NEONATAL SECTION OF ASPEN

Spring 2020

Letter from the Neonatal Section Chair

Dear Members,

Happy Spring! I hope you are all safe in this unprecedented COVID-19 time. My thoughts for any of you or your families personally effected. This virus has both immediate and long term sequela and we can adapt to learnings that may bring value to you all.

It is an honor for me to pick up as the Neonatal Section Chair from Dr. Yimin Chen who really set the stage for remarkable leadership. My vision for the next 2 years is to increase key topics, experts, and venues that resonate. Opportunities exist to connect in new ways virtually with our families, each other, neonatal teams (if you are working from home), and in continuing education events. As nutrition clinicians, we can bring attention to the impact nutrients have upon the immune health of our patients in unparalleled ways. Please reach out to me or my co-chair, Celina Scala, MS, RD, CSPCC, LD, CNSC to introduce ideas/issues that you believe could build capabilities or are interesting.

We hope to be able to *meet in person* at our next American Society of Parenteral and Enteral Nutrition (ASPEN), Clinical Nutrition Week set for March 20-23, 2021 in Denver, Colorado. Until then, we plan to have electronic newsletter connections, social media posts (Facebook, LinkedIn), mentee/mentorship opportunities, and links to help in your clinical practice.

Truly, this time will be marked in history and we can be a part of building a chapter of virtual and tangible neonatal nutrition in this journey.

Stay well and build connections.

My best regards,

Christina J. Valentine MD, MS, RD, FAAP

Neonatal Section Chair

Contents

Member Spotlight: Kathy Gura, PharmD, BCNSP, FASPEN

Margaret Murphy PharmD, BCNSP

What is your current job title and place of work?

Manager, Clinical Research, Department of Pharmacy
Clinical Pharmacist GI/Nutrition
Boston Children's Hospital (BCH)

What is your educational background?

BS and PharmD both from Mass College of Pharmacy and Allied Health Sciences, Boston (now MCPHS University).

How did you get involved in the field of clinical nutrition?

I have always had an interest in biochemistry and being at MCP when Dave Driscoll was on faculty I became interested in parenteral nutrition (PN) and all its complexities. I really didn't get really involved until I came to Boston Children's Hospital and began working with our team where Dr. Cliff Lo, Denise Richardson RN, and Sharon Collier RD brought me in and I really learned the nuts and bolts of clinical nutrition.

What specifically do you do in your current position?

I have been at BCH for more than 35 years, so I do pretty much anything asked of me. I am still very much involved with clinical nutrition/PN service, in particular our Center for Advanced Intestinal Rehabilitation (CAIR) and our home PN program. As a result of my work on intravenous lipid emulsions with one of our surgeons, Mark Puder, I have become very involved in clinical research programs, study trial design and working with new investigators. I tend not to give up anything, but rather keep acquiring new roles!

Why did you become involved in ASPEN and what are the benefits of being a member?

At the recommendation of our team's nurse, Denise Richardson, I became a member. She had suggested I join ASPEN because she thought the quality of the journals and the meetings was something I would benefit from. She also mentioned the large number of pharmacists involved in ASPEN and since I didn't have a local mentor, this fit the bill.

What recommendations would you give to someone just starting out in your field?

Try to get out of your comfort zone and meet other clinicians in other disciplines because there is so much you don't learn in school or if you stay only within your discipline. Network at the meetings and if you have a question, don't be shy about reaching out to an author of a paper or posting a question on a listserve. People are more than willing to help. Also, take advantage of any opportunity that presents. My research with fish oil lipid emulsions all started from a simple drug information question involving essential fatty acid deficiency in a soy allergic teenager.

What do you hope to accomplish as a part of the new Neonatal Section of ASPEN?

Hopefully to bring in more members and serve as a resource on new projects or guidelines. Anything that the section needs, I'm willing to help!

ASPEN News

- April Clinical Practice Highlights
- Nutrition Practice Shortage Updates
- Resources for Clinicians Caring for Patients with Coronavirus
- PN Product Shortage Management: ASPEN provides recommendations on appropriate dosing of PN nutrients for neonates, pediatric, and adult patients

Research Updates

The information presented in this newsletter does not constitute medical or other professional advice and should not be taken as such. To the extent that the information herein may be used to assist in the care of patients, this is the result of the sole professional judgement of the attending healthcare professional whose judgement is the primary component of quality medical care. The information presented in these documents is not a substitute for the exercise of such judgment by the healthcare professional.

