DECREASED STRESS LEVELS IN NURSES: A BENEFIT OF QUIET TIME

By Heather C. Riemer, RN, BA, CCRN, Joanna Mates, RN, MSN, Linda Ryan, RN, PhD, AHN-BC, and Bonnie J. Schleder, EdD, APN, CCRN

Background  The benefits of quiet time, a therapeutic method of improving the health care environment, have been evaluated in patients, but only a few studies have examined the effects of quiet time on intensive care nurses.

Objective  To evaluate the effects of implementing quiet time in a medical-surgical intensive care unit on levels of light, noise, and nurses’ stress.

Methods  Quiet time consisted of turning down the unit lights for a designated time. Levels of light, noise, and nurses’ stress were measured. Nurses’ stress levels were measured by using a 100-point visual analog scale; unit noise, by using a digital sound level meter (model 407736, Extech Instruments); and unit light, by using an illumination light meter (model 615, Huygen Corporation). Measurements were obtained 30 minutes before and 30 minutes, 1 hour, and 2 hours after implementation of quiet time.

Results  Analysis of variance and comparisons of means indicated that both light levels and nurses’ stress levels were significantly decreased after quiet time (both \( P < .001 \)). Noise levels were also decreased after quiet time, but the decrease was not significant (\( P = .08 \)).

Conclusions  Use of quiet time resulted in decreased light levels and decreased stress levels among nurses. Quiet time is an easily performed energy-saving intervention to promote a healthy work environment. (American Journal of Critical Care. 2015;24:396-402)
Nursing theorists Nightingale\(^1\) and Watson\(^2\) advocated for creating healing environments to benefit both patients and nurses. In intensive care units (ICUs), nurses must cope with a dynamic stressful environment.\(^3\) Nurses perceive this environment as a top health and safety concern.\(^4\) The American Association of Critical-Care Nurses emphasizes the importance of creating healthy work environments for nurses.\(^7\) This focus leads to interventions to generate positive outcomes and creates an environment where nurses can optimally contribute. The honor society of nursing, Sigma Theta Tau International, focuses on the emotional regulation of stress as a component of the healthy work environment.\(^8\) Inadequacy in the physical environment of an ICU contributes to nurses’ stress, fatigue, and burnout.\(^9\)

Noise and lighting are 2 independent variables of the ICU that contribute to nurses’ stress.\(^9\) ICUs are brightly lit, chaotic, and noisy environments that can overstimulate patients and staff. ICU light and noise levels generally exceed healthy parameters and are recognized as environmental pollutants.\(^10\)

In order to limit environmental pollutants in the hospital, optimal light and sound levels have been recommended. The Illuminating Engineering Society recommends that light levels be set at 108 lux (to convert lux to lumens per square foot, divide by 10.76), with a maximum of 323 lux, during the day. The higher value (323 lux) is the level needed to read a book in a hospital room.\(^11\)

The World Health Organization recommends sound levels of 35 dB or less in patients’ rooms.\(^12\) Sound levels in the ICU exceed this recommendation. In a comprehensive and systematic analysis of 3 hospital units, mean noise levels were 55 to 60 dB throughout a 24-hour period.\(^13\) In a research study\(^14\) of 5 intensive care units, mean noise levels were greater than 45 dB at all times and between 52 and 59 dB more than 50% of the time. Even at levels of 45 dB, noise disrupts routine communication and activity.\(^15\)

In noisy, busy ICUs, conversations naturally increase because of the Lombard effect, the propensity for speakers to involuntarily increase the pitch, intensity, and duration of their voice in the presence of noise.\(^16\) This noise pollution results in adverse outcomes, including hypertension, ischemic heart disease, sleep disturbances, and impaired wound healing. Uncontrolled noise triggers the human stress response, activating the sympathetic nervous system to release epinephrine and norepinephrine, which constrict the vessels and elevate blood pressure and heart rate.\(^17\),\(^18\)

