Benefits of quiet time interventions in the intensive care unit: a literature review

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Abstract
Sleep disturbance is a significant issue for patients in intensive care units (ICUs), which can affect their health and recovery from illness. Therefore, it is important to consider ways to address sleep disturbance in these settings. One strategy that has been suggested is the use of ‘quiet time’ interventions, which involve a defined period where there is a reduction in controllable light and sound, and where interruptions at the patient’s bedside are minimised.

Aim To determine the effectiveness of quiet time interventions in improving patients’ sleep quality in ICUs; to investigate other potential clinical benefits of quiet time interventions; and to consider the effect of incorporating open visitation when implementing quiet time interventions.

Method The author conducted a literature review of qualitative and quantitative studies that investigated the effects of quiet time interventions as a primary intervention in adult ICUs, with sleep quality as the outcome. Three databases were searched electronically for articles that met the inclusion criteria, and narrative synthesis was used to identify themes from these articles.

Findings A total of seven articles were included in this literature review. Overall, the evidence indicated that quiet time interventions can be effective in improving patients’ sleep quality; however, the study findings were variable and inconsistent. Quiet time interventions also appeared to provide some physiological benefits for patients, as demonstrated by reductions in respiratory rates, the administration of sedatives and the incidence of delirium, suggesting that patients are experiencing restfulness. Additionally, nurses reported an increasingly satisfying workplace environment following quiet time interventions.

Conclusion Quiet time interventions can improve patients’ sleep quality and have positive physiological effects for patients, such as improved restfulness. Quiet time interventions may also promote a healthier workplace environment and increase patient and family satisfaction. Considering the potential benefits and lack of evidence of harm, the author recommends that quiet time interventions are implemented in ICUs as part of routine practice.

Keywords
critical care, healthcare environment, ICU, intensive care, light reduction, noise reduction, quiet time, sleep deprivation, sleep quality

SLEEP DEPRIVATION IN intensive care units (ICUs) can adversely affect patients’ major organs, immune defence mechanisms, hormonal regulation and mental status (Friese 2008). Sleep deprivation has also been linked to increased incidence of falls, use of restraints and delirium, which may result in increased length of hospital stay, healthcare costs, morbidity and mortality (Mazer 2006, Desai et al 2013). Multiple factors may contribute to patients’ sleep disturbance in ICUs, including increased stress response...
KEY POINT
The busy ICU environment can negatively affect the well-being of patients, and noise levels within ICUs often exceed the World Health Organization (WHO) Europe (2009) recommendation that sound levels in hospitals should not exceed 40 decibels at night, since sound levels above this can disrupt patients’ normal sleep-wake patterns (Griefahn 2002, Tainter et al 2016).

associated with critical illness, pain, anxiety, discomfort, nursing and medical interventions, mechanical ventilation, lights and noise, side effects of medicines and underlying illness (Tamburri et al 2004, Drouot et al 2008). Noise, including monitor or ventilator alarms, ringing telephones and staff conversation, has been widely reported to be the most common cause of sleep disruption in ICUs (Coyer et al 2007).

The busy ICU environment can negatively affect the well-being of patients, and noise levels within ICUs often exceed the World Health Organization (WHO) Europe (2009) recommendation that sound levels in hospitals should not exceed 40 decibels at night, since sound levels above this can disrupt patients’ normal sleep-wake patterns (Griefahn 2002, Tainter et al 2016). Furthermore, Tembo et al (2013) reported that patients who had recovered from critical illness and been discharged from an ICU considered sleep to be a factor in their recovery.

As such, there is growing interest in research investigating strategies to promote sleep for patients in ICUs, and ‘quiet time’ interventions are one strategy that has been proposed to address sleep disruption (Gardner et al 2009). Quiet time is a defined period in which there is a reduction in controllable light and sound, and where interruptions at the patient’s bedside are minimised (Bartick et al 2010).

Traditionally, restricting visitors for critically ill patients was common practice in many countries because it was thought that receiving visitors may exhaust patients, interfere with healing, have adverse physiological effects for patients and increase the workload of healthcare staff (Sims and Miracle 2006). These visitor restrictions could be viewed as having a similar purpose to quiet time interventions. However, as a result of the drive to improve patients’ experience of healthcare and provide person-centred care (NHS England 2014, New South Wales Health 2016), open or flexible visitation in ICUs is common, which provides increasing opportunities for family and friends to access the patient’s bedside (Riley et al 2014). Research has demonstrated several positive effects of open visitation, such as improved satisfaction for families, patients and nurses (Soury-Lavergne et al 2011, Chapman et al 2016). Therefore, open visitation should be integrated alongside quiet time interventions.

Several studies have reported the effects of sleep deprivation on critically ill patients; however, there are few studies available that examine the role of quiet time interventions in this population (Gardner et al 2009). The author undertook a literature review to identify evidence related to the use of quiet time interventions and their potential benefits.

