## Sound Recommendations

### Neonatal Policy & Procedures Manual

#### Policy Group:
- Developmental Care

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### Purpose

- To promote an environment that enables the neonate the opportunity to develop and grow to their fullest potential.
- To adopt acceptable noise levels/standards and encourage allied health professionals to work within those levels and decrease extraneous noise. As per the 2007 recommendation standards for Newborn ICU design:
  - In infant rooms and adult sleep areas, the combination of continuous background sound and operational sound shall not exceed an hourly Leq of 45 dB and an hourly L10 of 50 dB, both A-weighted slow responses. Transient sounds or Lmax shall not exceed 65 DB, A-weighted slow response.
  - In staff work areas, family areas and staff lounge areas, the combination of continuous background sound and operational sound shall not exceed an hourly Leq of 50 dB and an hourly L10 of 55 dB, both A-weighted slow responses. Transient sounds or Lmax shall not exceed 70 DB, A-weighted slow response in these areas.
- Staff commitment to decreasing noise levels in the NICU
- All staff, parents, and visitors are aware of the effect of noise on premature and ill neonates.

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### Policy Statement

Normal development of a neonate’s auditory structures is dependent on interaction with the environment. The majority of the neonate’s auditory development occurs before term gestational age, with cochlear function and hearing starting by approximately 22-24 weeks. Infants born before term gestation are disadvantaged by not receiving the appropriate stimulation of the uterine environment, which has both protective and adaptive functions. In animal studies, the uterine environment is moderately loud with low frequency background sounds predominating and the maternal voice provides a distinctive and clear signal against the background noise. Amniotic fluid provides a filter for the human fetus against low, mid and high frequencies therefore allowing the fetus to focus on maternal sound. NICU environmental sounds are airborne with a wide variety of frequencies that are continuous and unpredictable.
Policy Statement

The sequence of sensory development is not altered by premature birth, and stimulation of a particular sensory system outside the natural developmental sequence may cause detrimental long term effects. Excessive noise may adversely affect a newborn’s growth and development and could have long term implications, including cochlear damage and speech and hearing delays. For appropriate auditory development, the fetus and neonate require exposure to various sounds at various frequencies; however an intense or atypically timed stimulus may interfere with the normal development processes.

Neonates will demonstrate fluctuations in heart rate, blood pressure, respiratory rate, oxygen saturation, and increased intracranial pressure when exposed to excessive noise. The preterm neonate has a limited ability to distinguish various sounds, such as voices, from mechanical sounds and has difficulty habituating to or tuning out these sounds. Sounds that are developmentally appropriate include those heard in the uterus such as the parents’ voices, and maternal heartbeat. The preterm brain recognizes these familiar and predictable patterns of sounds and can integrate them as the auditory system continues to develop. Brain maturation and growth requires protected periods of sleep, which does not occur if the average noise level is >45 dB. The average noise level of most NICU's is about 55 dB which is loud enough to wake a healthy, term baby.

The goal for controlling/limiting noise levels in the NICU is to preserve a large portion of each hour for infant sleep. Noise levels encountered in hospitals frequently disturb sleep states and disrupt stable behavioural states in healthy term and preterm infants. These frequent disruptions may interfere with the development of stable behavioural states and of well-regulated transition between states. Maintaining an hourly Leq of 50 dB is intended to encourage sleep for most healthy, term infants most of the time. Research suggests <5% of infants were disturbed or wakened by 12 minutes of broad band noise at 50dB. With every 5 dB increase, the percentage of disturbed or wakened infants rose so that 20% were affected by a 60 dB stimulus. The L10 ensures sound levels may exceed 55 dB only 10% of the time or for only a total of 6 minutes of any hour. A suggested Lmax of 70dB decreases disturbances in the infants sleep patterns and startle responses.

Loud sound levels also affect health care personnel. Elevated sound levels interfere with adult communication and performance of complex tasks. They also increase fatigue, irritability and work related stress. Sounds greater than 80 dB, will damage health care personnel’s hearing.

