Understanding Patient User Experience in Obstetric Work Systems

Enid N.H. Montague

Industrial and Systems Engineering Department
University of Wisconsin-Madison3270 Mechanical Engineering
1513 University Avenue Madison, WI 53706
emontague@wisc.edu

Abstract. Patient user experiences with medical technology may be important predictors of patient ratings of satisfaction with health care systems and of acceptance of technologies used in their care. The purpose of this study was to understand how patients experience medical technology during medical events as passive users. 25 women were interviewed after the birth of their child about the technologies that were used to provide them care. Interviews were transcribed verbatim and reduced to codes in the qualitative data analysis tradition. Results show that patients have user experiences with technologies as passive users.

Keywords: Patients, Technology, User Experience, Health Care.

1 Introduction

Human computer interaction theorists have begun to explore new definitions of user experience that include concepts such as trust, engagement, fun and fidelity [1, 2]. This study used qualitative research methods to develop a typology of obstetric patients' user experiences with medical technology and proposes a socio-technical systems framework for measuring and understanding patients' total user experience with medical technology. We examined patients' user experiences with medical technologies during the birth of their child using open-ended interviews with 25 mothers after they had given birth. The decision to explore patients' experiences with the technologies used in their care, was based on our hypothesis that patients have experiences with technologies and the technologies affect patients' experiences, even when patients are not active users of the technologies, in the same sense that their care providers might be.

1.1 Definitions of User Experience

There are three major perspectives of user experience; 1) user experience as human needs beyond usability; 2) user experience includes emotional and affective aspects of human interactions; and 3) user experience is the deconstruction of what it means to have an experience [3]. This study examined the user experiences of patients in an obstetric work system to build upon theoretical perspectives of user experience that

move user experience with technology beyond usability [3]. We were interested in how patients developed and expressed user experiences with technologies they might not use. We also wanted to understand the emotional aspect of user experience in health care, emphasizing how aspects of interactions with technologies and systems might lead to positive or negative user experiences. Lastly, we wanted to define user experience in the context of humans as both patients in a health care environment and as passive users of a technology.

1.2   User Experience Beyond Usability

Researchers have argued for the importance of including non-task related user needs in the design of products and systems, but gaps continue to exist in our collective understanding of the antecedents, factors and outcomes of emotional usability [3]. Researchers have explored constructs such as trust [4-6], fun [7-12] and happiness [13, 14] in relation to the creation of user experiences and perceptions of usability [15-17]. In health care work systems, trust and privacy are important for patients' interactions with technologies [18, 19]. We hypothesized that patients would expect their interactions with the technology and system to reflect their emotional experiences of happiness and excitement, which might affect their overall user experience.

1.3   Emotional User Experience

User experience research and health care research have recently adopted an emphasis on creating positive user experiences. In 2003 the Department of Health (DHS) found patient emotional experience to be an important predictor of overall patient satisfaction [20]. To work towards improved patient experiences the DHS issued a 'Patient Experience Statement' which summarizes how patients would like to experience the National Health System emphasizing emotional expectations rather than physical expectations [20]. Emotional experience is also important in user experience research; a major theme in this scholarship is understanding the relationship between design and emotional usability [15, 21-25]; specifically understanding how emotions lead to positive user experiences and how positive user experiences lead to emotions [3, 26, 27]. In this study we were concerned with the relationship between patients' user experiences with technologies and their resultant emotions; specifically how different aspects of the technology lead to different emotions.

