Nursing Staff Requirements for Telemedicine in the Neonatal Intensive Care Unit

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This research gauged nursing staff acceptance of a videoconferencing system within a Neonatal Intensive Care Unit (NICU) and identified a set of recommendations to be integrated into system design to maximise usability of the system by nursing end users. Both qualitative and quantitative data was collected through interview and questionnaire methods, designed to elicit system requirements from the nursing staff perspective. It is argued that videoconferencing should not substitute the physical tradition in which neonatal infants are monitored, nor be seen as a replacement for face-to-face communication. However, videoconferencing may provide a workable alternative when face-to-face communication is not possible. In particular, clinical and medical staff should maintain control over the operation of video links at all times.

INTRODUCTION

Research Aims

The Neonatal Intensive Care Unit (NICU) at Hope Hospital, Salford, U.K., along with the IT Institute, University of Salford, are currently developing a videoconferencing system for use within the NICU, under the ‘Medilink’ Project. The system is primarily intended to provide parental access to NICU infants without worry of location, as well as creating a facility for remote teaching and clinical observation. The system would provide a real-time video link between the infant and the parents and staff, relaying both sound and visual information.

Rector et. al. (1992) point to the poor record of system success in healthcare environments. It is argued that this lack of fruition may be attributed to the failure of the systems in meeting clinical requirements for usability. The degree of user involvement during the development process has been consistently identified as a key determinant of system success (Newman & Noble; Wastell & Sewards, 1995; Kontogiannis & Embrey, 1997), highlighting the need to elicit user requirements at the onset of the development process, allowing these to clearly drive the design of the system and interface, and determine the functionality. In acknowledgement of such issues, user-centred design becomes a vital methodology in working towards usability, particularly in areas where potential stakeholder conflicts may arise. Gathering user requirements from all stakeholders involved may be argued to increase usability by enabling a sense of system ownership by

end users through mediating functionality which is both relevant and actually required, and accounting for factors which may affect usability within the wider context of system use.

The initial proposal put forward by the Medilink Project identifies parents and infants as the key stakeholders in the videoconferencing system, while failing to account for the significant implications that such a system may bear upon working practices within the NICU itself. In response to this, our research employed the principles of user-centred design (Norman & Draper, 1986) and emphasised nursing staff within the NICU as the main end users of the proposed videoconferencing system. This argument may be substantiated by their role as both the primary carers for the infants on the ward as well as the main point of contact for parents.

As the Medilink Project incorporates several stakeholder interests, it is imperative to involve professional end users in the development process. Rector et al. (1992) argue that this form of user involvement may avoid serious design errors which may in turn impair the usability of the system. This rationale justifies the focus of this research and the scope of this paper.

Literature searches revealed the scarcity of similar studies in this area, establishing the Medilink Project as a pioneer in its field in Europe. The ‘Baby CareLink’ Project based at the Beth Israel Deaconess Hospital in Boston, U.S.A. has already attempted to meet similar objectives in establishing a videoconferencing system for use in NICU environments, providing ample material for a case study.
This research gauged nursing staff acceptance of a videoconferencing system within the NICU and identified a set of recommendations to be integrated into system design to maximise usability of the system by nursing end users.

**Introducing Telemedicine**

The use of information and communication technologies in healthcare environments has seen a significant increase in recent years. Applications may be as diverse as communicating via e-mail, consultation by videoconference, to remote telesurgery, and this broad spectrum of functions may be encapsulated under the term ‘telemedicine.’ Wooton (1996a) uses a working definition of telemedicine as “nothing more than medicine at a distance” but notes that this includes the activities of diagnosis, education and treatment.