Applicability

All Covenant Health Neonatal Nursery staff.
Procedure

1. Minimize talking at the bedside, and if necessary use a quiet voice or whisper. The recommended maximum acceptable noise level in NICU is 40-45 dB which corresponds to “the sound of leaves rustling in a gentle breeze”.
   - Ideally, patient care rounds should not occur at the bedside.
2. Consider implementing a “quiet hour” on each shift when staff endeavours to restrict all noise, care procedures, and tests to allow for uninterrupted sleep time for the infants.
3. No loud voices/laughing in patient care areas.
4. Infants should be able to hear their mother’s voice during daily activities.
5. Do not allow incubator doors to snap/click shut.
6. Do not tap, write, or place equipment on top of incubator.
7. Cover incubator tops and cribs when indirect lighting is not available. Shielding infant’s eyes but allowing visibility for parents and caregivers at all times.
8. Communication devices placed on vibrate for patient care areas.
9. Wear quiet soled shoes in patient care areas.
10. Face alarms away from infants and lower the volume as much as is safe.
11. All members of the infant care team are responsible for promptly addressing equipment alarms. Silence alarms before potential alarm conditions such as clamping arterial line to draw blood.
12. Be aware of the noise of running water.
13. Minimize respiratory equipment noise by turning off unused baggers and suction, and draining water in ventilator circuits.
14. Pad storage drawers and doors.
15. Use plastic trash cans without lids.
16. Consider sound control and noise as important factors when purchasing new equipment or renovating.
17. Conduct “loud” or “noisy” care giving related activities away from the bedside whenever possible.

### TABLE 1  Decibel Levels Within the NICU

<table>
<thead>
<tr>
<th>Activity</th>
<th>Associated Decibel Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>One nurse reporting to another at the bedside</td>
<td>50</td>
</tr>
<tr>
<td>Bradycardia alarm</td>
<td>55-88</td>
</tr>
<tr>
<td>General conversation</td>
<td>58-64</td>
</tr>
<tr>
<td>Using incubator top as writing surface</td>
<td>59-64</td>
</tr>
<tr>
<td>IV pump alarm</td>
<td>61-78</td>
</tr>
<tr>
<td>Turning sink on and off</td>
<td>66-76</td>
</tr>
<tr>
<td>Opening plastic sleeve of incubator</td>
<td>67-86</td>
</tr>
<tr>
<td>Closing an incubator cabinet</td>
<td>70-95</td>
</tr>
<tr>
<td>Closing a solid plastic incubator porthole</td>
<td>80-111</td>
</tr>
<tr>
<td>Dropping head of mattress</td>
<td>88-117</td>
</tr>
<tr>
<td>Placing bottle of formula on top of the incubator</td>
<td>96-117</td>
</tr>
<tr>
<td>Banging incubator to stimulate apneic infant</td>
<td>130-140</td>
</tr>
</tbody>
</table>

Adapted from Goldson (1999); Balogh, Kittenger, and Benzer (1993).
Definitions

1. Noise: Unwanted sound or discordant sound.
2. A-weighted: A frequency-weighting filter that approximates the frequency response of the human ear, which is less sensitive to low frequency than to high-frequency sound. A scale decibel expressed as dBA.
3. Leq (Equivalent sound level): The equivalent steady noise level which in a stated period would contain the same noise energy as the time varying noise during the same time period. It is an averaged sound measurement.
4. L10: That time-varying sound level which will be expected (i.e. exceeded) 10% of the time (during a specific measurement period).
5. Lmax: The maximum sound level of ≤1 second in duration during a measurement period. This is equated with an individual's perception of maximum loudness.

Supporting Policies

Cue Based Care
Developmental Care
Lighting
Positioning
Skin to Skin

References

References


References
Adapted with permission from Stollery Children’s Policy and Procedure Manual:
March 2012

Revisions
October 2012
November 2015
Signing

Original signed

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