Noise Reduction in the Neonatal Intensive Care Unit: Promoting Neuroprotection and a Healing Environment

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Background

The Neonatal Intensive Care Unit (NICU) is an environment filled with many types of stimuli which can be noxious to the still developing preterm infant. If exposure to these stimuli is not minimized, it can put the infant at risk for neurosensory deficits. Neuroprotection is a foundation of neonatal care that focuses on minimizing harmful stimuli and providing an environment that supports healing. A NICU filled with noise from monitor alarms, equipment, and staff conversations is far from a quiet and protective environment. The American Academy of Pediatrics (AAP) recommends that the noise levels in a NICU should not exceed 45 decibels (dB). Our open bay style NICU poses a challenge to achieving this recommendation because of limited buffers to noise, and the close proximity of bed spaces and staff workstations. We have learned that other NICUs with a similar unit design were not able to achieve the AAP's recommended noise level, however by using a structured quality improvement process, they were able to reduce noise levels significantly. We initiated this project to see if we could achieve similar results.

Aim

The aim of our project was to decrease the mean decibel noise level of our open bay style Level III NICU by 10% by one year; from 62.37 dB to 56.13 dB.

Interventions

Our interventions included targeted staff education (Nursing, Providers, Respiratory, Nutrition, Pharmacy, Occupational Therapy), environmental modifications, and behavioral changes.
Interventions were implemented in 3 rounds.
1st Round (March 2022):
• Education reinforcing the importance of neuroprotection and decreasing harmful stimuli for the preterm infant.
• Charge RN to Charge RN shift report changed from at the nurses' station to outside of unit.
• RN to RN shift report moved away from the bedside and with the expectation of low tone voices.
2nd Round (June 2022):
• Visual cues and quiet reminders for staff. "Quiet Zone" signs at each bedside.
• Yacker Trackers were placed in the unit; a stop light device that displays green, yellow, and red noise level indicators.
• Reinforcement of expectations of the changes to change of shift report.
• Modifications to multidisciplinary rounds; moving the team from bedside to bedside for rounds instead of gathering in one location.
3rd Round (Oct. 2022):
• Implementation of designated "Quiet Times" during each shift; dim lights in the unit and minimize conversations for 1 hour.
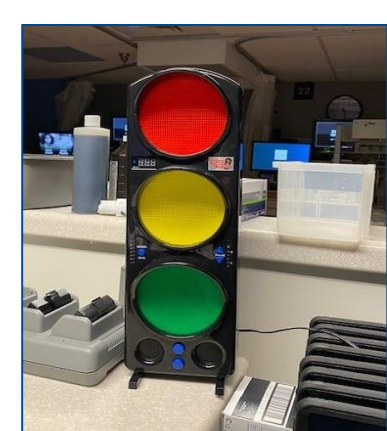
Data Collection and Analysis

