a need for the development and validation of tools to measure healthcare organizational climate and readiness for change.

INTRODUCTION

The literature is replete with reports of computer information systems' positive impact on healthcare, through improvements in the way information is collected, stored, retrieved and processed by clinicians. Studies have traditionally evaluated cost/benefit ratios and outputs of automation. Growing attention has also been given to the variable impact that computer systems implementations have had on the people and organizational cultures into which they are introduced.[1-7] Some information systems fail to improve information processing in the clinical environment, but worse yet are the systems that create more problems for users than the manual systems they replace. Formal evaluations of clinical systems must include measures of the social impact on organizations.

This paper presents a qualitative study of user acceptance of a computer system, which was implemented in two pediatric offices in the southeast. The Child Health Improvement Program (CHIP) was developed and initially implemented in the outpatient general pediatric clinic at an academic medical center. The system provides guided prompts for preventive services screening and teaching during pediatric office visits, and has demonstrated improvements in preventive services delivery compared with the previous manual system.[8] After successful implementation of the system at the medical center, the principal investigator developed a project to evaluate the CHIP system's effectiveness in community-based pediatric practices. Four community practices were selected for the project, based upon their proximity to the university medical center (50-mile radius) and willingness to participate in the project. The project compared preventive services delivery in two of the practices, which received the CHIP system, to the two that continued to use existing preventive services delivery methods.

The CHIP system was implemented at the two intervention practices in the fall of 1998. Both practices received comparable training, technical support, and post-implementation debriefing. Five months after implementation, Practice A continued to use the system but Practice B had quit using CHIP. The CHIP staff reported high user acceptance of the system at Practice A, and low acceptance at Practice B. The investigator then developed a plan to retrospectively examine the issues surrounding user acceptance of CHIP in the two pediatric offices. The research question for this study was: **What affected the user acceptance of CHIP in the two practices?** The operational definition of user acceptance encompasses both user satisfaction and the actual use of the system by those for whom it was intended.

METHODS

Utilizing a qualitative research design, a nurse researcher collected data through interviews with practice and CHIP staff, observations in the clinical environment, and review of CHIP implementation records. This inductive approach facilitated an in-depth study of individuals' perceptions of user acceptance of the CHIP system in the two practices.[9] The nurse researcher collected all data and was not a member of the CHIP staff.

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Interviews were conducted with a minimum of two nurses, two physicians and two front office personnel at each site, with additional interviews as needed until data saturation was achieved. All 6 of the CHIP staff were interviewed. Participation was optional and responses were kept confidential. The Committee on the Protection of the Rights of Human Subjects approved the study. Table 1 summarizes the sources of data.

Table 1- Data Sources

Practice A	Practice B
MD Interview- 2	MD Interview- 3
RN Interview- 2	RN Interview- 2
Office Staff- 2	Office Staff- 3
Observation- 2	Observation- 2
CHIP Staff	**Other**
Staff- 6	Records-10
Observation- 3	Consultant- 3

Data were entered into a word processing system as soon as possible after data collection. Data were then coded using the software program Non-numerical, Unstructured Data Indexing, Searching and Theorizing (NUDIST, Sage Publications, Thousand Oaks, CA). The software tool was utilized to identify commonalties in the subjects' perceptions of the user acceptance of CHIP at the two practices. Credibility was established with selected member checks, and comparison of emerging themes with the literature. The findings were then validated through member checks and consultation with a management consultant with expertise in introducing computer systems into clinical environments.

FINDINGS

Five main themes regarding the users' acceptance of CHIP were identified. They are listed in Table 2.

Table 2- Themes

1. Benefits versus Expense of System Use Varied
2. Organizational Cultures Differed
3. Differences in CHIP Staff/Practice Relationship
4. Post-Implementation Experience Differed
5. Transfer of Technology from Academic Medical Center to Private Practice Proved Challenging in Practice B

1. Usefulness

The benefits versus expense of system use varied at the two practices. Practice B had an existing, standardized, manual system for preventive services tracking and screening, and Practice A did not. The majority of the Practice B staff interviewed for the study reported that their manual system worked well, and in fact was superior to CHIP. The Practice A staff reported that their pre-CHIP preventive services screening wasn't standardized among physicians and had ample room for improvement through a systemized approach.

The staff from both practices had similar complaints about CHIP, but differed in their willingness to tolerate those perceived problems. Both practices reported that CHIP negatively impacted their workflow, as well as various problems related to system content, computer-generated forms, hardware and interfaces, and entering prior visit data. In spite of their complaints about CHIP, 5 of 6 Practice A staff felt that the benefits outweighed the expense of system use. Only 1 of 8 interviewees at Practice B felt that the benefits outweighed the expense of system use.

