CME

Development and Pilot Implementation of a Nutrition Curriculum and Rotation in Pediatric Gastroenterology Fellowships

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ABSTRACT

Structured nutrition rotations are rarely offered in pediatric gastroenterology fellowships. The North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) Nutrition Committee developed a curriculum to serve as the basis for a rotation in clinical nutrition. We worked directly with 5 fellowship programs to tailor the experience to individual institutions. As part of our pilot study, fellows completed knowledge assessments and self-assessment of comfort level at the start and end of the experience. We saw a trend in improvement of comfort level and increase in mean score on knowledge assessments, but the differences did not meet statistical significance. Fellows who completed the rotation had an increase in comfort level in all topics with most dramatic increases in nutrition management of cystic fibrosis, refeeding syndrome, and cholestasis. Objective measures of nutrition knowledge attainment and use of programmatic feedback to continually improve the learners' experience will help expand the nutrition curriculum to a broader audience.

Key Words: nutrition education, pediatric gastroenterology, pediatric gastroenterology fellowship

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What Is Known

- Despite its importance to the field of pediatric gastroenterology, nutrition education during pediatric gastroenterology fellowships is highly variable. There is a need for more structured and standardized experiences.

What Is New

- A pilot curriculum was developed and instituted within 5 pediatric gastroenterology fellowships.
- Post-curriculum, fellows showed improvement in self-assessment comfort level and knowledge assessment.
- The North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) and nutrition leaders have an opportunity to improve the quality of nutrition education by standardizing a curriculum and providing access to trainees.

In pediatric gastroenterology (Peds GI), understanding nutrition is a cornerstone of patient care. Pediatric gastroenterologists assess the growth and nutritional status of their patients and have an understanding of how diseases of the digestive system affect nutrition and conversely how changes in nutrition status can affect different disease states. The importance of nutrition education in pediatric gastroenterology fellowships has been highlighted by the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) (1,2).

Despite this well-recognized need for nutrition education, structured rotations are rarely offered to Peds GI fellows. Moreover, fellows in Peds GI consistently identified gaps in their nutrition knowledge (3). One barrier to providing this educational experience is a lack of a curriculum with clear learning objectives and clinical experiences.

The NASPGHAN Nutrition Committee developed a curriculum to serve as the basis for a rotation in clinical nutrition. The curriculum covers goals and objectives from published training guidelines and contains reading resources and references while providing an outline of relevant clinical experiences that can be customized to the needs of each institution. We developed this curriculum to test in a small pilot study with the ultimate goal of creating a curriculum that would be available to all Peds GI fellowships.

METHODS

Curriculum Development

The NASPGHAN Nutrition Committee developed a curriculum as the basis for a rotation in clinical nutrition that could be

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customized to individual fellowship programs. Goals and objectives were derived from core curricula derived from NASPGHAN training guidelines (1) and spanned the breadth of pediatric nutrition. The curriculum was composed of Level One Content (level 1) representing basic training in nutrition for all trainees and Level Two Content (level 2) representing advanced training for fellows with a specific interest in nutrition (Table 1) (4). For each content area, we compiled a set of resources including a reading list and online modules already available for use.

Implementation

We worked with Peds GI fellowship programs to customize a nutrition rotation by identifying available resources such as specialty dietitians, clinical exposure to nutrition topics, existing live didactics, and time available within the fellows' schedule for the experience. We then devised an outline for a rotation that included clinical experiences and self-study in areas where an appropriate local clinical experience or teaching/didactic experience could not be identified. Fellows participated in the customized rotation during the 2015–2016 academic year. The rotation length varied by site.

Ethics

The study was reviewed by the institutional review board at Nationwide Children's Hospital and considered exempt.

Data Collection

Pre-rotation

Before implementation of the rotation we asked all fellows, including those not participating in the rotation, to complete a pre-rotation self-assessment and knowledge assessment. The self-assessment consisted of 25 nutrition topics and asked fellows to rank their comfort level with the topics using a Likert scale (1 = not at all comfortable, 2 = slightly comfortable, 3 = somewhat comfortable, 4 = moderately comfortable, 5 = extremely comfortable). The knowledge assessment consisted of 15 multiple choice questions each corresponding to different topics in our curriculum.

Post-rotation

After the rotation, fellows answered a post-rotation self-assessment using identical topics and scale that was used before start of rotation. They also completed a knowledge assessment, which consisted of 15 multiple choice questions that were unique to the post-test but corresponded to the topics on the pre-test. Fellows also completed an evaluation of their experience using a Likert scale that asked for agreement with the following statements: ''The content of the nutrition curriculum was appropriate for my level of training,'' ''The resources provided helped to achieve the educational objectives outlined,'' ''The length of the rotation was sufficient,'' and ''Overall, I found this experience in clinical nutrition valuable.''