Aim
To determine the effectiveness of quiet time interventions in improving patients’ sleep quality in ICUs; to investigate other potential clinical benefits of quiet time interventions; and to consider the effect of incorporating open visitation when implementing quiet time interventions.

Method
The author conducted an electronic literature search of the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed and Ovid databases. Additional searches were also conducted using the Cochrane Library and the Wiley Online Library. The subject headings and keywords used were ‘quiet time interventions’, ‘sleep’, ‘noise’, ‘ICU’ and ‘critical care unit’, with minor adjustments for each database. Articles searched were from January 2000 to March 2017.

The inclusion criteria for this literature review were any studies investigating the effect of quiet time interventions as the primary intervention, as well as any studies conducted in adult ICUs with sleep quality as the outcome, measured either qualitatively (using primarily exploratory data such as opinions and motivations) or quantitatively (using objective data such as statistics and mathematical analysis). The included studies had to be published in English, peer-reviewed and have the full text available. All types of research design were considered for inclusion. The exclusion criteria were animal studies,
non-adult ICU settings, editorial or commentary papers, and articles where only the abstract was available.

Duplicate articles were removed, and the articles that were left were screened by title and abstract to determine if they met the inclusion criteria. The full text of the remaining articles was assessed and their reference lists were manually searched for additional articles. Articles that met the inclusion criteria were appraised using the Critical Appraisal Skills Programme (CASP) (2017a, 2017b) tools. Themes from these articles were identified using narrative synthesis, an approach that isolates themes from multiple studies, using the words and texts of the studies to summarise the findings.

Findings
A total of seven articles were identified from the search that met the inclusion criteria. Four of the seven studies were conducted in the US, and the remaining three studies were conducted in Taiwan, Denmark and the Netherlands. All of the studies reviewed used quantitative approaches. Outcome measures used in the seven studies were:

» Perception of patients’ sleep quality.
» Light and sound levels.
» Physiological parameters, such as respiratory rate, heart rate and mean arterial pressure.
» Incidence of delirium.
» Frequency of sleep.
» Sleep patterns.
» Sedation levels.
» Patients’ and nurses’ satisfaction with quiet time interventions.

Table 1 summarises the findings of the studies in relation to sleep quality, with more detail about each study provided in Table 2, available online at rcni.com/quiet-time. Overall, this literature review found that quiet time interventions provided physiological benefits for patients, such as reduced respiratory rates and administration of sedatives, which were suggestive of an increasingly restful state for patients (McAndrew et al 2016), as well as reduced incidence of delirium (van de Pol et al 2017). Additionally, nurses reported that their satisfaction with their workplace environment was improved following a period of quiet time interventions (Maidl et al 2014, McAndrew et al 2016). Patients and families reported improved experiences, with reduced anxiety ratings following each period of quiet time (Maidl et al 2014). However, one study found that quiet time interventions did not improve patients’ sleep levels (Maidl et al 2014), while van de Pol et al (2017) concluded that a quiet time intervention alone was insufficient to improve sleep quality.

Three main themes were identified from the literature, including:

» Effectiveness of quiet time interventions in improving patients’ sleep quality.

<table>
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<th>TABLE 1. Summary of the study findings in relation to sleep quality</th>
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<td><strong>Study</strong></td>
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<td>Boyko et al (2017)</td>
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Potential clinical benefits of quiet time interventions.
Effect of open visitation on quiet time interventions.

**Discussion**

**Effectiveness of quiet time interventions in improving patients’ sleep quality**

Olson et al (2001) examined the effect of quiet time interventions in one neurological ICU, comparing sleep frequency during a period of quiet time interventions (decreased light and sound stimuli) with a normal period of care. They found that the overall probability of patients being asleep was 1.5 times greater in the intervention group than in the normal care group; therefore, lowering light and sound levels in the ICU increased the likelihood of patients being able to sleep (Olson et al 2001).

Similar results were reported by Dennis et al (2010), who studied the effect of a quiet time intervention implemented between 2pm and 4pm in patients in one neurological ICU, finding that patients were four times more likely to be asleep during the quiet time interventions than in the preceding half hour. Dennis et al (2010) concluded that quiet time interventions can improve patients’ opportunity to rest, although further research is required into the factors that contribute to sleep disruption. However, one study examining the influence of quiet time interventions in one neurosciences ICU and a cardiovascular ICU did not demonstrate any statistically significant benefits to the patients’ sleep, pain, anxiety and blood pressure (Maidl et al 2014). These findings were consistent with van de Pol et al’s (2017) study, which concluded that a quiet time intervention alone was insufficient to significantly improve sleep quality.

