Information Sharing in Interdisciplinary Mobile Health Teams

Anne Moen[a], Ole Smørdal[a], Tove Kristiansen[a], Yngve Refseth[a], Berit Mortensen[b] & Terje Osnes[b]

[a] *InterMedia, University of Oslo, Oslo, Norway*
[b] *Rikshospitalet University Hospital, Oslo, Norway*

Abstract

This paper will focus on a participatory design process to develop narratives and video scenarios for shared understanding of mobile technologies' usability and feasibility to support health care providers' coordination and communication needs during the work day. Using these strategies facilitated discussions on 1) the individuals' vision of usability, 2) organizational aspects and 3) the potential for quality improvements for enhanced patient safety. This contributed to create shared understanding of the possible usefulness and feasibility of wireless PDAs and Tablet PCs in clinical practice.

Introduction

Access to updated clinical information and best evidence at the point of need, i.e. in patient-provider encounters, is a prerequisite in most health care activity. In fact, errors, adverse outcomes of care or compromised patient safety often relate to inadequate information access and poorly understood coordination and communication in the care settings [1, 2, 3, 4, 5].

In the Norwegian health care system, coordination and communication among health providers are commonly institutionalized in a daily routine of scheduled meetings, complemented by ad-hoc, predominately oral, information exchanges and coordination throughout the work day. Prevailing compensatory mechanisms, e.g. frequent paging, interruptions from phone calls, ad-hoc personal notes, redundant but cumbersome record keeping, as well as heavy reliance on personal or collective memory, are commonly observed to alleviate current challenges to coordination and communication in patient care. Use of mobile technologies, e.g. wireless PDAs, tablet PCs and the like, have been suggested and deployed as one of the approaches to allow better and more appropriate access to information for the individual provider [6, 7, 8, 9].

In this paper, we present the "MedMobil"-project's development of narratives and video scenarios to facilitate understanding of mobile devices' usefulness, feasibility and potential contributions to improvements enhancing patient safety in collaborative care.

Presentation of the project "MedMobil"

The project, "MedMobil", took place in collaboration between a clinical unit at Rikshospitalet University Hospital, Oslo, Norway and InterMedia, University of Oslo, Oslo, Norway[1]. It started as a user driven organizational learning project, initiated by physicians at Department of Oto-rhino-laryngology, Head & Neck Surgery at Rikshospitalet University Hospital.

The Ear, Nose and Throat Unit department (ENT) is highly specialized, and the providers perform care and offer treatment in the in-patient unit as well as the outpatient clinic. The patient turn-over in the ENT is high. On an average workday, 10-15 new patients are admitted, and 10-15 other patients are discharged from the in-patient unit. A high number of patients are also seen in the outpatient clinic. The providers, i.e. MDs and RNs, have different roles and are often in different locations. Also, their practice is highly mobile, requiring them to move between the unit, outpatient clinic, operating room and other labs to see patients. Access to information is not always facilitated in these locations.

Due to the high patient turnovers and the providers' practice, the case for "MedMobil" can be regarded as a complex one, placing high demands on information sharing and coordination needs in care and treatment. In addition, the practice seems contextually bound, with significant challenges for appropriate infrastructure to support and improve coordination and communication. In such environments, mobile technologies may prove to be efficient tools for improving information flow, supporting timely communication and enhancing coordination and collaboration between the providers.

Purpose

The purpose of "MedMobil" was to explore mobile technologies' feasibility to 1) enable learning in the workplace by improved access to information and

---

knowledge, and 2) support coordination and collaboration between health care providers in different roles and locations using mobile devices.

This presentation focuses on the iterative processes using narratives and scenarios to create shared understanding of areas of use for mobile technologies to capitalize their ability to support health care providers' coordination and communication needs during the work day.

Understanding user activities – narratives and scenarios

Requirements for the development and use of new technology and understanding the full range of user activities are not predefined concepts but rather a developmental process where new insights, contradictions, problems and "disturbances" shape and inform the development. To better understand user activities, we used a participatory design approach [10, 11] and created narratives and video scenarios to illustrate aspects of a work day in the relatively near future.

This approach required all participants to take part and contribute to clarification and share insight into professional roles, responsibilities, organizational contexts and information and communication needs. During iterative discussions and a participatory design workshop, a set of common situations in clinical practice with high demands for information access, information sharing and communication, were identified. In summary, these situations can be categorized as:

1) personal information management to support the individual's work, e.g. access to patient lists, reference material and clinical guide lines as well as standardized assessment tools.

2) information exchange for coordination and communication within or between groups, e.g. a unit's patient lists; admission, in-patient updates (team-sheet), surgery schedule.

3) need for sharing rich media, e.g. streaming of video and images of diagnostic procedures or surgery for peer consultation, competency development and teaching.

These three kinds of situations had different characteristics and represent special requirements to mobile devices' support of communication and coordination in the collaborative practice.

