



## KEY POINT SUMMARY

### OBJECTIVES

The objective of this study was to measure noise levels in an ICU and examine the impact of noise on post-cardiac surgery patients' heart rate (HR), blood pressure (BP), and physiological and psychological responses.

### DESIGN IMPLICATIONS

Since this article pertains to sound emanating from medical devices in an ICU, designers may consider using sound-absorbing material around (floor, wall or ceilings) these devices to reduce the noise levels.

## Associations of exposure to noise with physiological and psychological outcomes among post-cardiac surgery patients in ICUs

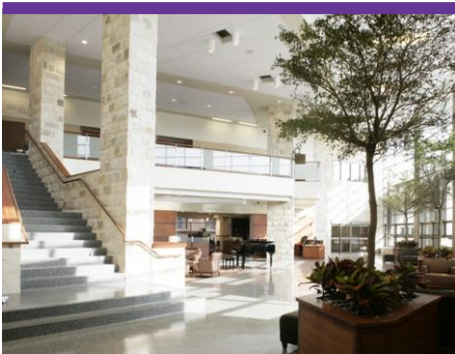
Hsu, S. M., Ko, W. J., Liao, W. C., Huang, S. J., Chen, R. J., Li, C. Y., & Hwang, S. L. 2010 | *Clinics*. Volume 65, Issue 10, Pages 985-989

### Key Concepts/Context

Noise can be an impediment to the sleep and recovery of a patient. An ICU has several instruments and devices that monitor a patient's vitals as they recover from a surgery. The authors suggest that these essential ICU devices can produce substantial sounds that potentially impact a patient's outcome. In this study, the authors examine the impact of noise on the heart rate (HR) and blood pressure (BP) of patients recovering in an ICU from cardiac surgery, as well as their physiological and psychological responses. This study was conducted in a hospital in Taiwan. The study findings show that the noise generated by medical devices in ICUs is significantly related with increased heart rate and blood pressure.

### Methods

The methodology involved an objective measurement of noise levels in the ICU with the help of a sound meter, the measurement of the patient participants' HR, systolic arterial blood pressure (SABP), diastolic blood pressure (DABP), and mean arterial blood pressure (MABP) with a physiologic monitor. The study also included administration of a survey questionnaire to patients recovering in the same ICU following a cardiac surgery. Sound/ noise levels and patient vitals were collected over a 42-hour period – noise was recorded continuously; HR and BP were measured every five minutes. The Impact of Noise Perception (INP) questionnaire, developed by the authors, had seven items to assess psychological response and nine items to assess physiological response to noise. These questionnaires were administered to the patients on the day of discharge from the ICU. Purposive sampling had been used to recruit 41 participants, of whom 40 completed the study. Data were analyzed statistically.



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## Findings

The study found that:

- On dividing the noise level data into seven six-hour periods, the average hourly ranges of
  - Noise level was between 59 and 60.8 dB(A)
  - Maximum noise level was between 77.3 and 81.3 dB(A)
  - Minimum noise level was between 53.4 and 55.3 dB(A)
- Sound levels were consistently the same throughout the study period, indicating that the patients were always exposed to high sound levels during their recovery period.
- Psychological and physiological impacts of noise were minor – most patients reported being ‘not affected’ or ‘mildly affected.’
- The three top psychological responses of patients were annoyance, being startled, and anxiety, none of which was significantly associated with the measured noise level in the ICU.
- The three top physiological responses of the patients were insomnia, tachycardia, and easy fatigue. Again none of these was significantly associated with noise levels in the ICU.
- For every 1 dB(A) rise in noise levels, the following significant increases were recorded:
  - HR by 0.07 beats/ minute (P<0.01)
  - SABP by 0.58 mmHg (P<0.001)
  - DABP by 0.15 mmHg (P<0.001)
  - MABP by 0.53 mmHg (P<0.046)

## Limitations

The authors do not identify any limitations to this study. However, they do indicate that sedatives and medications administered to the patients may have had an impact on their responses to the survey questions on perceived psychological and physiological impact of noise.

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