# Improving Growth Velocity in Very Low Birth Weight (VLBW) Infants: a Quality Improvement (QI) project

**Alhamad M, MD; Ben Ayad A, MD; Balakrishnan B, MD, CSSBB; Sapp K, MD; D'Souza S, MD; Rodriguez J, RD; and Fugate K, MSN RNC-NIC, CPQH**
**University of South Florida and Tampa General Hospital, Tampa, FL**

**USF HEALTH**

## Background

Inadequate postnatal nutritional support in very low birth weight (VLBW) infants, particularly protein and energy deficits, may result in growth failure and poor neurodevelopmental outcome[1].

Optimal growth of preterm infants is challenging to achieve. Most preterm infants fail to grow after birth for days, and once they start to grow, they do not sustain normal intrauterine growth rates. This problem is worse in infants who have intrauterine growth restrictions (IUGR), infants with reversed end-diastolic flow (REDF), and infants with serious illnesses and physiological instability. As a result, most preterm infants do not achieve normal anthropometric indices by term gestation[2].

Several reasons are identified for poor postnatal growth and VLBW infants, including: delay in the start of adequate nutrition, providing inadequate rates of macro and micro nutrients[3], delay in initiation of enteral feeding (due to IUGR or REDF status)[4], use of dilute nutritional mixes (e.g. unfortified human milk (mother's own or donor), and differences in practices between different neonatal intensive care units and between providers in the same unit[5, 6].

There is a strong evidence in the literature indicating that early aggressive nutritional management for VLBW infants, especially protein and calories, is necessary to achieve normal growth and development during post natal life[7].

To achieve improvement in nutrition and growth outcomes in Tampa general hospital neonatal intensive care unit (NICU), we designed a quality improvement (QI) project that is based on standardize evidence-based NICU feeding guideline with a focus on maximizing protein intake in VLBW infants.

## Problem Statement

The TGH NICU's VON 2015 data showed that the average growth velocity at initial disposition for infants who are VLBW or <30 weeks gestation was 12.6 g/kg/day, which was below VON mean of 12.8 g/kg/day.

## SMART Aims

By May 2017, >70% of VLBW infants who are receiving human milk (maternal or donor) for initial feeds will have a growth velocity >13.2 g/kg/day (VON top quartile) at initial disposition.
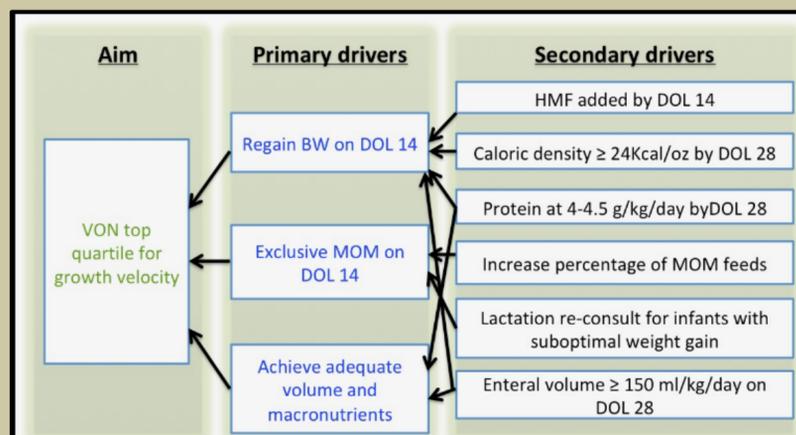
**Secondary aims:**
- >50% of infants will receive MOM (mother's own milk) exclusively by day of life (DOL) 14
- >80% will regain birth weight by DOL 14
- >50% with suboptimal weight gain will have lactation re-consult
- >70% will receive a minimum enteral volume of 150 ml/kg/day by DOL 28 (if not contraindicated)
- > 70% of infants will receive total protein of 4-4.5 g/kg/day by DOL 14.