Excessive noise levels have adverse effects on both the physical and the psychological state of the body, resulting in stress. People generally adapt to noisy work environments by becoming intensely focused, thereby becoming less interpersonally engaged. The frequency of errors is also related to excessive noise and is correlated with tension.\(^19\) Noise-induced stress is an independent predictor of burnout.\(^15\) Employees who suffer burnout can experience emotional exhaustion, depersonalization, and a feeling of decreased personal accomplishment.\(^20\)

Light exposure also results in physical and psychological effects, because of its influence on the body’s 24-hour circadian rhythm. Circadian rhythm affects hormones such as melatonin.\(^21\) If exposure to light is too great, secretion of melatonin is decreased and its stress-protective effects are minimized. Light and noise also stimulate the release of corticosteroids (cortisol) and catecholamines, which are physiologically associated with excessive stress levels.\(^18\),\(^22\)

Exposure to light, especially artificial lighting, can produce psychological adverse effects on nurses.\(^23\) These effects can change a person’s mood and alter alertness. Dynamic lighting, which has light settings with different combinations of intensity and color temperature, is used to support both mental alertness and relaxation.\(^24\) The changes in light settings are similar to the changes in daylight, which varies in intensity and color. The variation in intensity through interventions such as dynamic lighting can be used

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to stimulate the natural activation and relaxation cycle needed for a healthy work environment.\textsuperscript{25}

A therapeutic method of improving the environment is the implementation of quiet time. Trials of quiet time have been successful, and the method is used as a therapeutic patient intervention in some hospitals. Gardner et al\textsuperscript{26} used quiet time as a therapeutic intervention in a fast-paced, acute care environment to lower the noise level at certain times during the day to promote patients’ rest. In another study,\textsuperscript{27} when quiet time was implemented in a neurological ICU, significantly lower noise and light levels resulted in greater sleep for patients. To expand this concept, Morrison et al\textsuperscript{28} evaluated the impact of noise on nurses’ stress and annoyance in a pediatric ICU. A significant correlation occurred between higher sound levels and greater subjective stress and annoyance; however, the effect of light was not measured in the study.\textsuperscript{28}

Because lowering noise levels can beneficially affect relaxation and patients’ well-being, we assessed whether a simple measure such as turning down the lights to initiate quiet time affected noise and stress levels of nurses working in a medical-surgical ICU.

**Methods**

The study was reviewed and approved by the appropriate institutional review board and was completed in accordance with ethical standards set forth in the Helsinki Declaration of 1975. Information about the study was introduced to all registered nurses in the ICU at mandatory staff meetings. Nurses were asked to volunteer to participate, and those who were interested were thoroughly educated on the study procedures, use of the 100-point visual analog scale (VAS) of the Perceived Stress survey,\textsuperscript{29} and the risks and benefits of the study. Permission was obtained from Goodfellow\textsuperscript{29} to use the Perceived Stress survey. Data collection was performed solely by 2 trained nurse researchers to maintain consistency in methods. Informed consent and demographic data were obtained from all the participating nurses. The intervention and methods for collecting data were kept simple so that the study could be easily performed and reproduced.

**Sample Population**

The sample consisted of day-shift registered nurses who worked in the medical-surgical ICU. Day shift was defined as the shift from 7 AM to 7:30 PM.

The day-shift nurses were the only eligible candidates because quiet time was implemented from 2 PM to 4 PM. Nurses were included in the sample if they consented to participate in the study, served as a primary nurse, and were present in the ICU from 2 PM to 4 PM. Agency and float nurses who consented to participate in the study were included in the sample if they were intensive care nurses. Nurses were excluded from the sample if they were non-ICU nurses who were in the ICU taking care of overflow patients who did not require intensive care. These nurses were excluded because the researchers thought that the nurses’ stress levels might differ from those of an intensive care nurse. Nurses from other departments in the ICU at time of the data collection, such as those from the operating room, emergency department, endoscopy, or cardiac rehabilitation, were also excluded because they were not primary nurses of the ICU patients.

**Data Collection**

Data were collected 4 times a day for each nurse: 30 minutes before and then 30 minutes, 1 hour, and 2 hours after quiet time initiation. Data collection surveys were not completed during shifts when cardiopulmonary resuscitation or emergent situations in which a patient posed a threat to self or others occurred.

