

# ASPEN Nutrition Science and Practice Conference

## 2018 Call for Abstracts Table of Contents

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## 1. Key Dates and Submission Site

### **Original, International, Encore Abstracts**

Submission opens: June 15, 2017 at 8:00 am ET

Submission closes: September 18, 2017 at 11:59 p.m. ET;

There is one submission time period for the 2018 ASPEN Nutrition Science and Practice Conference. Late-breaking abstracts **WILL NOT** be accepted.

### **Submission fees\***

Early bird submission fee: \$50 from June 15, 2017 – September 4, 2017 at 11:59 pm ET

Standard submission fee: \$100 from September 5, 2017 – September 18, 2017 at 11:59 pm ET

\*Submission fees are administrative fees and are not meant to be punitive in nature. Submission fees are **NOT** refundable for any reason.

Notification of abstract status will be provided in early November 2017.

To submit an abstract, please visit the [Abstract Submission Site](https://aspen2018.abstractcentral.com/) or type the URL

<https://aspen2018.abstractcentral.com/> into your browser and follow the instructions provided. For questions on abstract submission, contact Michelle Spangenburg at [michelles@nutritioncare.org](mailto:michelles@nutritioncare.org).

## 2. Abstract Submission Options

**Original Abstracts** - *unpublished basic or clinical research and data, practice abstracts, retrospective studies, vignettes, or case studies.* Research methodology may range from prospective, randomized trials, and systematic reviews to quality improvement projects and unique case reports. Depending on review score, these abstracts may be presented in poster sessions, oral paper sessions, and/or the Research Workshop and are eligible for [Original Abstract Research Awards](#): Harry M. Vars and Promising Investigator, Research Trainee, Best International Abstract, Research Workshop Travel, Best of ASPEN Nutrition Science and Practice Conference, and Abstracts of Distinction. You must OPT-IN to be considered for the Vars/ Promising Investigator, Trainee, or Research Workshop awards. See added information in item #12 on page 7 of this document.

**Encore Abstracts** - *abstracts previously presented at another conference or previously published in a peer-reviewed journal.* Encore abstracts are eligible for presentation at ASPEN Nutrition Science and Practice Conference if the abstract was previously presented at a conference or submitted to a journal no more than 6 months prior to the ASPEN Conference. Abstract submission deadline of September 18, 2017. These abstracts will be presented as posters and are not eligible for Original Abstract Research Awards, except abstract of distinction.

**International Abstracts** - *Original or Encore Abstracts submitted by an investigator residing in a country other than the United States.* In addition to the awards noted above, Original International Abstracts are eligible for the International Abstract Research Awards: Best International Abstract or International Abstract of Distinction. Submitters must opt-in at the time of online abstract submission to be eligible for awards.

### 3. Abstract Topics

During the online abstract submission process, you will be asked to categorize your abstract according to ASPEN's six primary abstract topic areas to ensure that your abstract is reviewed appropriately. Please review **Table 1** below that summarizes these six groups of research in nutrition therapy and metabolism that ASPEN typically accepts. You will need to select at least one, but no more than three topic areas that are most relevant to your abstract. **The list is not all inclusive; you should select the best fit for your abstract.**

**Table 1. Abstract Topic Areas**

<b>Group # 1 Parenteral Nutrition Therapy</b>	access devices acid-base chronic / degenerative disease and PN compatibility complications diabetes – glucose control disease or condition specific PN drug–nutrient interaction fluid - electrolyte funding & reimbursement	home / alternate site indications lipid formulations macro & micronutrients monitoring nutrition support teams (related to PN) quality control & improvement (related to PN) safety shortages & alternative products stability
<b>Group # 2 Enteral Nutrition Therapy</b>	access devices chronic / degenerative disease and EN complications diabetes – glucose control disease or condition specific EN drug- nutrient interactions formulas funding & reimbursement	home and alternate site indications macro & micronutrients monitoring nutrition support teams (related to EN) quality control & improvement (related to EN) reimbursement safety
<b>Group # 3 Malnutrition, obesity, nutrition practice concepts and issues</b>	bariatrics bariatric surgery and complications body composition complementary & alternative medicine chronic diseases and nutrition related to malnutrition education ethics evidence-based practice exercise physiology guidelines	malnutrition malnutrition coding metabolic syndrome nutrition and taste obesity payers and malnutrition nutrition assessment nutrition support teams related to malnutrition or obesity quality control & improvement related to malnutrition or obesity- bariatric
<b>Group # 4 Critical care and critical health issues</b>	burns cancer cardiac critical care immunodeficiency and immunonutrition infection inflammation intestinal failure perioperative concerns (glucose control, CHO loading)	pharmaconutrition (related to critical care and critical health issues) pulmonary sepsis trauma wounds surgery transplant
<b>Group # 5 GI and other nutrition and metabolic– related topics</b>	allergy basic nutrient research biotics cholestasis chronic & degenerative disease endocrine gastroenterology geriatrics gut microbiota hepatic and pancreatic disease and conditions insufficiency	IBD metabolic pathways metabolomics nutrigenomics neurological disorders osteoporosis pharmacokinetics pharmaconutrition pancreatic insufficiency (cystic fibrosis) renal short bowel
<b>Group # 6 Pediatric/ Neonatal/ Pregnancy/ Lactation</b>	ketogenic diet NEC neonatal neonatal bone NICU & PICU	pediatric malnutrition pediatric short bowel PNALD pregnancy & lactation

#### 4. Abstract Methodology Types

You will need to select the single methodology category that most closely represents your abstract.