1.4   Deconstructing User Experience

Users bring an array of individual characteristics such as emotions, values, experiences, and mental models for interpreting sounds, sight, and touch; each of these characteristics effects new and current experiences [28]. To design a user experience the designer must understand the user holistically, which is particularly important when designing technologies for a health care experience. The experience of being a patient is one of inherent vulnerability and consternation; which may be created at the moment of the medical event or over time as one prepares for the event with smaller medical events. An experience contains countless discrete experiences that are associated with various environments, individuals and objects [29]. The experience of having a baby is made of many small experiences such as the physical experience of

being pregnant, having an ultrasound, visiting a hospital, interacting with a doctor and attending a childbirth class. A woman may have many key stakeholders in her experience, such as her friends and family who have had babies before her, her doctor, and her partner. The context of her interactions with her health care providers has the potential to create a type of experience for her; a warm homely doctors office creates a different experience from a sterile, clinic office. In this study we wanted to deconstruct the experiences patients were having with the technologies used in their care to understand how patients might fit in to the sociotechnical system as users.

2   Methods

2.1   Participants

Twenty-five new mothers represented the patient group. All mothers had given birth in a hospital and were between the ages of 19 and 35. Seventeen participants self identified as White or Caucasian, one participant identified as Asian and one as Hispanic, five participants identified as Black or African American. The total number of children a participant had ranged from one to four, 12 mothers had one child, nine had two children, four had three children and two had four children.

2.2   Procedure and Analysis

Qualitative research methods are effective at revealing meanings people assign to their experiences [30]. To explore patients' experiences with the technology they were interviewed about the kinds of technologies that were used in their childbirth experience, what they noticed about the technology and how the technology made them feel. Interviews were transcribed verbatim and data were analyzed using grounded theory methods, processes, actions and interactions involving many individuals were studied [31]. To clarify participants' understandings of their experiences with medical technology the methods used in this study involved: 1. Developing codes, categories and themes inductively rather than imposing predetermined classifications on the data [32]. 2. Generating working hypotheses or assertions [33] from the data. 3. Analyzing narratives of participants' experiences with medical technology [30].

3   Results

3.1   Technology Used

Patients reported the technologies that were used during the births of their children. These technologies were coded individually and then grouped into singular codes to describe technologies that were essentially the same. For example codes such as scalp electrode, vaginal fetal monitor, and internal fetal monitor were all coded as internal fetal monitor. These codes were then organized into larger categories. Larger categories labeled; low technologies, monitoring technologies and birth assistive technologies, were created to capture the purposes of the various technologies.

Low technologies were described as the sole technologies used in natural birth experiences; examples included adjustable beds and clamps. Monitoring technologies were divided into two categories, those that monitor the mother and those that monitor the baby. Maternal monitoring technologies included maternal heart monitor, blood pressure machines and contraction monitors, while fetal monitoring technologies included heart rate monitors and ultrasounds. Birth assistive technologies were those technologies that were used when natural birth did not occur and interventions were needed. These technologies ranged in invasiveness from forceps, vacuums, epidurals, induction, and c-sections. Three patients reported not remembering or knowing what was used.

3.2 See, Hear or Feel

Participants' responses to what they noticed about the technology were divided into what they could see, hear and feel. Thirty-three codes were derived from sight, 14 codes were derived from feelings and 13 codes from hearing. Example codes for seeing included being able to see the monitor, seeing alarms, seeing pulse rate, seeing graphical readouts, and seeing contraction graphs on the monitor. The group feeling, contained codes such as feeling the internal fetal monitor, feeling the monitor during contraction, feeling the oxygen mask, feeling straps of the monitor around the stomach area, feeling blood pressure cuffs, and feeling medications through veins. Hearing included codes such as hearing heart beats, hearing unidentified beeps, hearing unidentified noises, hearing the baby's heart beat, and monitor print outs.