A Lean Sigma model with a DMAIC framework (Define, Measure, Analyze, Improve, and Control) was used for this project. A Project Charter was created which included the NICU Nursing Council members as the project team. Baseline data collection was done by measuring noise levels at various times during the dayshift and nightshift over a three-month period (Jan. 2022-March 2022). Continuous noise levels in dB (LAeq) were recorded by using the National Institute for Occupational Safety and Health (NIOSH) sound level meter application downloaded on iOS platform smartphones. After analyzing the data, our baseline mean noise level was determined to be 62.37 dB. A cause and effect analysis was completed to identify key contributing factors to the noise levels. Further data analysis was performed using statistical testing with graphical depictions to confirm key factors. We found that verbal noise was a major contributor to the increased noise levels in our open bay design NICU. Events, such as change of shift report and multidisciplinary rounding, were recorded as having the highest noise levels. Multidisciplinary rounds had a mean noise level of 68.22 dB and change of shift report had a mean noise level of 63.62 dB. A review of our data analysis helped us target interventions. Noise levels in our NICU continued to be measured and analyzed after each intervention. Control charts and other statistical tools were used to evaluate and verify improvements.
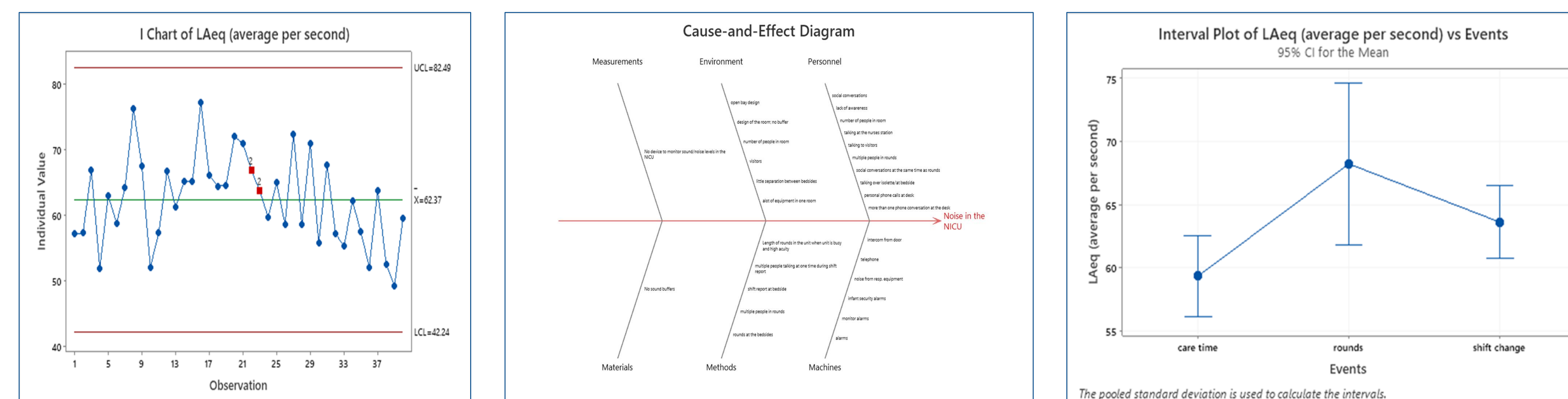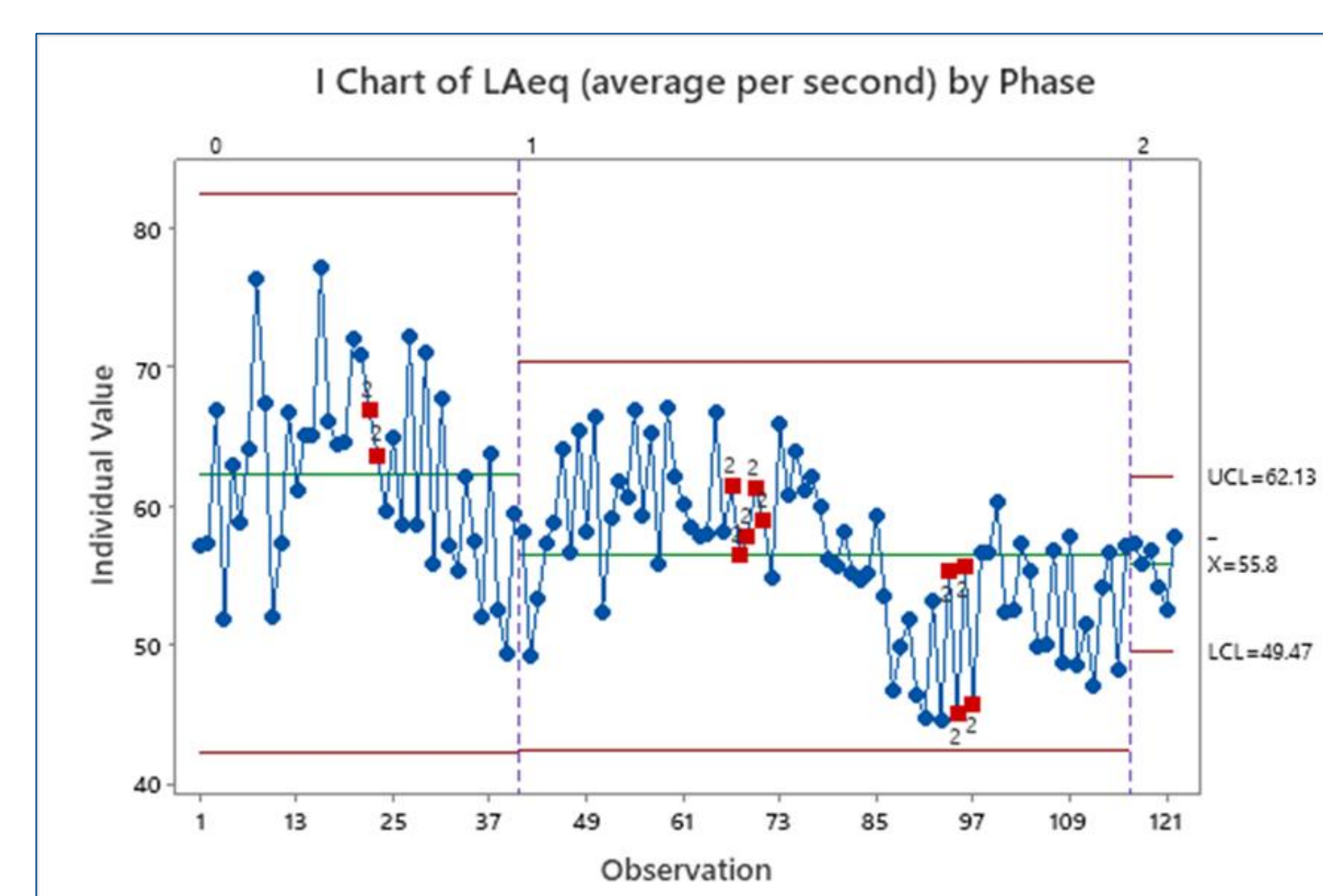

