NASPGHAN Guidelines for Training in Pediatric Gastroenterology

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1. OVERVIEW

The field of pediatric gastroenterology, hepatology, and nutrition (referred to subsequently as pediatric gastroenterology) continues to expand and evolve and is far different from 1999, when the previous guidelines on fellowship training in this field were published (1). Although still a relatively young field, this subspecialty is increasingly recognized and accepted throughout the world (2), albeit with varying degrees of medical resources and access to care. Tremendous medical advances, especially in the fields of genetics, infectious disease, pharmacology, and immunology, have changed our fundamental understanding of pathophysiology, and along with technological innovations, such as wireless imaging technology and intraesophageal impedance monitoring, have affected the way we diagnose and manage disease. At the same time, economic factors have become increasingly important in discussions of health care and graduate medical education (3). With rapidly escalating health care costs, care must be demonstrated to be not only high in quality but also cost-effective. Moreover, in response to pressure from the public to ensure practitioners are competent, accrediting agencies are imposing new and increasingly complex constructs for assessing the competency of our trainees. These factors demand that the training of pediatric gastroenterology fellows be continuously revised and reevaluated.

It is not sufficient to focus exclusively on the clinical aspects of training, however. Although the primary mission of fellowship programs is to create competent clinicians, ensuring the health of future generations requires a broader training mission that recognizes that some of our trainees will choose careers as researchers and medical educators. Fellowship training, therefore, must provide individuals with the opportunity to pursue other essential career pathways. The necessity of providing this more inclusive training must be reconciled with evolving lifestyle expectations of trainees (4) and duty hour restrictions (5).

In response to these enumerated factors, the Executive Council of the North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) charged its Training Committee with the task of updating the 1999 fellowship training guidelines. The goals outlined by the Steering Committee were to consider existing guidelines and seek consistency where possible; specifically incorporate the Accreditation Council for Graduate Medical Education (ACGME) competencies; create a framework that would permit consistent updating; reflect the unique aspects of pediatric gastroenterology, including the breadth of the field and unique nature of the patients, especially the changing presentation of disease as children develop; and respond to the practical needs of pediatric gastroenterology program directors.

In addition to the original NASGPHAN guidelines, other existing guidelines were reviewed in the preparation of this document. Table 1 provides a list of the primary guidelines and the means to access them. ACGME's Residency Review Committee issues standards for fellowship training in pediatric gastroenterology and updates them every 5 years, with the most recent update in 2009 (6,7). ACGME establishes detailed training program requirements that are not included in these NASPGHAN guidelines. Requirements for training as a pediatric gastroenterologist in Canada are enumerated by the Royal College of Physicians and Surgeons in Canada (RCPSC) (8,9). The European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) reviewed training issues and developed a curriculum for fellows in 2002 (2). The task force also reviewed the gastroenterology core curriculum generated by 4 adult gastroenterology societies that was updated in 2007 (10) and the recent guidelines for fellowship training in pediatric cardiology, a subspecialty with similar training issues, including procedure training and advanced training opportunities (11).

Unique Characteristics of a Pediatric Gastroenterologist

A pediatric gastroenterologist is expected to be an expert in the anatomy and physiology of a large segment of the human body

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TABLE 1. Guide to existing guidelines

Organization	Specification	Location (ref)
ACGME	Program requirements	Web site (6)
	Clinical training requirements	Web site (7)
	Duty hours	Web site (5)
ABP	Specifications for scholarly work	Web site (24)
RCPSC	Program requirements	Web site (9)
	Clinical training requirements	Web site (8)
AASLD, ACG, AGA, ASGE	Internal medicine training requirements in gastroenterology	Journal article (10)
ESPGHAN	Pediatric gastroenterology training requirements	Journal article (2)

AASLD, American Association for the Study of Liver Diseases; ABP, American Board of Pediatrics; ACG, American College of Gastroenterology; ACGME, Accreditation Council for Graduate Medical Education; AGA, American Gastroenterological Association; ASGE, American Society for Gastrointestinal Endoscopy; ESPGHAN, European Society for Pediatric Gastroenterology, Hepatology, and Nutrition; RCPSC, Royal College of Physicians and Surgeons in Canada.

that includes the esophagus, stomach, intestines, liver, biliary tree, and pancreas, as well as the diverse array of acute, subacute, and chronic illnesses that may affect these organs. Trainees must have the ability to analyze and integrate the clinical data, instead of limiting their thought processes to a particular organ or segment of the gastrointestinal (GI) tract. In pediatric gastroenterology, an assessment of growth and nutrition is an especially integral part of any patient's evaluation and care. Diseases of the digestive system can negatively affect the nutritional status of the child; conversely, the nutritional status of the child can profoundly affect the diagnostic evaluation of the patient.

In addition, the practitioner must possess exemplary interpersonal and communication skills, because the field of pediatric gastroenterology is truly multidisciplinary and requires routine consultations and collaborations with myriad allied providers, including endoscopy suite and operating room personnel, nurses, dietitians, pharmacists, social workers, surgeons, intensivists, radiologists, pathologists, psychologists, and psychiatrists. Many of the diseases encountered by a pediatric gastroenterologist also are of relevance to other subspecialties, including endocrinology, rheumatology, pulmonology, and metabolism/genetics, necessitating collaborative relationships with these experts.

A pediatric gastroenterologist, unlike an adult gastroenterologist, interacts extensively with both the patient and the patient's care provider(s). As such, it is imperative that the care not only be evidence-based and cost-effective but also be delivered in a compassionate manner that respects patients' families and their cultures. The fiscal aspects of health care, especially in the United States, are undergoing seismic modifications and it is anticipated that events in the next 5 years will be characterized by vastly different reimbursement models and accountability in medicine. A pediatric gastroenterologist will need to be adept at demonstrating added value to health care dollars and strive for continuous quality enhancement of care. Knowledge of the dollar footprint of care will be imperative, especially as the subspecialist will have increasing access to an ever-expanding array of technological tools and diagnostic modalities, including medical genetic and pharmacogenetic testing. Furthermore, it is likely that as medical homes are established, pediatric subspecialists will need to develop new relationships with primary care providers.

The other trend affecting fellowship programs is the juxtaposition of personal lifestyle choices and career choices. A subset of pediatric gastroenterologists works part-time for a variety of reasons, including needs for childcare, personal (or family) health issues, or other personal obligations or pursuits. Because these needs affect the training years, programs have increasingly adapted to trainee lifestyle requests. In the early years of this subspecialty, the majority of practitioners entered academic institutions, and this later expanded to private practice options. Presently, graduating trainees also consider hybrid practices in which they have an academic appointment with some role in trainee education, but otherwise maintain an independent practice.

In summary, the field of pediatric gastroenterology is undergoing rapid transformation and these updated guidelines aim to address the changes occurring in the training of this subspecialty during the last decade and, more important, to prepare us for the future.

Competencies

ACGME was established in 1981 with a goal of developing a uniform set of guidelines that could be applied to ensure and improve the quality of resident and fellow education. As part of its Outcome Project, 6 core competencies that could serve as focal points in the development of residency and fellowship training program curricula were identified in 1999 and became part of program requirements in 2002 (12). Similarly, the RCPSC developed a set of core competencies that are an integral part of fellowship training program curricula (Canadian Medical Education Directives for Specialists, or CanMEDS competencies) (13). Although the CanMEDS competencies are not identical to those of the ACGME, their goals are similar (Table 2). Application of these core competencies and implementation of assessment tools by program directors of pediatric gastroenterology fellowship training are required for program certification by the ACGME and the RCPSC. Table 3 indicates how the ACGME competencies are presented in this guideline document.

TABLE 2. ACGME and CanMEDS core competencies

ACGME	CanMEDS
Medical knowledge	Medical expert
Interpersonal and communication skills	Scholar
Patient care	Communicator
Systems-based practice	Collaborator
Practice-based learning and improvement	Manager
Professionalism	Health advocate
	Professional

ACGME, Accreditation Council for Graduate Medical Education; CanMEDS, Canadian Medical Education Directives for Specialists.