## Scope

VLBW infants admitted to TGH NICU, from admission to initial disposition.

## Key Drivers



## Interventions

| Baseline | Cycle 1 | Cycle 2 |
|---|---|---|
| • An interdisciplinary team was formed<br><br>• Nutrition guideline developed<br><br>• QI model of multiple Plan-Do-Study-Act (PDSA) cycles to develop change strategies | • Florida perinatal Quality Collaborative, Mom initiative to Improve volume of MOM.<br><br>• Encourage lactation re-consultation for infants with suboptimal growth.<br><br>• Total enteral protein is 4-4.5 g/kg/day before going up on the calories beyond 24 Kcal/oz.<br><br>• Establish dedicated nutrition rounds | • Project sustainability cycle in 3-4 months (August - September 2017)<br><br>• Florida perinatal Quality Collaborative, Mom initiative to Improve volume of MOM.<br><br>• Encourage lactation re-consultation for infants with suboptimal growth. |

## Results

**Demographics**:

| | Baseline (n=22) | Cycle 1 (n=25) | Cycle 2 (n=36) |
|---|---|---|---|
| Gestational age (weeks), average (SD) | 28.2 (2.9) | 28.4 (2.1) | 27.2 (2.8) |
| Birth weight (g), average (SD) | 1084 (300) | 998 (275) | 1030 (326) |
| Discharge weight on Fenton<3rd%ile, %(n) | 13.6 (3) | 12 (3) | 13 (3) |
| NEC, %(n) | 5%(1) | 0% | 8% (3) |
| Length of hospital stay (days), average(SD) | 67.5(37) | 65(34) | 70(26) |

**Outcomes**:

| Measures | Baseline (n=22) | QI 1 (n=25) | QI 2 (n=36) | Goal |
|---|---|---|---|---|
| Ave. growth velocity ≥13.2 g/kg/day at initial disposition, %(n) | 44 (11) | 48 (12) | 63 (15) | >70% |
| Regained birth weight by DOL 14, % (n) | 77 (17) | 96 (24) | 89 (32) | >80% |
| Weight gain ≥15 g/kg/day on DOL 28-35 or 1 week prior to discharge, % (n) | 50 (11) | 56 (14) | 64 (23) | >70% |
| Lactation re-consultation for suboptimal weight gain (after regained BW), % (n) | 0 (0/7) | 16 (2/12) | 22 (4/18) | >50% |
| >70% of feeding volume will be mom's own milk on DOL 14-21, % (n) | 50 (11) | 48 (11) | 50 (18) | >70% |
| >75% of feeding volume will be mom's own milk on DOL 28-35, % (n) | 44 (8) | 36 (8) | 47 (16) | > 75% |
| Infants who have total protein (>/= 4 g/kg/day) on DOL 14, % (n) | 29.4 (5) | 60% (15) | 72% (25) | > 70% |

## QI methodology

- Problem statement, SMART aims, and project scope.
- Process flow charts.
- Key drivers diagram.
- Measurement grid.
- Plan-Do-Study-Act (PDSA) cycles.

## Outcomes Summary

- The percentage of infants with growth velocity of > 13.2 g/kg/day at initial disposition improved from 44% to 63% (goal >70%).

- **TGH NICU 2016 VON data showed an improvement in average growth velocity from 12.6 g/kg/day in 2015 to 13.2 g/kg/day in 2016.**

- Goals for **regaining birth weight by DOL 14** and **optimizing protein intake** were achieved.

- There was a trend towards improvement for exclusive use of MOM and lactation re-consults for sub-optimal weight gain.

- TGH NICU 2016 VON data showed an improved rate of infants receiving MOM at the time of discharge from 37% in 2015 to 44% in 2016.

## Conclusion

Growth velocity of VLBW infants may be improved through the implementation of QI methodology. A main driver of improved growth is achieving goal protein requirements.

## References

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