Human Milk Research Updates

Christine Sharp, MS, RDN, LDN, CNSC

Macronutrient Analysis of Donor Human Milk Labelled as 24 kcal/oz

Study Design: Cross sectional

The American Academy of Pediatrics and World Health Organization recommend that premature infants receive donor human milk (DHM) when maternal breastmilk is not available. DHM use is beneficial in avoiding bovine-based formulas; however, DHM alone is insufficient to meet the macro and micronutrient needs of the developing preterm infant. Thus, it is standard practice to fortify DHM. Milk banks in the United States generally offer a higher calorie DHM (hcDHM) to the institutions they supply. While it is assumed that standard DHM is 20 kcal/oz, the true caloric density can vary greatly. There is data describing caloric variability of standard DHM; however, hcDHM has not been evaluated in the same manner in the literature thus far. The objectives of this study were to determine the macronutrient content (MNC) of hcDHM measured with a near infrared analyzer, to compare point-of-care determinations of MNC information on milk bank labels, and to assess MNC variability between milk banks. Samples of hcDHM were obtained from bottles purchased for clinical care in the Connecticut Children's Level IV Hardford NICU over a 9-month timeframe. DHM samples were obtained from 5 different milk banks. Seventy-five convenience samples were analyzed for MNC with similar content of protein, fat, carbohydrates, and calories to that expected of human milk. The caloric sample mean was found to be significantly lower than the labeled value of 24 kcal/oz [22.35 $\pm$ 2.59, IQR (16.5- 30.27 kcal/oz), $P < 0.001$]. The protein content was available for only 30 of the 75 samples. Of that, 55.2% were considered within the labeled value of protein content. The mean protein content of the samples was 1.12 g/100 mL $\pm$ 0.27 IQR (0.51-2.07). Fat, calorie, and protein content of hcDHM did vary greatly between the five milk banks sampled (fat: $P = 0.01$; protein: $P < 0.001$; calories: $P = 0.001$). Limitations to this study include inadequate information about the hcDHM from individual milk banks, variability in the number of samples collected and studied from each milk bank, and the use of infrared spectrometry to analyze fat and protein content which may be less accurate than reference methods. The researchers concluded that while the results of this study provided descriptions of significant differences between milk bank labeled MNC and the point-of-care for hcDHM, further research needs to be conducted to explore the extent and causes of said variability as well as the implications to the developing preterm infant.

Jo, D.B., Hagadorn, J.I., Smith, K.C. et al. Macronutrient analysis of donor human milk labelled as 24 kcal/oz. J Perinatol 40, 666–671 (2020). https://doi.org/10.1038/s41372-020-0624-2

Breastmilk and COVID-19

For clinical guidance, the United Nations Children's Fund (UNICEF), World Health Organization (WHO), the US Centers for Disease Control and Prevention (CDC), and the American College of Obstetrics and Gynecology (ACOG) have clinical recommendations regarding breastfeeding and the provision of breastmilk during the coronavirus pandemic.

Please visit The International Society for Research in Human Milk and Lactation (ISRHML) for updated guidance and evidence-based research related to the novel coronavirus (SARS-CoV-2), human milk, and lactation.

Supplemental Nutrition Research Updates

Hillary Zellner, MS, RD, LDN, CNSC & Sonia Govil, MS, RD, CNSC

Impact of Gastrostomy Tube Placement on Short-Term Weight Gain in Hospitalized Premature Infants

Study Design: Cross Sectional Cohort

Premature infants may require supplemental enteral nutrition upon discharge due to slow progression of feeding skills, development of oral aversion, parental issues related to feeding or breastfeeding issues. There has been an increasing trend in which providers view gastrostomy tube (G-tube) placement as a superior alternative to oral or nasogastric feeding methods for premature infants at discharge. This is due to suggestion of improved nutritional status, growth and development as well as decreased risk of aspiration. Puia-Dumitrescu and colleagues evaluated weight changes before and after placement of a G-tube as well as weight gain prior to hospital discharge with matched controls without G-tubes. Infants born <37 weeks gestation between 2004 and 2013 were included from the Pediatrix Medical Group Clinical Data Warehouse. Exclusion criteria included major congenital anomalies and those without daily weight data. A linear regression was used to compare daily changes in weight for each infant before G-tube placement with the patient's weight gain after placement. Secondly, a treatment effect model was estimated by matching G-tube infants 1:1 to untreated controls based on propensity scores to assess weight gain at 7, 14 and/or 30 days prior to discharge. There were 1,393 infants who had a G-tube placed during the study period with a median birth weight and gestational age of 872 grams and 27 weeks, respectively. Of note, the placement of G-tubes within this population increased from 0.2% in 2004 to 0.6% in 2013. Daily weight gain 8-14 days postplacement was less during the 14 days prior to placement (18 gm/day vs 28 gm/day, $p<0.001$). When extended to 30 days, there was no longer a significant difference between pre- and postplacement data (24 gm/day vs 26 gm/day, $p=0.20$). However, the sample size was limited as only 88 of 1,393 patients (6%) were hospitalized 30 days pre and 30 days post G-tube placement. Infants with G-tubes gained less weight per day compared to controls (21.1 gm/day vs 24.3 gm/day, $p<0.001$) during the last 7 days prior to discharge with no significant differences when extended to 14 or 30 days. Although there were no significant differences shown on the effect of short-term weight gain during hospitalization, G-tube placement remains effective in providing a safe route for nutrition support, fluids and medications. Additional studies are imperative to further identify the indications for G-tube placement, reason for increase in G-tube use and the long-term impact of these feeding routes.