Table 1. Code Families of Technology Attributes Associated with Positive and Negative Feelings

Positive feelings	Negative feelings
Technology was comforting	Immobility
Perceiving heart beat is comforting	Belt as the source of negativity
Having the technology equaled overall good feelings	More pain than necessary
Knowing when and how long contractions would be	Frustrated about IV
Monitors helped outsiders (partners and nurses)	Unreliability
Seeing and monitoring ones own blood pressure.	Machines were distracting
Keeping an eye on babies heart beat	Equipment didn't feel natural
Knowing more	Contraction monitor is unnecessary
Knowing that the mom and baby were being monitored	Depending on others
Knowing that the baby is ok	Dislike of blood pressure cuff
	Feeling like you're in a hospital
	Doctors pushing more medical Interventions

3.3 Positive and Negative Experiences

After open coding, patients' experiences with the technologies were categorized into ten positive experiences and twelve negative experiences (see Table 1). Positive feelings were characterized as feelings that were welcome and comforting. These feelings were the result of what the patient noticed from the technology and how it helped them feel positive about the technology and the process. Negative feelings were characterized by expressions of negativity towards the technology and the feelings that resulted from the feedback from the technology.

4   Discussion

The results show that patients have user experiences with technologies that are used in their care and translate the feedback they receive into positive and negative feelings. Positive feelings were the result of what the patient noticed from the technology and how it made them feel comforted or positive. Subcategories of positive experiences included:

1. Generally feeling that technology was comforting because it gave them more information about what was happening to them and their baby. Erin expressed positive feelings when she said, "It made me feel I guess more comfortable and relaxed knowing that you know my baby's heart rate was being monitored and they knew what was going on as far as my contractions when they developed and… it was more comfortable."
2. Hearing the simulated heartbeat from the fetal heart monitor gave mothers comforting feelings. Hearing the heart beat, gave them a sense of reassurance that the baby was healthy and that they were more connected to their baby.
3. Having the technology equaled overall good feelings for some mothers. The presence of the technology made them feel that they were receiving first class care and that the system would be prepared if anything were to go wrong.
4. Knowing when and how long contractions. Mothers described knowing about the contractions as a positive experience for themselves and for the information it provided to their partners and care providers. Knowing when they would have contractions helped them prepare for them and it also helped their partners empathize when they could see the intensity of contractions on the monitors.

Kelly expressed positive feelings about the technology when she said "I'd say it was comforting, to be able to hear that the babies were doing fine, and you know, to be able to know when you were having a contraction too, and how much longer you were going to have to endure it. So I would definitely say it was comforting."

Negative feelings were characterized by expressions of negativity towards the technology and the feelings that resulted from the feedback from the technology. These negative feelings were:

1. Immobility was described as a source of negatively; the presence of the technology changed participants' experiences as patients. With the fetal heart rate monitor, patients were not able to move freely without regard to how the movement would affect the monitors functioning. Nicole expressed negative feelings about immobility

and depending on others when she said "I didn't like having to wear the monitors. I mean they put them around and she… kind of… you're kind of on a leash, so if you are trying to turn around to get comfortable, you can't. You have to ask the nurse, to like, make sure everything is still hooked up when you go to turn on your side and stuff like that. And that was kind of a pain."

2. Participants described frustration about having to use intervention that they perceived to be unnecessary. These interventions included intravenous therapy, automated blood pressure cuffs, and points where doctors suggested they interventions that had not planned for such as induction and epidurals.

3. Unreliability was a salient theme in negative experiences as indicated by the number codes between and within interviews. Participants expressed negative feelings when they could not depend on the technology to accurately reflect the health and well being of their baby. Jennifer discussed how unreliability contributed to a negative experience when she said:

"It's a little nerve wracking when they are like okay you know uh you know we are suppose[d] to be able to monitor the baby's heart rate and we can't find it. Even the attitude of the nurses in the room, they were agitated when they couldn't find the heart rate so you know and then, you know, you hear the beeeeeep, the loud beeps of straight lines and things like that. So it is, you know, you know, having had a more consistent experience with my son, you know, having all that going on and having the nurses attitude be a little more agitated with the process you know it kind of it kind of sends you into a "okay what's going on? Why isn't this working? Is something wrong with the baby?" So it was a little, a little nerve wracking not knowing, you know, not knowing why alarms were going off or not knowing why their machines weren't working for me."