**Healthcare Reform**

The phenomena of telemedicine is gaining increasing political utility in healthcare reform (Blanton & Balch, 1995; Guterl, 1994), where it derives strength from rapidly improving technology and falling costs to counteract the mounting pressure upon healthcare resources (e.g., Otake et al., 1998; Elgraby, 1998; Mitka, 1998). Both the U.S. and British governments have launched initiatives to utilise information technology effectively in support of improved patient care and population health (NHS Executive, 1998; Guterl, 1994). In America, it is estimated that widespread use of telemedicine could cut healthcare costs by $36 billion (Blanton & Balch, 1995; Guterl, 1994), whilst the British government is investing £1 billion into their ‘Information for Health’ strategy (NHS Executive, 1998).

Videoconferencing in particular has been highlighted as bearing the greatest cost savings from the wealth of possible technologies, due to its functionality in reducing unnecessary travel and waiting time for both healthcare professionals and patients (Guterl, 1994).

**The Prevalence of Videoconferencing in Telemedicine**

Videoconferencing relies on using a video channel to bring remote participants together, so that both audio and visual information is transmitted in real time. The motivation behind videoconferencing lies in its potential to simulate the visual cues present in face-to-face interaction, thus increasing the productivity of the communication process by reinstating the factors of communication otherwise absent when using audio-only channels (Sellen, 1995). The benefits that videoconferencing can theoretically provide in medical applications are therefore significant, where care can be brought to the patient irrespective of physical distance, along with the consequential ease of pressure upon healthcare resources.

Despite the obvious cost, time, and access benefits that telemedicine entails, its reception by the medical profession has been somewhat hesitant to date (Grigsby, 1995). The American Telemedicine Association estimated 25 active telemedicine projects in the U.S. in 1995 (Blanton & Balch, 1995), whilst the figure in Europe was deemed to be only marginally higher, with 40-50 systems in various stages of development (Sund & Rinde, 1995). Such scepticism towards the advantages of telemedicine may be attributed to the lack of thorough research into its feasibility (Wooton, 1996b; U.S. Dept. of Health & Human Services, 1997; Stahlman, 1998), particularly in the light of the highly sensitive nature and internal diversity of the genre in which use is propagated.

Videoconferencing technology appears to have failed to meet the commodity status predicted by the Gartner Group in 1991 (Grantham, 1994). In particular, doubts have been raised about the medium’s capacity to appropriately communicate the non-verbal visual cues that underlie the main benefits of utilising a visual link (e.g. Grantham, 1994; Scott, 1996; Melymuka, 1998). Indeed, Sellen (1995) cites the lack of evidence to support that access to visual information via video bears any significant improvement upon the quality of communication in comparison to audio-only information whatsoever.

This lack of research may in turn underlie the factors of concern, which may have contributed towards the reluctance of both the medical community and patients to embrace the opportunities offered by telemedicine applications. The prevailing attitude towards the adoption of telemedicine surely warrants the need for a user-centric approach to the integration of technology into healthcare environments, thus retaining focus upon care and enabling ownership of the functionality of applications to actual end-users, i.e. medical and clinical staff and their patients. Only then may system success be assured.

**Technology in the NICU**

NICUs are not unfamiliar with innovative uses of technology, technological advances which facilitated the miniaturisation of evaluation and treatment methods for very small subjects in the 1960s revolutionised intensive care (Stahlman, 1989), and have been primarily responsible for reductions in both perinatal and neonatal mortality (Paneth, 1990). Technology has also enabled an increase in the number of beds on NICU wards and in profits through the reduction in the duties of medical personnel. However, Stahlman (1989) argues that this depersonalisation of care has also resulted in conflict, whereby the increasing complexity of technology required specialist personnel, thus fragmenting care of the infant. This may entail detrimental effects upon both care and the information provided to parents. Open communication and cooperation between parents and NICU personnel are highlighted as key facets to the success of family-centred neonatal care (Harrison, 1993), yet it could be argued that technology to date has been an impediment to this (Stahlman, 1989).

The use of videoconferencing within healthcare environments has been shown to produce mixed outcomes in terms of the medium’s utility in supporting healthcare without being detrimental to its quality (e.g., Harrison et al., 1996; Sund &...