Puia-Dumitrescu M, Benjamin Sr DK, Smith BP, Greenburg RG et al. Impact of gastrostomy tube placement on short-term weight gain in hospitalized patients. Journal of Parenteral and Enteral Nutrition. 2020;44(2):355-360.

To Feed or Not to Feed: A Critical Overview of Enteral Feeding Management and Gastrointestinal Complications in Preterm Neonates with a Patent Ductus Arteriosus

Study Design: Narrative Review article

Patent Ductus Arteriosus (PDA) is a common condition among preterm neonates. The development of gastrointestinal (GI) complications in preterm infants with a hemodynamically significant (hs-PDA) is a common concern among NICU providers and remains a major challenge in enteral feeding management in this fragile population. The purpose of this narrative review was to summarize the available research and discuss the relationship between presence and treatment of hs-PDA, enteral feeding practices, and GI outcomes in preterm infants.

The first-line approach to PDA closure is targeted pharmacological treatment. This includes indomethacin, ibuprofen, and more recently, paracetamol. Surgical closure is considered a rescue treatment when medical treatment fails. However, there is a higher morbidity and mortality rate in infants who require surgical closure. Alterations in hemodynamics and mesenteric perfusion, put infants with PDA at high risk for nutrition-related difficulties. The number of days required to reach enteral intakes ≥ 150 ml/kg/day is commonly evaluated as marker for feeding intolerance. Preterm infants with a large PDA take significantly longer to achieve full enteral feeds (FEF) compared to those with moderate or small PDA. Feeding type should be highly considered in those with PDA. It is well known that human milk, either maternal or donor, plays a key role in promoting gut maturation and is associated with several nutritional and clinical benefits. This includes lower risk of GI complications, such as NEC, as well as earlier FEF achievement. Therefore, human milk should be the feeding of choice for this population, when available.

The authors concluded that, due to lack of evidence on feeding practices in preterm infants with hs-PDA, the enteral feeding management should be highly individualized based on the infants' hemodynamics and clinical status.

Martini S, Aceti A, Galletti S, Beghetti I, Faldella G, Corvaglia L. To Feed or Not to Feed: A Critical Overview of Enteral Feeding Management and Gastrointestinal Complications in Preterm Neonates with a Patent Ductus Arteriosus. Nutrients. 2019;12(1):83. Published 2019 Dec 27. doi:10.3390/nu12010083

Parenteral Nutrition and Shortages Research Updates

Alyssa Norris, MS, RD, CDN, CLC, CSNC

The Influence of Donor Milk Supplementation on Duration of Parenteral Nutrition in Preterm Infants

Study Design: Retrospective pre/post observational study

It is well established that donor human milk (DHM) is a good protective agent in the prevention of necrotizing enterocolitis (NEC) among very low birth weight (VLBW) infants. However, there is limited data that associates the use of DHM with improvement in feeding tolerance. The purpose of this study was to evaluate the influence of DHM on the duration of parenteral nutrition (PN), growth, and morbidity among VLBW infants. The researchers hypothesized that infants on DBM would reach their enteral goal sooner (150mL/kg/d) which would result in less PN days. This was a retrospective pre/post

observational study that compared two groups of newborns with a gestational age of ≤32 weeks (N = 284; each group n = 142). The groups were identified based on availability of DHM, with the patients in Group 2 having access to DHM. All newborns were started on parenteral nutrition and continued until the enteral feeding volume reached 120 mL/kg/day. In Group 2, all participants received DHM as a supplement to MOM if necessary. DHM was continued until the infant reached 1,500 grams. The results showed that there was no significant difference in the duration of parenteral nutrition between the two groups: 12 days in group 1 versus 11 days in group 2 (p = 0.822). The *z*-scores for weight and height of newborns was lower in Group 2 = -1.8 and -2.3, respectively versus Group 1 = -1.2 ($p < .001$) and -1.8 ($p = .005$), respectively. In conclusion, this study found no association between number of days on PN and the administration of donor milk as a supplement to mother's milk.