Research Methodology	Examples
Basic Science	“Bench research” <i>In vitro</i> studies or animal research
Clinical Science	Observational or interventional clinical trials, case-controlled or case studies, registry driven analyses, qualitative studies
Education, Quality Control & Improvement	Education or quality improvement programs, non-scientific surveys, programmatic communication
Meta-analyses, Systematic Review	Meta-analysis or Systematic Review of other studies

**Sample Abstracts** - All ASPEN Nutrition Science and Practice Conference abstracts must present qualitative or quantitative data that are directly relevant to the topic of the abstract. Abstracts describing only methodologies, concepts, or other topics will not be accepted without accompanying data or results. Case studies are exempt from the requirement for extensive data but must be unique, providing learning points or unusual clinical presentations. Please click directly on the hyperlinks below for examples of several types of previously accepted abstracts.

- [randomized trial](#)
- [systematic review](#)
- [quality improvement project](#)
- [case study](#)
- [basic science](#)

**Research Agenda** - In November 2013, ASPEN’s [Research Agenda](#) was published. This document, found in **Appendix B** will familiarize abstract authors with investigative priorities established by our Society. Authors are encouraged to be aware of and, when possible, submit abstracts reflecting these core research areas. Please note that this is not a requirement, but rather a statement of ASPEN’s priority research interests.

#### 5. Disclosure Information and Off-label Discussion

Disclosure information is required for **all authors** at the time of submission of the abstract. If any of the abstract authors have financial relationships with a commercial interest (any entity producing, marketing, re-selling, or distributing healthcare goods or services consumed by or used on patients) that are relevant to the topic of the abstract, the following needs to be submitted for EACH author:

- *Company name* (commercial interest).
- *What was received* (i.e. honorarium, financial support/grant or research funding/equipment or supplies, fee for service; ASPEN does not want to know amounts, just the description of what was received)
- *Role played* (such as speaker bureau, employee, consultant, PI on a supported grant, or other financially beneficial relationship)

Providing accurate disclosure information is mandatory, and failure to do so will result in an inability to participate in the conference programming in any capacity.

If the abstract discusses off-label uses (product applications that are not approved by the U.S. FDA) of licensed pharmaceutical or medical device products, the authors will need to identify the product and the nature of off-label use.

## 6. Presentation Type

You must choose one of the following options as your presentation preference:

- oral presentation
- poster presentation
- either oral or poster

The Abstract Review Committee will try to accommodate preferences, but the final presentation type will be dependent on the score the abstract received.

When submitting, be prepared to answer these:

- Did you have to obtain approval of your abstract content from any commercial sponsor prior to submitting this abstract?
- Was this work conducted under approval of ethical, animal, or human study boards (IRB, etc.) as applicable? If not, you must explain why not, or why approval was not necessary.
- Did you confirm disclosure information with each author?
- Was this abstract topic was inspired by a previous ASPEN Research Workshop (live, online, or in print)?
- Do you need to acknowledge financial support /funding (Grant/University/ Industry/etc.)?

## 7. Abstract Writing Standards

**Presenting Author** - The presenting author is listed as the first author in the submission system, is designated as the presenter, and is required to attend ASPEN Nutrition Science and Practice Conference if the abstract is accepted. There are no financial stipends available to cover expenses.

**Abstract Character Count** - A maximum of 3780 characters, approximately 500 words, including spaces and punctuation is allowed. This does not include title and author/institution list.

**Accuracy, Grammar, Spelling** - Submit abstract in Word or other word-processing software. If accepted, YOUR ABSTRACT WILL BE PUBLISHED AS SUBMITTED. ***You are 100% responsible for spelling, grammar, and scientific accuracy.***

**Tables and Images** – It is important that you follow these instructions as well as those in the submission site. A maximum of 2 tables, either created within the system or converted to an image file, and 2 images /figures /charts (bmp, gif, tif, jpg) are allowed per abstract. There are no character count limits for these items. Images should be set at 300 dpi in order for clarity in print. Free graphics software include: [www.irfanview.com](http://www.irfanview.com); [www.gimp.org](http://www.gimp.org); [www.getpaint.net](http://www.getpaint.net). **The submission site CANNOT ACCEPT PowerPoint, Word, PDF or Excel files as table or image uploads. An X in the image box at submission indicates you submitted an unusable format! If your images are not readable after submission, they will not accompany the published version of your abstract in JPEN.**