In "MedMobil", these types of situations were exemplified in four narratives of daily situations to identify typical situations for use of mobile devices. To exploring mobile devices usability for learning in the workplace and to support coordination and communication, narratives have several advantages. Narratives may compensate or complement fragmented and sometimes incoherent pictures and facilitate shared, comprehensive understanding. As a shared artifact, the narratives represent common ground to discuss the future by sharing and developing ideas for mutual understanding [12]. Due to the condensed format, narratives can be a tool for constructions and re-

constructions of a situation [13]. The narratives informed video scenario development as a common artifact to understand existing communication patterns and information sharing by the health providers. This use of narratives; as a process as well as a product, contributed to assessment and discovery, reflection and analysis for meaning making among the individuals as well as the group [12].

In this project, the narratives allowed for comparison of current practice to a future where well-known situations and practices are solved in new ways. In the iterative development process, the narratives also played a motivational role and facilitated discussions of suggested future work environments with mobile devices the providers' information access, information sharing and communication needs.

Using the narratives for development of video scenarios, we shared examples of what the future may be like and not what it is going to be. The tentativeness inherent in the narratives allowed for clarifying contradictions, exchange different points of view between the providers and between providers and researchers. This stimulated discussions that helped understand disturbances in communications as well as benefits and barriers to new forms of collaboration and communication [13]. Better understanding of the activities and areas to be supported and the capabilities of mobile devices, their functionality and feasibility to support health care providers' complex practice are important when describing or exemplifying functionality and future use of mobile technologies.

The narratives were used to develop video scenarios that focused on common situations during a typical day introducing different artifacts to exemplify support for mobile information access, communication and coordination [14]. The scenarios focused on

1) Updated Common Information Spaces, introducing a networked Tablet PC, PDAs and a wall mounted electronic white-board as artifacts.

2) Just-in-time Communication and Coordination, exemplifying PDAs and electronically available calendars as artifacts.

3) Just-in-time Coordination, using PDAs and electronically available activity schedules or shared resources as artifacts.

4) Clinical decision-making enhanced by Rich Media, using streamed video clips and images from technology in the operating room and wireless PDAs as artifacts.

The video scenarios as audiovisual representations encouraged development of collective experiences and creation of meaning beyond personal meaning making.

Discussion

Most reported studies of mobile devices in health care focus on a single function or domain specific support

by the device [6, 8, 9]. Little attention is given to collaboration in clinical practices, and the communication and coordination of activity in interdisciplinary, highly mobile health teams. In "MedMobil", the narratives and video scenarios facilitated discussions of a future where mobile devices support health care providers in different roles and locations. Narratives and video scenarios allowed us to tap into the complexity of the operation in the ENT department and to generate creativity, imagination and constructive images of one possible future. The narratives and video scenarios contributed to understanding more of the particular practice and more comprehensive views of mobile devices' potential use [12, 13].

The emerging sense making seemed to contribute to reduction of inherent uncertainty related to changes in technology development. Our discussion will relate to

1) the individual provider's view of usefulness.

2) organizational aspects related to use of mobile devices.

3) quality improvements and enhanced patient safety.

Focusing on *the individuals' view of usefulness,* the providers' perception of usefulness, understandability and feasibility of the mobile devices were detailed.

Most participants acknowledged the potential for less redundant information, time savings, and improved communication and information exchange. The narratives gave specific examples hereof. Especially, the potential for access to an updated patient chart, more appropriate information sharing and timelier communication would support their professional accountability since documentation, peer consultation for learning, or competency development were better supported. Lack of access to the information itself, unavailable information or poorly organized information is reported to cause errors [1, 2], and the mobile devices would improve access.

At the same time, concerns for dependability and reliability of the device, what may happen to the patient-provider relationship, as well as the provider's clinical practice arose. Some wondered if the patient would experience health care as too efficient, rationalized and streamlined, and some suggested that they may be more vulnerable to exploitation in contexts of increased pressures for productivity.

Focusing on *organizational aspects*, the scenarios were a catalyst to explore influences on work flow and identify benefits and barriers to full use of mobile devices, e.g. wireless PDAs and Tablet PCs [13]. As devices to ease communication and coordination of patient care among providers in different roles and locations, mobile devices were seen to offer the providers' timelier access to updated and richer or more detailed information; e.g. patient lists and streamed rich media. Observed, operating ad-hoc information sharing and situational adjustments in clinical practice can become more formalized and traceable, allowing for audit trails etc. Some pointed out that the full potential

would be realized when the electronic patient record (EPR) could be accessed through mobile devices.

At the organizational level, security concerns and maintenance of privacy and confidentiality in wireless networks emerged as a significant infrastructural barrier. Recently; this particular health care organization regard wireless networks as sufficiently secure to allow sharing of patient information without threats to patient privacy and information confidentiality. During the "MedMobil" project however, this was not the case and, like "turf-wars", this turned out as a significant barrier to progress in this particular project.