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TABLE 3. Mapping ACGME competencies to guidelines

Competency	Guideline section
Medical knowledge	Overview, Content Area text
Patient care	Overview, Content Area text
Communication	Overview
Problem-based learning	Overview
Professionalism	Overview, Content Area tables
Systems-based practice	Overview, Content Area tables

ACGME, Accreditation Council for Graduate Medical Education.

The *competency of medical knowledge* (CanMEDS Medical Expert and Scholar) requires that fellows demonstrate knowledge of relevant biomedical, clinical, epidemiological, and socio-behavioral sciences and their application to patient care. Areas that are particularly applicable to understanding the clinical manifestations and treatment of GI disease include developmental biology, pharmacology, host/microbial interactions, immunology, and genetics. Fellows should develop an understanding of the pathophysiology underlying the disorders that are encountered in ambulatory and inpatient settings. Medical knowledge should be obtained through didactic conferences, self-directed learning, and in the course of supervised clinical care. Concepts important for training in pediatric gastroenterology are included in the individual content areas.

The *competency of patient care* (CanMEDS Medical Expert and Manager) is directed at ensuring that fellows are able to provide competent and compassionate care to their patients. They must be able to gather appropriate information via the performance of a complete clinical history and comprehensive physical examination, review of medical records, and appraisal of up-to-date scientific evidence. They must be able to develop and implement patient management plans, taking into consideration patient/family preferences. They must be able to interpret diagnostic and therapeutic interventions and develop the clinical judgment necessary to make informed decisions. Fellows also are expected to develop technical competency in the performance of GI procedures that are considered essential for the practice of pediatric gastroenterology and should understand the indications, benefits, risks, and limitations of all procedures commonly used in the evaluation of children with GI disorders. Enumeration of the patient care experiences required for training in pediatric gastroenterology is included in the individual patient content areas of this document. Recommendations for procedural training are reviewed in a separate section of this overview and in more detail in the final section of these guidelines.

The *competency of practice-based learning and improvement* (CanMEDS Scholar) emphasizes lifelong learning. Instruction in this competency should help fellows to develop a set of skills that will empower them to serially assess and reflect upon their perceived strengths and weaknesses as clinicians, and to develop strategies and realistic goals to improve their clinical practice. This includes the ability to incorporate constructive feedback provided by supervisors, colleagues, other health care providers, administrative staff, and patients. In addition, this process of continuous improvement requires the ability to use information technology to support their education and an understanding of the principles and application of evidence-based medicine. Fellows must perform practice-based improvement, which involves obtaining information about their own population of patients, instituting a change, and assessing the effect using a systematic methodology. This competency also includes the development of specific teaching skills that will permit fellows to effectively educate patients and families, students, residents, other fellows, and consulting physicians.

The *competency of interpersonal and communication skills* (CanMEDS Communicator) encompasses more than the performance of specific tasks or behaviors. Fellows should demonstrate interpersonal skills such as the ability to be present in the moment; awareness of the importance of the relationships among physician, patient, and family members; respect for others and treating others as one would like to be treated; and the capacity to adjust interpersonal skills based on the needs of different patients and families (14). Fellows must be able to create and sustain therapeutic and ethically sound relationships with patients, use effective listening skills to facilitate relationships, and work effectively with others as a member or leader of a health care team. Physician providers must be able to communicate across cultural and socioeconomic boundaries. In addition, fellows should begin to learn the skills necessary to communicate their findings and experiences with colleagues and other health care providers, both orally and in the form of written reports, manuscripts, and case series. Such skills are critical in practicing medicine effectively in a multidisciplinary setting.

The *competency of professionalism* (CanMEDS Professional) includes training to ensure that fellows will be able to provide compassionate care to their patients in a manner that is sensitive to language, age, culture, sex/sexual orientation, religious persuasion, and disabilities. Professionalism is realized through partnership between a patient and doctor, based on mutual respect, individual responsibility, and appropriate accountability. It should include such areas as honesty and integrity, self-awareness and knowledge of limits, reliability, respect for others, compassion, altruism and advocacy, continuous self-improvement, collaboration, and working in partnership with members of the health care team (15). Moral reasoning and judgment also are essential components of professional behavior. Fellows should receive formal training in bioethics to equip them in addressing complex problems, such as parental unwillingness or inability to provide life-saving care for their child. The content areas of this document include examples of the specific application of this competency to disorders encountered in the course of pediatric gastroenterology practice.

The *competency of systems-based practice* (CanMEDS Health Advocate, Manager, and Collaborator) challenges fellows to conduct their clinical efforts in a manner that is medically sound, of high quality, and cost-effective. This requires that fellows understand different types of medical practice and delivery systems. Fellows must learn skills that will enable them to advocate for their patients and to coordinate services drawn from throughout the health care system. Upon completion of training, the fellow should be able to demonstrate his or her understanding of the roles of members of a multidisciplinary team and how to lead a multidisciplinary group that ensures optimal management of complex conditions, such as inflammatory bowel disease (IBD) or intestinal failure. The content areas of this document also include examples of the specific application of this competency to disorders encountered in the course of pediatric gastroenterology practice.

A number of metrics can be used to evaluate fellow performance, and specific competencies may be best addressed through the application of different methodologies (16,17). Medical knowledge may be best assessed with traditional tools such as written examinations or standardized oral examinations. Other competencies are better assessed using a variety of tools, including record review, chart-stimulated recall, checklists, logs/portfolios, standardized patient examinations, objective structured

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clinical examinations, simulations, patient surveys, and 360° global ratings. Although the particular choice of evaluation metrics may vary from institution to institution, it is essential that all pediatric gastroenterology fellowship training programs develop a process that facilitates the longitudinal collection of information/data and provision of constructive feedback to fellows in a manner that is timely, respectful, and most likely to positively contribute to their long-term personal and career development. Faculty development is key to the establishment of these metrics and to an effective feedback process. At present, few faculty are expert in these areas (18).

A fundamental difficulty in assessing trainees based on the ACGME competencies is that supervising physicians often are asked to do this outside the environment of clinical care and without knowledge of the longitudinal development of trainees (19). A proposed solution to this dilemma is the creation of entrustable professional activities (EPAs) (20,21). According to ten Cate and Scheele, EPAs are part of the essential professional work; must require adequate knowledge, skill, and attitude; lead to recognized output of professional labor; be independently executable; and be observable and measureable in its process and outcome. An example of a possible EPA in pediatric gastroenterology is the medical management of the postoperative liver transplant patient. EPAs provide a clinical context in which to judge a trainee's competence in >1 of the 6 areas defined by ACGME. In this example, trainees' competency in systems-based practice could be assessed in his or her ability to work on a multidisciplinary team and the competency in communication assessed in his or her ability to provide compassionate and respectful anticipatory guidance to the transplant patient and family. ten Cate and Scheele suggest that one could create a matrix listing specific EPAs on 1 axis and the ACGME general competencies that could pertain to the EPAs on another. Successful training, then, would require reaching the entrustable level of each EPA within a set time period by satisfying all of the relevant competencies. To assist program directors in conceptualizing the application of ACGME competencies, the content areas of this document include the development of tables that relate possible EPAs in each specific area to appropriate competencies. In the future, guidelines for training in pediatric gastroenterology may be based on a series of carefully defined EPAs.

ACGME and the American Board of Pediatrics (ABP) initiated a pediatrics milestones project to better define the competencies and improve the assessment of outcomes (22,23). The project specifies 52 subcompetencies and proposes a series of developmental levels for assessment. Application of the milestones to subspecialty training must await further study and validation.

Clinical Training Guidelines

ACGME requirements for subspecialty training in pediatric gastroenterology specify that the training program should be 3 years in length and ensure trainee competence as defined by their 6 competencies in the treatment of infants, children, and adolescents with diseases of the GI tract, the pancreas, the hepatobiliary tract, and nutrition. Current RCPSC guidelines require only 2 years of fellowship for certification in pediatric gastroenterology (8). To meet all of the recommendations enumerated below for a 3-year fellowship, candidates training in Canada could arrange an additional year of fellowship or obtain equivalent training after completing their fellowship.