**Author Personal Information** - When submitting an abstract, provide:

- First and last name
- Credentials/Degree (e.g. MD, PhD, RD, RN, RPh, PharmD, MBBS, etc.)
- Job/position title; Institution/organization
- Business address including City, State/Province, Country, zip
- Email address
- Business telephone
- Conflict of interest disclosure information

**Abstract Revisions** - You may login to the [Abstract Submission](https://aspen2018.abstractcentral.com/) site or type the URL <https://aspen2018.abstractcentral.com/> into your browser as many times as necessary to complete the submission process until the submission deadline of September 18, 2017, 11:59 p.m. ET. ASPEN will only review your abstract if you have completed the submission process, including the payment step, by the submission deadline. **Revisions will NOT be accepted after the submission deadline.**

## **8. Abstract Acceptance Criteria**

ASPEN Nutrition Science and Practice Conference abstracts must meet the following criteria for acceptance:

- Abstract submitted in English, including tables/charts and figures
- Relevance and uniqueness of the study or presentation to the field of nutrition therapy and metabolic support
- Authors are encouraged to submit abstracts that: address unique or emerging nutritional issues; contribute new information to the field; show strong applicability to or improvement of nutrition therapy practice or metabolic support
- Clarity of the introduction, hypothesis, or purpose for the study or presentation
- Quality of the research design and methodology
- If relevant, the hypothesis is clearly stated
- Methods are clear and appropriate
- Sufficient sample size to validate conclusions
- Investigators took measures to control for threats to validity and reliability
- Validity and sufficiency of the data
- Enough data or findings to form conclusions
- If relevant, statistical analysis of the data is appropriate
- Study was completed
- Relevance of the conclusions to the data
- Case studies and vignettes are exempt from the requirement for extensive data; however, must be unique, providing learning points or unusual clinical presentations
- Abstract carefully reviewed for spelling, grammar and formatting
- Abstract is free of promotional material, and it is not commercial in nature
- Brand names for products or services are not mentioned in the title, but may be mentioned once in the methodology section

## **9. Abstract Selection Process**

**Review and Selection Process** - The ASPEN Abstract Review Committee conducts a rigorous peer review of all abstracts submitted. On average, ASPEN accepts approximately 85 - 90 percent of all abstracts submitted. There will be no reconsideration of non-accepted abstracts. Abstracts are selected for Poster Sessions at designated times in the Exhibit Hall, or oral presentations, and may additionally be poster presentations at the Research Workshop. There is no refund of the submission fee if the abstract is not accepted.

If your abstract has been accepted for presentation, but you are unable to attend ASPEN Nutrition Science and Practice Conference, contact Michelle Spangenburg at ASPEN as soon as possible at [michelles@nutritioncare.org](mailto:michelles@nutritioncare.org). You will have two options: 1) Designate a co-author on the abstract as the new presenting author; or 2) Withdraw the abstract. There is a withdrawal deadline of November 21. Refunds will not be issued for abstracts that are withdrawn.

## **10. Abstract Publication and Copyright**

All accepted abstracts are published online in the [Journal of Parenteral and Enteral Nutrition \(JPEN\)](#)

**Original Research-** You will be asked to transfer the abstract copyright to *JPEN*, ASPEN's scientific journal, for your original abstract. All authors must agree to this. Read further instructions in the online system.

**Federal Employees-** Federal employees may select the box indicating there is no copyright to convey.

**Encore Abstracts** - Encore abstracts (previously presented at another conference or submitted to a journal no more than 6 months prior to the ASPEN Nutrition Science and Practice Conference abstract submission deadline) can be submitted, but will not qualify for Original Abstract Research Awards and will be presented as posters. If you are submitting an abstract that was previously presented, you will advise ASPEN via a checkbox in the abstract submission site. You must provide the name of the conference and date presented. If the abstract was previously published, the full citation is requested. In either case (published or presented), if you wish to have ASPEN republish your work in *JPEN* online, we must have formal re-publication (re-print) permission from the conference organizer or journal publisher, whoever holds the copyright for the abstract. **It is your responsibility to obtain permission to re-print** your work from the copyright owner, and to submit it to ASPEN, [michelles@nutritioncare.org](mailto:michelles@nutritioncare.org). If permissions are not received by November 21, your abstract title, author list, and encore status will be published without the abstract text. If the previous conference/journal did not take copyright, there is a check box indicating that you have the right to convey it to ASPEN.

## **11. Submission/Registration & Travel Fees**

**Submission Fees-** The cost of submission for Original, Encore, and International Abstracts is \$50 per abstract during the early bird submission period from June 15, 2017 – September 4, 2017 at 11:50 pm ET and \$100 during the standard submission period from September 5, 2017 – September 18, 2017 at 11:50 pm ET. If an abstract is not accepted, the cost of submission will NOT be refunded. Abstracts that are voluntarily withdrawn will NOT have the submission fee refunded.

