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Understanding the Situated Use of Healthcare Technologies

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Abstract
Real interactions around healthcare technologies are inherently complex. To evaluate existing technologies and identify requirements for new systems, a focus is needed for data gathering and analysis. We describe qualitative studies of the use of various healthcare technologies. In our studies to date, we have focused on either particular technologies (and a variety of users) or particular user groups (and a variety of tools). A variety of data gathering and analysis methods have been applied, depending on both the research questions and practical considerations. Looking ahead, we anticipate further challenges as the emphasis on patients taking more responsibility for their own care, and hence for using healthcare technologies unsupervised, in the home and out-and-about, grows.

Keywords
Digital Libraries, medical devices, usability, use, human error, sense making, collaboration

ACM Classification Keywords
H.1.2 Human Factors. H.5.2. User interfaces (Evaluation). J.3 Health.

Introduction

In this short workshop paper, we present a brief reflective account of how and why we have conducted particular evaluation studies in the healthcare arena, and some of the challenges that we are facing as we plan future studies.

Case studies

Our past studies have focused particularly on how non-personal information resources are used by clinicians and patients. Such information includes hospital-based information such as ward protocols, medical digital libraries, patient booking systems and web-based health information. Even if a particular focused interaction takes place between one person and a particular system, its use is always located within a broader context that includes other people, other systems and other interactions. Both our past and our proposed studies aim to understand the design and use of particular technologies within the broader context within which that use is situated.

In a study of the design of electronic patient booking systems, we were interested in how these systems were changing the time management practices of physiotherapists. Our study [5] compared the patient booking practices across three UK National Health Service (NHS) Trusts, one of which had moved completely to electronic booking, one of which worked entirely with paper, and one of which used mixed technologies. Obviously, there are many other factors that influence the uses of different systems, such as size and busyness of the different physiotherapy practices, local cultures and evolved practices [6], and a focused qualitative study did not seek to account for all these issues. Rather, the focus was on how the shared patient booking system was used, how individual physiotherapists used their personal work diaries and how information was coordinated across these different tools. Data was gathered using a mix of individual interviews and observation sessions, focusing on the work of the practice receptionist. The detailed artifact design and use was also studied (how information was laid out, how changes were recorded, how appointment slots and other meetings were marked, etc.). A mixed qualitative data analysis was conducted; this was partly guided by well-formed questions, such as what breakdowns in coordination occurred between the different booking / diary systems and how the overall system design supported (or failed to support) coordination, while also being open to emergent themes. For example, as data gathering and analysis progressed, it became clear that diary control practices were an issue. This issue could be followed up explicitly in further data gathering and analysis, in the style of Grounded Theory [3]. The modes of data gathering and analysis were determined by the focus of study: the interest in booking systems (in their various forms) and how they are used; the privacy issues (and hence difficulty) of gathering data in the clinical situation (i.e. the ongoing patient–physiotherapist interaction); the relative ease of inspecting artifacts and of observing the receptionists' interactions.

Whereas the receptionists' interactions with booking systems could be observed, because they take place frequently and in a defined place, clinicians' and patients' use of digital libraries are relatively difficult to observe, because they may happen in various places (the office, the home, the ward, etc.), and are relatively infrequent and opportunistic. In our studies of digital library use (e.g. [1], [2]), our focus was on

people' perceptions on digital libraries and their roles in clinical care, rather than on the details of particular interaction designs. Had the focus been on interaction designs, it would clearly have been necessary to organize relatively formal evaluation studies of particular systems, which might have taken place away from the workplace (e.g. in a usability laboratory). In the circumstances, it was more important to develop an understanding of situated use: of how technologies are selected, appropriated, shared or circumvented, by the various stakeholder groups who interact with and around systems. While a few observations were conducted, studying the information practices of multi-disciplinary team (MDT) meetings, most data was gathered through in-depth interviews and focus groups, involving stakeholders (medical staff, nurses, Allied Health Professionals, patients, carers and health technologists). A Grounded Theory approach to data collection and analysis was used to identify emergent themes including the importance of Communities of Practice [6] in the adoption and use of technologies [1] and the importance of information mediation in helping patients to interpret information relative to their own individual situations [2].

Our studies to date have been relatively non-intrusive: making use of interviews more than observations, and considering non-personal information. They have addressed large-scale issues of technology deployment and adoption, but have not informed the details of the designs of particular systems. Future studies are being planned that move into more challenging territory.

Future challenges

In the UK, there is an ongoing emphasis on health (public and professionals working together to maintain health rather than simply reacting to illness) and on patients taking responsibility for their own health management. Increasingly "health care" is taking place in the home, in shopping centres and elsewhere. We are planning future studies that require an understanding of technology design and use in such varied settings. Interviews will not be sufficient for understanding the details of users' experiences with technologies (from web-based information resources to mobile vital signs monitoring devices and ambulatory syringe pumps).

Observational work in homes presents a special research challenge in terms of the efficiency, effectiveness, privacy and ethical issues of data gathering and analysis. However, this mode of study has importance in seeing how technology integrates with the home and makes patients feel more confident in a familiar setting [4]. Our outline plan is to use a combination of diary studies, interviews and video capture to record minor incidents, working with patients and carers as partners in understanding and critiquing the design of the systems that they use. The investigation of appropriate modes of data gathering will also be exploratory, working with participants to establish what works best for them as well as what yields the most reliable and relevant data.

Some studies will focus on the individual, considering how they make use of a rich ecology of tools, how the design of particular tools influences their experience, and how tools mediate their interactions with other people (lay and professional). Other studies will focus on particular technologies: how those technologies are used by different individuals (often in conjunction with other systems), and how their design might be

improved (e.g. reducing errors or increasing findability and comprehensibility of information).

A further challenge will be how to test prototype medical technologies in realistic situations. Laboratory studies may identify core usability problems, but do not reveal issues concerning use in context (e.g. an alarm may be clear in isolation, but cause confusion or overload where there are many distractions). It is not possible to test prototypes of safety-critical devices in the natural setting. Therefore, it is necessary to create simulated settings (typically involving actors) to test devices. The question of what level of realism is essential for testing particular system features remains a topic for further research.

Summary

Healthcare technologies can be tested in the laboratory in similar ways to any other systems. However, they also pose many particular challenges: being used by people with very different backgrounds, across a wide range of situations, and raising both privacy and safety concerns. There is an urgent need not just to conduct evaluations of healthcare systems but also to better understand the range of possible approaches to evaluation, their costs and their benefits.

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