Acknowledging the increasing complexity of pediatric gastroenterology practice and the ACGME requirements, we recommend that at least 15 months should be devoted to clinical training in inpatient and ambulatory settings (Table 4). This length of clinical training would still permit the fellow to be supported by research training grants that restrict clinical activities after a first clinical year. Traditionally, the majority of fellowship training has occurred in the inpatient setting; however, given that clinical pediatric gastroenterology is predominantly an outpatient practice, consideration should be given to providing a significant component of training in the ambulatory setting. A continuity care outpatient opportunity of at least 1/2 day/week should be provided during the entire 3 years of fellowship. Throughout the training period, duty hours should conform to the guidelines issued by ACGME and be monitored closely (5).

TABLE 4. Apportionment of training time

Category	Months of training*
Clinical	15–24
Scholarly project	12–21†

* Vacation time should be distributed proportionally between time devoted to clinical training and the scholarly project.

† The nature of the scholarly project must be considered in the apportionment of time. Some projects will require longer time investment to achieve acceptable quality goals.

The fellow should assume progressively increasing responsibility for clinical care and demonstrate increasing competence, both in the inpatient and ambulatory settings, during the course of the fellowship. Fellows also should demonstrate increasing competence in the performance of routine diagnostic and therapeutic GI procedures.

Fellows have differing career goals that may affect their training. The current flexibility of training should allow trainees with specific interests to obtain additional clinical training, including training in selected areas, such as neurogastroenterology and motility, nutrition, intestinal failure, IBD, therapeutic endoscopy, hepatology or liver, small bowel, and multivisceral transplantation after the required 15 months of clinical training. For example, if a fellow seeks to obtain expertise (without formal certification) in areas such as motility or management of intestinal failure, additional training, up to 9 months during the 3-year fellowship, could be devoted to this special interest. Alternatively, such specialized training could occur after completion of the pediatric gastroenterology fellowship, as a separate fourth year or in a mentored clinical practice. Such training should not interfere with completion of the scholarly work product. Depending on local institutional resources, the flexibility also should permit fellows who are interested in academic careers to pursue advanced degrees, such as a master's degree in public health or clinical science.

Trainees interested in a career in investigation (basic, translational, or clinical) would receive research training during their fellowship; however, fellows and programs should recognize that the path to independence as an investigator commonly requires that at least 4 to 5 years of training is needed to equip a fellow to work independently as an investigator in his or her area of interest. Whether this career path is included as an extra 1 to 2 years as a trainee or as junior faculty depends on local institutional resources, availability and type of funding to support further research training, and the individual needs of trainees. Table 5 suggests lengths of total training for pediatric gastroenterologists seeking different career pathways.

Endoscopy and Other Procedures

Procedures are an integral part of the practice of pediatric gastroenterology, and trainees are expected to demonstrate

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TABLE 5. Overall training for different career pathways

Intended career pathway	Length of training, y*
Clinical practice	3
Clinical practice with subspecialization	3–4
Medical education	3
Independent research	At least 4–5

*The estimates assume 3 years for standard pediatric gastroenterology fellowship.

competency in the performance of a wide array of procedures. Endoscopy and related procedures, such as liver biopsy and motility procedures, are in a continual state of evolution as a result of technological advances in equipment, changes in other diagnostic disciplines (eg, radiology), and shifts in the health care delivery system. Nevertheless, it remains important to establish guidelines for pediatric gastroenterology training programs so that trainees are up to date in the most current techniques available. Certain core principles of procedure training will remain important regardless of the details of specific procedures. Trainees must understand the appropriate indications, risks, benefits, and alternatives of both diagnostic and therapeutic procedures. Each program must have formal mechanisms for monitoring and documenting trainees' development of skills in the performance of each procedure on a regular basis. Ideally, trainees should maintain a log detailing procedures performed and problems encountered. This will facilitate the regular feedback that must be given to trainees throughout their training as to their level of skill acquisition and whether they are meeting expectations for their level of experience. Trainees who are not achieving expected goals should be given constructive guidance in how to achieve the necessary level of endoscopic competence for their level of training. Adequate training and the minimal threshold number of procedures recommended to achieve competency for each procedure are defined in the endoscopy and procedure guideline for training that follows. Each trainee does not necessarily have to attain competence in all of the procedures outlined, but it is important that each trainee become familiar with every procedure and understand its application, interpretation, and limitations.

Endoscopic competency is recognized as a continuum. As such, it is recognized that some trainees will achieve procedural competency at a lower number of procedures because of superior hand–eye coordination and other factors that determine procedural success, whereas others will require more instruction or experience to achieve the same level of proficiency. Although emphasizing that true procedural competency rather than volume is the more appropriate goal, careful review of the published literature allows for estimation of minimal numbers that should be achieved before performing procedures independently. Trainees are expected to achieve competence in the procedures that they intend to perform without supervision after completion of training. At completion of training, trainees who have not achieved adequate procedural competence in a procedure that they wish to perform will require mentoring by an experienced proceduralist until such time as procedural competency has been met.

Therefore, an essential aspect of all training programs is to ensure that each trainee is adequately exposed to relevant procedures, which include diagnostic and therapeutic upper GI endoscopy, percutaneous endoscopic gastrostomy tube placement, diagnostic and therapeutic colonoscopy, endoscopic examination of the small intestine (capsule endoscopy and/or small bowel enteroscopy), endoscopic retrograde cholangiopancreatography, percutaneous liver biopsy, rectal biopsy, manometry (esophageal, antroduodenal, colonic and anorectal), esophageal pH and impedance monitoring, and breath test analysis. Since the publication of the 1999 North American Society for Pediatric Gastroenterology and Nutrition training guidelines (1), the 2009 ACGME update has moved several procedures from the ''demonstrate competence'' list to the ''understand the principles'' list, including paracentesis and percutaneous liver biopsy (7). This change was driven by the recognition that some of the procedures are being increasingly performed by interventional radiologists. These trends will continue to affect the training of pediatric gastroenterologists and certification requirements. As a result, guidelines for procedure training will require regular updates.

Scholarship

Integral to the advancement of the care of children with GI, hepatobiliary, pancreatic, and nutritional disorders is the elucidation of basic disease mechanisms and the development of new diagnostic and therapeutic strategies. In addition, a greater understanding of the genetic, molecular, and cellular processes controlling the development and function of the GI tract, liver, and related organs is essential to progress in disease prevention and health maintenance during childhood. The continuation of these advances requires the availability of individuals with training in basic, clinical, and translational sciences, medical education, health services, and health policy. All clinicians in the subspecialty of pediatric gastroenterology must understand the foundations of the field and be prepared to assess the impact of new information on clinical care and thus practice evidence-based medicine.

Congruent with ACGME and ABP guidelines (7,24), subspecialty training in pediatric gastroenterology must emphasize scholarship. All fellows must receive formal training in scholarly pursuits and participate in basic, clinical, or translational research, or another scholarly activity. The inclusion of forms of scholarship other than research recognizes the importance of all contributions vital for the continued advancement of the field of pediatric gastroenterology.

Scholarship, in this context, can be conceived as 4 interrelated domains of academic activity (25). The scholarship of discovery encompasses the activities involved in original basic science and clinical research. The scholarship of education involves the development of educational strategies, curricula, and assessment tools for the communication of knowledge to students and the public. The scholarship of integration is concerned with making connections among diverse disciplines such as the use of communication technology in telemedicine, engineering methods in genomics research, or ethics in patient care. The scholarship of application involves the use of knowledge to solve problems of individuals and society. The types of scholarly work described by this domain include clinical trials and epidemiologic studies. Many translational biomedical activities are included within the domains of integration and application.

Trainees need to acquire knowledge in all aspects of scholarship through a combination of didactics and direct participation in a meaningful scholarly project with appropriate mentorship. The experience must begin during the first year and continue throughout the period of training. The ABP sets requirements for the nature of the scholarly project and its output, but it does not stipulate the amount of time that must be devoted to this activity. To meet the goals established by the ABP, at least 12 months of fellowship training should be committed to scholarship activities, although some activities, such as a basic science project, clearly require a longer time commitment. Ideally, at least some contiguous blocks of time will be designated for completion of the scholarly activity.

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During these designated periods, 80% of the trainees' time should be committed to scholarly work.

