1-2020

Creating A Noise-Reducing, Wearable Intervention For Newborns In The NICU

Mohammad Rasool
Thomas Jefferson University, mohammad.rasool@jefferson.edu

Alexandra A. McCullough
Thomas Jefferson University, alexandra.mccullough@jefferson.edu

Alison Romisher
Thomas Jefferson University, alison.romisher@jefferson.edu

Robert S. Pugliese, PharmD, BCPS
Thomas Jefferson University, Robert.Pugliese@jefferson.edu

Bon Ku, MD, MPP
Thomas Jefferson University, bon.ku@jefferson.edu

Design Scholarly Inquiry Abstract (JeffSolves Program)

Project Title: Creating A Noise-Reducing, Wearable Intervention For Newborns In The NICU

Author(s): Mohammad Rasool, BA**; Alexandra McCullough, BS**; Alison Romisher, BS; Robert Pugliese, PharmD, BCPS*; Bon Ku, MD, MPP*

Background: Excessive auditory stimulation can have negative effects on the growth and development of newborn babies. The American Academy of Pediatrics states that newborns should not be exposed to sounds in excess of 45dB while they are in the hospital, however noise levels in NICUs across the country are often between 50-100dB. A design project was conducted to develop an intervention that could reduce infant exposure to excessive noise.

Methods: Neonatologists, nurses, audiologists, music therapists, sound designers, soft materials experts, and medical device designers were interviewed and consulted throughout the design process. A 24-hour sound recording using a REED-SD-4023 meter was performed in multiple areas within the Jefferson NICU where newborns are located. Market, patent, and materials research was also completed, in addition to preliminary sound testing on materials that were considered for use in the intervention. Feedback from primary stakeholders, including neonatologists and nurses, guided improvements to the prototypes.

Results: The 24-hour sound recording showed that noise levels in the Jefferson NICU were above 45dB for 100% of the time, and above 60dB for 44% of the time. The maximum noise level reached 93dB. The preliminary sound testing on selected materials showed that a quarter-inch layer of Sorbothane (the primary sound-dampening layer of the earmuff component

of the wearable intervention) reduced noise levels by approximately 15dB at 990Hz.

Conclusions: Newborns in the Jefferson NICU are consistently exposed to noise levels above the recommended 45dB limit. The wearable intervention developed in this design project could be a solution. The amount of noise-reduction that the intervention provides will need to be tested with high fidelity. Next steps could also include a design validation test or a pilot study within the NICU. The project was limited by a lack of formal user survey data and an inability to obtain primary end-user (i.e., newborn) feedback.

Word Count: 299