

COMMENTARY

Do earplugs stop noise from driving critical care patients into delirium?

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See related research by Van Rompaey *et al.*, <http://ccforum.com/content/16/3/R73>

Abstract

Quality sleep is a problem for the critically ill who are cared for in an environment where interventions night and day are common, staff members are constantly present in relatively high numbers, and treatment is accompanied by a range of changing warning tones and alarms and lights. These critical care units are generally designed without a focus on patient comfort, sleep, and rest and often lack access to appropriate natural daylight. To add to this problem, critical illness, particularly sepsis, disrupts circadian rhythms and sleep patterns, and disruption of circadian rhythms, in turn, impairs immunity and contributes to delirium. In a randomized controlled trial in the previous issue of *Critical Care*, Van Rompaey and colleagues have intervened to reduce noise, which is a key factor in this disruption, by having patients use earplugs at night. Delirium was assessed by using the NEECHAM (Neelon and Champagne) confusion scale, and sleep perception was assessed by patients' responses to a set of five questions. After the first night, patients reported a better sleep perception and the occurrence of delirium was reduced (hazard ratio of 0.47 for the development of delirium) or was delayed. The study did not quantify adequacy of pain control in post-surgical patients and used patient reporting to assess sleep. Whether patients were receiving respiratory or other organ support was not reported. The potential benefit of earplugs is an important practical finding that could be implemented in most intensive care units.

Introduction

Lack of quality sleep is a major problem for all patients, especially those who are critically ill, and so ways of avoiding disruption by sudden or even sustained noise may well have a role in the modern critical care unit. In the previous issue of *Critical Care*, Van Rompaey and colleagues [1] argue that earplug use not only produces better reported sleep but also decreases delirium.

Does patient use of earplugs reduce delirium?

Reduced sleep quantity and quality have significant implications for critically ill patients [2] and are made worse by environmental factors, including patient care activities, noise, and light interruptions [3]. Mean levels of peak noise are comparable to those of a busy office and account for 15% to 20% of patient arousals or awakenings [4]. Other factors such as medication exposure and the acute illness itself are also important; for example, endotoxin disrupts sleep patterns in animal models [5] and in patients with sepsis [6]. To make matters worse, sleep deprivation itself may impair immune function by reducing natural killer and cellular immune responses in humans [7], promoting bacterial invasion [8], and reducing the response to immunization [9].

Increasing severity and number of organ dysfunctions indicate a worsening prognosis for patients. Delirium may well indicate organ dysfunction of the brain and is often an early indicator of a more general deterioration. Patients who develop delirium have increased critical care and hospital length of stay, mortality, and longer-term cognitive impairment [10]. Development of hyperactive delirium complicates critical care therapy, causing, for example, intolerance of continuous positive airway pressure or non-invasive ventilation or increased doses of sedation or related medication to control behavior, which in turn accumulate. These may then increase somnolence and adverse effects and impair other body organ systems. Hypoactive delirium may not be identified or may be misdiagnosed, leading to delays in correction of delirium risk factors and hence increasing delirium duration [10].

The environment of the intensive care unit is frequently ignored as a key factor in patient well-being. Staff

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members may not recognize the significant disruption caused by care activities, noise at night, and disrupted day/night light patterns. For many years, architects or hospital planners have neglected appropriate sound insulation or the inclusion of sources of natural light to reinforce the day/night cycle. As a result for many critical care environments, it may be important to accept that, in some circumstances, environmental change will take years to effect and will be expensive. Therefore, simple and low-cost patient interventions, such as the use of earplugs, may be a pragmatic solution for many.

This study illustrates some of the difficulties of conducting this type of study on relatively large numbers of patients in critical care. It shows the importance of reducing ambient noise and reinforces the worldwide need for a consistent focus on critical care unit design and staff behavior. Questions remain unanswered or factors remain difficult to measure. Firstly, single-center studies, such as this one, present problems for determining the effectiveness of the application of any therapy to a less cooperative environment in the future. For example, patient acceptance of earplugs was 79%, which is much higher than the 10% reported in another sleep study [11]. We know that many of the patients are surgical and have similar Therapeutic Intervention Scoring System and Sequential Organ Failure Assessment scores and Simplified Acute Physiology Score, but we do not know how the patient groups differed in terms of type or effectiveness of analgesia. Despite the similar scores, we know that 22% (treatment) versus 26% (control) were emergency surgical patients. Could this have impacted on differing modes of analgesia or incidence of sepsis or medicine exposure? We also see the variable impact of critical care design: only 60% were exposed to visible daylight (a potential problem for many similar interventions in critical care units). It is hard to determine whether these differences in light levels and patterns were important [12-14]. The assessment of sleep is also difficult in critically ill patients, particularly in delirium-positive patients [15], and an invalidated subjective score was used. Noise is only one of the many modifiable risk factors for delirium [10], and the fact that the most significant difference was in the patients with mild confusion may explain the reported benefits of improved sleep. Despite these issues, 136 patients were included and randomly assigned (with 46 refusals), suggesting that this therapy could be widely applied with an improvement in hazard ratio of 0.47 for delirium.

Conclusions

In normal life, no one would argue that ongoing loud conversations, combined with sudden and inappropriate

changes in light level, extremes of temperature, or the sound of car alarms outside, were conducive to nocturnal sleep, even in healthy individuals. So why do we accept a similar situation for the critically ill? This is an important study showing that a simple intervention to combat noise may have an important role in delirium risk reduction.

Competing interests

The authors declare that they have no competing interests.

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