Trainees must participate in a formal core curriculum in scholarship. The curriculum should be presented in a format that stimulates learning behavior through the use of diverse educational modalities, including lectures, group discussions, journal clubs, and research conferences. The curriculum should provide trainees with the opportunity to achieve an in-depth understanding of biostatistics, epidemiology, clinical and laboratory research methodology, study design, critical literature review, ethical norms governing scholarly activities (presentation of data, collaborative activities, confidentiality in peer review, authorship designation, social responsibility, human rights, and animal welfare), application of research to clinical practice, and evidence-based medicine. The curriculum also should include principles of teaching and adult learning, curriculum development, and assessment of educational outcomes. Trainees should acquire the necessary skills to deliver information in oral and written forms, prepare applications for approval and potential funding of clinical and research protocols, and complete abstracts and manuscripts for publication. Furthermore, the trainees should develop as effective teachers of individuals and groups of learners in clinical settings, classrooms, and seminars.

Per ABP requirements (24), all fellows are to complete a supervised scholarly activity. This activity must be directly related to the field of pediatric gastroenterology, hepatology, or nutrition, with the objective to prepare trainees to become effective subspecialists and to contribute to the advancement of scholarship in the field. Participation in the scholarly activity should lead to the development of skills to critically analyze the work of others; gather and analyze data; assimilate new knowledge, concepts, and techniques; formulate clear and testable questions from a body of data; derive conclusions from available data; and translate ideas into written and oral forms. The scholarly activity may include basic, clinical, and translational sciences, medical education, health services, and health policy. Acceptable projects include basic, clinical, and translational research; meta-analysis or systematic review of the literature; critical analysis of health services or policies; and curriculum development. The project must be hypothesis driven or have clearly stated objectives, and requires in-depth integration and analysis of information or data. Trainees must actively participate and acquire comprehensive knowledge of all aspects of their scholarly activity. Trainees should practice reflective critique during the performance of the scholarly activity by thinking about the work, seeking the opinion of others, and responding positively to criticism. The scholarly activity is to lead to a work product for which trainees are responsible for a significant portion of its completion. Examples of an acceptable work product are a peer-reviewed publication, a formal report extensively describing a completed or complex ongoing activity, a peer-reviewed extramural grant application, and a thesis.

Fellowship training in scholarship is to be performed in a supportive, stimulating, and inquisitive environment. Trainees must have the opportunity to discuss and critically analyze current literature, present their work in conferences, and interact with other trainees and faculty in a wide variety of disciplines. To provide an appropriate scholarly environment, faculty of the program must include people with established skills in scholarship, preferably in different areas of basic science, clinical science, health services, health policy, and education.

Trainees should designate a faculty member to provide mentorship during their scholarly activity. The mentor is fundamental to the training process and must commit to support trainees during the extent of their scholarly activity. The mentor should have an established record of productivity in scholarship, have attained excellence in a field related to pediatric gastroenterology, and be aware of the opportunities for trainees to apply for grant support, participate in national conferences, and collaborate with others in the subspecialty of pediatric gastroenterology. The mentor must ensure that the support, facilities, and equipment required for the completion of the specific scholarly activity are available to the fellow and must monitor his or her progress and provide ongoing feedback.

Each trainee is to have a scholarship oversight committee (SOC), governed by written guidelines (24). The SOC, in conjunction with the designated mentor and program director, is responsible for the guidance of trainees through the completion of the scholarly activity and for the assessment of whether a specific activity and the product of that activity meets the current ABP guidelines for certification. The SOC, as stipulated by the ABP, is to comprise at least 3 individuals (including the mentor), with 1 member from outside the subspecialty of pediatric gastroenterology. The program director can serve as a mentor and participate in committee activities, but he or she is not formally a member of the SOC. The committee is to meet on a regular basis during the period of training, at least twice per year. The committee is to assist trainees in the development of a course of study to acquire knowledge and skills beyond those provided by the core curriculum to ensure successful completion of the scholarly activity. The SOC will evaluate each fellow's progress, involvement in the specific scholarly activity, product of the scholarly activity, and defense of the product of the scholarly activity at its completion. The SOC will advise the program director on each fellow's progress during the training period and determine whether the scholarly activity was performed and completed according to the local program and ABP guidelines.

Advanced Training

Given the explosion of knowledge and technology, some pediatric gastroenterologists have restricted their practices to certain highly specialized clinical areas. Preparation to practice in these areas may require further training to develop the medical knowledge and clinical and technological skills necessary to achieve competency. At present, the field of pediatric cardiology includes multiple areas of subspecialization, and guidelines for training in each of these were published in 2006 (11). As the discipline of pediatric gastroenterology develops further, it is likely that new subspecialties will develop and others will change.

The goal of advanced training in pediatric gastroenterology is to provide specialized clinical instruction for subspecialty trainees exceeding what would be expected in a traditional 3-year fellowship training program. Examples of areas in which advanced training can be appropriate include but are not limited to pediatric transplant hepatology, neurogastroenterology and motility, therapeutic endoscopy, IBD, intestinal rehabilitation and small bowel/multivisceral transplantation, and nutrition. Such training could be obtained in 1 of 3 ways: within the context of a standard 3-year fellowship, assuming all of the basic requirements for clinical training and scholarship are met; during an additional, dedicated fourth year of fellowship training; or postfellowship in the course of mentored, specialized practice.

The only current official mechanism for obtaining advanced training in pediatric gastroenterology is that which exists for pediatric transplant hepatology (26). Obtaining a certificate of added qualification in this subspecialty requires the completion of an additional year of fellowship training in pediatric transplant hepatology and passing a certifying examination, offered jointly by the ABP and the American Board of Internal Medicine (27).

Although the original NASPGHAN guidelines specified requirements for advanced training in other areas of subspecialty

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TABLE 6. Format of the content areas

Section	Description
Importance of area	Statement of the significance of the content area within pediatric gastroenterology
Medical knowledge	Enumeration of the concepts necessary for competent clinical care
Patient care	Enumeration of the skills and patient experiences necessary for competent clinical care: history-taking and physical examination, use and interpretation of diagnostic tests, participation in multidisciplinary care and longitudinal follow-up
Professionalism	Table relating to EPA(s)
Systems-based practice	Table relating to EPA(s)
Developmental context	Examples of emphasizing different disease presentations at different ages

within pediatric gastroenterology (1), clear pathways for advanced fellowship training do not exist and, therefore, specifications for achieving this training were not included in this document. Furthermore, it is unlikely that the ABP will be able to offer certifying examinations, given the expected small numbers of applicants. We do, however, recommend that NASPGHAN consider defining the requirements for programs that may offer advanced training in areas other than pediatric transplant hepatology and for fellowship training in these areas.

Format of the Content Areas

Traditional approaches to enumerating the medical knowledge and clinical skills that trainees must develop to master a specialty field have resulted in lengthy and detailed lists of specific items. In practice, such lists have been rarely accessed by program directors and therefore been of little practical benefit. The Guidelines Steering Committee established a number of guiding principles for the development of content areas. First, the committee believes that to be effective, the format of the content areas should be simplified by avoiding repetitious language and emphasizing concepts rather than details. In the current era of expanding medical knowledge, retention of all relevant facts is impossible and problem-based learning, often on a Web-based platform, is becoming an essential part of practice and should be encouraged. Another goal was to create a format that could be updated easily periodically in response to changes in medical knowledge and practice. Finally, a link to the ACGME competencies for each content area was thought to be important to help embrace all aspects of trainee development that are necessary to meet both professional and lay concepts of acceptable practice.

The Steering Committee identified 11 areas of content that best encompassed the breadth of pediatric gastroenterology without resulting in needless complexity: acid-peptic disease, congenital anomalies of the GI tract, GI bleeding, GI infections, hepatobiliary disorders, IBDs, malignancies and premalignant conditions, motility and functional GI disorders, nutritional disorders, pancreatic disorders, and intestinal failure. For each of these content areas, acknowledged experts were drafted to lead task forces, and they in turn invited additional experts to serve on these task forces.

The format of each content area acknowledges the key role of the competencies in fellowship training. The outline of the content areas and the relation of the format to the general AGCME competencies are shown in Table 6. The last section of Table 6 emphasizes the importance of the developmental context in understanding the field of pediatric gastroenterology.

