



## KEY POINT SUMMARY

### OBJECTIVES

The objective of this study was to determine the effectiveness of built environment interventions in managing behavioral and psychological symptoms of dementia among residents in long-term care settings.

## A Comparison of Sound Levels in Open Plan versus Pods in a Neonatal Intensive Care Unit

*Ramm, K., Mannix, T., Parry, Y., & Gaffney, M. P. (C). 2017 | Health Environments Research & Design Journal, Volume 10, Issue 3, Pages 30-39*

### Key Concepts/Context

Noise in a neonatal intensive care unit (NICU) can be a primary factor for stress for preterm infants, their family, and staff. High sound levels can potentially harm sensorineural systems of the infants. Literature shows that low background sounds are crucial to neurological development of preterm infants. The noise level in the NICU is recommended to be between 40 and 45 decibels. The authors cite studies that show noise levels can become very high in open bay NICUs even though the plan allows for simultaneous monitoring of several infants. On the other hand, according to recent studies, low noise levels in single family room NICUs may adversely impact sensory development. In this paper the authors present their findings from a study comparing noise levels between a six-bed pod and an 11-bed open plan NICU in a tertiary hospital in Australia. The study concluded that both NICUs are noisier than the recommended 45 decibel levels. However, pods are quieter than open plan NICUs.

### Methods

The study took place in a tertiary hospital in Australia that catered to high-risk and complex pregnancies and neonatal care. This comparative study compared real-time noise levels in two NICUs (a six-bed pod and an 11-bed open plan) using sound dosimeters continuously for four weeks. Observational data was also collected. A dosimeter was placed in each unit between two beds in a high-traffic area. The instruments recorded decibels continuously for four weeks. The highest and lowest noise levels were stored every 60 seconds. Once a week there was an hour-long break in collecting data as the dosimeters were removed for recording data and battery checks. During these four weeks, two researchers observed and collected data when nursing handovers took place, when admissions and procedural tasks



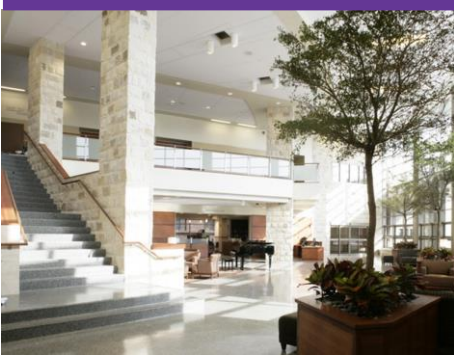
were underway, and during quiet periods – to gather information about factors affecting differences in noise levels recorded by the dosimeter. The time periods during which observational data was collected were – 1 a.m.-2 a.m.; 9 a.m.-11 a.m., and 2 p.m.-3 p.m. Chi-square tests were conducted to analyze data. The authors referred to the open plan NICU as “NICU” and to the pod NICU as “pod” for this paper.

## Findings

On analyzing the data, the authors found the noise levels in both units in all time periods were higher than the recommended 45 decibels except in the pod between 1 a.m. and 2 a.m. Noise levels in the open plan NICU were higher than noise levels in the pod NICU – the difference in sound levels was statistically significant.

- The mean decibel recorded for the entire study period was:
  - NICU: 48.99773 decibels
  - Pod: 47.29533 decibels
- The mean decibel recorded during quiet time (1 a.m.-2 a.m.):
  - NICU: 49.05 decibels
  - Pod: 44.5 decibels
- The mean decibel recorded during multidisciplinary rounds was:
  - NICU (9 a.m.-10 a.m.): 52.4 decibels
  - Pod (10 a.m.-11 a.m.): 48.8 decibels
- The mean decibel readings during the nursing handovers (2 p.m.-3 p.m.) was:
  - NICU: 53.1 decibels
  - Pod: 51 decibels
- The range of the noise levels was:
  - NICU: 26.3-74.5 decibels
  - Pod: 26.5-75.9 decibels

According to the observation data, the peaks in noise levels were found to be correlated with the following activities, thus concluding that ward rounds and handover periods were noisier:



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- Low- and high-pitched alarms of the physiological monitors, high-pitched cot alarms, high-pitched noises from blender gases, respiratory support sounds, ward rounds, nurse conversations, and ringing of doorbells in the NICU
- Low- and high-pitched alarms of the physiological monitors, crying infants, equipment being moved, hand-washing, respiratory support sounds, parent and nurse conversations, and ringing of doorbells in the pod

### Limitations

The authors do not identify any limitation to their study. Since the authors recommend the pod layout over the single family room plan for NICUs, their study could have been more robust with measurements of noise levels in a single family room during the same study period.

### Design Implications

This study suggests the following implications for design:

- Take into consideration workflow traffic and identify locations where noise may potentially occur during the design stage;
- Locate equipment storage, office equipment and restocking trolleys away from infant areas; separate corridor access for waste handling and linen disposal with well-insulated closing systems;
- Use noise-reduction ceiling tiles, vinyl-faced acoustic material, and carpets to reduce traffic sounds.

The authors also recommend the design of pod NICUs over single family room NICUs pending further research.

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