**Registration & Travel Fees-** Visit [www.nutritioncare.org/conference](http://www.nutritioncare.org/conference) and click Attendees. ASPEN will make every effort to notify all abstract authors of their acceptance status prior to the early-bird registration deadline. You are encouraged, however, to register for ASPEN Nutrition Science and Practice Conference when you submit your abstract. If the early-bird deadline has passed, ASPEN may extend it for abstract authors. Individuals who have an abstract accepted into the conference program as a poster or oral presentation are responsible for their own travel and conference registration expenses.

## 12. Original Abstract Research Awards

**Abstract Awards Consideration** - You must opt in to be considered for most Original Abstract Research Awards. There are some obligations associated with the awards, and you must certify that you acknowledge and will accept those obligations if your abstract is selected. Detailed information regarding the obligations are included in the online submission system.

ASPEN offers the following awards:

- **Harry M. Vars Award and Promising Investigator Award** – honors an Early Career Investigator (within 10 years of completing terminal research degree or medical residency) who has submitted a top-scoring original abstract, and demonstrates excellence via a manuscript and oral presentation at the ASPEN Nutrition Science and Practice Conference Premier Paper Session. The Promising Investigator Award is given to the runner up in the competition. \$1,000 award for Vars, \$750 award for Promising Investigator.
- **Research Trainee Awards** – honor investigators still in training who have submitted top-scoring original abstracts to the ASPEN Nutrition Science and Practice Conference. \$500 travel award.
- **International Abstract Research Awards** – honors international investigators who have submitted top-scoring original abstracts to the ASPEN Nutrition Science and Practice Conference.
- **Research Workshop Travel Awards** – honors Early Career Investigators who have submitted top-scoring original abstracts to ASPEN Nutrition Science and Practice Conference that align with the year’s Research Workshop topic. Up to \$600 travel expense award.

### Awards not requiring opt-in:

- **Abstracts of Distinction** – Awards given to first authors of top-scoring abstracts that display extraordinary originality, explore new aspects of a topic, and/or investigate unique aspects of a subject. Submitters are not required to opt-in to compete for this award.
- **Best of ASPEN Nutrition Science and Practice Conference.** For each of ASPEN’s six abstract categories (Parenteral, Enteral, Malnutrition/Obesity/Practice concepts, Critical Care, GI, Pediatric/Neonatal), the presenting author of the top-scoring (non-Vars candidates) will be acknowledged with a certificate and will be published in *JPEN online and in print* awarded abstracts. Winning Encore must provide ASPEN with permission to reprint their abstracts from the copyright owner prior to November 21.

Abstract Type	Abstract Research Award Eligibility					
	Vars/Promising Investigator	Research Trainee	International	Research Workshop	Abstracts of Distinction	Best of ASPEN Nutrition Science and Practice Conference
Original	Yes	Yes	Yes*	Yes*	Yes*	Yes*
Encore	No	No	No	No	No	yes

**\*Submitters whose abstracts are selected as Vars Candidates are not eligible**

### **New at the 2018 ASPEN Nutrition Science and Practice Conference: Resident Physician award.**

Physicians in resident training programs may be eligible for complementary registration, given an accepted abstract.

For more information, visit [ASPEN's Research Awards](http://nutritioncare.org/Research/Awards/Original_Abstract_Awards/) webpage or type the URL [http://nutritioncare.org/Research/Awards/Original\\_Abstract\\_Awards/](http://nutritioncare.org/Research/Awards/Original_Abstract_Awards/) into your browser. Encore Abstracts are accepted for poster presentations and are ineligible for these awards. Late-breaking Abstracts are eligible only for Abstracts of Distinction (International or US).



### 13. Resources

The following resources are available to assist with preparation of ASPEN Nutrition Science and Practice Conference abstracts.

- [Frequently Asked Questions](#) About Abstract Submission
- Boullata JI, Mancuso CE. A “How-To” Guide in Preparing Abstracts and Poster Presentations. *Nutr Clin Pract.* 2007; 22: 641-646.
- Bliss DS, Guenter PA, Heitkemper MM. [Clinical Research: From Proposal to Publication: Are You Writing Research Right?](#) *Nutr Clin Pract.* 2000; 15: 299-305.
- [ASPEN’s Poster instructions](#)
- A [Research Toolkit](#) is available to ASPEN members as a resource with information on General Research, Research Design and Methodology, Grant Writing, and more

### American Society for Parenteral and Enteral Nutrition Research Agenda

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### Introduction

The American Society for Parenteral and Enteral Nutrition (ASPEN) is dedicated to improving patient care by advancing the science and practice of clinical nutrition and metabolic support. Founded in 1976, ASPEN is an interdisciplinary organization whose members are dedicated to the practice and research in clinical nutrition and nutrition support therapy, which includes parenteral nutrition (PN) and enteral nutrition (EN). With more than 5,500 members from around the world, ASPEN is a community of dietitians, nurses, pharmacists, physicians, scientists, students, and other healthcare professionals from every facet of nutrition support, clinical practice, research, and education.