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2. CONTENT AREAS

Organizing the essential knowledge and skills that fellows should acquire by the end of fellowship training into an easily readable document is a daunting task. Although the 11 content areas were chosen to reflect the major themes in pediatric gastroenterology, some specific topics do not clearly fit into any area and others overlap ≥2 areas. Readers seeking a truly comprehensive list should also consult the ABP Content Outline for Pediatric Gastroenterology (1).

Trainees in pediatric gastroenterology should understand the diagnostic and therapeutic approach to important GI problems in children that are not included in any single content area, such as the following:

- Vomiting
- Diarrhea
- Abdominal pain
- Abdominal mass lesions
- Conditions associated with protein-losing enteropathy
- Abdominal trauma
- Rectal prolapse

In addition, trainees should be familiar with the diagnosis and management of conditions that frequently are managed primarily by pediatric surgeons and other pediatric subspecialists, including the following:

- Acute appendicitis
- Pyloric stenosis
- Intussusception
- Other causes of obstruction of the GI tract
- Foreign bodies
- Necrotizing enterocolitis of the newborn

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Congenital Anomalies

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Importance of Area

Because many children with congenital anomalies present initially to a pediatric gastroenterologist and usually continue their posttreatment long-term care with a pediatric gastroenterologist, trainees should be familiar with these anomalies and the diagnosis, treatment options, and long-term prognosis for these patients.

Medical Knowledge

Trainees in pediatric gastroenterology should understand the embryologic origins, normal histology, and vascular supply of the entire digestive system and have a detailed understanding of fundamental developmental processes, including intestinal rotation and fixation. They should know the incidence, presentation, and natural history of congenital anomalies, both treated and untreated. For anomalies having a known genetic basis, they should understand the pattern of inheritance and implications for the family. Trainees should be familiar with the differential diagnosis of the various anomalies and the various treatment approaches, even though many therapy options fall outside the role of a pediatric gastroenterologist. When surgical treatment is needed, trainees should understand the general techniques and potential complications.

Trainees should understand the malformations that can directly affect feeding:

- Pierre Robin sequence
- Cleft lip and palate
- Treacher Collins syndrome
- Anomalies of and around the esophagus (eg, atresia, web, tracheoesophageal fistula [TEF], and vascular ring)

Trainees should thoroughly understand the advantages and disadvantages of feeding methods, how feeding choices can be individualized for each child's needs, and that feeding choices in infancy can have significant consequences for future feeding abilities.

Trainees should be familiar with anatomic anomalies of the foregut (including the liver, biliary system, and pancreas). Trainees should understand the presentation and complications of anatomic variants of hepatic and pancreatic anatomy and vascular supply, including congenital biliary atresia, choledochal cyst, annular pancreas, and pancreas divisum. They should know the strengths and pitfalls of various diagnostic methods (eg, ultrasonography, computerized tomography [CT], magnetic resonance cholangiopancreatography [MRCP], and endoscopic retrograde cholangiopancreatography [ERCP]) in assessing the pancreas and biliary tract.

Trainees should be aware of other foregut anomalies, including anomalies of the stomach and duodenum (eg, web, duplication, atresia), which may present with upper GI tract obstruction.

Trainees should be aware of important congenital anomalies of the midgut, including anomalies of the small intestine (eg, web, duplication, atresia, Meckel diverticulum). They should comprehend abnormalities of rotation and fixation, including malrotation and volvulus. Trainees should know that the differential diagnosis of a small bowel obstruction in the newborn also includes meconium ileus from cystic fibrosis. Trainees should be familiar with anomalies of the hindgut, including abnormalities of fixation, atresias, and anorectal malformations.

Trainees should understand the wide age range of presentation of these and other associated anomalies, and they should be familiar with methods of diagnosing these anomalies and indications for surgery. They should also know diagnostic and therapeutic approaches to upper GI (UGI) and lower GI (LGI) obstruction and be able to recognize the symptoms and signs of bacterial overgrowth that may accompany obstruction or blind loops.

Trainees also should be familiar with the treatment and consequences of abdominal wall defects (eg, gastroschisis,

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omphalocele) and of congenital diaphragmatic hernias. Trainees should recognize that abdominal wall and diaphragm defects are typically associated with anomalies of intestinal rotation, but that in most cases these are clinically inconsequential.

Trainees should be aware of syndromes and associations that frequently include congenital anomalies of the GI tract (eg, Down syndrome, VACTERL association [a combination of at least 3 of the following defects: vertebral defects, anal atresia, cardiac defects, TEF, renal anomalies, and limb abnormalities]). Trainees should understand congenital anomalies that can cause disorders of defecation (eg, spina bifida, tethered cord, Hirschsprung disease), and they should be familiar with syndromic conditions that have hepatobiliary associations (eg, Alagille syndrome). Trainees should be familiar with the presentation, differential diagnosis, evaluation, and long-term treatment of these disorders.

Trainees should appreciate that many of these congenital anomalies of the intestinal tract have long-term motility consequences because of disordered fetal GI development, and they should become proficient in treatment approaches for the feeding-intolerant child.

Required Patient Care Experiences/Skills

Trainees should develop the necessary skills and experience in history taking and physical examination of neonates and children of all ages with regard to potential congenital anomalies. They should learn to exercise clinical judgment about which children require further investigation and which tests are most appropriate based on the anomaly being considered and the age of the patient (eg, barium enema, rectal suction biopsy, anorectal manometry to evaluate for Hirschsprung disease).

Trainees' experience should include time evaluating neonates in a high-risk newborn nursery. They should be able to counsel families about prognosis and management of congenital anomalies in the neonatal period; for example, they should be able to present the prognosis for an infant with omphalocele or gastroschisis, and the factors that predict a favorable outcome.

Trainees should participate in inpatient and outpatient management of the preoperative and postoperative care of patients with anomalies requiring surgery in the neonatal period (eg, esophageal atresia). Trainees should be able to determine the appropriate uses of various feeding devices and should develop skills in handling commonly used equipment and solving potential complications. This experience should include placement, care, and troubleshooting gastrostomy and jejunostomy tubes and other feeding devices.

Trainees should develop skills in the procedures used to assess and/or manage children with congenital anomalies (eg, percutaneous gastrostomy tube placement in the neonate with Pierre Robin sequence who cannot feed orally). Trainees should be able to perform rectal suction biopsies to evaluate for Hirschsprung disease and interpret the histopathologic findings. They should understand the implications of congenital malformations and their prior surgical repair when considering endoscopic evaluation. They should be familiar with the indications, technique, and complications of dilatations (eg, of an esophageal stricture following repair of esophageal atresia).

Trainees should develop skills in interpreting the results of investigations used to assess for congenital anomalies, including diagnostic imaging techniques:

- Ultrasonography
- Fluoroscopy
- CT
- Magnetic resonance imaging (MRI)

Trainees should be able to participate with competence in multidisciplinary teams, including working closely with pediatric surgeons, geneticists, neonatologists, dietitians, and feeding therapists. They should be skilled in communicating effectively with nursing staff and familiar with the home supply needs of children with feeding or continence issues, and how to provide for those needs. They also should be familiar with specific enteral and parenteral nutrition options for maintaining appropriate nutrition in these patients.

Trainees should have the opportunity to maintain continuity with their patients during the course of their training and to experience the long-term care of patients with congenital anomalies and how these will or will not affect the patients' ability to achieve developmental milestones (eg, ability to achieve continence of stool for a child born with imperforate anus).

Examples of Relevant Competencies—Congenital Anomalies

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Discussion of new diagnosis of TEF and esophageal atresia	Participation in family meetings to counsel families regarding surgical and feeding issues and prognosis	Patient survey; 360° evaluation; chart-stimulated recall; OSCE; direct observation by faculty followed by feedback; portfolios used for self-reflection
	Discussion of new diagnosis of Meckel diverticulum	Participation in family meetings to counsel family regarding a life-threatening GI event	Patient survey; 360° evaluation; chart-stimulated recall; OSCE; direct observation by faculty followed by feedback; portfolios used for self-reflection
Systems-based practice	Participation in the multidisciplinary care of patients with complex congenital lesions (eg, diaphragmatic hernia, gastroschisis)	Participation in multidisciplinary care team, including surgical, medical, and behavioral providers	360° evaluation, including providers of consulting services; chart-stimulated recall; portfolios

(continued)

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Examples of Relevant Competencies—Congenital Anomalies (Continued)

Competency	Relevant area	Recommended experience	Suggested means of assessment
Developmental context	Understanding the implications of esophageal atresia and other foregut anomalies upon the development of feeding skills and the long-term consequences of interruption of this process	Lecture, seminar, or case-based discussion on acquisition of feeding skills, management of feedings in patient with repaired TEF and esophageal atresia	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge
	Understanding the different presentations of choledochal cysts in different age groups	Lecture, seminar, or case-based discussion of choledochal cysts	Exam MCQ; chart-stimulated recall

GI, gastrointestinal; MCQ: multiple-choice questions; OSCE, Objective Structured Clinical Examination; TEF, tracheoesophageal fistula.

