Improving Nutrition in Extremely Low Birth Weight Infants: A Quality Improvement Project

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The nutritional management of the extremely low birth weight infant has been a source of controversy and practice variation between and within facilities [Clin Perinatol 29 (2002) 225–244]. By using proven quality improvement methods, a multidisciplinary team implemented processes such as *Feeding Guidelines* and a *Feeding Intolerance Algorithm* to standardize nutrition and impact clinically relevant outcomes including (1) reduced days to initiate feedings, add fortifier, and reach full fortified feedings; (2) central line days reduced by 30%; (3) increased discharge weight; and (4) more than 50% reduction of infants discharged home with head circumference less than the third percentile. This project is a straightforward improvement process of getting "back to the basics" and improving quality and consistency of nutrition in extremely low birth weight Infants. By researching the supporting evidence, achieving staff and physician buy-in, and having the commitment of a dedicated team, this project can be safely implemented and result in standardization of nutrition practice leading to reduction in practice variation and improved clinical outcomes.

Keywords: Extremely low birth weight (ELBW); Plan do study act; Feeding guidelines; Fenton fetal-infant growth chart; Feeding intolerance algorithm; Starter TPN; Early trophic feedings

Provision of nutrition to the neonatal intensive care unit (NICU) patient is an essential part of daily care that affects every neonatal patient. It is often taken for granted and overlooked, but has significant impact on many clinically relevant outcomes. Evidence exists to support the safety and effectiveness of a consistent approach to enteral feedings.[1-4] There is also evidence to advocate for early proper nutrition to reduce the risk of poor developmental outcomes.[5] As a result of a common belief and documented inconsistent practice in providing nutrition to our most at-risk population, we selected this opportunity as a quality improvement project.

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Children's Hospital Orange County was a participant in the Vermont Oxford Network (VON) NIC/Q 2005 Quality Improvement Collaborative. Our individual success represents the application of quality improvement methods and resources adopted as a result of participation in the VON NIC/Q 2005 Evidence-Based Quality Improvement Collaborative for Neonatology. The results and opinions expressed are those of the authors and not necessarily those of the participants in the VON NIC/Q Collaborative or VON.

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1527-3369/08/0802-0252$34.00/0
doi:10.1053/j.nainr.2008.03.010

Neonatal Intensive Care Unit Quality Improvement

Quality improvement was once a phrase that elicited audible groans, as many staff saw it as a management necessity, but not part of their daily job. This notion has changed in recent years and now staff is not only encouraged to participate on a daily basis, but also challenged to lead various quality improvement initiatives. It has become more and more apparent that for improvement to occur and be sustained, the change has to become part of the NICU culture.[6] Enculturation of changes will occur more readily when staff has an active role in developing and implementing the change process. Therefore, the goal of improving the quality of care provided to all infants has become the responsibility of each team member.

As the public becomes more and more involved in participative health care management, there is increasing access for the consumer to investigate the quality of care each institution has a record of providing. National organizations such as The Leapfrog Group were formed with the purpose of choosing the purchase of health care by "rewarding hospitals that implement significant improvements in quality and safety."[7] Other organizations such as the National Initiative for Children's Healthcare Quality is also dedicated to improving quality of the healthcare delivered to children.[8]

Our NICU has joined a quality improvement collaborative specifically focused on the NICU patient. The Neonatal Intensive Care Quality Improvement Collaborative is a series of collaborative efforts from multiple NICUs. The group,

organized and administered by the Vermont Oxford Network, uses quality improvement methods to make measurable improvements in the quality and safety of neonatal care.[9]

The Challenge

As a large NICU in a children's teaching hospital, we felt our approach to the nutritional care of the extremely low birth weight (ELBW) infant could be improved by reducing practice variation. A retrospective chart audit of ELBW infants born in 2004 and admitted to our NICU within the first days of life confirmed our suspicion of vastly different approaches to providing nutrition to this at-risk population. Our center, like many other level IIIC NICUs, struggles to have a consistent neonatologist presence owing to the neonatology group providing coverage at several referring hospitals as well. Another contributing factor to inconsistent practice is the pediatric resident house staff who rotate every 4 weeks and are often providing front line management overnight. These factors were seen as components contributing to our practice variation and were seen as areas of opportunities to focus in standardizing our approach to nutrition.