Research is the mechanism by which the science and practice of clinical nutrition and metabolic support can be refined and advanced with the ultimate goal of improving patient care. Articulation of a research agenda is an important step toward achieving this goal. ASPEN’s research agenda is not intended to be a comprehensive review of the literature. Rather, the research agenda is aimed to help promote

continuity across ASPEN's activities and help communicate ASPEN's research priorities to the larger clinical and research communities with the broader goal of advancing research and scholarly discourse in priority areas. Accordingly, the primary goal of this document is to provide patients, families, researchers, federal agencies, and other stakeholders with an assessment of key areas of nutrition and metabolic support that will benefit most from additional research efforts in the next decade.

ASPEN's 2013 Research Agenda was developed by ASPEN's Research Committee (RC). The RC provides leadership in research and research training for the organization and is responsible for developing and facilitating its research goals. ASPEN's Board of Directors charged the RC with defining a research agenda for the organization. Responding to this request, the RC chair worked with the members of the RC to obtain consensus on the structure and content of this document. The original ideas were drafted and circulated to the RC for comment and revision. After these revisions were incorporated into a final outline, the RC chair asked several members of the RC to write specific sections of the document based on their expertise. These sections were compiled and edited into a single document that was recirculated to the RC for review. Feedback from that review was incorporated into a revised version of this document. The document was then reviewed by a number of external reviewers who have a track record of producing influential research in the field, as well as members of ASPEN's Board of Directors. Their comments and suggestions were incorporated into the final version of the document which was approved by the Board.

## Research Agenda

Despite significant advances in medical research and improvements in healthcare delivery systems, malnutrition remains a common healthcare issue with a particularly high prevalence among hospitalized patients. According to data collected from the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project, in 2010, protein calorie malnutrition was present in more than 773,000 hospital discharges. There is ample evidence supporting the relationship between nutrition deficits and increased morbidity and mortality. For example, studies have shown that among hospitalized patients, chronic caloric deficit, either in terms of total daily calories or protein calories, is associated with increased infectious complications, duration of mechanical ventilation, and length of stay in both the intensive care unit (ICU) and hospital. In various patient populations and care settings, suboptimal nutrition status is also associated with chronic complications such as failure to thrive, impaired learning and cognition, skeletal muscle wasting, falls, and functional decline. Based on this evidence, it is reasonable to assume that prevention or correction of chronic nutrition deficits can have a positive impact on patient outcomes.

Since the publication of seminal research dating from the 1960s in which beagle puppies were injected with nutrient substances and fluids, as well as subsequent work in severely malnourished patients who received PN solutions infused continuously through an indwelling central catheter, there has been growing interest and progress in the field of nutrition support therapy. Today, nutrition support is a key aspect of nutrition therapy. This component of medical treatment can include oral, enteral, and parenteral nutrition aimed at maintaining or restoring optimal nutrition status and health.

Over the past few decades, advances in enteral and parenteral access techniques, formulations of different nutrients, improved understanding of intestinal physiology, and accumulating information on optimal selection of candidates for parenteral and enteral feedings have made the provision of nutrition support accessible to virtually all patients who require it. Indeed, the proliferation of nutrition support technologies, coupled with improved knowledge regarding proper patient selection and feeding strategies, has contributed to the emergence of clinical nutrition as an independent medical and surgical specialty. Despite this progress, data concerning many aspects of nutrition support remain limited, and practice strategies in many subpopulations (eg, children, the elderly, obese, and critically ill) and care settings (eg, home health) require further refinement. For example, despite the plethora of published data examining energy requirements and nutrient provision, reliable information describing how nutrition

interventions impact clinical outcomes remains limited. Inconsistent findings in the published literature may be explained in part by how malnutrition or risk for malnutrition were defined, when feeding was initiated, how different disease states and patient populations modify risk of nutrition-related complications and responses to feeding, and how measurement biases and precision impact the determination of energy requirements. As a result, future research should include both basic science-oriented investigations aimed at improving our understanding of the science of nutrient regulation in different disease states, as well as clinical and translational research to determine how the practice of nutrition support can continue to be refined and individualized to optimize clinical outcomes. With these considerations in mind, the following sections articulate ASPEN's priority areas for future research.