Jimenez, B.C., et al. The Influence of Donor Milk Supplementation on Duration of Parenteral Nutrition in Preterm Infants. (2020) *Journal of Human Lactation*, 1-9.

Early Parenteral Nutrition in Neonates with Congenital Diaphragmatic Hernia

Study Design: Retrospective Review

Due to recent innovations and improved care, there has been an increase in survival rate of infants with congenital diaphragmatic hernia (CDH). However, severe growth restriction in early childhood still remains a common problem. The ideal nutritional strategy for neonates with CDH has not been well studied. The purpose of this study was to determine the efficacy and safety of early parenteral nutrition (PN) in neonates with CDH. CDH neonates at a single institution were retrospectively reviewed from 2005-2014. There were a total of 30 neonates included in this study with a gestational age ranging from 34 - 40 weeks and birthweight ranging from 2,052 - 3,730 grams. The neonates were divided into three different groups based on the PN administration: 1) non-early PN (amino acids (AA) <1.0 g/kg/day, no lipids administered) 2) transitional period (AA 1-2.5 g/kg/day, lipid 1 g/kg/day) and 3) early PN (AA ≥3.0 g/kg/day, lipid 1.0 g/kg/day). There was no significant difference in the final day of PN and the first day of enteral feeding or body weight at discharge among the groups. However, the weight gain rate from birth to discharge was higher in the early PN group than the non-early PN group (p = 0.023). Although this study showed increased weight gain with early PN administration, further research is needed in order to determine the efficacy and safety of early PN administration in infants with CDH.

Yoshida, T., Goya, H., Iida, N., Sanabe, N., & Nakanishi, K. (2020). Early parenteral nutrition in neonates with congenital diaphragmatic hernia. Pediatrics International, 200-205.

GI Research Updates

Jacqueline Wessel RDN, CNSC, CSP, CLE

Plasma Citrulline Concentrations in Neonates With or Without Gastrointestinal Disease During Periods of Parenteral or Enteral Nutrition

Study Design: Prospective Comparative Group Analysis

Recent research efforts have focused on developing biomarkers that are indicative of intestinal adaptation in those with gastrointestinal (GI) disease. Citrulline is an amino acid that is synthesized in enterocytes. Retrospective work has revealed that infants with GI disease have a lower plasma citrulline concentration than infants without GI disease. The aim of this study was to prospectively analyze plasma citrulline levels in preterm neonates with and without GI disease and with variable bowel lengths. These levels were compared on a period of exclusive parenteral nutrition (PN) versus a period of both PN and enteral nutrition (EN). The researchers used high-performance liquid chromatography and tandem mass spectrometry (LC-MS/MS) for the citrulline analysis. Forty-five

infants with a gestational age of 24—37 weeks were included in this study. There were a total of 164 plasma samples obtained and analyzed. The infants were classified into 3 groups: 1) No GI disease, 2) GI disease without resection and 3) GI disease with resection. Groups 1, 2, and 3 had a median plasma citrulline concentration of 12.3 (5.6-39.4) µmol/L, 14.9 (6.8-39.8) µmol/L, and 10.8 (2.0-23.6) µmol/L, respectively. After Bonferroni corrections, it was found that Group 3 had a significantly lower median plasma citrulline concentration when compared to Group 1 or 2. There were no significant differences when comparing mode of nutrition (PN vs. PN/EN). The authors concluded that there was a lower plasma citrulline concentration in premature neonates with bowel resection versus those without, which reinforces citrulline's role as a gut mass marker. However, the results were unable to support plasma citrulline as a monitoring marker of intestinal function in this heterogeneous population of neonates.

Herrera O, Talato AJ, Helms RA. Plasma citrulline concentrations in neonates with or without gastrointestinal disease during periods of parenteral or enteral nutrition. J Parent Enter Nutr 2019 43:977-985.

