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Original article

Healthcare professionals' views of smart glasses in intensive care: A qualitative study

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ABSTRACT

Objective: The aim of this study was to describe healthcare professionals' views of smart glasses before their implementation in an intensive care unit, both regarding quality of use of the glasses and to identify possible intensive care situations where the glasses could be used to increase patient safety.
Methods: Data were generated through focus group interviews and analysed using thematic content analysis.
Findings: The findings describe participants' views of smart glasses divided into three categories; Smart glasses to facilitate work at intensive care unit; Quality of use and Utilisation. Participants assumed smart glasses to cause both effect and affect in intensive care. Participants' concern for patients arose recurrently and through their concern intention to work to promote patient safety.
Conclusion: Smart glasses are suggested as a complement to existing monitoring and routines and cannot replace human presence in intensive care.

Implications for Clinical Practice

- Smart glasses can facilitate monitoring but cannot replace human presence in intensive care.
- To increase patient safety smart glasses are recommended as a complement to existing monitoring equipment and routines.
- User training and support is needed before and during implementation of smart glasses in intensive care.
- Usage routines are needed before starting to use smart glasses in intensive care.

Introduction

Our most critically ill patients are admitted to intensive care units (ICUs). Evidence-based practice and advancements in technology have made it possible to treat patients with increasingly severe and complex conditions (A'roch et al., 2012). Intensive care is high-tech and complex, with use of for example, ventilators, monitors and infusion-pumps with potent drugs. Monitors provide ICU staff with objective information about the patients' conditions (i.e. vital signs), usually including ECG, heartrate, blood pressure and oxygen saturation. Patients' conditions can change rapidly, demanding a fast and correct response from ICU staff to save lives. Vital signs are one important part of the decision-making. Individual limits are set for each parameter, and if the parameter goes out of the set range an alarm triggers, attracting ICU staff attention (Hudak et al., 1998). Technology is an important and obvious part of ICU care, but alarms are known to cause stress to patients, family and ICU staff (Hudak et al., 1998; Wenham and Pittard, 2009).

Due to their critical condition, ICU patients are extra vulnerable (Hudak et al., 1998). Patient safety is therefore an ongoing effort

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with the aim of improving quality of care and reducing harm caused by healthcare (Mitchell, 2008). Harm in this case includes not only infections and wounds. It can also include development of ICU-delirium caused by the stressful, noisy ICU environment (Carr, 2007; Wenham and Pittard, 2009) or treatment delays when physicians lack sufficient information to make decisions about proper interventions.

In autumn 2015 an analysis was made in a general six-bed ICU in a medium-sized hospital in southern part of Sweden. ICU staff highlighted areas that could be improved in order to increase patient safety and enhance quality of care. These areas were presented in a workshop for innovative information technology solutions. Use of smart glasses was one of several solutions suggested, and a project called Smart Use of Communication in Complex Care Environments (SUCCCE) started.

Smart glasses are a rather new platform for applications (like smart phones and tablets) that can be described as "a computerised communicator with a transparent screen and a video camera, wearable as a pair of glasses". They are controlled by touch or voice and can display text and images, take pictures and use Wi-Fi or Bluetooth to communicate (Klein et.al., 2015). Since their introduction in 2010, smart glasses have been used in research projects in healthcare settings with positive results (Aungst and Lewis, 2015; Klein et al., 2015; Mitrasinovic et al., 2015; Wu et al., 2014; Yu et al., 2016), for example streaming surgeries to surgeons-in-training or for consultations at a distance. Limitations mentioned are for example battery life and privacy issues (Mitrasinovic et al., 2015). According to our literature review, smart glasses have not been found being used in the complex ICU context.

Within the SUCCCE project, use of smart glasses has been suggested to, among other things, make vital signs accessible for decision-making and provide alarm management. A literature review (Mitrasinovic et al., 2015) indicates that smart glasses with special ICU application can be assumed to assist in this matter. Our study seeks to further investigate smart glasses in the complex ICU setting.

Objective

The aim of this study was to describe healthcare professionals' views of smart glasses before implementation in an intensive care unit, both regarding quality of use of the glasses and to identify possible intensive care situations where glasses could be used to increase patient safety.

Methods

A qualitative design was chosen to meet the aim of the study. Data were collected through focus group interviews (FGIs) (Polit and Beck, 2016; Sinuff et al., 2007) and analysed using thematic content analysis (Graneheim and Lundman, 2004). This is known to be a suitable approach when the aim is to describe people's views on a specific topic, especially were knowledge is lacking. Rich material can be gathered through narrations and discussions in FGIs (Polit and Beck, 2016). Through thematic content analysis the material can be sorted into categories and themes, and new implications for evidence-based practice can be formulated (Graneheim and Lundman, 2004; Polit and Beck, 2016).

Setting

The study took place in a general six-bed ICU in a medium-sized hospital in southern part of Sweden. At the time of the study, 16 physicians, 41 critical care nurses (CCNs) and 24 assistant nurses (ANs) worked in this ICU. All physicians were intensivists or intensivists in training, and all nurses had specialist education for intensive care.

Participants

All permanent employees of the ICU were invited to participate. Information about the study was sent out by e-mail several weeks in advance and posters were posted in staff areas. The FGIs were performed during working hours. In total, 36 healthcare professionals participated in six FGIs, with physicians, CCNs and ANs interviewed in separate groups (Table 1). Since their duties and responsibilities in the ICU differ, the authors assumed that the different professions would have different opinions about smart glasses.

Ethical approval

This study was conducted according to the principles of the Declaration of Helsinki (World Medical Association, 2013). Ethical approval was obtained from the Regional Ethical Review Board in Lund, Sweden, (Dnr 2016/773). Permission to carry out the study was received from the ICU management. All participants received both written and verbal information about the study. Written consent was obtained. Participants were informed that the study was conducted on a voluntary basis and that they could withdraw their consent at any time.

Data collection

Data were collected in autumn 2016 through FGIs, which yielded rich material. FGIs began with a short presentation of the research project. Smart glasses were shown and participants had a chance to try them. Some of the participants had not seen or even heard of smart glasses before. An interview guide was used (Polit and Beck, 2016) with questions that encouraged narration: "Tell me when you think smart glasses could facilitate your work", "Tell me what information you would like to see in the smart glasses", "Tell how you want the information to be presented" and "Tell me if you think smart glasses can affect patient safety, and if so, how". Follow-up questions were used, such as "Can you tell me more?". The first author conducted the FGIs as moderator and one of the co-authors was an observer. The moderator guided the discussions and the observer took notes, observed non-verbal body language and asked some follow-up questions. The interviews took place in a conference room just outside the ward and lasted 40–51 min. The FGIs were recorded digitally and transcribed verbatim by the first author. Only a few new issues came up in the last FGI, which indicates some data saturation (c.f. Polit and Beck, 2016).

Table 1
Participant characteristics.

	Physicians	CCNs[a]	ANs[b]
Number	7	17	12
FGIs[c]	1 (n = 7)	3 (n = 4, 8 and 5)	2 (n = 6 and 6)
Age	29–56	30–60	29–64
Gender	3 female 4 male	16 female 1 male	12 female
ICU Experience	1–25 years (mean 12)	1–33 years (mean 19)	1–41 years (mean 22)

[a] Critical Care Nurses.
[b] Assistant Nurses.
[c] Focus Group Interviews.

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