TABLE 1. List of topics included in the curriculum

- Level 1 of the curriculum (Basic knowledge requirements)
  - Basic Nutritional Principles
    - Physiology of digestion and absorption, metabolism of nutrients across different parts of the gastrointestinal (GI) tract.
    - Developmental changes in digestion and metabolism
    - Understanding of macro and micronutrient absorption, including specific sites of absorption, dietary agents that enhance or block absorption, and post-absorption path of the micronutrient
  - Nutrition assessment and needs
    - Use published recommendations and predictive equations to understand nutrition requirements and energy expenditures for children across different stages of development including fluids and calories, in addition to macro and micronutrient requirements
    - Apply tools to assess nutritional status including growth measure, anthropometrics, laboratory studies, indirect calorimetry, and dual-energy x-ray-absorptiometry
    - Be aware of how disease states (and some medications) alter nutrition needs. Use that knowledge to formulate individual plans for nutrition intervention and monitoring through longitudinal assessments
  - Feeding
    - Understand factors that affect a person's intake in health and disease
    - Knowledge of development of the oral cavity, basics of mastication, and mechanisms of swallowing
    - Evaluate and treat patients with feeding problems
    - Develop a working knowledge of lactation and support of the breast-feeding mother
  - Malnutrition
    - Be aware of disease states that cause nutrient losses and deficiencies
    - Comprehend the manifestations of nutritional deficiencies and toxicities
    - Recognize signs and long-term consequences of kwashiorkor
    - Know the physiology of and approach to refeeding syndrome
    - Understand consequences of excess nutrition intake and obesity
    - Be familiar with evaluation of overweight and obese children, complications of obesity, and the spectrum of options for management, including bariatric surgery
  - Specific gastrointestinal disease states
    - Understand nutrition requirements and interventions in specific disease states including short bowel syndrome, cystic fibrosis, celiac disease, hepatobiliary disease, inflammatory bowel disease, and functional GI disorders
  - Enteral and parenteral nutrition support
    - Design nutrition interventions and monitor response for children with under- and overnutrition
    - Be familiar with the nutritional content and methods of administration of enteral nutrition including infant formulas and pediatric enteral nutrition products (standard and disease-specific)
    - Know the supplements and additives that can modify breast milk or formulas
    - Understand enteral access devices including their placement, care, and complications
    - Have working knowledge of principles of vascular access, including the placement, care, and complications of vascular access devices
    - Understand indications, formulations, complications, and monitoring for parenteral nutrition
- Level 2 of the curriculum (Advanced training for fellows with specific interest in nutrition and desiring additional experience and proficiency)
  - Inpatient and outpatient nutrition-related management of patients with diseases outside the GI tract
    - Endocrinopathies, renal, and bone disease
    - Cardiac disease- congenital heart disease and critical cardiac care-related nutrition
    - Preterm infant nutrition
    - Neurological issues including: children with cerebral palsy, muscular dystrophies, and ketogenic diet
    - Sports nutrition and integrative nutrition
    - Global health-related nutrition
  - Understand the Multidisciplinary Organization and Administrative Structure of Inpatient and Outpatient Nutrient Support Services
  - Ethics and Legal Issues Surrounding Nutrition

RESULTS

Participation and Implementation

Five fellowship programs enrolled and worked on design of a curriculum and pre- and post-rotation assessments. The participating programs included Alfred I. duPont Hospital for Children, Baylor College of Medicine, University of Oklahoma Health Sciences Center, Vanderbilt University School of Medicine, and Weill Cornell Medicine. An additional institution, Nationwide Children's Hospital, developed the curriculum and completed

our pre-rotation assessments but their fellows did not participate in the rotation but rather served as part of our control sample for post-rotation knowledge assessment.

Three programs had a longitudinal implementation where they offered the curriculum in 1 or 2 half-day sessions per week; 2 offered this longitudinal implementation to first year fellows. In addition to the longitudinal implementation, 1 program also offered the curriculum as a 4-week elective for second and third year fellows. One program implemented the curriculum as a required 4-week rotation for first year fellows while another implemented it as a 4-week elective for second year fellows.

Self-assessment of Comfort Level With Nutrition Topics

The pre-rotation self-assessment was completed by 28 fellows at 6 institutions and the post-rotation self-assessment was completed by 8 fellows at 5 institutions. Pre-rotation results showed that the overall average comfort level of all topics and corresponded to the ''slightly'' to ''somewhat'' comfortable range on the Likert scale. The topics that fellows were least comfortable with included: interpretation of resting energy expenditure from calorimetry, use of specialized anthropometrics, nutritional management of patients with cystic fibrosis, and physiology of micronutrient absorption. Topics that fellows were most comfortable with included: assessment of nutritional status, nutritional management of celiac disease, refeeding syndrome, and calculation of daily nutritional requirements. Fellows who completed the rotation had an increase in comfort level in all topics with most dramatic increase seen in the topics of nutritional management of patients with cystic fibrosis, identification and management of refeeding syndrome, and nutritional management of cholestasis. The self-assessment scores are detailed in supplemental table 1, *http://links.lww.com/MPG/B478*.

