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Outcomes of Implementation of an Evidence-Based Enteral Feeding Protocol in Neonates Weighing Less Than 1800g at Birth

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Background

Several studies have demonstrated that the implementation of standardized enteral feeding guidelines can lead to positive outcomes in the neonatal intensive care unit (NICU), including improved nutrition, decreased need for parenteral nutrition (PN), central lines and decreased costs [1-6]. Furthermore, implementation of standard feeding regimens have significantly reduced the incidence of necrotizing enterocolitis (NEC), a devastating gastrointestinal emergency in neonates. It has been reported that NEC has an iatrogenic component related to variations in feeding practices [7]. While the exact mechanism of the reduced risk of NEC and implementation of feeding protocols is unclear, standard feeding regimens likely improve consistency in feeding practice contributing to the decreased NEC rate [8].

Purpose

To develop a standardized feeding protocol aiming to provide evidence-based guidelines to promote consistency in feeding practices within the NICU, optimize nutrition, and decrease the need for PN.

Methods

A neonatal nutrition work group consisting of a neonatologist, neonatal nurse practitioner, and registered dietitian at Maine Medical Center developed a feeding protocol after a comprehensive literature review and protocol collection from various institutions around the country. The protocol addressed timing of feeding initiation, duration of trophic feedings, type of feeding, rate of feeding advance, timing of fortification, and when to discontinue TPN (Figure 1).

Once the protocol was finalized, staff education was completed in May 2015 and the new protocol implemented in June of 2015. Pre-implementation data (n=116) and post-implementation data (n=114) were collected by retrospective chart review to assess and compare feeding related variables between the two groups.

Between-group variability was tested using the independent samples standard deviation F tests to evaluate if the feeding protocol resulted in more consistent feeding practices from pre- to post-implementation (as reported by Street et al., 2006).

Results

There were no significant differences between the two groups for gender, gestational age, birth weight, or the development of NEC, which was very low (1% in each group). There was a significant difference (p=.000) in the type of feeding, with more infants receiving breastmilk (93%) in the pre-implementation group than those in the post-implementation group (73%).

There was also a significant difference (p = .008) in day of life feeds provided goal calories of 115-125 kcal/kg/day (M = 10.55 vs. 8.96). There was a significant (p < .05) reduction in the day of life birth weight was met or passed (10.0 vs 9.0) between the pre- and post-protocol implementation groups. No other statistically significant results were found for the remaining outcomes: days on TPN, PICC line in place, or spent in NICU; or day of life EN feedings started or at full volume EN feeds.

Figure 1. Feeding Grid

Weight (g)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11
500	1	1	1	2	3	4	5	6	7	8	9
600	1	1	1	2.5	4	5.5	7	8.5	10	11	
700	1	1	1	2.5	4.5	6.5	8.5	10.5	11.5	13	
800	2	2	2	4	6	8	10	12	15		
900	2	2	2	4.5	7	9.5	12	14.5	17		
1000	2	2	2	5	7.5	10	12.5	15	18		
1100	3	3	3	6	9	12	15	18	21		
1200	3	3	3	7	9	12	15	18	22		
1300	3	3	3	7	9.5	13	16.5	20	24		
1400	3	3	3	8	11	15	19	23	26		
1500	5	11	17	23	28						
1600	6	12	18	24	30						
1700	7	12	18	24	30						
1800	8	15	23	31	33						



Results

Table 1. Feeding Outcomes Pre- and Post-Protocol Implementation

Feeding Outcome Variables	Pre		Post		p
	M (SD)	Median	M (SD)	Median	
Number of days on PN	7.06 (4.97)	6.00	6.50 (4.11)	5.00	.699
DOL feedings started	2.03 (0.75)	2.00	2.03 (0.96)	2.00	.617
Days of trophic feeds	3.59 (2.57)	3.00	2.14 (1.66)	2.00	.000
DOL feedings advanced	5.59 (2.74)	5.00	4.18 (2.16)	4.00	.000
DOL to goal volume	9.44 (4.76)	8.00	8.58 (3.62)	8.00	.354
DOL to full calories	10.55 (4.85)	9.00	8.96 (3.67)	9.00	.008
Days with PICC	2.97 (5.59)	0.00	2.30 (4.16)	0.00	.639
DOL birth weight met/passed	10.24 (3.39)	10.00	9.04 (3.88)	9.00	.010
NICU length of stay	29.72 (27.47)	23.00	29.82 (29.30)	21.00	.603

Results cont.

There was a statistically significant reduction in variability in number of days on trophic feeds prior to advance and number of days PICC line was in place, from pre- to post-protocol implementation. Moreover, there was a significant reduction in variability for day of life EN feedings were advanced, day of life at full EN feeds, and day of life goal calories reached (115-125 kcal/kg/day). A significant difference was also found for variability in days of life EN feedings started – with more variability in the post-implementation vs. pre-implementation phase (SD= 0.96 vs. 0.75, respectively).

Table 1. Variability in Outcomes Pre- and Post-Protocol Implementation

Feeding Outcome Variables	Pre	Post	F	p
	SD	SD	F	p
Number of days on PN	4.97	4.11	1.46	.044
DOL feeds started	0.75	0.96	1.67	.006
Days of trophic feeds	2.57	1.66	2.39	<.001
DOL feeds advanced	2.74	2.16	1.62	.011
DOL to goal volume	4.76	3.62	1.73	.004
DOL to goal calories	4.85	3.67	1.75	.003
Days PICC	5.59	4.16	1.81	.002
DOL birth weight met/passed	3.39	3.88	1.31	.154
NICU length of stay	27.47	29.30	1.14	.491

Conclusions

Implementation of an evidence-based enteral feeding protocol resulted in more consistent feeding practices and improved nutritional outcomes in this study. Outcomes included decreased time to get back to birth weight and decreased time to reach goal caloric intake. Having consistent feeding practices in the NICU have been postulated to be a contributing factor for reducing the risk of NEC. This was not seen in our study because the rate of NEC in both groups was very low.

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