Various parameters were used in the studies discussed in this article, including duration of study, visitation policy and data collection tools; similarly, the data collection tools used to measure patients’ sleep quality varied, which may have resulted in the differences in the study findings. For example, Olson et al (2001) and Dennis et al (2010) used nurse observation checklists and sleep observation tools (Edwards and Schuring 1993) to assess patients’ quality of sleep, while Maidl et al (2014) and van de Pol et al (2017) used a questionnaire that evaluated patients’ perception of sleep (Bourne et al 2007).

Li et al (2011) investigated the efficacy of using sleep care guidelines for noise and light reduction in improving the sleep quality of patients in one surgical ICU. The intervention involved reduced light and sound levels and minimal interruptions between 11pm and 5am, which demonstrated improvements in sleep quality and sleep efficiency. However, the sample for this study was reported to be less acute than a typical sample of patients in ICUs, because none of the patients were intubated or mechanically ventilated. This meant that, although the results were positive with regards to improving the sleep of patients in one ICU, generalisability was not demonstrated.

It has been found that some nurses may overestimate patients’ sleep quality (Kamdar et al 2012, Maidl et al 2014). Since nurse observation checklists and sleep observation tools rely solely on nurses’ perceptions, there is a potential for bias in the interpretation of data, which may lead to the role of quiet time interventions in ICUs being represented inaccurately (Pannucci and Wilkins 2010). However, despite conflicting results in the studies used in this literature review, most patients viewed quiet time interventions as valuable and important experiences (Dennis et al 2010, Maidl et al 2014).

Polysomnography – the recording of physiological variables such as respiratory function during sleep – is used to assess the structure of sleeping patterns, such as REM (rapid eye movement) and NREM (non-rapid eye movement) sleep (Kapur et al 2017). Boyko et al (2017) conducted a randomised controlled trial that involved using a 48-hour polysomnography in 17 patients who were mechanically ventilated. Their aim was to investigate whether providing quiet time interventions – including reduced light, alarm noise, and visits after 10pm, and avoiding unnecessary
procedures between 10pm and 6am – would enhance the sleep quality of patients who are mechanically ventilated. Patients were also offered ear plugs and eye masks during the intervention, although not all agreed to use them. Boyko et al (2017) found that 53% (n=9) of patients exhibited characteristics of normal sleep, whereas 47% (n=8) of patients demonstrated pathologic sleep patterns; therefore, they concluded that improving environmental conditions did not guarantee normal sleep in patients in ICUs.

Based on the seven studies reviewed, there is inadequate evidence to propose that a quiet time intervention is effective in improving patients’ sleep quality in ICUs. The heterogeneity of the findings suggests that caution should be exercised when implementing quiet time interventions into practice with the aim of improving patients’ sleep quality in ICUs.

**Potential clinical benefits of quiet time interventions**

In addition to improved sleep quality, this literature review identified several other clinical benefits of quiet time interventions, including reduced administration of sedatives, reduced incidence of delirium, positive effects on patients’ physiological parameters and reduced stress levels among nurses.

McAndrew et al (2016) examined the effect of a period of quiet time interventions – lights turned down, shades drawn and televisions turned off between 2pm and 4pm – in 72 patients who were mechanically ventilated. They found that sedatives were administered less frequently following a quiet time intervention, which facilitated the removal of patients from mechanical ventilation, which has been found to reduce the length of patient stays in the ICU (Sessler and Pedram 2009). McAndrew et al (2016) also found a significant difference in respiratory rate, with 32 patients experiencing lower respiratory rates following quiet time interventions than before these interventions.

McAndrew et al’s (2016) findings were consistent with van de Pol et al’s (2017) study, which found that fewer ‘sleep-inducing medications’ were used in the post-intervention period. van de Pol et al (2017) also found that the incidence of delirium in patients in the ICU was significantly reduced following the implementation of a nocturnal quiet time intervention, which included reducing non-patient-related activity around the bed space, reducing the volume of alarms, and providing ear plugs.

Although van de Pol et al’s (2017) study did not demonstrate any improvement in sleep quality during quiet time interventions, the reduction in the use of sleep-inducing medicines may have contributed to the reduced incidence of delirium, because sustained use of sedatives increases the likelihood of developing delirium in ICUs. Similarly, patients exposed to higher levels of noise require higher doses of sedatives than those in a quiet environment; therefore, fewer interruptions and reduced external stimuli may have contributed to the reduction of delirium (Khademi et al 2011, van de Pol et al 2017).

Quiet time interventions may also improve the ICU environment for healthcare staff. ICU nurses often work in a stressful environment in which suboptimal noise and lighting levels can increase their stress levels (Chaudhury et al 2009). Stress induced by noise has also been reported to be a predictor of ‘burnout’ in nurses, which can result in emotional exhaustion, decreased sense of achievement and depersonalisation (Juslén and Tenner 2005). In addition, continuous noise has been linked to tachycardia among nurses, as well as negatively influencing their work performance (Konkani and Oakley 2012).