Early Predictors of Enteral Autonomy in Pediatric Intestinal Failure Resulting From Short Bowel Syndrome: Development of a Disease Scoring Tool

Study Design: Retrospective Cohort Study

Pediatric Intestinal Failure (IF) secondary to short bowel syndrome (SBS) results in dependency on parenteral nutrition (PN) while intestinal adaptation occurs. The goal of this present study was to look at specific anatomical and clinical variables in the early postoperative period to better predict enteral autonomy (EA) in order to develop a disease severity tool. Enteral autonomy was defined as the ability to maintain adequate growth for at least 12 weeks after the discontinuation of PN and fluids. IF secondary to SBS was defined as PN >6 weeks after primary intestinal surgery and/or residual small bowel length <25% expected for age at time of the primary surgery based on previously established norms.

This retrospective analysis included 139 patients. The data collected included demographics, intestinal anatomy, nutrition, surgical history, and clinical factors at 6 months such as conjugated bilirubin. It was found that 95 (68%) of patients achieved EA. The Cox proportional hazards (CPH) model used for analysis revealed that patients who possessed >50% of residual small bowel, had an intact ileocecal valve, and >50% of enteral tolerance at 6 months were positively associated with EA. A conjugated bilirubin level >2mg/dL was negatively associated with EA. A severity score was created by weighing the parameters from the CPH model with a maximum value of 8. The score was stratified into 3 categories: mild, moderate, and severe in order to assist in prediction of PN dependence. Although the tool needs to be validated, the development and use of a tool will help in standardization across centers.

Belza C, Fitzgerald K, de Silva N, et al. Early Predictors of Enteral Autonomy in Pediatric Intestinal Failure Resulting From Short Bowel Syndrome: Development of a Disease Scoring Tool. J Parenter Enter Nutr 2019: 43:961-969.

Social Media Update

Leah Cerwinske, MSN, RDN, LDN, CNSC

Hello neonatal nutrition enthusiasts! Have you been keeping up the NICU conversations and questions going on for our social media group? The neonatal section of ASPEN has two accounts (Facebook: https://www.facebook.com/groups/aspenneonatalsection/ and Linked-

In: https://www.linkedin.com/groups/12072776) to provide you with information. Our goal, as always, is to provide up-to-date information and practical suggestions for clinical practice based on the latest research and expert experience. During the past few months, we have had less dialogue on our social media accounts and we want to hear your thoughts. How can we make these venues more useful to you all as practitioners? If you have ideas or feedback for the social media committee, WE WANT TO HEAR FROM YOU! Please contact Leah Cerwinske at lcerwins@gmail.com with any feedback or interest in committee involvement. We need more volunteers to help with social media, so don't hesitate to reach out if interested.

Neonatal Continuing Education Opportunities

Jennifer Wax, RD, LDN, CNSC

ASPEN Best Practices in Parenteral Nutrition Series Training Program (4 part series)

- May 20th: Prescribing the Parenteral Nutrition (PN) Order and Beyond
- May 27th: Reviewing and Verifying the Parenteral Nutrition Order
- June 4th: Compounding Parenteral Nutrition Admixtures
- June 11th: Administering the Parenteral Nutrition
- Early registration ends on May 16th, 2020 / Regular registration ends on June 2nd, 2020
- info@nutritioncare.org

Gold Neonatal Online Conference

- Date: May 26-August 21
- https://www.goldneonatal.com

34th International Conference on Neonatology and Perinatology - Webinar

- Date August 20-21, 2020
- https://neonatology.insightconferences.com/webinar

Growing in Excellence: Maximizing Growth Outcomes in the High Risk Neonate

- Date: September 11, 2020 8am – 4:10pm
- Virginia Neonatal Nutrition Association
- Lewis Ginter Botanical Gardens, Richmond VA
- https://www.vaneonatalnutrition.org/conferences.html

Nutrition Support Fundamentals Course - ASPEN

- Date: to be announced in Spring

Neonatal Section Member Spotlight and Accomplishments

We want to hear from you! The ASPEN Neonatal Section group is proud of the many accomplishments of our members and we'd like to highlight what you're doing. If you have any feedback or ideas, noteworthy awards, presentations, published research, or projects that you'd like to share with our members please let us know by contacting the section group newsletter editor Sabrina Bierman (sabrinabierman92@gmail.com).

Rhoads Research Foundation

Please consider donating to Rhoads Research Foundation. This Foundation is named in the honor of Dr. Jonathan Rhoads, M.D. for his outstanding and pioneering work in the fields of clinical nutrition, nutrition support and surgery. Through its annual grants program, the Foundation funds exceptional scientific research projects submitted by early career investigators of clinical nutrition and metabolic

support in alignment with the priorities in ASPEN's research agenda. No matter how much you are able to contribute in these economic times every dollar collected is greatly appreciated. If you contribute please just follow this link. Rhoads Research Foundation Donations

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