Designing Technology to Support Information Flow for Asynchronous Co-located Medical Shift Work

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ABSTRACT

This research explores the design and development of technology to support information flow during nurses' shift change. We are conducting an observational study in a hospital ward to acquire an understanding of the processes, practices and mechanisms currently used to support information transfer during shift change and to find out what technologies are appropriate for supporting such an intensive flow of information. We have identified a complex set of resources that are used for the information assembly and disassembly during the process. We expect to develop a set of design implications for designing collaborative groupware to support information flow during shift change.

Categories and Subject Descriptors

H.5.3 [Group and Organization Interfaces]: Asynchronous Interaction

General Terms

Design, Human Factors.

Keywords

Shift work, artifacts, asynchronous co-located cooperative work, healthcare, information assembly, information disassembly. technology design.

1. INTRODUCTION

Communication within medical environments is ubiquitous and accounts for a substantial part of healthcare practitioners' daily routines, encompassing interactions in varying contexts and information sharing across temporal and spatial dimensions [1]

As we move into the 21st century, medical care is making increasing use of technology and electronic medical records are prevalent. However, the handling of medical information is often still a mixture of handwritten notes, large charts on white boards, digital records, verbal handover and printed records. In this period of shifting media usage, the task of information assembly and disassembly that nurses are faced with during shift change is perhaps unnecessarily complex. This is in part due to the fact that the technology in use was probably initially designed for office use, with only the software specifically designed for hospital use.

Our research addresses the question of how to design software and technology that works together in order to better support the task of information exchange and fit more seamlessly and less obtrusively into the working environment.

We will start by observing how tasks are currently performed, in order to acquire insights into how technology should be designed to support these activities. Therefore, our first step is to conduct an observational study in a hospital ward to understand how communication takes place between nurses during shift change, what practices are used, what artifacts are employed, and what problems nurses encounter while seeking the information they require. Shift change is of particular interest because it spans the continuum of synchronous and asynchronous collaboration. It is largely asynchronous but also contains a brief moment when shifts overlap that is usually used to better support the asynchronous activities. In studying these activities, our research contributes to the field of CSCW by:

1. Developing a better understanding of co-located asynchronous collaboration.
2. Providing an understanding of the actual practices of information flow during shift change. This will include the reality of the continuum between synchronous and asynchronous collaboration as manifested in nurses' shift change.
3. Developing a set of design guidelines to help design technologies to support the information flow during shift change.
4. Contributing to a generalized framework that can be applied to inform design of technologies to support information flow for other asynchronous co-located collaborations.

2. BACKGROUND

Shift work is indispensable in the round-the-clock healthcare sector and it relies heavily on effective information transfer across shifts to ensure patient safety. The information communicated during shift change influences the delivery of care for the entire shift and the overall quality of healthcare extended to patients.

A literature survey report prepared by the Australian Council for Safety and Quality in Health Care in March 2005 showed that *"ineffective handover can lead to wrong treatment, delays in medical diagnosis, life threatening adverse events, patient complaints, increased health care expenditure, increased hospital length of stay and a range of other effects that impact on the health system"* [4]. Missing information, distractions, and lack of confidentiality, such as no privacy at nurse's station or patients' relatives in close proximity, were reported to be the top three problems identified during nurse shift change [3]. We therefore focus on the basic practices of information flow during nurses' shift change and on how technologies can help improve the efficiency and effectiveness of the information flow processes.

3. SHIFT CHANGE COMMUNICATION

Patient handover provides the opportunity for nurses in consecutive shifts to communicate important medical information such as patient's diagnosis, vital signs, diagnostic tests and restrictions, to ensure the continuity of patient care [4]. In practice, some of the shift change activities may happen synchronously (i.e., nurses of consecutive shifts may meet during an overlap period between their shifts to effect the information flow), while some occur asynchronously. For example, information flow often happens through mediating artifacts such as a whiteboard and/or notes and records since nurses do not often meet during the overlap period. In the latter situation, the temporal, and sometimes spatial, separation between information senders and recipients makes shift work difficult, as the separation (temporal and/or spatial) prevents them from discussing and clarifying the interpretation of the information in transit [4].

4. THE STUDY

We have commenced an intensive observational study at a local teaching hospital ward, Ward of the 21st Century (W21C), to collect data on the current work practices of nurses' shift change. We are interested in how their work is organized, how it is carried out, how it is managed, what intermediary artifacts are used and how it can be supported by technology. The collected data will be analyzed, followed by implications development and software/technology design.
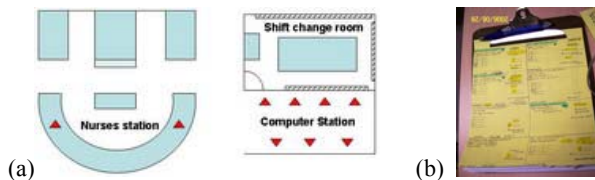
Figure 1: (a) Ward layout showing the nursing station, shift change room and computer terminals where most of the activities during shift change take place (b) an example of personal notes.

Figure 1a shows the part of the layout of the ward where most of the shift change activities take place. Current shift change routines involve interactions with a complex set of media at the beginning of a shift to assemble necessary information and to disassemble information appropriately at the end of a shift (Fig. 2). These media may be paper-based, digital, verbal or displayed. At the beginning of a shift, nurses retrieve information from all or a subset of these resources and the information extracted is often customized as personal notes (Fig. 1b). At the end of a shift, nurses post patient information on large whiteboards inside the shift change room, update digital media and perform oral report(s), based on their end-of-shift personal notes. These activities may be performed in different order. While each medium has its specific function, information often exists

redundantly in a variety of media. Therefore, we are also interested to investigate if and how such redundancy should be eliminated [2]. To carry out these activities requires spatial movements across different information sources and subtle temporal coordination such that information is available at the right place and at the right time. In addition to these overt behaviours that are discernable, we also observe the more subtle actions that take place during shift change. For example, we want to find out what has happened in response to a sigh or a disapproving head-shaking and what remedy will be exercised. Our goal is to design and develop a technology prototype appropriate to support the practical activities and actions that take place during shift change.
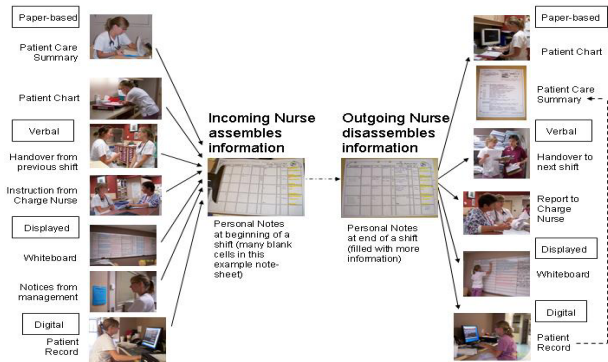
Figure 2: Communication artifacts involved in shift change

5. CONCLUSION

Effective information flow during shift change has an important impact on the provision of healthcare to patients and it is of paramount importance that information is shared accurately during shift change. To achieve this, we are vigorously collecting data on how and what information is currently communicated, what artifacts help effect the information sharing, what problems people encounter with the existing system and what mobility issues are involved so that we can develop a set of design implications on technology to support information flow during shift change.

6. ACKNOWLEDGMENTS

7. REFERENCES

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