

Too Loud!

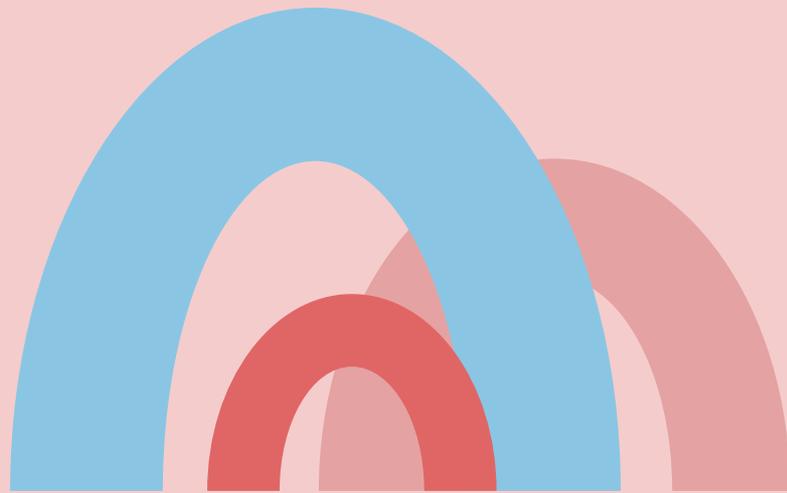
A PROJECT FOR SOUND REDUCTION IN THE NEONATAL INTENSIVE CARE UNIT

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GOAL OF PRESENTATION

- Discuss the high level and impact of noise in the NICU
- Talk about interventions
 - From small changes to large-scale innovations



THE main ISSUE

- The WHO recommends a noise level of less than 35 dB in any intensive care unit¹ and the AAP recommends a noise level of less than 45 dB during the day.
- The average sound level in a NICU is 54 dB²
- In one study, the median noise levels were 59.5dB in a regular room and 65.8dB in an incubation room³
- What does 35 vs 54 dB vs 65 dB sound like?

35 dB - Whisper

45 dB - Bird calls

60 dB - Household refrigerator

70 dB - Vacuum

LEVELS OF NOISE In decibels (dB)

PAINFUL & DANGEROUS		
Use hearing protection or avoid	140	<ul style="list-style-type: none">• Fireworks• Gun shots• Custom car stereos (at full volume)
	130	<ul style="list-style-type: none">• Jackhammers• Ambulances
UNCOMFORTABLE		
Dangerous over 30 seconds	120	<ul style="list-style-type: none">• Jet planes (during take off)
VERY LOUD		
Dangerous over 30 minutes	110	<ul style="list-style-type: none">• Concerts (any genre of music)• Car horns• Sporting events
	100	<ul style="list-style-type: none">• Snowmobiles• MP3 players (at full volume)
	90	<ul style="list-style-type: none">• Lawnmowers• Power tools• Blenders• Hair dryers
Over 85 dB for extended periods can cause permanent hearing loss.		
LOUD		
	80	<ul style="list-style-type: none">• Alarm clocks
	70	<ul style="list-style-type: none">• Traffic• Vacuums
MODERATE		
	60	<ul style="list-style-type: none">• Normal conversation• Dishwashers
	50	<ul style="list-style-type: none">• Moderate rainfall
SOFT		
	40	<ul style="list-style-type: none">• Quiet library
	30	<ul style="list-style-type: none">• Whisper
FAINT		
	20	<ul style="list-style-type: none">• Leaves rustling

**OCTOBER IS NATIONAL AUDIOLOGY AWARENESS MONTH
AND NATIONAL PROTECT YOUR HEARING MONTH**

Visit www.HowsYourHearing.org to learn more about audiology and hearing loss.

Think you may have a hearing loss? Click on the "Find an Audiologist" link of the Web site to locate and set up an appointment with an audiologist in your area to get your hearing tested.

THEORETICAL FRAMEWORK

- **Florence Nightingale's Environmental theory**
 - Defines nursing as 'the act of utilizing the patient's environment to assist them in recovery.'
 - Nightingale viewed noise as a major environmental factor that is controllable and results in positive effects on patient's recovery.
- **Application to the NICU**
 - This implementation would promote infant development due to quiet and more peaceful environment.

WHY IS NOISE HARMFUL?