### Malnutrition Assessment, Diagnosis, and Intervention in the Context of Nutrition Support Therapy

Over time, malnutrition has been defined using varied criteria in diverse patient populations. This variability has created difficulties in capturing the true prevalence of this condition. Furthermore, 4 trends have impacted nutrition support practice in ways that have resulted in the need for a more precise definition of malnutrition. First, advances in technology have enabled clinicians to respond more effectively to patients who are candidates for nutrition support. Second, data generated from evidence-based medical and nutrition care in the acute care setting have facilitated more life-sustaining interventions and improved overall short-term survival for patients who suffered from acute illnesses or injuries. However, this success has also increased the number of acutely and severely ill patients who are at risk of developing nutrition deficits. A third trend is the global obesity epidemic, which has placed nutrition support practitioners in the position of managing malnutrition and its complications in a context that was not considered by previous malnutrition assessment schemes. A fourth issue relates to challenges associated with cost containment in the U.S. healthcare environment, where nutrition support is a relatively expensive intervention that is also associated with considerable risk. These trends have converged, and resulted in the need to develop a consensus definition for malnutrition. Ideally, this definition would enable nutrition support professionals to use common language to characterize patients' nutrition needs and devise management plans that are consistent among providers. In addressing this goal, a critical gap that requires immediate attention involves identification of the most effective strategies to teach current and future clinicians standard approaches to identifying and diagnosing malnutrition.

Although a consensus definition for malnutrition will represent a meaningful step forward for the field, current definitions are directed toward undernourished and adult patients. While obese patients can theoretically be judged as malnourished using current guidelines, clarification and refinement of the approach for assessment of obese patients are necessary. More important, nutrition support clinicians often provide care to patients who are not yet malnourished but who are at high *risk* of becoming malnourished during their course of therapy. Improved understanding of the risk that these patients present may be needed to justify nutrition support resources in a cost-conscious healthcare environment. Prospective cohort studies that include the natural history of patients who are at risk of malnutrition and that aim to describe physical symptoms, clinical assessments, laboratory tests, and diagnostic tools for use in all categories of patients would be helpful to address these critical gaps.

When the consensus language and criteria in defining malnutrition are applied across diverse nutrition support settings, it is expected that the availability of information and feasibility of assessment methods, as well as prevalence of malnutrition and associated outcomes will vary. Research is needed to identify which diagnostic criteria and tools are most useful and practical in different practice settings. What are the most important clinical outcomes for patients in diverse care settings, and how are they linked to nutrition status? In the hospital setting, mortality and morbidity (eg, infections, and length of hospital stay) are commonly assessed. With new cost-containment efforts being directed toward reducing hospital readmissions, analysis should also include evaluations of how malnutrition impacts hospital readmission rates for patients who have been previously discharged to different clinical settings. Furthermore, there is a need to understand the impact of malnutrition as patients' transition in different care settings and across the continuum of care.

Once consistent definitions and identification of malnutrition are in common use, issues related to optimal implementation of nutrition support will need to be addressed. What approaches to provision of nutrition support are most effective in varied settings and populations? What approaches are most beneficial? Which are too expensive or impractical for widespread implementation? Randomized controlled trials (RCTs) are the optimal approach to answering these questions.

### Diagnosics and Techniques in Nutrition Support

In addition to establishing a consistent definition and diagnostic criteria for malnutrition, an equally important research priority concerning this issue is to validate both quantitative and qualitative diagnostic approaches in malnutrition assessment. Although serum concentrations of several visceral proteins (eg, serum albumin level and transthyretin) have been used as surrogate markers of nutrition status, recent evidence has demonstrated that these measures are neither sensitive nor specific to nutrition response, especially in patients with acute inflammation or liver and renal disease. Other techniques such as skinfold thickness measurements, bioelectric impedance analysis, dual energy X-ray absorptiometry, densitometry, ultrasound and magnetic resonance imaging have been used to assess body composition. Unfortunately, many of these approaches have only been used in research involving healthy individuals or in subgroups of patients with limited or specific comorbidities. In most settings, the utility of these techniques as a prognostic indicator for malnutrition is unknown. In addition, the feasibility of applying these techniques in different patient populations, especially those who are clinically unstable or critically ill, is limited.

Once a diagnosis of malnutrition is confirmed, the major ongoing challenges are to determine the optimal nutrition support regimen and to evaluate the adequacy of, and response to the prescribed regimen. We consider indirect calorimetry the gold standard in individualizing caloric needs for patients in the clinical setting, and it should be used when the accuracy of predictive equations is in doubt. Nevertheless, the results obtained from indirect calorimetry can be limited by the patient's clinical condition, practice setting, equipment costs, and required staffing. In addition, indirect calorimetry does not assess the adequacy of specific nutrients. As a result, additional tests such as 24-hour urine analysis for nitrogen balance is often necessary to provide a more thorough evaluation of the patient's needs and to monitor the response to the nutrition support regimen. Therefore, further research is needed to help refine our ability to individualize nutrition prescription to provide a more comprehensive, yet efficient and less labor-intensive caloric assessment.

Currently, there is no well-established, sensitive marker or diagnostic test that can provide a patient-specific assessment of response to nutrition therapies. In patients receiving prepyloric enteral feeding, determining feeding intolerance and when feeding should be withheld continues to be intensely debated. Future investigation should be directed at improving the assessment of gastrointestinal function and gastric emptying in patients, especially those who are enterally fed in ICU and non-ICU settings.