Functional GI and Motility Disorders

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Importance of Area

Because functional GI disorders (FGID) and motility disorders are common in children, trainees in pediatric gastroenterology require comprehensive exposure to the diagnosis and treatment of these disorders and their complications, as well as a thorough understanding of their pathophysiology.

Medical Knowledge

Because of the wide range of disorders in this category, the discussion of medical knowledge is divided into 2 sections: FGID and disorders of transit.

FGID: Trainees in pediatric gastroenterology should understand the types and current classification of FGID by the Rome III criteria, including the disorders in the 2 main groups: neonates and infants and children and adolescents (Table 1). They should be familiar with the epidemiology of FGID, including the following:

- Prevalence in different geographic areas
- Age-related vulnerability
- Sex predominance of certain disorders
- Natural history

Trainees should thoroughly comprehend the biopsychosocial model of illness and the concept of the brain–gut axis in the evaluation and treatment of FGID. They also should be cognizant of fictitious disorder by proxy and how it may mimic organic or functional disease.

For each FGID syndrome (Table 1), trainees should know the following:

- The diagnostic criteria
- The alarm signs that should prompt further evaluation
- The role of different diagnostic tests (including indications and limitations of manometry testing in FGID)
- The indications and adverse effects of the available medications
- The role of psychological evaluation and behavioral modifications as part of the multidisciplinary approach to children with FGID

TABLE 1. Rome III classification of FGID

Neonates and infants	Children and adolescents
Infant regurgitation	Vomiting and aerophagia
Infant rumination syndrome	Adolescent rumination syndrome
Cyclic vomiting syndrome	Cyclic vomiting syndrome
Infant colic	Aerophagia
Functional diarrhea	Abdominal pain-related FGID
Infant dyschezia	Functional dyspepsia
Functional constipation	Irritable bowel syndrome
	Abdominal migraine
	Childhood functional abdominal pain/childhood functional abdominal pain syndrome
	Constipation and incontinence
	Functional constipation
	Nonretentive fecal incontinence

FGID, functional gastrointestinal disorders.

Disorders of Transit: Trainees should comprehend the swallowing mechanism, including the role of the central nervous system in swallowing. They should be familiar with the indications and technique of performing tests to evaluate swallowing disorders in children.

Trainees should know the anatomy and innervation of the different portions of the esophagus and understand the most common causes of esophageal dysmotility, including those occurring in eosinophilic esophagitis and other kinds of esophagitis and in achalasia. They should have sufficient exposure to children with a history of TEF to recognize the dysmotility associated with this entity and be able to manage symptomatic children with TEF.

Trainees should be familiar with the pathophysiology and modes of presentation of gastroesophageal reflux disease (GERD) and how it is distinguished from physiologic gastroesophageal reflux. They should understand the differential diagnosis of GERD, its evaluation (including pH monitoring, esophageal impedance monitoring, and endoscopy with biopsies), and treatment options (including lifestyle changes, pharmacologic therapy, and fundoplication).

Trainees should know the causes and presentation of gastroparesis and be familiar with the indications and limitations of the tests available for the diagnosis of gastroparesis. More specifically, they should know how to interpret nuclear medicine gastric emptying studies and how to integrate information about gastric emptying in the evaluation and treatment of the child with nausea, vomiting, and other dyspeptic symptoms. They should know the treatments available for gastroparesis including lifestyle changes,

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medications (indications and adverse effects), and the role of surgery.

Trainees also should be familiar with the causes of pseudoobstruction, its presentation, and the available tests to diagnose pseudoobstruction. In addition, they should understand the prevalence and role of small bowel bacterial overgrowth in motility disorders.

Trainees in pediatric gastroenterology should be able to recognize normal and abnormal defecation patterns in children, from newborns to adolescents. Trainees should understand the causes of chronic constipation and fecal incontinence and know when diagnostic studies are indicated. They should understand the approach to treatment, including lifestyle changes, diet, and medications.

Trainees should be familiar with Hirschsprung disease, including the following:

- Pathophysiology
- Epidemiology
- Diagnostic approach – barium enema, anorectal manometry, and suction and full-thickness rectal biopsy (including how to recognize ganglion cells on histological sections)
- Surgical approach and complications

Trainees should understand manometry procedures and their application to disorders of transit, as follows:

- Indications
- Technique of performing
- Risks and shortcomings
- How to recognize tracings consistent with achalasia and Hirschsprung disease (including identification of the recto-anal inhibitory reflex)

Trainees should be aware of the effect of systemic endocrinopathies on GI motility and possible contribution to disorders of transit.

Patient Care Experiences/Skills

Trainees should be proficient in performing complete histories and physical examinations of patients with FGID or suspected motility problems. They should be able to identify and evaluate GI symptoms, nutritional issues, psychosocial concerns, and other relevant findings.

Trainees should participate in the care of a sufficient number of children with swallowing problems, feeding difficulties, FGID, GERD, constipation, and motility disturbances to be exposed to a wide array of presentations, complications, and therapeutic interventions. They should have the opportunity to participate in the evaluation of children with Hirschsprung disease and collaborate with colleagues in radiology and surgery in diagnosis and management. They should also participate in the care of children with pseudoobstruction.

Trainees should be able to apply and synthesize appropriate evaluation plans, including the following:

- Laboratory studies
- Radiologic imaging
- Endoscopy and colonoscopy
- Motility studies
- Mucosal biopsies

Trainees should understand the complexity of caring for children with FGID and motility disorders and recognize the importance of a multidisciplinary approach to the problem. Trainees should participate in patient care with teams including but not limited to social workers, psychologists, nutritionists, neurologists, surgeons, pathologists, nurses, and motility specialists. Trainees also should play an active role in the nutritional management of children with pseudoobstruction or motility disorders that require enteral nutrition via tubes or parenteral nutrition. Trainees should participate in the long-term care of children with FGID and motility disorders, including continued consultation with other medical specialists as required.

Examples of Relevant Competencies—Functional GI and Motility Disorders

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Understanding the social impact of fecal incontinence	Directly participate in the care of patients with fecal incontinence, including the psychosocial aspects, interaction with social workers and psychologists, as necessary	Patient survey; 360° evaluation; chart-stimulated recall; OSCE; portfolios for reflection
Systems-based practice	Management of patient with constipation and/or fecal incontinence in the setting of congenital problems such as myelomeningocoles	Discussion and collaboration with other disciplines, including neurology, neurosurgery, urology, nursing, social work, and psychology in patient evaluation and management, participation in team meetings	360° evaluation; including providers from other disciplines; Chart-stimulated recall; portfolios
Developmental context	Understanding the developmental aspects of fecal continence	Lectures, seminars, and case-based discussions, management of children of different ages with a focus on normal and abnormal defecation	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge

MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination.

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GI Bleeding

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Importance of Area

GI bleeding occurs not uncommonly in children, is often worrisome, and is occasionally life threatening. Understanding the different etiologies by patient age, the importance of assessing the severity of bleeding, and methods for accurately determining the cause and site of bleeding are critical in the proper management of this condition. Individuals caring for patients with GI bleeding must be able to identify and respond to signs of hypovolemic shock and impending decompensation to prevent ongoing blood loss and avoid a medical emergency.

Medical Knowledge

Trainees in pediatric gastroenterology should comprehend the differential diagnosis of, diagnostic techniques for, and treatment of GI bleeding, as well as have a thorough understanding of the pathophysiology. The potential sources of UGI and LGI bleeding are listed by age group in Tables 1 and 2.

