Timely Extubation in Low-Birth Weight Preterm Infants Using a Standardized Protocol – A Quality Improvement Initiative

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BACKGROUND

- Prolonged mechanical ventilation contributes to long-term complications among preterm neonates, such as bronchopulmonary dysplasia (BPD).
- Extubation protocols can improve patient outcomes by decreasing the duration of mechanical ventilation in the neonatal intensive care unit (NICU).
- The current standard of practice within the hospital and literature review was evaluated and standardized to facilitate timely extubation.

PROJECT AIM

Reduce the median time intubated by 3 days in preterm infants with birth gestational age less than 29 weeks and birth weight less than 1500 g over nine months after establishing an algorithm followed by sustaining the project for three months.

METHODS AND PDSA CYCLES

- Literature review led to the selection of weight, mean airway pressure (MAP), FiO_2, pH, and $PaCO_2$ as the criteria to determine extubation readiness (Fig. 1).
- A multidisciplinary team of physicians, medical student, respiratory therapists, statistician , and nurses was formed to evaluate, create, and implement the protocol and the Plan-Do-Study-Act (PDSA) cycles.
- The outcome measures included the total time of intubation and BPD incidence. The process measures was time to first extubation attempt. The balancing measure was re-intubation rate within 48 hours of an extubation trial.
- Baseline data was collected in the NICU from March 2023 to October 2023 for comparison before implementation of protocol.
- Several PDSA cycles were implemented starting Nov 2023 that included creation of a note with a dot phrase used by the RTs, clarifying and ensuring compliance of the criteria, and inclusion of the criteria in the flowsheet on the EHR.

Weight	> 600 g
MAP	< 11cm H_2O
F_iO_2	< 40%
pH	> 7.25
P_aCO_2	< 55 mmHg 1st week of life < 65 mmHg after 1st week
All requirements met?	➔ready for a trial of extubation

Fig. 1: Checklist to determine extubation readiness

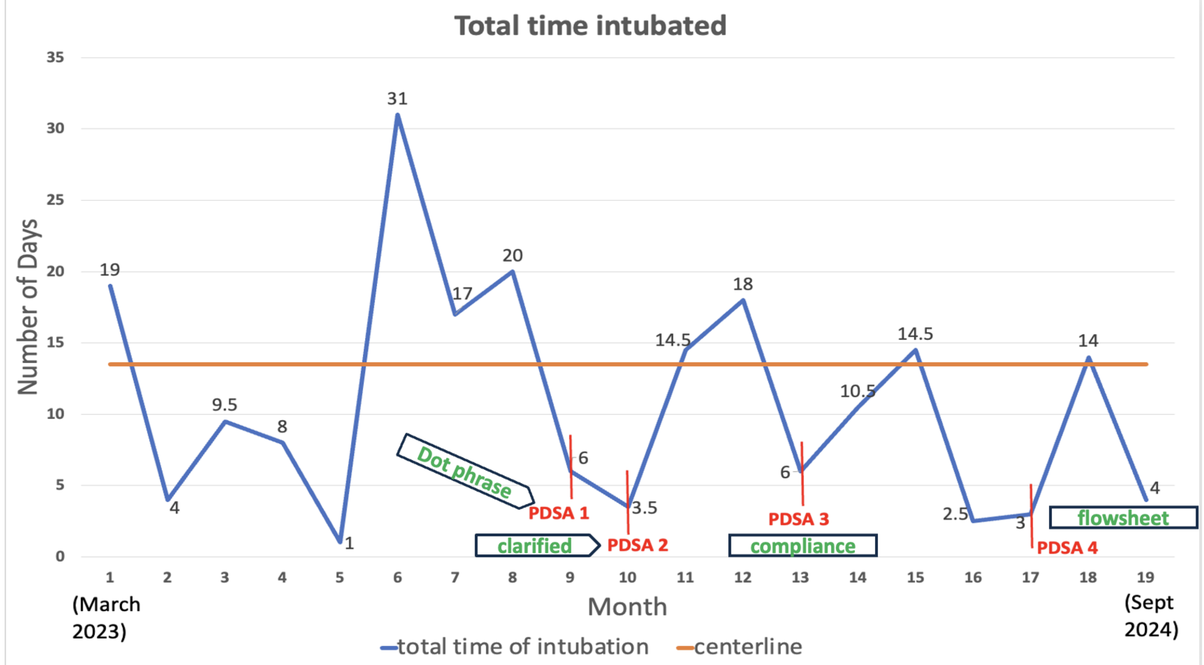

Fig. 2: Median total time intubated in preterm infants

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RESULTS

- The median total time of intubation was recorded each month (blue line, Fig. 2). Centerline was found to be at 13.5 days (orange line, Fig. 2).
- Centerline shift was not seen as the intubation time was longer than our goal during some months.
- During months 11, 12, and 15, the infants requiring prolonged intubation were extremely preterm between 22-26 weeks and were critically ill with multiple comorbidities that required them to be intubated for longer periods.
- During month 18, inconsistent compliance was noted.

DISCUSSION

- Protocol algorithms can be created using evidence-based literature reviews and input from a multidisciplinary team.
- Extremely preterm neonates with multiple comorbidities that require prolonged care and inconsistent compliance with protocol could have contributed to no change in the centerline.
- Positive communication and smoother decision-making among the team members in the NICU was noted because of this initiative.

NEXT STEPS

- Conduct another PDSA cycle where providers explain in their progress the reason behind a baby not being extubated when they met the extubation criteria. Data collection and analysis will continue to be done by the NICU providers.
- QI initiative to standardize the post-extubation respiratory support will be undertaken.

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