At present, a rudimentary understanding exists regarding how genetic variations, epigenetic events, and the gut microbiome affect patients' nutrient requirements and responses. Furthermore, little is known about individual-level responses to nutrition support regimens, the dose–response relationships associated with specific nutrients, how these factors are affected by nutrigenomics, and what factors predicts favorable or unfavorable clinical responses or events. With advances in technology and the ability to measure patients' metabolomic and microbiome profiles, the answers to these questions may have a significant impact on patient outcomes and could reshape nutrition support practices in the future.

### Clinical Trials and Outcomes Research

There is a paucity of RCTs in the field of nutrition support. As a result, clinical practice guidelines have evolved from information gathered from studies of lower methodological quality (ie, small clinical trials,

observational studies, and expert opinion). RCTs are needed in essentially every setting where nutrition support practice occurs (ICU and non-ICU hospitalized patients; rehabilitation, skilled nursing facilities, and nursing homes; clinics and patients' homes). These studies should enroll the full age range where nutrition support is practiced, especially in age-specific studies (eg, neonates, infants, children, adolescents, adults, geriatric patients). Moreover, since the "best" outcomes for effective nutrition support care are not yet identified, a broad range of clinical outcomes should be investigated (eg, mortality, infection, length of stay, readmission, growth in children, weight loss in obese subjects, muscle strength and function, successful functional discharge) and the potential modifiers for nutrition risk (eg, aging, metabolic disorders, organ dysfunction and transplantation, cancer care, and failure to thrive) should be evaluated. To facilitate understanding of the complex interplay among nutrition and inflammation, inflammatory biomarkers (eg, C-reactive protein concentrations) and indices of the acuity and severity of illness (eg, APACHE II, PIM2, SOFA score, etc) should be evaluated in these trials. Large cohort studies such as the outcome data that will result from the Sustain™ home PN registry will build a strong foundation for research questions to be answered by RCTs.

### Translational Research

Translational research is currently a major focus of the National Institutes of Health (NIH) and other federal and nonfederal funding agencies. Although definitions vary, the NIH defines translational research as the process of transforming laboratory discoveries into new therapies for patients. Other examples include translation of results from clinical studies into everyday clinical practice and healthcare decision making. This can include research that translates discoveries made through clinical RCTs performed at tertiary academic medical centers to clinical research studies based in "real-world" community settings. Other types of translational research focus on effective implementation of clinical research findings and clinical pathways in all practice settings (ie, tertiary academic medical centers to small community hospitals).

One of the major criticisms of current practice in nutrition support is that common clinical practices are often based on limited scientific data or mechanistic understanding and expert opinion. Thus, there may not be a strong rationale for use of specific EN and PN products in specific patient populations or medical conditions. For example, existing data that guide the clinical management of most drug–nutrient interactions are based mostly on anecdotal experience, uncontrolled observations, and opinions, whereas the scientific foundation of our understanding of the mechanism of drug–nutrient interaction remains quite limited. There is a need to bridge this, and similar gaps between the science and practice of nutrition support through clinical/translational research.

Another example of the need for translational research involves the longstanding debate on whether continuous enteral feeding decreases the oral bioavailability of certain drugs. This could be first addressed by conducting *in vitro* investigations on the physicochemical interaction between the target drugs and specific nutrients, comparing the intestinal transport and metabolic profiles of these compounds using cultured cell lines and animal models, determining how nutrients and drugs alter the function and genomic expression of their target transport proteins, and designing RCTs comparing the clinical outcomes of different management approaches. Similar research is necessary in predicting drug–nutrient interactions in the parenterally fed patient with additional emphasis on physiochemical compatibility considerations.

Increasing evidence suggests that diet and nutrition have direct and indirect roles in gene expression, epigenetic regulation, protein production, and metabolic profile. To date, little nutrition-oriented research has been performed using these newer approaches. Using genomic, epigenomic, transcriptomic, proteomic, and metabolomic analysis of biological samples, the field can begin to think about application of data generated from these approaches in the design of interventional trials in nutrition support. These approaches have already been adopted in major clinical trials in pharmaceutical research and cancer

treatment. The incorporation of “omic-based” research in nutrition support would help achieve the goal of prescribing personalized nutrition support to individual patients.

## Safety

In addition to the science of nutrition support, it is also important to continue to evaluate the safe practice of nutrition support. This is a particularly important issue because of challenges associated with economic shortfalls in the healthcare system. Some of these research priorities have been previously addressed in ASPEN’s Parenteral Nutrition Safety Consensus Recommendations and its 2009 Enteral Nutrition Practice Recommendations. Areas needing research include safe prescribing, order review, compounding and administration. Enteral and parenteral access-related issues including placement and reduction of access-related complications are also in need of further study. The fallout from recent contamination of both PN and EN formulas points to the need for improved approaches to best practices for PN and EN delivery systems and error reporting. The continued challenge of medication and drug shortages, especially with parenteral electrolytes and micronutrients, has reaffirmed the urgent need for research to develop alternate products, regimens, or methods of nutrient delivery that are safe and effective in preventing nutrient deficiency in patients who are dependent on nutrition support. Only with further research on process questions will practice improve and these therapies become safer.

