Faster Increase of Feedings in LBW Infants; Feasibility, Safety and Monitoring of Growth Milestones With Clinical Decision Support to Improve Compliance and Metrics

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BACKGROUND

- Inadequate nutrition early in life is major contributor to growth failure and neurodevelopmental impairment
- Even though feeding a low birthweight (LBW) infant is a fundamental part of management, a great deal of heterogeneity of practice exists
- Each NICU develops its own protocol and although often consensus-based, compliance is difficult to track, and impact of adherence is largely unknown

PURPOSE

- Evaluate effectiveness and safety of a protocol on feeding milestones and growth
- New feeding protocol implemented at level III NICU (Aug 2020)
- To understand current standard of care, 5 years of nutritional practices used to benchmark feeding milestones, growth and outcomes
- After implementation, tracked provision of nutrition under the Protocol Period, including recent period of using clinical decision support tool

METHODS

- Data for 624 LBW infants born <36 weeks gestational age including a sub-cohort of 86 very low birthweight (VLBW, <1500g, <34 weeks GA) was analyzed
- Feeding protocol based on three categories of gestational age at birth (<32, 32-34, and >34 wks)
- Protocol recommended:
  - Initiation of enteral feeds in first 12 hours of life
  - Advancement at rates of 20-40cc/kg/day
  - Fortification to 24cal at 100-120cc/kg/day (for infants <34 weeks)
- Feeding protocol incorporated into a NutritionIQ platform, NICUtrition®, which imported data directly from EMR to allow for analysis of adherence to the protocol, tracked milestones and outcomes, and provided clinical decision support

Earlier initiation of enteral feed and earlier fortification is safe and improves growth	LBW <36 Weeks		
	After Protocol	Before Protocol	
# Infants	229	395	
Mean GA @ Birth	33 1/7	33 1/7	*p-value*
Feeding Milestones			
First Enteral Feed (# days)	0.5	0.8	*0.00001*
First Fortification (# days)	4.5	7.8	*2.51E-15*
First Full Feed (# days)	4.4	6.1	*8.86E-12*
PN Days	2.0	3.0	*7.90E-04*
Full Oral Feeds (# days)	11.3	10.4	*0.29402*
Growth			
Return to Birthweight (# days)	11.8	12.3	*0.26932*
Avg Growth Velocity (g/kg/day)	15.3	15.5	*0.59681*
Avg 34 wks PMA z-score	-0.5	-0.6	*0.36881*
Birth to D/C weight z-score delta	-0.6	-0.7	*0.00016*
Birth to D/C HC z-score delta	0.0	-0.4	*0.04237*
Length of Stay	25.9	21.2	*0.00347*
Morbidities (AVG)			
NEC	0.0%	0.3%	*0.03042*
Sepsis	1.3%	3.5%	*0.09875*

Faster increases safe and feasible for VLBW infants; improved compliance with use of decision support tool	VLBW <1500 g			VLBW <1500 g		
	After Protocol	Before Protocol		After NICUtrition®	After Protocol	
# Infants	28	58		19	9	
Mean GA @ Birth	29 0/7	29 2/7	*p-value*	29 3/7	28 2/7	*p-value*
Feeding Milestones						
First Enteral Feed (# days)	0.9	1.2	*0.05190*	0.9	0.9	*0.982181*
First Fortification (# days)	6.0	9.5	*3.88E-07*	4.7	8.6	*0.000488*
First Full Feed (# days)	6.6	8.9	*0.00021*	5.6	8.8	*0.006578*
PN Days	7.1	9.0	*0.02817*	5.5	10.7	*0.012119*
Full Oral Feeds (# days)	30.3	29.0	*0.68328*	29.6	31.7	*0.734141*
Growth						
Return to Birthweight (# days)	11.9	12.8	*0.39324*	10.9	14.0	*0.060102*
Avg Growth Velocity (g/kg/day)	15.9	15.4	*0.42394*	16.4	14.7	*0.095326*
Birth to D/C weight z-score delta	-0.4	-0.9	*0.00010*	-0.3	-0.6	*0.151002*
Birth to D/C HC z-score delta	0.5	-0.7	*0.14939*	0.7	0.2	*0.673875*
Operational Metrics						
Protocol Compliance	50%	N/A		52%	42%	*0.464124*
Length of Stay	63.2	51.6	*0.02009*	56.7	77.0	*0.045039*
Morbidities (AVG)						
NEC	0%	0%	*NM*	0%	0%	*NM*
Sepsis	4%	14%	*0.150222*	0%	11%	*0.149557*

RESULTS

Low Birthweight Infants <36 weeks (n=624)

- Implementation of feeding protocol resulted in statistically significant earlier first and full enteral feeds and earlier fortification
- Average growth velocity was similar between the periods, but infants experienced better growth, as measured in z-score change from birth to discharge for weight and head circumference
- Infants had statistically significant fewer days of parenteral nutrition (PN)
- Necrotizing enterocolitis (NEC) and late onset sepsis rates were reduced with introduction of the protocol, with NEC being statistically significant

Very Low Birthweight Infants <34 weeks (n=86)

- With the introduction of the protocol, infants received earlier fortification and achieved full feeds faster, resulting in better growth with weight z-score change from birth to discharge being statistically significant
- Compliance to the protocol was 42%, and with introduction of the tool increased to 52%, further accelerating milestone achievement and reduced length of stay by 20 days on average (*p=0.045*)
- Sepsis and NEC were reduced but did not achieve statistical significance

CONCLUSIONS

- Nutrition planning and protocol development benefit from accurate, real-time assessment of practice to inform not only clinical patient care but also research and quality improvement
- Considerable time and effort are expended to develop feeding guidelines given there are no national standards to direct when to initiate, advance and fortify enteral feeds
- It is feasible, effective and safe to introduce early enteral feeds and fortification and rapidly advance for LBW infants improving milestones and growth
- Such practices are safe and effective for VLBW infants born prior to 34 weeks resulting in better growth
- Clinical decision support can drive standardization to a feeding protocol, make data accessible and analysis feasible in times of limited resources and improve operational metrics