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Standardizing feeding strategies in preterm infants with birth weight >1500 g: current perspective

Abhay Lodha [1,2,3]✉

Pediatric Research; https://doi.org/10.1038/s41390-024-03660-z

Due to advancements in perinatal and neonatal care practices and technology in neonatal intensive care units (NICUs), survival of extremely premature infants has improved in recent decades. However, these infants remain at risk for various morbidities of the gastrointestinal system such as necrotizing enterocolitis (NEC) and challenges related to growth and nutrition. Some of the challenges include decisions regarding the type of fortification, feed volume increments, defining inadequate growth, and inconsistency among healthcare workers in adhering to feeding guidelines. These issues can lead to extrauterine growth restriction and possibly impact neurodevelopmental outcomes. Failure to provide adequate nutrition is associated with increase in morbidities such as NEC, sepsis, and retinopathy of prematurity in preterm infants, as well as subsequent neurodevelopmental impairment.[1–5]

Problems with maintaining standard nutritional practices in modern NICUs include frequent changes in neonatologists and residents, clinical staff turnover, including nurses, inadequate support from registered dietitians, and the absence of standardized feeding (SF) guidelines, particularly for extremely premature infants. These inconsistencies in feeding strategies impact the risk of NEC, prolonged use of total parenteral nutrition (TPN), extended central line use and associated infections, postnatal growth, and hospital length of stay. Standardizing any protocol or guideline in healthcare systems has been proven to enhance patient safety, reduce the likelihood of errors, improve care quality, boost efficiency, minimize practice variation, and ultimately lead to cost savings in the long term.[6]

Additionally, Patole et al.[7] in their systematic review and meta-analysis, demonstrated that implementing a SF regimen can reduce the incidence of NEC by as much as 87% and aid in the early detection of the disease.[7] Also, another study showed that the risk of NEC, duration of TPN, use of central lines, and time to reach full feeds were reduced in infants with a birth weight of less than 1500 g ($P < 0.001$).[8] A strategy for the prevention of NEC and better growth is the implementation of SF guidelines.[9,10] Neonatal care and decision during rounds in NICUs should not only focus on ventilation but also include nutritional care with input from registered dietitians. This approach is essential to optimize nutritional requirements, prevent postnatal growth faltering, and achieve body composition similar to that of a fetus at the same postmenstrual age.[11]

In addition to illness, gestational age and birth weight are the two main factors for determining volume-based enteral feedings.[12] Other clinical factors that influence the increment of feed volume include abdominal distension, gastric aspirate, bilious aspirate, and stool production.

The recent Annual Canadian Neonatal Network report mentioned that 99% of neonates who survived among all admitted infants in their NICUs weighed between 1500 and 2499 g, which constitutes 32.5% of all neonates born in Canada.[13] As survival rates for preterm infants improve, more emphasis is being placed on enhancing the quality of outcomes by focusing on optimizing nutritional management, particularly through SF strategies for preterm infants born weighing more than 1500 g. This aims to avoid inconsistencies among healthcare workers and poor postnatal nutritional care, which can negatively impact neurodevelopmental outcomes. In a study by Street et al.[14] involving 126 patients (58 during the non-implementation period and 68 during the implementation period) with a birth weight of less than 2000 g, the use of SF guidelines in the NICU was associated with significantly less variability in feeding-related outcomes, possibly due to better feeding tolerance. However, this study did not show any differences in the risk of NEC, intestinal perforation, mortality, or length of stay.[14]

In the current issue of *Pediatric Research*, Fu et al.[15] highlighted the potential role of SF protocols and donor breast milk (DBM) in preterm infants born weighing more than 1500 g. The study compared the placement of central catheters for nutrition as a primary outcome, days to reach full enteral feeding volume, and growth parameters before and after the implementation of these protocols.[15] Interestingly, the authors selected central line placement as the primary outcome, rather than time to attainment of full feeds or proven NEC as outcomes. In the SF group, feeds was advanced at 30 mL/kg/day for infants born at less than 33 weeks' gestation, who were also eligible to receive donor breast milk (DBM). The study supports faster rates of SF advancement (>30 mL/kg/day) for preterm infants weighing more than 1500 g to reduce the need for vascular access.[15] The incidence of central line insertion, NEC (Stage 2 & 3) and rate of DBM provision were similar between eras. In contrast to Fu et al.[15] a quality improvement study[16] involving 100 infants, the use of SF guidelines with faster feed advancement led to earlier achievement of full enteral feeds, reduced the duration of TPN, and minimized central line usage.[16] However the risk of NEC was not different between the groups in infants born at or before 32 weeks.[16] Another study involving premature infants with a