Results
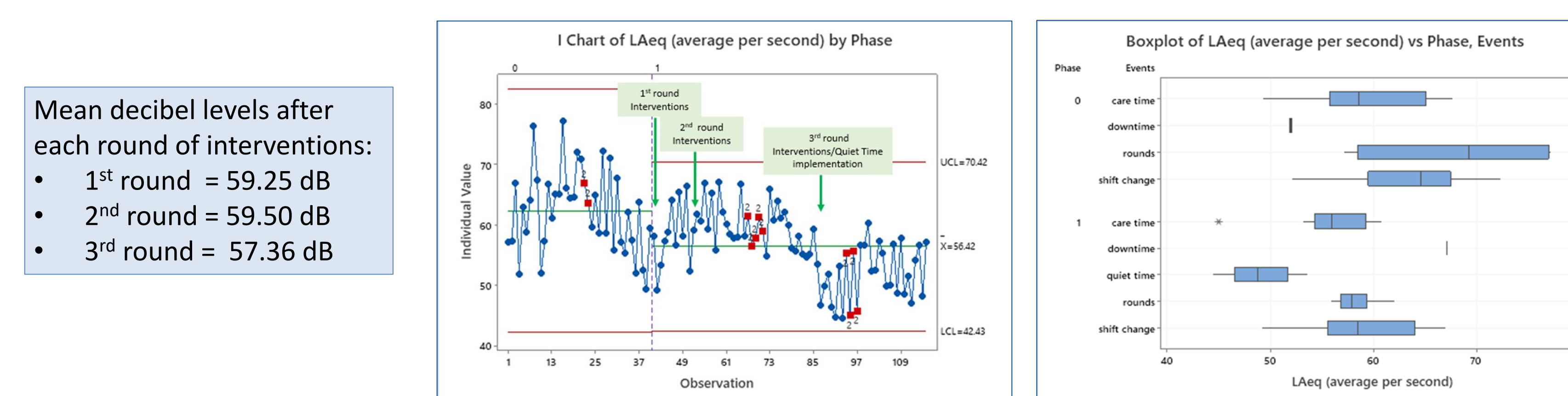
Mean decibel levels after each round of interventions:
• 1st round = 59.25 dB
• 2nd round = 59.50 dB
• 3rd round = 57.36 dB

Mean decibel levels with each Phase of the project:
Phase 0 = Baseline Data = 63.27 dB
Phase 1 = Improve Phase = 56.42 dB
Phase 2 = Control Phase (just starting) = 55.8 dB

Implications for Practice

Our findings reinforced the challenges that NICUs with an open bay design have with minimizing noise. With no barriers between patient bed spaces and staff central workstations, it is easy to reach noise levels above those recommended by the American Academy of Pediatrics. However, a decrease in noise levels can be achieved using a Lean Sigma model for quality improvement. Furthermore, noise levels can be decreased during high noise events such as change of shift report and multidisciplinary rounds. The implementation of a "Quiet Time" on each shift proved to be essential in achieving the lowest noise levels in our unit. We were able to meet the AAP's recommendation for noise levels below 45 dB during our "Quiet Time" hours. Our next steps are to continue to monitor noise levels in our NICU. As we move forward into the Control Phase of our project, we look forward to sustaining the improvements we have made.

Lessons Learned

Education is not enough to change culture, is a lesson we learned early on in this project. Our early interventions focused on providing education on the best practices for noise control but with this knowledge, decreases in noise levels were not sustained. Interventions that supported just-in-time noise level reminders and standardized practices that forced the focus on decreasing noise, such as designated "Quiet Times", had the most impact on sustaining decreased noise levels. However, we did experience challenges with standardizing our "Quiet Times" during each shift. We initially chose a set time for each shift, but quickly realized that this needed more flexibility; the expectation was changed to have 1 hour of "Quiet Time" on each shift and not set times. We also learned that continued monitoring and having unit champions to reinforce compliance with practice changes was important.

References

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