Noise Levels in the Neonatal Intensive Care Unit: Literature Review

Kelsey Bierman

Lakeview College of Nursing

Dr. Ariel Wright

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The purpose of this paper is to perform a quantitative literature review. Quantitative research is rooted in philosophical assumptions of positivism and determinism (Houser, 2020). Positivism assumes that features of the environment have an objective reality, and determinism is the belief that events are not random but have preexisting causes (Houser, 2020). A literature review provides an in-depth analysis of what is known and missing related to a specific topic (Houser, 2020). This quantitative literature review will focus on elevated noise levels in neonatal intensive care units (NICU), what causes the elevated noise level, and what detriments increased sound levels can have on premature infants. Medical improvements have enabled infants to survive as early as twenty-two weeks of gestational age (Mayhew et al., 2022). When infants are born this early, they have an immature central nervous system, and excessive noise levels can result in problems with infants' sleep patterns, growth, and neurodevelopment (Mayhew et al., 2022).

First Elevated Sound Levels in the Neonatal Intensive Care Unit: What is Causing the Problem?

The article by Mayhew et al. (2022) states that noise in the NICU can negatively impact the multiple body systems of the preterm infant. Some body systems that noise impacts include the cardiovascular, respiratory, and auditory systems (Mayhew et al., 2022). When preterm infants experience sudden and loud noises, they can exhibit changes in heart rate, apnea, hypertension, as well as disruption in their sleep patterns (Mayhew et al., 2022). According to the American Academy of Pediatrics (AAP), the recommended sound level in the NICU is 45 decibels (dB). The sounds in the NICU reach as high as 160 dB consistently (Mayhew et al.,

2022). This article aims to identify the average noise levels in a level III NICU and the environmental factors contributing to the elevated noise levels (Mayhew et al., 2022). The study found that throughout the morning, evening, and night shifts, the noise levels were consistently above the recommended 45 dB (Mayhew et al., 2022). The environmental factors noted to increase noise levels in the NICU included health care professionals (HCPs) talking too loudly at the bedside, the number of people in the room, the number of neonates in the room, the number of alarms, infant acuity, and shift type (Mayhew et al., 2022).

Key Points

This study was a descriptive, quantitative research design that utilized observational and sound-level measurements. The study received research ethics approval from the Ottawa Hospital Research Institute, Institutional Approval for the Ottawa Health Science Network Research Ethics Board, and the University of Ottawa Office of Research Ethics and Integrity. The study occurred at a level III NICU in a perinatal center in Ottawa, Canada. The researcher conducted sound measurements over a total of twenty-one shifts, including seven-day shifts (0600-1400), seven evening shifts (1400-2300), and seven-night shifts (2300-0600). However, the first two day-shift data were unusable due to malfunctions with the technology. The device used to measure the sound levels were the Casella model CEL 242-K, and the calibrator used was the Casella CEL-120. These devices were placed in the exact location each time and measured sound continuously. The sampling method used in this study was convenience sampling, where the sound was collected based on proximity to the most acutely ill neonates. Observational data was recorded hourly and documented on a data collected sheet designed by the researcher of this study Kelli Mayhew. The average sound level over all three shifts was 58.3 dB for the day shift, 53.6 dB for the evening shift, and 54.4 dB for the night shift. The

observational data showed that multiple people, including infants, HCPs, and visitors, were in the room during each shift which increased the noise level. The untimeliness of silencing alarms, the humming of the blanket and milk warmers, and the noise made by portable x-ray machines all contributed to increased sound levels in the NICU. A simultaneous multiple linear regression analysis helped to determine the significance of elevated sound levels with the environmental factors recorded. The elevated noise level was statistically significant and positively correlated with the number of people in the room; the p-value was less than 0.001. There was a significant pattern of the average day shift noise compared with the night shift; the p-value was 0.001. There was also a statistical significance between the shift types with a p-value less than 0.05.

Assumptions

In the article by Mayhew et al. (2022), she suggested that a way to reduce noise levels in the NICU would be to get away from open bay NICUs and instead redesign NICUs to include single patient rooms (Mayhew et al., 2022). While this may reduce the noise levels in the NICU, not all hospitals have the funding to redesign the unit altogether. Another assumption from this research is that all levels of NICUs will have the same noise level. A level III NICU center will likely have much more noise than a level I NICU. More research is required to compare the noise levels in each level of NICUs ranging from level I to level IV. Another assumption the researcher has is that HCPs want to learn and implement strategies to decrease noise levels to help precipitate positive outcomes for neonates. Although hopefully, all HCPs do care for their patients and their outcomes.

Deficit/Conclusion

Although the researcher makes a few assumptions, this student agrees that hospitals should prioritize strategies to decrease the noise level in the NICU. This research article helped prove that the noise level in this environment is above the recommendations set by the AAP 90% of the time (Mayhew et al., 2022). On average, they were fourteen times louder than that recommendation (Mayhew et al., 2022). There is a clear need for change in this setting. Some changes that this student agrees with include ongoing education for the staff and visitors about the importance of creating a quiet environment, silencing alarms as quickly as possible, and changing staffing ratios (Mayhew et al., 2022). The researcher has concluded that hospitals should have new and updated technology that allows the staff to visualize the dB value. Seeing a change in the noise level allows HCPs to see an immediate change based on their behaviors. Having immediate feedback may help with positive reinforcement and hopefully drive the staff to continue to educate their colleagues and visitors on the importance of creating and maintaining a quiet environment for the neonates admitted to the unit (Mayhew et al., 2022). The most crucial goal in the NICU is to give the patients everything they need to have a positive outcome. If maintaining a quiet environment will help these neonates grow and develop, implementing strategies to meet this outcome should be a priority.

References

Houser, J. (2020). *Nursing research: Reading, using, and creating evidence* (5th ed.). Jones & Bartlett Learning.

Mayhew, K. J., Lawrence, S. L., Squires, J. E., & Harrison, D. (2022). Elevated sound levels in the neonatal intensive care unit: What is causing the problem? *Advances in Neonatal Care*, *00*(0), 1–10. https://doi.org/10.1097/anc.0000000000000996