2. Social Worlds

The two practices varied significantly in many aspects of organizational culture, or as Aydin and Rice[7] describe it, social worlds. The Practice A staff conveyed a readiness to change that wasn't present in Practice B. For example, one front office staff member at Practice A stated, "We've had lots of changes here. It was just one more. Everyone liked it because it was new." Staff at Practice A described an atmosphere that fostered team spirit, whereas Practice B interviewees reported discontent among staff and lack of cohesiveness in the face of changes in office processes. Though both practices reported comparable daily patient volume, all Practice B staff members interviewed reported that the clinic was too busy to effectively implement a change such as the CHIP system. The practice had a history of resistance to change, exhibited by one staff member's comment, "We've had a scheduling computer for 6 months. They sent people to classes and still the staff won't use it."

The practices both had strong support from senior management initially. However, they varied in the way in which informal power was manifested in the opinion leader in each practice. At Practice A, the opinion leader also adopted the role of system champion, and worked to build staff consensus that the system would improve care and should thus be accepted. At Practice B, the opinion leader had a more autocratic style and countered the champion's efforts to gain system acceptance. The senior manager took a passive role after the initial planning meeting. Eventually the champion decided that she couldn't support the system alone and stated she gave up on getting the staff to accept it.

3. Partnership

The CHIP staff described a very different relationship with Practice A compared to Practice B. One notable difference was the practices' expectations for system support and modifications. Both the CHIP and Practice A staff described their relationship as a partnership with regard to system support and modifications. For example, one Practice A front office staff member, initially new to computers, worked to become proficient in trouble-shooting problems and now provides initial support onsite. CHIP staff also talked about a general willingness among the Practice A staff to take accountability for CHIP-related tasks, such as re-booting the system. In their descriptions of negotiations about potential CHIP system modifications, both the CHIP and Practice A staff describe a give-and-take relationship, whereas the CHIP staff reported that Practice B was unrealistic in their expectations regarding changes. The CHIP staff didn't have the resources to meet Practice B's expectations for rapid response to modification requests.

As the situation progressed at Practice B, the staff became more vocal in their displeasure with the system, their requests for system changes decreased. The CHIP staff reported that most of the subsequent CHIP modifications were done at the request of Practice A, which they felt were more reasonable in their expectations. Practice B staff reported that their requests for system modifications were often not addressed. The CHIP staff perceived a general lack of accountability for CHIP-related tasks at Practice B. One Practice B staff member stated that a staff nurse who was trained by the CHIP staff to do initial trouble-shooting of system hardware was resented by the other staff for being singled out. However, no other staff members were willing to take responsibility for ensuring that the system was working, had paper in the printer, or calling CHIP staff for support when hardware problems occurred.

As the Practice B users became more discontented with the system, the CHIP staff felt an increasingly strained relationship with those users in comparison with Practice A. They perceived the Practice A staff as supportive, forgiving partners, but felt uncomfortable when making service calls and holding project status meetings at Practice B. As one CHIP staff member put it, "Who wants to support a place that rolls their eyes, or goes and hides when we walk in the door?"

4. Post-Implementation

The CHIP staff described the two clinics' differing needs for change management strategies during and after system implementation. The champion was identified early at Practice A, and that physician was an integral part of the project team from planning through post-implementation evaluation. The CHIP staff observed that, as issues came up regarding the system, all staff members at Practice A were empowered to address them so problem resolution was effective. Though the system champion was identified at Practice B, that physician was mistakenly also identified as the opinion leader during the project planning phase. It was well after CHIP implementation, and faltering user acceptance, that the CHIP staff discovered the opinion leader was another physician, who had not been active in the project planning and implementation processes. Consequently, that opinion leader didn't fully understand the fact that the CHIP system would replace, not supplement, the existing manual system in which he/she was heavily invested. Although post-implementation debriefings had been conducted with some of the key personnel at Practice B, the opinion leader had missed some of those sessions. Misunderstandings between the CHIP and practice staff about the system's impact on the existing manual system, and significant workflow issues had gone unapprised for a period of time, and the opportunity for compromises was lost. Also, the CHIP staff member responsible for being the clinical liaison between the practices and CHIP had left for another job. Staff at both practices reported a desire for continued involvement of a clinical liaison throughout the post-implementation phase.

