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ORIGINAL ARTICLE

Noise in the ICU patient room — Staff knowledge and clinical improvements

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KEYWORDS
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Summary
Introduction: The acoustic environment in the intensive care unit patient room, with high sound levels and unpredictable sounds, is known to be poor and stressful. Therefore, the present study had two aims: to investigate staff knowledge concerning noise in the intensive care unit and: to identify staff suggestions for improving the sound environment in the intensive care unit patient room.
Method: A web-based knowledge questionnaire including 10 questions was distributed to 1047 staff members at nine intensive care unit. Moreover, 20 physicians, nurses and enrolled nurses were interviewed and asked to give suggestions for improvement.
Results: None of the respondents answered the whole questionnaire correctly; mean value was four correct answers. In the interview part, three categories emerged: improving staff's own care actions and behaviour; improving strategies requiring staff interaction; and improving physical space and technical design.
Conclusion: The results from the questionnaire showed that the staff had low theoretical knowledge concerning sound and noise in the intensive care unit. However, the staff suggested many improvement measures, but also described difficulties and barriers. The results from this study can be used in the design of future interventions to reduce noise in the intensive care unit as well as in other settings.

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Implications for Clinical Practice

- Intensive care unit staff who work closely with patients need to be more aware of the negative health consequences of noise.
- However, since the area is complex, combined efforts, including knowledge, are needed when discussing sound improvements.
- The main responsibility for education lies with health care professionals' educational institutions, as many noise-reducing measures are on the individual- level and are relatively simple to perform.
- Discussion seminars might be a good way to highlight the complexities and opportunities in the field and to encourage and share noise-avoiding and noise-reducing behaviours.
- The results from this study can be used in the design of future interventions and measures intended to improve the sound environment around the most critically ill patients.

Introduction

In recent years, several acoustic studies have noted that the sound environment in the intensive care unit (ICU) patient room is noisy and demanding (Darbyshire and Young, 2013; Johansson et al., 2012b; Konkani and Oakley, 2012; Ryherd et al., 2008). Moreover, it has been found that the noises are unpredictable and unexpected as they have numerous sources (Johansson et al., 2012a; MacKenzie and Galbrun, 2007). The extent of the problem is not yet fully understood, but the impact of noise pollution in patient rooms in other hospital areas has been investigated. Cardiovascular responses, increased pain, prolonged stay and sleep disturbances are some negative responses to noise (Hsu et al., 2012). These effects must be taken seriously, especially in caring for the most seriously ill and vulnerable patients. One of the key roles of staff is to prevent and manage the environmental impact in the ICU; therefore, knowledge in the field is fundamental and essential for all staff involved. Unfortunately, a previous study, investigating ICU nurses' knowledge levels ($n = 96$) showed that their knowledge was deficient concerning sound and noise and their effects (Christensen, 2005). Thus, more research is needed to determine whether this applies to all professions, since there is a lack of studies examining the knowledge levels of all health professionals working bedside in the ICU. What we do know is that staff activity in the patient room has been identified as a noise problem (Akansel and Kaymakci, 2008; Johansson et al., 2012b; MacKenzie and Galbrun, 2007). Therefore, many attempts to reduce noise in the ICU have focused on staff knowledge and behaviour (Konkani and Oakley, 2012). These include educational programmes (Monsen and Edell-Gustafsson, 2005), behavioural modification programmes (Kahn et al., 1998), the implementation of guidelines (Li et al., 2011; Walder et al., 2000) and sound detector controllers (Taylor-Ford et al., 2008). Most of these studies show that an intervention through which staff changed their awareness and knowledge about sound, was successful in creating a better patient sound environment. Unfortunately, this type of action has not been widely implemented. The reason for this is unknown; although staff involvement may be an important factor, there are currently no studies investigating the views of staff themselves regarding what changes are needed and what barriers exist. Recent Swedish studies show that noise levels in the ICU remain high and that patients are well aware of and responsive to the surrounding sounds (Johansson et al., 2012a,b). Still, (Eliassen and Hopstock, 2011) showed that only about 10% of the ICU nurses ($n = 25$) in their study reduced alarm levels on monitors and ventilators during the day and that only 22% avoided bedside conversations at night. One reason for this could be that staff interventions have some effect, but fail to have long-term results, but this has not been investigated. However, we do not currently know the degree to which clinical staff have knowledge on the topic; nor do we know whether the interest in and knowledge on the issue have changed over time, i.e. if longer work experience or age generate a greater awareness of the importance of noise. An overall mapping regarding the level of knowledge among health professionals is needed, as is a deeper understanding of the thoughts and arguments from staff regarding the sound sources in the ICU as well as proposals for action. Therefore, the aims of this study were to: first, investigate physicians', nurses' and enrolled nurses' knowledge concerning sound and noise in the ICU; and second, identify the suggestions from staff for improving the sound environment in the ICU patient room.

Methods

Based on the two aims, this study is divided into two parts.

The first, corresponding to the first aim, has a comparative, descriptive design and includes data from a web-based self-administrated questionnaire, analysed using non-parametric and descriptive statistics. The second part corresponds to the second aim and has an explorative and descriptive design. This part consists of text from 20 in-depth interviews, analysed using qualitative conventional content analysis (Hsieh and Shannon, 2005).

Settings

Nine ICUs in western Sweden were chosen, representing Swedish ICUs in general and situated within a geographically acceptable distance (Table 1). Some of these ICUs had carried out extensive renovations, which in most cases had resulted in improvements such as one- or two-bed instead of multiple-bed rooms. Furthermore, some had created separate places for reporting, rounds and monitoring. Other ICUs