**Procedure**

Nurse participants for each day were assigned numbers so that they would be surveyed sequentially at the appropriate time intervals. After the nurses were assigned numbers, the researcher calibrated the digital sound level meter (model 407736, Extech Instruments) and the illumination light meter (model 615, Huygen Corporation) according to the manufacturers’ recommendations. The researcher approached nurse No. 1 for the day at the appropriate time intervals and asked the nurse to mark a point on the VAS line on the Perceived Stress survey corresponding to the intensity of the nurse’s current stress level. While the nurse completed the VAS, the researcher measured the sound and light at the location where the nurse was positioned in the unit. The researcher documented the light and sound measurements on a data collection spreadsheet. After turning down the unit’s lights at 2 PM to start quiet time, the researcher sought out the subsequent eligible nurses sequentially and repeated the process at the described intervals.

The researchers also documented in a log book instances when data were ineligible, such as when the nurses were not on the unit during the entire period of quiet time. The log book, completed demographic
surveys, and all data collection tools were kept in a locked drawer accessible solely to the researchers.

Data Analysis
Collected data were transferred into SPSS for Windows, version 20.0, software (IBM SPSS) for statistical analysis. Demographic data were evaluated descriptively to determine characteristics of the participants and are reported as number and percentages or means and standard deviations. Repeated-measures analysis of variance was used to assess the differences in light, noise, and nurses’ stress levels before and after quiet time. Statistical significance was set at the .05 level.

Results
The study consisted of 124 observations of 22 clinical nurses who worked in the ICU. Although 142 observations occurred, 18 were not included in analysis. One observation was excluded because of cardiopulmonary resuscitation of a patient; all other excluded observations were due to the nurse not being on the unit the entire time. Of the participating nurses, 18% (4) were men and 82% (18) were women; 77% (17) of the nurses worked full time, and 23% (5) worked part time. Among the participants, 27% (6) had less than 5 years of nursing experience, 36% (8) had 6 to 10 years, and 36% (8) had more than 10 years (percentages may not total 100 because of rounding).

Light level decreased significantly ($P < .001$; Figure 1) from baseline (mean, 369 lux) to 2 hours after quiet time (mean, 179 lux). Although noise decreased from baseline (mean, 62.93 dB) through 1 hour after quiet time (mean, 60.88 dB), the level began to increase at 2 hours after quiet time (mean, 61.69 dB; Figure 2). Finally, the stress scores reported by the nurses decreased significantly ($P < .001$; Figure 3) from baseline (mean, 46.36) to 2 hours after quiet time (mean, 35.36).

Comparisons of means determined that light decreased significantly over time ($P < .001$; see Table). Significant differences in light were identified between baseline and 30 minutes, 1 hour, and 2 hours after quiet time. The decrease in light 30 minutes after quiet time did not differ significantly from the decrease at 1 hour after quiet time or the decrease at 2 hours after quiet time. The difference between 1 hour and 2 hours after quiet time also was not significant.

Compared with the baseline value, noise was also decreased at 30 minutes, 1 hour, and 2 hours after quiet time (see Table). However, analysis of variance indicated that mean decibels did not decrease significantly over time ($P = .08$). In comparison, nurses’ stress levels decreased significantly over time ($P < .001$). After the lights were turned down, the baseline values differed significantly from the values at 30 minutes, 1 hour, and 2 hours after quiet time. Both the values at 30 minutes and the values at 1 hour differed significantly from the values at 2 hours after quiet time (see Table).

Discussion
Our results indicate that a significant change in light occurred after the implementation of quiet time and remained throughout the quiet time. The finding that turning down the lights resulted in significantly less light from baseline throughout the study was not surprising. What was surprising was that in a busy chaotic ICU, turning down the lights was welcomed. Nurses were initially worried about a lack of visibility due to decreased lighting. Once the nurses experienced the change in light, visibility was no longer a concern. Quiet time was also sustained after the conclusion of the research study.
The important finding in our study is that nurses’ stress decreased with the implementation of quiet time, which consisted of simply turning down the lights. Because no other interventions (eg, coaching staff to turn off pagers, limiting procedures, or restricting family members’ visits) were performed during this time, data collection was easily done by 1 researcher per day. Light and noise