## Summary and Future Actions

ASPEN’s RC has identified research priorities ranging from improving the definition of malnutrition to the design and implementation of RCTs in specific areas and patient populations. This document serves not only as a call to action for nutrition support investigators, but also as a guide for these investigators and sponsors in their efforts to conduct and support nutrition support research that is likely to have the greatest impact in the short term. The final section of this document provides a list of specific research topics and challenges in nutrition support that ASPEN believes are in greatest need of immediate attention. It is also hoped that both researchers and funding agencies will respond to these challenges in the next few years.

## Recommendations for Future Research

### Malnutrition Assessment, Diagnosis, and Intervention in the Context of Nutrition Support Therapy Across the Continuum of Care

- Determine the most effective methods of training clinicians in advanced nutrition assessment skills
- Perform studies to improve malnutrition assessment, diagnosis, and intervention in the context of nutrition support therapy for patients in all age groups
- Develop and validate nutrition assessment instruments for hospitalized obese patients
- Develop and validate nutrition assessment instruments for hospitalized pediatric patients
- Conduct feasibility and validation studies for measures of body composition, muscle strength, and physiological function in hospitalized patients
- Evaluate how nutrition status may affect the delivery of end-of-life care
- Evaluate the impact of malnutrition and nutrition support therapy in terminally ill patients, especially those receiving comfort care
- Evaluate appropriateness of and payment for malnutrition coding in hospitalized patients

## Diagnostics and Techniques in Nutrition Support

- Identify and validate novel biomarkers and imaging modalities for assessing nutrition status and prognosis

- Develop objective techniques for nutrition assessment that can identify patients at risk for malnutrition-related complications
- Investigate innovative methods of therapy assessment and delivery
- Improve the application of microarray, metabolomic, and proteomic technologies in nutrition research
- Identify therapeutic targets based on genetic associations
- Create and expand patient registries, data sharing, research consortia, and other shared research resources to enhance research capabilities

### Clinical Trials and Outcomes Research

- Perform rigorous, adequately powered RCTs, including comparative effectiveness studies
- Report the characteristics and clinical outcomes of home PN patients through the use of the Sustain™ registry.
- Describe a wide range of clinical outcomes (beyond mortality, length of stay, infection) associated with malnutrition in all settings where nutrition support is provided
- Compare clinical outcomes in patients with established malnutrition and those at high risk of developing malnutrition
- Compare clinical outcomes in patients with obesity in all settings where nutrition support is provided
- Compare clinical outcomes in patients with serial measures of malnutrition criteria to determine whether the degree of malnutrition increases during hospital admission and who is at greatest risk
- Compare varied nutrition support interventions (EN, PN, oral supplements, specific micronutrients, etc) in cohort studies or RCTs
- Evaluate the cost–benefit ratio of nutrition support interventions (EN, PN, oral supplements, specific micronutrients, etc) in varied disease states, care settings, and malnutrition categories
- Evaluate the optimal approach for managing PN and EN during the perioperative period
- Evaluate the value and impact on nutrition support training and the impact of the multidisciplinary nutrition support team on clinical outcomes
- Quantify the value of nutrition support training and nutrition support team in patient outcomes and impact on health system

### Translational Research

- Develop improved animal models for translational bench to bedside research relevant to nutrition support therapy
- Determine mechanisms and responses to drug nutrient interactions in different populations and disease states
- Utilize data generated from genomic, epigenomic, transcriptomic, proteomic, and metabolomic analysis of biological samples to identify malnutrition and its response to specific nutrition therapies
- Design interventional and comparative effectiveness trials in nutrition support and develop more personalized strategies for optimal nutrient delivery

### Safety

- Determine the optimal approach in supplementing micronutrients in patients receiving PN during drug shortage
- Develop alternate products, regimens, or methods of delivery for micronutrients and electrolytes that are safe and effective in preventing nutrient deficiency in patients who are dependent on nutrition support

- Identify the optimal use of independent clinician double-checks in critical aspects of PN administration process
- Identify educational strategies that are most effective in developing and validating competence in PN administration procedures
- Reduce PN errors and identify environmental and human factors that contribute to PN administration errors
- Identify strategies to mitigate the risk of PN administration errors
- Evaluate the impact of vascular access devices to obtain blood samples for laboratory tests on infection rates and accuracy of laboratory tests
- Evaluate the impact of placing a new vascular access device for newly initiated PN therapy
- Determine the impact of the electronic medical record in improving safe delivery of nutrition therapy
- Evaluate how nutrient shortages affect patients/consumers receiving nutrition support therapy over time

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### Article Notes

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