- Excess auditory stimulation results in negative physiological responses including increased HR and respirations and decreased O₂ saturation.
- At 24 weeks gestation, connections between the periphery and the cerebral cortex begin to be established. Effects of excess noise in this period become evident at 32-34 weeks gestation when infants are developing the ability to coordinate autonomic responses to environmental stimuli.
- The long term effects of this poor perfusion are attributed to a wide variety of things such as slower language development and auditory processing along with behavioral issues such as ADHD.⁴

HOW TO SOLVE THE PROBLEM

smaller
intervention

larger
intervention

Talk quietly

Soothing
parent voices

No shouting
across unit

Close
incubator port
holes gently

Turn off the
radio

Do not tap on
incubators

HOW TO SOLVE THE PROBLEM

smaller
intervention

larger
intervention



Group meetings
in conference
room

Phone volume at
lowest audible
setting

Switch
unnecessary
auditory alarms
to visual only

Silence necessary
auditory alarms
promptly

Maximum auditory
alarms on 55 dB

Rubber shoes
on all
furniture

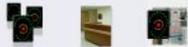
SoundEar II

SOUND EAR II SIGN

SoundEar II Noise Activated Warning Sign



SoundEar II Noise Warning Sign



Features

- Lights up when noise levels are too high
- Attractive design for use in public areas
- Green = Monitoring : Yellow = Getting loud : Red = Too loud
- Warning level adjustable from 40 to 115 dB(A)

Applications

- Hospital noise
- NICU and neonatal units
- Schools - study rooms, classrooms, cafeteria, library
- Offices and Call Centers
- Entertainment Venues
- Noise at Work - see [SoundEar II Industrial](#)



SUPPORTING RESEARCH

Research to implement various interventions

- Talk in a quiet volume, avoid shouting, have group meetings in a separate room, turn off the radio, etc.
- This lowered the level of the NICU volume significantly.
- By numbers, “the noise reduction was maximum in the ventilator room by 9.58 dB and least in the extreme preterm room by 2.09 dB⁷

Research to reduce false alarms

- 68% of hospital alarms have been found to be false²

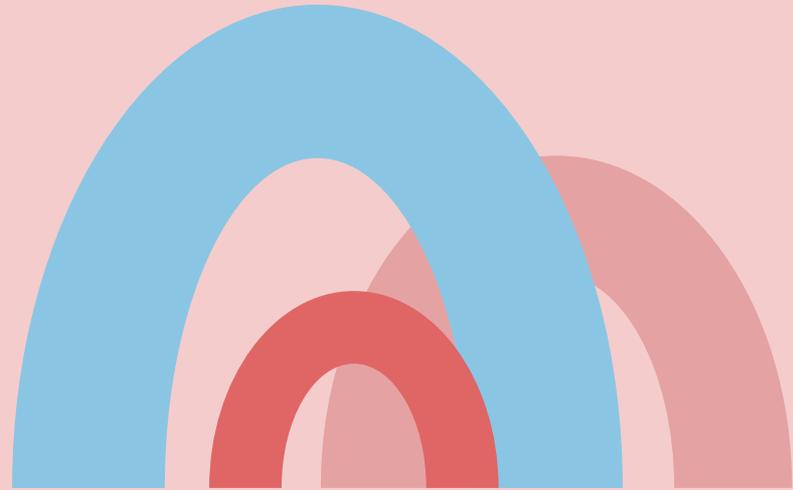
Research in favor of a digital interface system:

- Nurses reported that the visual alarm promoted a higher awareness of the noise level in the infants room along with them being more conscious about their noise level when performing interventions in that patients room⁶

current POLICY

Noise

- A. Expose infants to soothing sounds such as parent's voice, soft singing, and reading.
- B. Reduce noise as much as possible
 - a. Alarms set on lowest/quietest level.
 - b. Alarms silenced/answered promptly.
- C. Talk quietly around the bedside.
- D. Incubator considerations
 - a. Close incubator portholes gently.
 - b. Do not place anything on top of incubators.
- E. Do not tap on incubator.