4. A final major theme in negative experiences included participants' feelings that the technology was unnatural in their experience. The unwanted presence of technology was expressed by codes that described the presence of the machines and their outputs as distracting, the technology as unnatural and feeling like they were "in a hospital" as an unwelcomed experience.

5   Conclusion

One of our objectives was to define user experience in the context of humans as both for patients in a health care environment. Our results provide evidence to support the notion that patients have experiences with technologies used in their care. We also hoped to understand the relationship between characteristics of the technologies and positive or negative user experiences. Emotional aspects of user experience were present in our findings in both positive and negative experiences. When technology worked well, it had the potential to create positive experiences and enhance the patients' connection with their babies. Examples of designs that enhanced the emotional experience were the audible simulated heartbeat; when patients could hear the heartbeat they felt reassured that their baby was ok. Negative experiences occurred when technology did not work well or when care providers could not get technologies to work properly. We hypothesized that patients would expect their interactions with the technology to reflect their expected emotional experiences. Patients identified

mismatches between the experience the technology afforded them and their desired experience. These experiential mismatches were reflected in patients' desire not to feel like they were in a hospital or feeling the technology was an unnatural artifact in their experience. Patients also identified experiences where technologies met their expected needs, such as a need for more information or assurance that they were receiving high quality care.

Patients' experiences with technologies contributed to positive and negative experiences as individuals and the resultant co-experiences patients experienced with their birth partners and care providers [28]. Technologies that lead to positive experiences lead to positive co-experiences; seeing the contraction graph allowed partners and care providers to share patients experiences by showing them when contractions would occur, the intensity and how long they would last. Hearing the baby's heartbeat allowed both the patient and the birth partner to experience the baby. We found that patients' experiences were grounded in expectations and contexts such as feeling that the "technology gave more information" or "feeling the technology was unnatural."

This study was limited by its small sample size, study population. The qualitative methodology used, was not intended to build causal relationships but to generate hypotheses about patient user experiences. Future studies should explore patient user experiences in other health care contexts and the effects of patients' positive or negative user experiences on the health care work system. Understanding how to design technologies that create positive experiences for both patients and workers will lead to more effective health care systems.

Reference

1. Davis, M.: Theoretical foundations for experiential systems design. In: Proceedings of the 2003 ACM SIGMM workshop on Experiential telepresence. ACM Press, Berkeley (2003)
2. Blythe, M., Wright, P., McCarthy, J., Bertelsen, O.W.: Theory and method for experience centered design. In: CHI 2006 extended abstracts on Human factors in computing systems. ACM Press, Montrcal (2006)
3. Hassenzahl, M., Tractinsky, N.: User experience—a research agenda. Behaviour & Information Technology 25, 91–97 (2006)
4. Cassell, J., Bickmore, T.: External manifestations of trustworthiness in the interface. Communications of the ACM 43, 50–57 (2000)
5. Corritore, C.L., Kracher, B., Wiedenbeck, S.: On-line trust: Concepts, evolving themes, a model. International Journal of Human-Computer Studies 58, 737–758 (2003)
6. Friedman, B., Kahn, P.H., Howe, D.C.: Trust online. Communications of the ACM 43 (2000)
7. Aboulafia, A., Bannon, L., Fernstrom, M.: Shifting Perspective from Effect to Affect: Some Framing Questions. In: Proceedings of The International Conference on Affective Human Factors Design, pp. 508–514 (2001)
8. Agarwal, R., Karahanna, E.: Time Flies When You're Having Fun: Cognitive Absorption and Beliefs About Information Technology Usage. MIS Quarterly 24, 665–694 (2000)
9. Bonner, J.V.H.: Envisioning Future Needs: From Pragmatics to Pleasure. In: Green, W.S., Jordan, P.W. (eds.) Pleasure with Products. Taylor & Francis, London (2002)
10. Carroll, J.M., Thomas, J.M.: Fun. Sigchi Bull. 19, 21–24 (1988)
11. Draper, S.W.: Analysing fun as a candidate software requirement. Personal Technology 3, 117–122 (1999)