Two studies included in this literature review found that nurses positively responded to quiet time interventions (Maidl et al 2014, McAndrew et al 2016). This finding is consistent with a study by Riemer et al (2015), which found that reduced light intensity could explain reduced stress levels among nurses because light results in physiological activation of the stress response, including the production of cortisol and catecholamines.
Therefore, using a quiet time intervention to reduce light and noise levels can be an effective strategy in producing a healthier workplace environment for ICU nurses.

**Effect of open visitation on quiet time interventions**

Two of the seven studies included in this literature review prohibited visitors during the quiet time intervention, which may have contributed to the benefits of quiet time interventions demonstrated in these two studies (Olson et al 2001, Dennis et al 2010). However, the positive effects of having family members or friends at the patient’s bedside have been well-documented in the literature, with relaxed visiting hours leading to improved satisfaction among family members, patients and nurses (Marco et al 2006, Kleinpell 2008). Chapman et al (2016) stated that the removal of even minimal visitation restrictions was associated with a significant increase in family satisfaction.

This literature review did not find any evidence that open visitation negatively affects the implementation of a quiet time intervention; therefore, open visitation should be encouraged. It is also important for nurses to provide visitors with information about any quiet time interventions so that they can actively participate.

Considering the significant benefits of quiet time interventions and the lack of evidence of harm identified in this literature review, the author recommends that quiet time interventions are implemented as part of routine ICU practice.

**Limitations**

Several limitations of the studies included in this literature review have been identified. The fact that the studies were conducted in different ICU settings could have influenced the ability to provide quiet time interventions; for example, patients in neurological ICUs might require hourly assessments, which means they must remain awake.

Only two studies undertook light level measurements (Olson et al 2001, Dennis et al 2010), while sound levels were measured in five studies (Olson et al 2001, Dennis et al 2010, Li et al 2011, Boyko et al 2017, van de Pol et al 2017). Sound levels during quiet time interventions ranged from 46.9 decibels to 62.2 decibels in these five studies, all of which were higher than the WHO Europe (2009) recommendation of 40 decibels at night. The degree of noise and light reduction required to ensure therapeutic levels during a quiet time intervention remains unclear from this literature review.

Suboptimal compliance with quiet time interventions was reported in most of the studies (Olson et al 2001, Dennis et al 2010, Maidl et al 2014, McAndrew et al 2016, Boyko et al 2017). This may be a particular issue in neurological ICUs, where patients may require frequent neurological monitoring and administration of medicines, which can contribute to sleep disruptions (Kamdar et al 2012). Nursing and medical interventions, interruptions from colleagues and diagnostic procedures also contributed to non-adherence with quiet time interventions (Olson et al 2001). Therefore, a high risk of performance bias may be present in the study findings.

Another potential limitation was the lack of robust study designs in the included studies. Only one of the studies was a randomised controlled trial (Boyko et al 2017). Other study designs posed a high risk of selection bias because of non-randomised sampling (Olson et al 2001, Dennis et al 2010, Li et al 2011, Maidl et al 2014, McAndrew et al 2016, van de Pol et al 2017). Similarly, the lack of blinding in the study designs that used observation tools was another potential limitation (Olson et al 2001, Dennis et al 2010, Li et al 2011, Maidl et al 2014, McAndrew et al 2016, van de Pol et al 2017). One study included a measurement tool developed by the researchers to assess patients’ sleep quality; however, this tool had not been validated previously (McAndrew et al 2016). Several of the studies also used observational tools, questionnaires or surveys that involved information bias resulting from a measurement error (Pannucci and Wilkins 2010); for example, the Richards-Campbell Sleep Questionnaire was used in three
Open visitation should be considered as a standard measure in ICUs, because it has the potential to increase patients’ and families’ satisfaction.

There is minimal research measuring the effect of quiet time interventions on sleep quality, partly because of the challenges involved in obtaining valid sleep measurements, particularly because tools such as polysomnography are expensive and require specialist skills to collect accurate data. Therefore, nurses should consider further research into the effect of quiet time interventions on outcomes such as: the incidence of delirium; whether day-time or night-time quiet time interventions are more beneficial; the sound level reduction required to achieve desired outcomes; and the generalisability of quiet time interventions in ICUs to other patient populations.

**Conclusion**

Most of the evidence in this literature review indicated that quiet time interventions can improve patients’ sleep quality; however, further research is required in this area. Quiet time interventions can also have several positive physiological effects for patients, as demonstrated by reductions in the administration of sedatives, respiratory rates and the incidence of delirium, thus suggesting that patients’ rested state was improved. Quiet time interventions may also promote a healthier workplace environment for nurses and increase satisfaction for patients and their families, especially when aligned with open visitation.

**References**


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