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Virtual Baby Visit Going Mobile

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Abstract
Applications of Information Technologies (ITs) are increasing in the healthcare domain. ITs have been proven to be a support for the dissemination of knowledge and training amongst specialists in the use of computer-aided surgery [2]. The development of new technologies advances care opportunities for patients, e.g., improving patient well-being by reducing pain through clinical investigation [6]. Recent developments in ITs towards a digital hospital [8] address medical practitioners and patients within the walls of the hospital. Little attention has been given to crossing these walls, for example, supporting relatives of hospitalized patients. This column presents an example of traditional boundaries of the hospital disappearing by the use of standard ITs. It explores the potential benefit brought by external system integration in the connecting area of Health Informatics/Telematics.

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INTRODUCTION

Applications of Information Technologies (ITs) are increasing in the healthcare domain. ITs have been proven to be a support for the dissemination of knowledge and training amongst specialists in the use of computer-aided surgery [2]. The development of new technologies advances care opportunities for patients, e.g., improving patient well-being by reducing pain through clinical investigation [6]. Recent developments in ITs towards a digital hospital [8] address medical practitioners and patients within the walls of the hospital. Little attention has been given to crossing these walls, for example, supporting relatives of hospitalized patients. This column presents an example of traditional boundaries of the hospital disappearing by the use of standard ITs. It explores the potential benefit brought by external system integration in the connecting area of Health Informatics/Telematics.

THE APPLICATION

The Telebaby system is an internet facility coupled to video-streaming that links parents to their hospitalized premature infant in intensive care. Parents were offered the possibility of seeing their hospitalized newborn outside of the official visiting hours at the hospital. Mounted on a standard equipment rail on the crib and having a fixed focus, twenty analogue cameras were routed to an Internet stream using a patch bay in a close circuit. The encoding was done on-line/real-time with a buffer of five seconds, and the frame rate was ten frames per second. In general, a higher quality does not provide a better image of the newborn since the load of encoded data is relatively low: changes in light intensity are low, the newborn hardly moves since movement in and around the crib is limited. Sound is not transmitted because the microphone of a newborn in another crib could accidentally transmit speech from physicians about the other nearby newborn.

The software and operating system were accessible through a standard browser via the hospital's website. The login screen had a disclaimer page covering legal issues. The administrator had access to all menus including: the system users menu where types of users could be set and the camera control menu that controlled the IP settings of the streams. The general fields menu defined the patient data fields displayed along with the stream. The automation department and nurses had access to the patient menu where streams were assigned to patients and where pre-defined patient data fields were filled in.

The camera overview menu gave a thumbnail page of active streams. The parents' menu displayed the stream of their newborn and some data fields such as the telephone number of the unit and the name of the primary nurse. Health care professionals were provided the full right to switch the camera off at any given time, i.e., when giving care to the babies for medical and ethical purposes. Parents were carefully explained and agreed

with the concept of “care first”. A disconnected blue screen simply meant that the infant was being taken care of.
Use of the Telebaby system did not require the parents to be Internet experts. For those who did not have a personal computer, pre-configured laptops including an Internet account were made available. Parents had a hardcopy manual that was comprehensive in language use and had step-by-step screenshots. The software also had an extensive manual that was accessible via the website. Only after having successfully logged on to the demonstration stream were parents given the login-name and password for their child.

RESULTS

A study was conducted at the Perinatal Center of the University Medical Center of Utrecht (The Netherlands) to investigate the usage of the system. The center handles 10,000 cases with 30,000 follow-up consultations in obstetrics. Of 4,500 admissions, 2,000 are newborns of which 1,000, 500 and 500 are in intensive/high, medium and low care, respectively. The group of parents was surveyed and, their login behavior was closely monitored.

The results of the survey indicated that the parents felt much less anxious about their infant (78%). Only 18.5% faced a blue screen at the login phase. Both parents used the system daily in most conditions (85%) and will recommend the system to parents in a similar situation (100%). The Telebaby system reduced the anxiety-state of the parents associated to the separation from their newborn [7].
The log file contained data such as duration and frequency of use per stream (29,663 log records) or a unique viewer identifier. The usage was high between 11 am and 3 pm. The short but frequent visits at 2 pm and 9 pm offered parents a certain feeling of control since at that time they would most likely see their baby moving. The monitoring of the login behavior of the parents showed that ITs for distributing multimedia allowed parents to virtually visit their baby more often; the time indicated that the visits performed the role of giving the parents of the newborns a certain feeling of control. Ongoing research at a different hospital site reveals a similar pattern of behavior.