Our Process

A multidisciplinary team was formed consisting of medicine, nursing, pharmacy, and dietary services. The team followed the Plan Do Study Act method of quality improvement. The following outlines specific components our team investigated or implemented in each step of the Plan Do Study Act process.

Plan

- Created a multidisciplinary team chartered to implement nutrition best practices in the NICU
  - ➢ Initial meeting to establish short- and long-term project goals
  - ➢ Working meetings held weekly for the first 6 weeks, then every 2–3 weeks
- Assessed our current practice, culture, and beliefs
  - ➢ When feedings were started, how feedings were advanced, why feedings were stopped
- Extensive neonatal evidence review including
  - ➢ Safety of early trophic feedings, volume to start, volume and rate of advance, when to add fortification, feeding route
  - ➢ Use of standardized feeding protocols, benefits/risks
  - ➢ Definitions of feeding intolerance
  - ➢ Incidence of necrotizing enterocolitis (NEC) related to use of *Feeding Guidelines*
    - ▪ Effects of start and rate of feeding advance
    - ▪ Reduction with use of standardized guidelines[4]
  - ➢ Administration of protein—inclusion in first parenteral fluids, benefits of protein addition to enteral feedings
- Evaluation of current tools used by other centers and assessment of adapting these tools to fit our culture

Do

- Evidence discovered in the literature review uncovered an opportunity to improve the safety of our current practice regarding use/care of feeding tubes
  - ➢ Bacterial colonization of indwelling feeding tubes may increase risk of feeding intolerance[10]
    - ▪ Practice of monthly feeding tube removal and replacement changed to weekly, instill sterile water in tube post feeding to clear, clarified recommended provider handling of feeding tubes
- Implemented use of the Fenton Fetal-Infant Growth Chart for Preterm Infants[11]
- Developed three *Feeding Guidelines* differentiated by birth weight
  - ➢ NICU Feeding Guideline/Schedule A Birth Weight ≤750 grams (Fig 1)
  - ➢ NICU Feeding Guideline/Schedule B Birth Weight 751–1000 grams
  - ➢ NICU Feeding Guideline/Schedule C Birth Weight 1001–1500 grams
- Developed a *Feeding Intolerance Algorithm* to assist decision making regarding stopping or continuing feedings (Fig 2)
  - ➢ Anticipate residuals to approximate trophic feeding volumes
  - ➢ 2 mL/kg or up to 50% of previous feeding may be considered normal finding in the absence of other clinical changes[12]
  - ➢ If a feeding is held, consider each scheduled feeding as an opportunity to restart: at previous volume, at a reduced volume, at trophic volume[2]
- Developed a protocol for early parenteral amino acid administration
  - ➢ "Starter TPN" D5W or D10W at 80 mL/(kg day) = 2.8 g/(kg day) protein
  - ➢ Goals: improve nitrogen balance, glycemic control, and growth
  - ➢ Added to admission order set
- Developed standardized physician order set for use of *Feeding Guidelines*
  - ➢ Initially paper based, then computerized physician order entry
- Gained approval by physicians, clinical practice council, and pharmacy for implementation of:
  - ➢ *Feeding Guidelines*
  - ➢ *Feeding Intolerance Algorithm*
  - ➢ Starter TPN
- Extensive education focusing on current practice variation, evidence supporting early trophic feedings, use of standardized feeding guideline, reduction in NEC, goal protein delivery
  - ➢ Individualized discussion with primary neonatologists
  - ➢ Nursing staff education strategies
    - ▪ Two morning case conference presentations
    - ▪ Poster display with small and individual group training