Disrupted rhythms and mobile ICT in a surgical department

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ABSTRACT

Purpose: This study presents a study of mobile information and communication technology (ICT) for healthcare professionals in a surgical ward. The purpose of the study was to create a participatory design process to investigate factors that affect the acceptance of mobile ICT in a surgical ward.

Methods: Observations, interviews, a participatory design process, and pilot testing of a prototype of a co-constructed application were used.

Results: Informal rhythms existed at the department that facilitated that people met and interacted several times throughout the day. These gatherings allowed for opportunistic encounters that were extensively used for dialogue, problem solving, coordination, message and logistics handling. A prototype based on handheld mobile computers was introduced. The tool supported information seeking functionality that previously required local mobility. By making the nurses more freely mobile, the tool disrupted these informal rhythms. This created dissatisfaction with the system, and lead to discussion and introduction of other arenas to solve coordination and other problems.

Conclusions: Mobile ICT tools may break down informal communication and coordination structures. This may reduce the efficiency of the new tools, or contribute to resistance towards such systems. In some situations however such "disrupted rhythms" may be overcome by including additional sociotechnical mechanisms in the overall design to counteract this negative side-effect.

1. Introduction

Mobile information and communication technology is making its way into many professional contexts, transforming work processes and practices. Providing access to necessary information and resources "anywhere, anytime" is often the goal for mobile information and communication technology (ICT), as this has the potential of enabling the worker to be more autonomous and able to solve his/her problems at the point of action [1].

Healthcare professionals are highly mobile so mobile ICT seems particularly relevant in this context [2]. Healthcare professionals work in offices, patient rooms, examination rooms, laboratories, surgical rooms, as well as a number of other locations. Healthcare professionals often change work mode between more stationary work in inpatient wards and examination and surgical rooms, and various modalities of mobility [3] within a ward or department.

Some health professions' work is more characterized by mobility than others. Nurses for example rarely have offices or other fixed workplace. For others mobility is required in parts of the day. Physicians for example are mobile during rounds. This mobility has a wide range of effects on hospital work, including making it difficult to get hold of colleagues when needed [4]. In addition to care and direct medical work,

healthcare professionals also carry out a number of administrative work tasks such as handling messages, logistics, and documentation [5,6].

This mobility combined with the stressful nature of hospital work has a number of effects on communication patterns [7]. One consequence is that local mobility, where people move within "buildings and rooms in a local environment" [8], may be needed in order to support informal interaction. Even in a study on designers, who had most of their information already in a computer and network system, Bellotti and Bly [9] found that people tend to be mobile and seek colleagues for direct face to face conversations to solve a number of issues and to align work processes.

Informal communication is important to work [10,11], and [10] define informal communication to be situations of communication where participants, time, place, and topic has not been agreed in advance.

> "*Informal encounters are useful means of getting people to know and like each other, of creating a common context and perspective, and of supporting planning and coordination in group work. Indeed, without them, collaboration is less likely to start and less productive if it does occur. Physical proximity helps by allowing appropriate people to encounter each other frequently, by supporting visual channels to induce and assess readiness for communication, and by supporting highly interactive conversation.*" Kraut et al. [10]

In hospital work informal communication is also noted as a critical component of work [12,13]. Health professionals have been observed to favor synchronous forms of communication [7,14], contributing to highly interruptive behavior, increasing the risk of errors [13]. The number of possible conversations between people in a group increases dramatically as the number of people in the group increases [15].

Because interruptions have a detrimental effect on task completion [16] it seems that attempting to make information that often caused interruptions more easily available is well motivated.

An important factor in facilitating opportunities for interaction is rhythms in the workflow [17]. We can distinguish between formal and informal timely structures or rhythms in work [18]. Formal rhythms are systemic and include work hours and organization of lunch-breaks and regular meetings, while informal rhythms are those rhythms that arise from duration of typical work processes and social habits. Rhythms play an important role in information seeking and people's awareness of such rhythms makes it possible to plan for when and where it is likely to find a colleague or other professional [17]. Another key concept with respect to rhythms and a mobile workforce is that there are times that workers need to be co-located and times that they do not [19]. Providing workers with tools that give them more information as such, does not mean that they will be completely freed up from the need for face-to-face discussions [9].

One general characteristic of studies of rhythm to date is that they have primarily focused on rhythms related to formal work processes and issues such as the time of shifts, etc. Informal rhythms and their role in supporting informal communication have not been widely studied.

In this paper, we present a study of the impact of a mobile ICT system on rhythms and informal communication among nurses in an inpatient ward in a surgical department at a university hospital in Norway.

The study was conducted as part of a project investigating issues that affect acceptance of mobile ICT in hospital work, and studying situations and problems where this technology would add value to the users or organization. The overall project began in 2000 and continued through 2005, with follow ups annually since. The majority of the data was collected between 2001 and 2004. The goal was to gain knowledge from all the relevant phases including design, development, implementation and evaluation during field trials. A tool was designed to support information seeking functionality that previously required the nurses visit the nurses headquarters (HQ). By freeing the nurses from the need to visit the HQ the tool impacted rhythms that supported informal communication there. The study reports on possible effects from these "disrupted rhythms", and potential solutions to deal with these effects.

Moving away from the desktop and office settings brings in more complex contexts for the use of ICT and this study investigates how informal communication, enabled by the informal rhythms of the work, was affected by introducing a mobile ICT service. The main research problem was to identify and describe factors that could promote or discourage future use of mobile ICT among healthcare professionals.

2. Methods

At the time of the project there were few mobile systems for nurses available for full scale implementation in a hospital setting. A prototype oriented approach was thus adopted where we would design, develop and deploy systems that would be used for the investigation. Key elements of the methods of our study were ethnomethodology, participation, prototyping, grounded theory, and a "learning by doing" approach.

2.1. Setting and participants

The inpatient ward studied is part of a surgical department at a university hospital. The ward has 20 beds for admitted patients, and seven additional beds in the post op/intensive care unit located on the same floor as the inpatient ward. Patients in this ward are either being prepared for surgery or is recovering after surgery. The actual number of patients in the ward varies according to seasonal variations and campaigns when patients waiting for a specific type of procedure are called in so that the surgeons can focus on that type of procedure. In addition there are urgent admission patients that always get priority. The department operates on a 24/7/365 basis and has around 70 nurses and around 20 surgeons and interns. The surgical teams do scheduled procedures at daytime, and maintain an on call service for emergency cases 24/7.

The layout of the ward is such that the Head Quarters (HQ) is located approximately halfway down one of two corridors