5. Researcher or Vendor?

Throughout the interviews, a prominent theme was the challenge of implementing systems developed for academic medical center environments into private practice settings. Staff at both practices said that, at the outset of the project, they looked forward to working on the CHIP project. Both reported that they often participated in clinical research partnerships with academic centers, though the projects were typically pharmaceutical studies as opposed to technology research. The subjects from both practices, as well as the CHIP staff, described a lack of clarity regarding the CHIP staff's role as academic researchers versus software vendors. There was no consensus among the study subjects as to whether the project purpose was an academic-private research partnership evaluating an evolving system in a new setting, or a mature product being implemented by the academic "vendors" in pediatric office settings. There was also a difference of opinion among CHIP staff regarding their role in system support, and the degree to which the system might be modified at the practices' requests. The team had

decided that CHIP would not be customized for an individual site, so any modifications would have to be implemented at all 3 sites, the academic center and Practices A and B. As the project progressed, some CHIP staff members expressed a dislike for providing support, as well as making extensive system modifications at the request of one or both practices. In follow-up interviews with the CHIP staff about the practices' expectations, they explained that they might have given mixed messages to the practices about the extent to which CHIP would be modified during the project.

DISCUSSION

The marked differences in experiences with CHIP at the two practices presented a natural experiment, in which to study the influence of people and organizational issues on users' acceptance of clinical systems. A conceptual framework, developed by researchers at the Royal College of Nursing (RCN) to describe the process of successful implementation of research into practice, provides a model in which the findings of this study can be interpreted.[10] At the core of the framework are three interdependent elements: evidence, context and facilitation. The researchers contend that successful implementations of research in practice settings must address the interplay between these three elements. First, the evidence itself is viewed as a factor in successfully translating research into practice; the scientific rigor of the research findings, plus the level of consensus among the scientific community regarding the strength of the evidence influence successful translation. The optimal context for implementing research in practice settings is a culture that is patient-centered, with effective leadership and a high degree of quality assurance monitoring. Successful facilitation of research into practice is based on the practice setting's respect and empathy, successful change agenda negotiation, and consistent and appropriate facilitator presence and support.

The five main themes, which emerged from the data sources, can be viewed in the context of the RCN model. The success of the CHIP implementation in the community practice settings was affected by differing levels of user acceptance, and was dependent on the interplay between the elements of evidence, context and facilitation at each site. Practice A displayed a high level of consensus regarding the evidence that the CHIP system facilitated improvements in preventive services delivery, whereas in Practice B there were differences of opinion about the evidence. The context and style of facilitation of the practices were also markedly different. Practice B represented a task-driven culture, with a lack of team roles, and a lack of clarity surrounding authority and the change agenda. Practice A was characterized as a learning organization, with effective teamwork, and a clear change agenda that was successfully negotiated by the champion who functioned not just as an opinion leader, but more importantly, as an effective facilitator.

Previous authors have described a key measure of success in clinical system implementation: Does the system work better than the system it replaced?[1] The staff at Practice B felt that their previous, manual system had met their needs, but CHIP did not. On the other hand, Practice A embraced CHIP as meeting their needs for a system for preventive services tracking, which they lacked before the project. Though both practices had similar workflow complaints about CHIP, the complaints were handled in very different ways. As with all projects that automate previously manual processes, the CHIP system required that the practices modify their operational flow. In Practice B, the change in workflow created by CHIP was perceived as having a major, negative impact on operations. Practice A staff also reported that using CHIP initially slowed down operations due to workflow problems, but the staff reacted by getting together and coming up with a better way of integrating CHIP into the daily routines. They also described a tolerance for the fact that the staff were learning to use a new system and would likely speed up as they became proficient with the computer. At Practice B, users reacted to the workflow problems by not using CHIP; when the clinic got busy they reverted to the manual system.

Though it became clear that Practices A and B reacted differently to change, the CHIP staff found themselves unprepared for tailoring the implementation to two very different office cultures. The loss of the clinical liaison may have impacted negatively on the change management process during the post-live period. The implementation of CHIP at Practice B was complicated by a challenging organizational culture: lack of staff cohesion, autocratic opinion leader, poor morale, and a sense of being overworked.

Change management strategies are an integral part of all successful computer system implementations.[1,11,12] Assessment tools which measure the organization and individual users' attitudes toward changes involved with information systems have been developed and validated in the business and information technology communities.[13-16] Some have

been adapted for use in healthcare settings.[1] More work is needed to develop and validate such tools, which have the potential to facilitate the change process in clinical system deployment.

CONCLUSIONS

The implementation of the CHIP system proved successful in Practice A, but not in Practice B. The study findings are consistent with the RCN conceptual framework for successful implementation of research into practice. Acceptance of CHIP differed in the two practices for several reasons. There were differences in the practices' acceptance of the evidence about CHIP's effectiveness. The context in which the two organizations' cultures and leadership operated were significantly different, as were the processes by which change was facilitated. More work is needed to develop and validate tools to measure healthcare organizational climate and readiness for change. Such tools have the potential to facilitate the change process in clinical system deployment.

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