[1]Section of Newborn Critical Care, Department of Pediatrics, Department of Community Health Sciences and Alberta Children's Hospital Research Institute, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada. [2]Alberta Children's Hospital Research Institute, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada. [3]Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, AB, Canada. ✉email: aklodha@ucalgary.ca

Received: 8 September 2024 Accepted: 23 September 2024
Published online: 22 October 2024

birth weight of 1000–1500 g, found that increasing enteral feed volumes by 30–40 mL/kg per day (compared to 15–24 mL/kg) did not raise the risk of NEC or death (RR 1.02, 95% CI 0.64–1.62) in VLBW infants.[17] It is clearly evident that the risk of NEC has not changed when using SF guidelines indicating the multifactorial nature of NEC.

Fu et al.[15] also found that the median days to reach full enteral volume were not different between the groups.[15] This finding was consistent with another study by Loomis et al. which examined the impact of implementing SF guidelines in NICU infants born at ≤32 weeks' gestation and with a birth weight of ≤1500 g. The study found no significant effect on the time to first feed, time to reach full fortified enteral feedings, time to regain birth weight, or the incidence of metabolic bone disease and cholestasis.[18]

The study by Fu et al.[15] was retrospective in nature which introduces selection and measurement bias, and had inconsistent use of a recumbent measuring board for obtaining weekly length measurements, with a focus on short-term outcomes. The study also found no significant difference in the median days to reach full feed volume, though there was a narrower distribution post-implementation ($P < 0.001$). In terms of growth velocity, this was not differed between groups, and had a 10% increase in DBM intake and was associated with a decrease in weight velocity by 1.0 gram/day (95%CI −1.43,−0.58; $P < 0.001$).[15] However, this finding is confounded by a major limitation due to simultaneous implementation of the feeding protocol and DBM use eligibility, making it difficult to determine the individual effects on feeding tolerance in premature infants. The study's epoch-based design lacked a power calculation to detect outcome differences, introducing Type II error (also known as beta error). Moreover, the study population focused on infants born at less than 33 weeks' gestational age, excluding late preterm infants, which may limit the generalizability of the findings.[15] Another nutritional change during the pre-implementation era was the increase in the upper birth weight cutoff for initiating amino acid and dextrose infusions, from 1750 to 2500 g, potentially introducing further bias.[15]

The role of a SF guideline in small-for-gestational-age infants (SGA) is unclear and was not addressed in the Fu et al. study.[15] However, a randomized controlled trial by Sergeyev et al. demonstrated that in infants with a birth weight of ≤1750 g, those receiving rapid enteral feeding advancement using a SF regimen reached full enteral feeds sooner than SGA infants who were not fed using the SF regimen.[19]

Retrospective studies exploring the impact of SF practices in preterm infants are underpowered to detect true difference in the intervention and primary outcomes. The outcomes are also affected by mid-study changes in inclusion criteria, often resulting in Type II errors and inconclusive findings. Therefore, we strongly recommend conducting a well-powered, prospective multi-center trial to rigorously evaluate feeding practices, including faster feed advancement rates, fortification and its effects, and the impact of donor breast milk on growth in preterm infants born weighing more than 1500 g. Neglecting to control for clinically relevant confounding variables can lead to inaccurate estimation of the relationship between independent and dependent variables.

Feeding policies should incorporate various strategies to assess their impact on growth and other neonatal outcomes. These strategies include the timing of feed initiation, monitoring of gastric residuals, presence of bilious aspirate, concurrent feeding with indomethacin, ibuprofen therapy, feeding methods, type of feed, safe rates of feeding advancement, and the definition and management of feeding intolerance. Incorporating SF policies in NICUs is essential not only for optimizing nutritional intake and promoting healthy growth but also for significantly reducing the risk of morbidities in premature infants, ultimately improving their long-term outcomes, quality of life and reduces the variation in practice among healthcare workers in NICUs.[9,20–22] Successful implementation of a SF guidelines requires multidisciplinary collaboration, regular auditing and measurement of team members' compliance, and frequent educational sessions. This approach is expected to positively impact healthcare costs and parental satisfaction.[23]

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COMPETING INTERESTS

The author declares no competing interests.

ADDITIONAL INFORMATION

Correspondence and requests for materials should be addressed to Abhay Lodha.