More than one viewer could access the streams at one time. The majority of the parents of the hospitalized baby shared their login with other family members. One family had about 40 different users. Another family extended the login information to Brazil. Worldwide communication was established in the whole family and produced a feeling of closeness amongst the concerned family members. The Telebaby system was a support for the parents to verbalize and share emotions with relatives and thus led to positive psychological adjustment [5]. Overall, parents were very satisfied with the added value of the Telebaby system.

The results of a questionnaire on a 5-point scale (Strongly Agree to Strongly Disagree) indicated that the Telebaby system principally lowered the state of anxiety associated to the parent-child separation (see Table 1).

I could simply see my baby and it was important to me	100%
It helped me to feel much less worried about my baby	78%
It made me feel anxious to see my baby via the PC (reversed item)	0%
It was a possibility to check if my baby was taking good care of	37%
It was not too difficult to log off and to stop the connection	67%
I will recommend the Telebaby system to parents in a similar situation	100%
I found it overall an important added value for us, parents	89%

Table 1. Added value of the Telebaby system has perceived by the parents

Both parents used the system in most conditions (81.5%) and were enthusiastic about the possibility of using Telebaby complementary to their regular visits at the hospital. Of concern to psychologists today is the risk of a society emerging where the electronic connectivity passes over the essential human need for contact and communication. Additionally, evidence indicates that only 23% of the parents reported some difficulty when logging off the Telebaby system; however, stopping the connection was not associated with a negative emotion. 'Live' visits were always first choice; that is, the Telebaby was meant to be an additive support to bonding, not a substitute [1]. The system cannot replace the warm physical skin-to-skin contact of parents with their newborn, but this technology certainly precipitates more relaxed parents in a stressful situation.

Hundreds of babies and their family now benefit from the Telebaby system in its replication form. The system has become a standard facility for large perinatal centers in the Netherlands. The professionals and parents have adopted the system as part of everyday care. From a medical perspective, adding dynamic medical data, such as blood saturation and heart rate, will made the project more useful for physicians and nurses [3]. The Telebaby system addressed the needs of the parents and did not directly stimulate the newborn. Surrounding the newborn with familiar sounds, similar to those heard in utero, could play a role in the sensorial stimulation. This may reduce behavioral and intellectual deficits that have physiological correlates [4].

GOING MOBILE

From a practical perspective, allowing the parents to watch their baby from a mobile phone is a logical next step in the evolution of Virtual Baby Visit at the Hospital. Streaming video to a mobile device over GPRS and Edge

phones is technically feasible. However, the low framerate (typically 6-7 frames per second) and the limited screens (typically QVGA) do not allow the desired user experience. The screens and video capabilities of new UMTS phones will allow parents to check their baby anytime and anywhere. The screen size ranges from QVQA (2006) to VGA (2007) and the increased bandwidth allows frame rates of more than 10 frames per second.

We are currently investigating whether streaming video, point-to-point video telephony or new technologies such as IMS (IP Multimedia Subsystem) are the best way to implement the Telebaby on a mobile phone platform. Point to point video telephony has the lowest implementation barrier and allows a two-way connection, which would have the advantage so that the parents can talk back to the baby. However, one has to be aware that many hospitals do not allow the use of mobile phones. It could be done using video streaming that is restricted to a few phone numbers only. Research also suggests that the mother's voice plays an important role in the mother-child bonding, an expansion worthwhile to be investigate. Trials will start later this year.

TO CONCLUDE

To conclude, although one could argue that the Telebaby is just a data exchange system, the nature of the data and its positive contribution to the parents determines its successful application. With healthcare moving towards a much more patient-orientated approach, relatively simple and low cost applications can contribute to the well-being of parents and thus of their babies. Given the parameters of the situation, parsimony and ethical considerations have to lead the use of such a system. When ITs are used selectively and led by ethical reflection rather than by a bulimia of communication, ITs can be of benefit in the everyday life at the hospital.

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