Multiple providers in different roles and settings depending on partial information too often result in errors of omission, errors of planning or errors of execution, and potential adverse events due to inefficient access to updated information and timely communication channels to inform their practice [2].

Focusing on *quality improvement* and *patient safety* by changes in the providers' practice environment in terms of information access, sharing and communication, mobile devices like PDAs and tablet PCs provide attractive just-in-time access to information, alleviating identified sources of errors and adverse outcomes, important contributions at a systems level [2, 5, 15]

Concluding remarks

The case in "MedMobil"; coordination and communication practices in an ENT department, can be regarded as a fairly complex case, but still a representative one for clinical practice in Norwegian Hospitals. Collaborative practice of health care providers in different roles and locations coupled with high patient turnovers challenge us to develop infrastructures and use technologies that support patient safety and accountable, professional practice. Therefore, improved information access for coordination, information sharing and communication in collaborative practice of interdisciplinary, mobile health care teams are urgently needed. Mobile devices can be advantageous if and when they enhance the providers' access to information, knowledge and peer-consultation.

The participatory design approach and iterative processes to develop narratives and video scenarios used in "MedMobil" showed the power of stories in discussions to develop shared understanding of mobile devices' potential to support collaborative practice. Communication and information sharing using wireless PDAs and Tablet PCs in the clinical setting could change, but still support coordination and communication patterns. Further deployment of mobile devices to support providers in different roles and in different locations can be efficient to improve patient safety at a systems level by information access, information sharing and supported communication to coordinate collaborative practices.

Acknowledgments

developing the narratives for the video scenarios, and Ms. Kathie Ludwig, for editorial assistance.

References

[1] IOM. *Crossing the Quality Chasm. A New Health System for the 21st Century*. Washington DC: Institute of Medicine; 2001.

[2] IOM. *To Err is Human. Building a Safer Health System*. Washington DC: Institute of Medicine; 2000.

[3] Dick RS, Steen EB, Detmer DE, editors. *The computer-based patient record: an essential technology for health care*. Rev. ed. Washington, D.C.: National Academy Press; 1997.

[4] Dahl T, Opdahl Moe T. *Gårsdagens fagforståelser - dagens problem ? Profesjoner, fag og ledelse i sykehus. [In Norwegian]*. Trondheim: SINTEF Teknologiledelse IFIM; 2000. Report No.: STF38 A00506.

[5] IOM. *Keeping patients safe; transforming the work environment of nurses*. Washington DC: National Academy Press; 2004.

[6] Rothschild JM, Lee TH, Bae T, Bates DW. Clinician Use of a Palmtop Drug Reference. *J. Am. Med. Inform. Assoc*. 2002;9(3):223-229.

[7] Ammenwerth E, Buchauer A, Bludau B, Haux R. Mobile information and communication tools in the hospital. *Int. J. Med. Inf.* 2000;57:21-40.

[8] Fischer S, Stewart T, Mehta S, Wax R, Lapinsky SE. Handheld Computing in Medicine. *J. Am. Med. Inform. Assoc*. 2003;10(2):139-149.

[9] McAlearney AS, Schweikhart SB, Medow MA. Doctors' experience with handheld computers in clinical practice; qualitative study. *BMJ* 2004;328(www.bmj.com June, 1st. 2004).

[10] Greenbaum J, Kyng M. *Design at Work: Cooperative Design of Computer Systems*. New Jersey: Hillsdale.; 1991.

[11] Vimarlund V, Timpka T. Design participation as an insurance: risk-management and end-user participation in the development of information systems in healthcare organizations. *Methods Inf Med* 2002;41(1):76-80.

[12] Inman P-L, Vernon S. Assessing Workplace Learning: New Trends and Possibilities. *New Directions for Adult and Continuing Education*. 1997;75:75-85.

[13] Allan J, Fairlough G, Heinzen B. *The Power of the Tale. Using Narratives for Organisational Success*. New York: John Wiley & Sons, Ltd; 2001.

[14] Refseth Y. *En dag på sengeposten [video scenario in Norwegian]*. Oslo: InterMedia; 2003.

[15] Berwick DM. A User's Manual For The IOM's 'Quality Chasm' Report. *Health Aff* 2002;21(3):80-90.

Addresses for correspondence

Anne Moen, RN, Dr. polit
InterMedia, University of Oslo
P.O.Box 1161, Blindern,
N-0318 Oslo, Norway
Email: anne.moen@intermedia.uio.no

Terje Osnes, Professor, MD, Dr. med.
Department of Oto-rhino-laryngology, Head & Neck Surgery,
Rikshospitalet University Hospital,
Sognsvannsvn. 20
N-0027 Oslo, Norway
Email: t.a.osnes@klinmed.uio.no