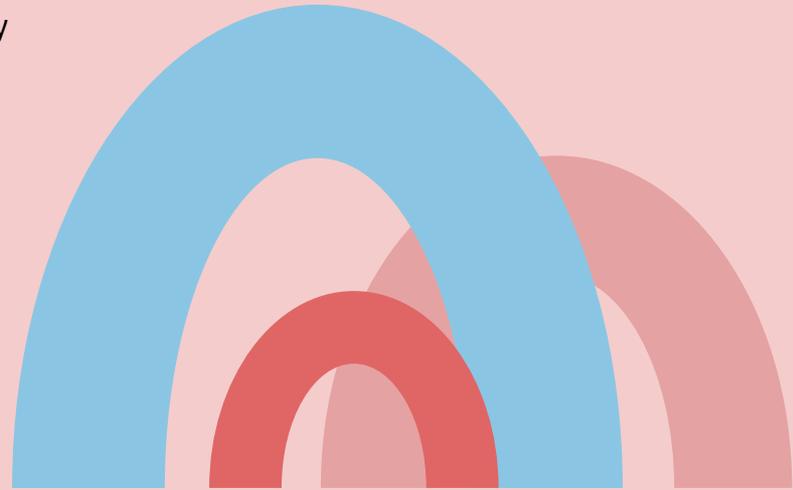
RECOMMENDATIONS FOR PRACTICE

Noise

- A. Expose infants to soothing sounds such as parent's voice, soft singing, and reading.
- B. Reduce noise as much as possible
 - a. Alarms set on lowest/quietest level.
 - b. Alarms silenced/answered promptly.
 - c. Visual Alarms installed (Recommended: Sound Ear Noise II Activated Warning Sign)
 - d. Set auditory alarms to a maximum of 50 dB
 - e. Install rubber shoes on all furniture
- C. Talk quietly around the bedside.
 - a. Group meetings must be held in conference rooms
- D. Incubator considerations
 - a. Close incubator portholes gently.
 - b. Do not place anything on top of incubators.
- E. Do not tap on incubator.

summary

- Reduction of noise in the NICU will lead to better development of patients
- Specific interventions can be implemented to achieve this goal
- These interventions range from small to large scale, but all have the ability to be applied in some way



References

1. Darbyshire, Julie. *Sleep in the Intensive Care Unit: Limiting Elements of Noise in the Critical Care Environment (SILENCE)* [Doctoral dissertation, University of Oxford]. Oxford University Research Archive.
2. Freudenthal, A., Stujvenberg, M., & Goudoever, J. (2013). A quiet NICU for improved infants' health, development and well-being: a systems approach to reducing noise and auditory alarms. *Cognition, Technology & Work*, 15(3), 329-345. <https://doi.org.ezproxy.waterfield.murraystate.edu/10.1007/s10111-012-0235-6>
3. Parra, J., Suremain, A., Berne Audeoud, F., Ego, A., & Devillion, T. (2017). Sound levels in a neonatal intensive care unit significantly exceeded recommendations, especially inside incubators. *Acta Paediatrica*, 106(12), 1909-1914. <https://doi-org-ezproxy.waterfield.murraystate.edu/10.1111/apa.12906>
4. Bremner, P., Byers, J. F., & Kiehl, E. (2003). Noise and the premature infant: physiological effects and practice implications. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 32(4), 447-454. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C18&q=noise+levels+in+the+nicu&oq=noi
5. Darbyshire, J. L., Greig, P. R., Hinton, L. & Young, J. D. (2021). Monitoring sound levels in the intensive care unit: A mixed-methods system development project to optimize design features for a new electronic interface in the healthcare environment. *International Journal of Medical Informatics*, 153, 1-7 <https://doi.org/10.1016/j.ijmedinf.2021.104538>
6. Balci, S. Calikusu Incekar (2017). The effect of training on noise reduction in neonatal intensive care units. *Journal for specialists in pediatric nursing : JSPN*, 22(3), 10.1111/jspn.12181. <https://doi.org/10.1111/jspn.12181>
7. Ramesh, A., Suman Rao, P. N., Sandeep, G., Nagapoornima, M., Srilakshmi, V., Dominic, M., & Swarnarekha. (2009, April 23). Efficacy of a low-cost protocol in reducing noise levels in the Neonatal Intensive Care Unit. *Indian Journal of Pediatrics*, 76, 475-478. <https://doi.org/10.1007/s12098-009-0066-5>
8. *SoundEar II Sign*. Noisemeters Inc. <https://www.noisemeters.com/product/soundear/se2ear/>