12. Monk, A., Hassenzahl, M., Blythe, M., Reed, D.: Funology: Designing enjoyment. In: Conference on Human Factors and Computing Systems, CHI 2002, Minneapolis, Minnesota, USA (2002); Workshop description Funology: Designing enjoyment
13. Bruseberg, A., McDonagh-Philp, D.: New product development by eliciting user experience and aspirations. International Journal of Human-Computer Studies 55, 435–452 (2001)
14. Margolin, V.: Getting to know the user. Design Studies 18, 227–236 (1997)
15. Overbeeke, K., Djadjadiningrat, T., Hummels, C., Wensveen, S.: Beauty in Usability: Forget about Ease of Use? In: Green, W.S., Jordan, P.W. (eds.) Pleasure with Products, pp. 9–18. Taylor & Francis, London (2002)
16. Noyes, J., Littledale, R.: Beyond Usability, Computer Playfulness. In: Green, W.S., Jordan, P.W. (eds.) Pleasure with Products, pp. 49–59. Taylor & Francis, London (2002)
17. De Angeli, A., Lynch, P., Johnson, G.I.: Pleasure versus Efficiency in User Interfaces: Towards an Involvement Framework. In: Green, W.S., Jordan, P.W. (eds.) Pleasure with Products, pp. 97–111. Taylor & Francis, London (2002)
18. Dolan, G., Iredale, R., Williams, R., Ameen, J.: Consumer use of the internet for health information: a survey of primary care patients. International Journal of Consumer Studies 28, 147–153 (2004)
19. Ball, M.J., Lillis, J.: E-health: transforming the physician/patient relationship. International Journal of Medical Informatics 61, 1–10 (2001)
20. Opinion Leader Research for the Department of Health: Results from a programme of consultation to develop a patient experience statement High Holborn, London WC1V 7QG (2003)
21. Logan, R.J., Augaitis, S.: Design of Simplified Television Remote Controls. A Case for Behavioral and Emotional Usability (1994)
22. Bates, J.: The Role of Emotion in Believable Agents. Communications of ACM 37, 122–125 (1994)
23. Creusen, M., Snelders, D.: Product Appearance and Consumer Pleasure. In: Green, W.S., Jordan, P.W. (eds.) Pleasure with Products, pp. 69–75. Taylor & Francis, Abington (2002)
24. Jordan, P.W.: Designing Pleasurable Products. Taylor & Francis, London (2000)
25. Schenkman, B.N., Jönsson, F.U.: Aesthetics and preferences of web pages. Behaviour & Information Technology 19, 367–377 (2000)
26. Kim, J., Moon, J.Y.: Designing towards emotional usability in customer interfaces- trustworthiness of cyber-banking systems interfaces. Interacting with Computers 10, 1–29 (1998)
27. Desmet, P., Overbeeke, C., Tax, S.: Designing products with added emotional value: Development and application of an approach for research through design. The Design Journal 4, 32–47 (2001)
28. Forlizzi, J., Battarbee, K.: Understanding Experience in Interactive Systems. In: DIS 2004, Cambridge, Massachusetts, USA (2004)
29. Forlizzi, J., Ford, S.: The building blocks of experience: An early framework for interaction designers Systems 2000, New York, NY (2000)
30. Polkinghorne, D.: Two conflicting calls for methodological reform. The Counseling Psychologist 19, 103–114 (1991)
31. Creswell, J.W.: Qualitative inquiry and research design. SAGE, Thousand Oaks (2007)
32. Glaser, B.G., Strauss, A.L.: The discovery of grounded theory: Strategies for qualitative research. Aldine, Chicago (1967)
33. Erickson, F.: Qualitative methods in research on teaching, p. 147 (1985)