\[\text{Figure 2} \quad \text{Mean scores for noise over time.}\]

\[\text{Figure 3} \quad \text{Mean scores for stress over time.}\]

\[\text{Table}\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>30 Minutes after</th>
<th>1 Hour after</th>
<th>2 Hours after</th>
<th>F score</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light, (^a) lux</td>
<td>369 (102)</td>
<td>152 (162)</td>
<td>180 (161)</td>
<td>179 (171)</td>
<td>95.601</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Noise, (\text{dB})</td>
<td>62.93 (5.7)</td>
<td>60.89 (7.5)</td>
<td>60.88 (9.1)</td>
<td>61.69 (5.0)</td>
<td>3.203</td>
<td>.08</td>
</tr>
<tr>
<td>Stress score</td>
<td>46.36 (28.5)</td>
<td>40.70 (26.6)</td>
<td>34.31 (25.9)</td>
<td>35.36 (26.2)</td>
<td>25.609</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

\(^a\)To convert lux to lumens per square foot, divide by 10.76.
were measured at the participants’ location when they filled out the Perceived Stress survey, isolating the potential environmental influence on nurses’ stress at the time stress was reported.

Controlling an environmental pollutant such as light may promote a healthy work environment, because excessive light results in physiological changes that stimulate the stress response, including the release of cortisol and catecholamines. The environmental change of turning down the lights could explain the physiological decrease in nurses’ stress levels. Perhaps this decrease in stress was the reason nurses in a chaotic ICU continued to turn down the lights even after the research study was completed. The nurses simply felt better.

The reduction in noise in our study is also an important physiological health outcome because noise-induced stress may result in staff burnout. More research with the measurement of noise during the full duration of quiet time might yield statistically significant results. Because the effect of noise on physiological health is known, another research approach might be to add interventions that decrease noise. Decreased noise is also a measure of patient satisfaction, and promotion of rest without distraction is viewed as a nursing function to promote healing. In institutions where noise levels have been decreased by implementation of quiet time for patients’ benefits, determining the impact of the environmental change on health care workers would be useful.

Limitations and Recommendations

Limitations of this study included performing the intervention in a single ICU, at specific intervals, with participation by nurses who worked day shifts only. Replication of the study in additional hospitals, on different nursing units, on other shifts, and with a larger sample size of nurses and other health care workers would be useful. Such a study would help reach a wider critical care community in which the structural configuration of the unit and the composition of health care workers might differ.

Our study was performed during 5 weeks during May and June; the patient census and acuity level may differ between seasons. Additionally, we did not consider sociodemographic variables of individual nurses or patients. Future researchers might consider performing the study for a longer period, at times outside the 2-hour period we used, and including acuity, census levels, and demographic variables in the research design. Also missing from our study is a more thorough comparison of stress levels determined before quiet time. With measurements taken at more intervals throughout a shift, a researcher might be able to isolate the loudest or brightest times of day in a unit, as well as times of highest perceived stress. These results may indicate the best time to implement quiet time.

Conclusions

Implementation of quiet time, defined as turning down the lights in an ICU between 2 PM and 4 PM, resulted in a significantly decreased mean light level. Although noise levels also decreased over time, the change was not significant. Nurses’ stress levels decreased significantly, confirming that controlling light may result in decreased stress levels and promote a healthier ICU working environment, a change that might lead to better patient care and less staff turnover. Although quiet time was an easily performed, energy-saving intervention, more research is needed to better analyze and develop interventions to promote greater physiological and psychological health for nurses, patients, and patients’ families in the critical care community.

ACKNOWLEDGMENTS

We thank the intensive care nurses for their participation in the research study. Data analysis and manuscript review were performed by Suela Sulo, PhD, James R. and Helen D. Russell Institute for Research and Innovation, Advocate Lutheran General Hospital, Park Ridge, Illinois.

FINANCIAL DISCLOSURES

None reported.

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REFERENCES


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Am J Crit Care 2015;24 396-402 10.4037/ajcc2015706
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