TABLE 2. Differential diagnosis of acute LGI bleeding in pediatric patients

Infant*	Child and adolescent
Necrotizing enterocolitis	Anal fissure
Infectious colitis	Infectious colitis
Allergic colitis	Polyp
Hirschsprung enterocolitis	Lymphonodular hyperplasia
Ischemic colitis	Meckel diverticulum
Inflammatory bowel disease	Intussusception
	Inflammatory bowel disease
	Hemorrhoid
	Solitary rectal ulcer
	Hemolytic uremic syndrome
	Münchausen syndrome by proxy
	Ischemic colitis
	Vascular malformations and angiomata
	Malignancy

* In addition to all causes of UGI bleeding outlined in Table 1.

TABLE 1. Differential diagnosis of acute UGI bleeding in pediatric patients

Newborn	Infant	Child	Adolescent
Swallowed maternal blood	Stress gastritis or ulcer	Mallory-Weiss tear	Mallory-Weiss tear
Vitamin K deficiency	Esophagitis	Gastritis or peptic ulcer	Esophagitis
Stress gastritis or ulcer	Mallory-Weiss tear	Esophagitis	Esophageal ulcer (pill, caustic, or infectious etiology)
Esophagitis	Esophageal/gastric or duodenal duplication	Varices	Gastritis or ulcer
Vascular malformations (hemangioma, telangiectasia, arteriovenous malformation)	Caustic ingestion	Portal hypertensive gastropathy	Varices
Anatomic lesions (gastric polyp, duplication)	Vascular malformations (hemangioma, telangiectasia, arteriovenous malformation)	Caustic ingestion	Portal hypertensive gastropathy
Gastric heterotopia	Henoch-Schönlein purpura	Vascular malformations (hemangioma, telangiectasia, arteriovenous malformation)	Vascular malformations (hemangioma, telangiectasia, arteriovenous malformation)
	Varices	Henoch-Schönlein purpura	Crohn disease
	Foreign body	Tumor	Dieulafoy ulcer
	Tumor	Foreign body	Hemobilia
		Anatomic lesions (polyp, duplication)	Anatomic lesions (polyp, duplication)
		Crohn disease	

With regard to acute GI bleeding, trainees in pediatric gastroenterology should understand the following:

- The initial and subsequent assessment of a patient with acute GI bleeding, including the signs of impeding decompensation or shock
- The requirements for fluid resuscitation and medical treatment of hemorrhagic shock
- The need to focus on the location and severity of the bleeding
- The components of the preendoscopic evaluation and understand the need for the patient to be hemodynamically stable before endoscopic evaluation
- The elements of postprocedure care, including prevention and assessment of ongoing blood loss

Trainees in pediatric gastroenterology should be familiar with the differential diagnosis and diagnostic approach to the pediatric patient with subacute, intermittent, or chronic GI bleeding from either an upper or lower tract source, including the appropriate use of upper endoscopy and/or colonoscopy as both a diagnostic and therapeutic tool. In the evaluation of bleeding of obscure origin, trainees should comprehend the appropriate use of techniques such as capsule endoscopy, small

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bowel enteroscopy, and radiologic imaging (eg, nuclear medicine, angiography).

Trainees should understand the appropriate endoscopic assessment and treatment of GI bleeding and that esophagogastroduodenoscopy (EGD) is usually indicated for assessment of acute UGI bleeding requiring transfusion or unexplained recurrent bleeding and can determine the source of the bleeding in most cases from an upper tract source. Trainees must recognize that because UGI bleeding in children frequently stops spontaneously, emergency endoscopy is indicated only when the findings will influence a clinical decision, such as the need for medical or surgical therapy, or if endoscopic therapy can be performed that will stop the ongoing bleeding or prevent rebleeding.

Trainees should comprehend the distinction between lesions amenable to endoscopic therapy (eg, polyps, ulceration, angiomata) and bleeding lesions likely to require surgical therapy to terminate the bleeding episode (eg, Meckel diverticulum, malignancies). Trainees should understand the risks, benefits, applications, and limitations of these techniques, including electrocoagulation (eg, heater probe, monopolar probe, multipolar electrocoagulation probe), argon plasma coagulation, injection of hemostatic agents, band ligation, and mechanical clipping. Trainees should understand that because there is little published experience with these techniques in children, the best technique for each type of bleeding has not been established. Trainees should be aware that the combination of injection (using hemostatic agents such as epinephrine) and thermocoagulation or other mechanical techniques appears to be the most effective endoscopic treatment of UGI bleeding resulting from gastric or duodenal ulcers in children.

Trainees should understand that endoscopic treatment of esophageal varices includes injection sclerotherapy, variceal banding, or a combination of these techniques, and they should know the efficacy and complications of each technique. This should include knowledge that complications of injection sclerotherapy comprise strictures, recurrence of the varices, and recurrent bleeding and that band ligation is becoming the preferred method in both pediatric patients and in adults, is better tolerated in children than sclerotherapy, and has fewer complications (eg, retrosternal pain, fever). Trainees must understand that banding equipment has not yet been adapted for use in infants and small children.

In the setting of acute GI bleeding, trainees must understand the potential benefits and risks of medical therapy, including the following:

- Administration of selective vasoconstrictors (eg, somatostatin analogues), including dosing and duration of therapy
- The role of H2-receptor antagonists and proton pump inhibitors
- Appropriate use of antibiotics in patients with acute bleeding, especially those with cirrhosis, underlying cardiac disease, and other conditions that are associated with an increased risk of infections during a bleeding episode

Trainees should comprehend the value of the various surgical treatment options, including the following:

- Exploratory laparotomy, which is generally reserved for uncontrollable bleeding
- Procedures for bleeding originating from a posterior duodenal ulcer with arterial bleeding, bowel perforation with bleeding, gastroesophageal variceal bleeding, or GI bleeding originating from malignancy
- Portosystemic shunting procedures (mesocaval, distal splenorenal, or central portocaval shunt)
- Esophageal transection, in which the distal esophagus is transected and then stapled back together after varices have been ligated, or devascularization of the gastroesophageal junction (Sugiura procedure), a rare but potentially lifesaving surgery for bleeding esophageal varices

Significant advances in the field of interventional radiology for GI bleeding for both pediatric patients and adults allow for both rapid diagnosis and therapy of many types of bleeding lesions. Trainees should be familiar with the risks, benefits, applications, and limitations of angiographic and other imaging/interventional methods for the diagnosis and therapy of GI bleeding in pediatric patients, particularly when bleeding is obscure in origin or refractory to endoscopic therapy. Trainees should understand the indications, contraindications, diagnostic yield, and relative merits of the following procedures:

- Meckel's scan
- Nuclear medicine bleeding scan (tagged red blood cell scan)
- CT angiography
- Diagnostic and therapeutic angiography (including embolization and coiling, and the radiologic transjugular intrahepatic portosystemic shunt insertion)

Patient Care Experiences/Skills

Trainees should understand how to obtain a history directed at assessing the rate, severity, and location of the bleeding, and how to identify possible etiologies of GI bleeding. They also should be able to perform a physical examination to evaluate the hemodynamic status of the patient and identify mucocutaneous, abdominal, or other physical examination findings that may suggest the etiology of the bleeding.

Trainees should be competent at performing upper endoscopy and colonoscopy and selected therapeutic procedures. They should be able to identify endoscopic lesions that may result in blood loss. Although the number of therapeutic procedures may be insufficient to obtain competency, opportunities for learning these procedures can take place at hands-on courses. Detailed competencies in terms of procedure skills including methods of assessment are outlined separately in this document (See ''Training in Endoscopy and Related Procedures'').

Trainees should participate in the management of patients of different ages with GI bleeding and be able to integrate endoscopic findings, including results of capsule endoscopy and small bowel enteroscopy, as well as those from radiologic procedures, into a management plan for diagnosis and therapy.

Trainees should understand the team approach to the diagnosis and management of GI bleeding and participate in clinical decision making with radiologists, surgeons, and intensivists.

Trainees should have the opportunity to do a follow-up evaluation of patients with a history of GI bleeding and provide counseling regarding possible recurrent bleeding.