Knowledge Assessment

The pre-rotation knowledge assessment was completed by 26 fellows at 6 institutions and the post-test was completed by 15 fellows at 6 institutions. Of the 15 completing the post-test, 8 participated in the rotation and 7 did not participate. The topics for which questions were most frequently answered incorrectly on pre-test were lactation, vitamin and mineral supplementation, and complications of parenteral nutrition. The mean score on the pretest was 67.4% and the mean score on the post-test was 75% ($P > 0.05$). For fellows who did participate, the mean pretest score was 66.5% and increased to 78.5% ($P > 0.05$). The knowledge assessment scores are detailed in supplemental Table 1, *http://links.lww.com/MPG/B478*. Supplemental content 2, *http://links.lww.com/MPG/B478* has a sample of questions used in the knowledge assessments.

Rotation Evaluation

Post rotation evaluation was completed by 8 fellows. All fellows (100%) agreed or strongly agreed that the content of the curriculum was appropriate for their level of training; 87.5% of fellows agreed or strongly agreed that the resources provided helped to achieve the objectives and that the experience in clinical nutrition were valuable. Fellows were also asked if they felt the length of the rotation was sufficient; 62.5% agreed or strongly agreed with this statement.

DISCUSSION

The first step in the development of a curriculum is to identify a problem and perform a general needs assessment (5). The requirement for nutrition education in Peds GI fellowships is clearly stated in training guidelines (1). Despite these guidelines, a 2012 survey noted that only 31% of level 1 nutrition topics based on training guidelines at the time (2) were, however, consistently covered by >80% of fellowship training programs (6).

After identifying a problem and performing a general needs assessment, medical educators are asked to perform a targeted needs assessment (1). This involves exploring the target audience and its learning environment. Variation in training in nutrition occurs on multiple levels. First, programs have created their own curriculum including clinical rotations and didactics. Second, variation is inherent to our current system where the majority of the clinical experience is obtained in the first year of fellowship followed by more research-focused years in the latter years of training. In this system, first-year fellows' exposure to clinical nutrition topics differs among institutions, and their experience in subsequent years differs based upon research commitments and career plans. Finally, as adult learners, trainees typically choose what they would like to learn and devote time to topics they find relevant and interesting (7).

The concept of andragogy, or adult learning theory, suggests that an adult learner's readiness to learn depends on a need, or what is needed to help in real-life situations (7). One impetus for not learning clinical nutrition is the presence of highly specialized dietitians in most institutions. Pediatric gastroenterologists and trainees often rely on dietitians to manage enteral and parenteral nutrition, and unique aspects of disease-specific nutrition care. Access to these dietitians is, however, not guaranteed, especially when fellows leave larger academic institutions and transition to smaller centers or private practice.

Dietitians should have a role in the nutrition education of trainees. This should be done through understanding the learner's background and integration into curriculum with clear goals and objectives. In the previous survey, the majority of the teaching was conducted by physician faculty (61%) and most of the education was provided through clinical-care experiences. Given that programs and individuals have expressed a lack of training in nutrition, it seems we may, however, be perpetuating a cycle of undereducated faculty members who are, in turn, unable to meet the nutrition training needs of their trainees. Furthermore, the same survey indicated that a lack of faculty interest was a barrier to nutrition education (6).

Another obstacle to nutrition teaching is time. Peds GI fellowships are busy with clinical obligations, structured didactics, research projects, and other training requirements. Many program directors are forced to prioritize their learners' needs as they receive requests from other faculty and hospital administration competing for the trainees' time. Hence, nutrition education is assumed to occur within the already scheduled clinical and didactic experience. Although there are clear advantages to experiential learning, one distinct disadvantage is that it leaves knowledge gaps where trainees have not had substantial experience.

In our pilot project, we aimed to develop a curriculum and implement it in a small number of Peds GI fellowships. We worked with individual programs to identify resources that were available at their institutions (eg, an inpatient feeding team, an outpatient lactation consultation service, an eating disorder service) as well as experiences already in place (writing parenteral nutrition, structured didactic sessions). We paired our curriculum with the current fellowship schedule and available resources to create a clinical nutrition elective that met all of the learning objectives. When possible, programs utilized onsite and live resources and if not possible, our curriculum directed the fellow toward a relevant resource.

It is difficult to obtain meaningful quantitative data with our small sample size. Like most quality improvement projects and education research, our participants responded positively to the intervention. This is demonstrated by improvements in self-assessment of comfort level and post-test scores in our participants compared to non-participating fellows. The take-away from this project is that fellowship programs are eager for help in creating a more solid nutrition program at their institution. The opportunity exists for development of an independent curriculum as a complete nutrition program or could be personalized to institutions to serve needs unmet by their available resources. Ongoing evaluation and feedback is the cornerstone to curriculum development and will be required to best meet the needs of our learners.

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