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Examples of Relevant Competencies—GI Bleeding

Competency	Relevant area	Recommended experience	Suggested means of evaluation
Professionalism	Discussion of acute life-threatening event with family	Participation in family meetings under supervision of attending physician	Patient survey; direct observation by faculty followed by feedback; 360° evaluation; portfolios used for self-reflection; chart-stimulated recall; OSCE
	Obtaining informed consent for diagnostic and therapeutic endoscopic procedures	Lecture or seminar on informed consent; experience obtaining consent, initially under attending supervision	Record review of completed forms; checklist; direct observation by faculty followed by feedback
Systems-based practice	Participating in multidisciplinary care of patient with severe GI bleeding	Discussion with consulting physicians, and participation in team meetings	360° evaluation including consulting providers; chart stimulated recall
Developmental context	Understanding the change in differential diagnosis of bleeding and diagnostic approach with increasing patient age; understanding age-dependent response to blood loss	Lecture; experience managing patients with GI bleeding at different ages	Simulation; OSCE; exam MCQ; direct observation; use of case vignettes to assess knowledge

GI, gastrointestinal; MCQ: multiple-choice questions; OSCE: Objective Structured Clinical Examination.

GI Infections

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Importance of Area

Infections of the GI tract are an important subset of GI disorders to which the pediatric patient is particularly predisposed. Infections also can mimic other GI disorders, such as IBD, and vice versa. Trainees in pediatric gastroenterology, therefore, require comprehensive exposure to the diagnosis and treatment of bacterial, viral, and parasitic infections and their complications.

Medical Knowledge

Trainees in pediatric gastroenterology should understand the basic pathophysiology, including host defense mechanisms against enteric infections and factors that determine microbial virulence. Trainees should comprehend how congenital or acquired immunodeficiencies can alter the host response to GI infections.

Trainees in pediatric gastroenterology should have an understanding of the epidemiology, natural history, and complications associated with *Helicobacter pylori* infection and a thorough knowledge of the indications and current recommendations for the testing and treatment of *H pylori* infection.

Trainees should understand the clinical manifestations, including extraintestinal manifestations, and the complications, diagnosis, and treatment of bacterial infections that cause diarrhea, including the following:

- *Campylobacter*
- *Salmonella*
- *Shigella*
- *Yersinia*
- *Escherichia coli* (enterotoxigenic, enteroadherent, enteroinvasive, enteroaggregative, adherent invasive, and Shiga toxin producing)
- *Clostridium difficile* (including an approach to antibiotic-associated diarrhea)
- *Vibrio*
- *Listeria*

Trainees should be familiar with the signs and symptoms of small bowel bacterial overgrowth, as well as its predisposing factors, the available diagnostic tests, and currently recommended therapies.

The pediatric gastroenterology trainee should be aware of potential emerging pathogens and should be able to recognize illnesses related to toxin exposure (eg, staphylococcal food poisoning). They should comprehend the pathophysiology of bacterial-mediated diarrhea and know how to develop a management plan, including the rationale for the use or avoidance of antibiotics, physiologic basis and use of oral/intravenous rehydration solutions, and the advantages and disadvantages of adjunctive therapy (eg, probiotics). Trainees also should be aware of the public health issues related to infections from these organisms. Trainees also should be able to identify and diagnose infections that can resemble Crohn disease (CD).

Trainees should be familiar with the epidemiology, clinical manifestations, prevention, and therapy of viral enteric pathogens (eg, rotavirus; caliciviruses, including noroviruses, adenoviruses, and astroviruses). Trainees also should be familiar with cytomegalovirus colitis and the manifestations, diagnosis, and treatment of Epstein-Barr virus–related complications, particularly in the immunocompromised patient.

Trainees should be familiar with the clinical manifestations, diagnosis, and treatment options for common parasitic infections, including giardiasis, *Entamoeba histolytica*, and cryptosporidium. They should comprehend the controversies surrounding the

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pathogenicity of other agents (eg, *Dientamoeba fragilis, Blastocystis hominis*).

Trainees should understand the primary and secondary immunodeficiencies with GI manifestations and the pathogens, including fungal agents, such as *Candida albicans*, encountered under these circumstances. Trainees should be familiar with the sexually transmitted diseases that can affect the GI tract.

Patient Care Experiences/Skills

Trainees should develop expertise in performing a history and physical examination aimed at identifying potential enteric infections or immunodeficiencies with GI manifestations. This expertise can be achieved by working with patients with GI infections in both inpatient and outpatient settings. Where specific enteric infections or immunodeficiencies are rare and unlikely to be encountered, case-based teaching, multidisciplinary case conferences, simulations, and learner-directed reading can be used to ensure that adequate medical knowledge is achieved.

Trainees should become experienced in performing diagnostic testing in patients and should understand the indications and limitations of testing for enteric infections, including being able to use procedures to exclude infections. Trainees should be able to interpret laboratory, radiological, endoscopic, and histological findings. Pediatric gastroenterology trainees should participate in pathology and radiology joint management conferences when possible to enhance knowledge development.

Because of the varied clinical manifestations and need for specialized testing, the management of patients with GI infections often requires multidisciplinary interactions with pathologists, microbiologists, infectious disease specialists, and immunologists. Trainees should be involved in coordinating these multidisciplinary consultations for patients when indicated (eg, suspected immunodeficiency presenting with enteric infection).

Trainees also should participate in the treatment of children with acute and chronic enteric infections to develop the necessary skills to initiate and implement the appropriate treatment.

Hepatology

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Importance of Area

Because diseases of the liver and biliary tract have a significant impact on children, trainees in pediatric gastroenterology should have comprehensive exposure to the diagnosis and treatment of these disorders and their complications, as well as a thorough understanding of their pathophysiology.

Medical Knowledge

Trainees in pediatric gastroenterology should understand the normal structure and function of the liver and biliary tree, and the prevalence, natural history, age-appropriate differential diagnoses, and genetic and other risk factors of hepatobiliary disorders. Caring for children with hepatobiliary disease requires a thorough understanding of both common and rare causes, including infectious, metabolic, genetic, anatomic, immunologic, and toxic (Table 1).

Trainees should understand the varying clinical manifestations of these disorders, especially the issues that are unique to pediatric hepatobiliary disorders (eg, effects on growth, nutrition, puberty, psychosocial functioning).

Trainees also should have a complete understanding of the diagnostic criteria that distinguish liver and biliary diseases with common patterns of presentation (eg, cholestasis, neonatal cholestasis, elevated aminotransferases, hepatomegaly, hepatosplenomegaly, acute liver failure, direct or indirect hyperbilirubinemia, ascites), including differences in the following:

- Affected populations
- Results of laboratory evaluations
- Histopathology
- Radiologic studies
- Disease course

Examples of Relevant Competencies—GI Infections

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Approach to patients with possible sexually transmitted diseases	Care of patients with such infections with participation in discussions with patients and/or families as appropriate	Patient survey; direct observation followed by feedback; 360° evaluation; chart-stimulated recall; OSCE
Systems-based practice	Participating in multidisciplinary care	Observation of, and discussion with, providers of consulting services (eg, radiology, microbiology, infectious disease, immunology)	360° evaluation, including providers of consulting services; chart-stimulated recall; portfolios
	Understanding public health implications of community-acquired enteric infections	Reading of relevant materials; reporting infections to relevant agencies as indicated	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge
Developmental context	Trainees will recognize how developmental context can affect the susceptibility to and clinical manifestations of enteric infections (eg, rotavirus)	Directed and independent reading; care of patients with GI infections at various ages and demographics	Exam MCQ; chart-stimulated recall examination; use of case vignettes to assess knowledge

GI, gastrointestinal; MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination.

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TABLE 1. Categories of hepatobiliary disorders

Categories	Disorders
Viral hepatitis	Hepatitis A, B, C, D, and E, EBV, HSV, CMV, and enterovirus
Metabolic liver diseases	Wilson disease, hemochromatosis, galactosemia, fructosemia, glycogen storage diseases, disorders of fatty acid oxidation (MCAD, LCAD, LCHAD), mitochondrial disorders, tyrosinemia
Genetic disorders	α-1-antitrypsin deficiency, Alagille syndrome, PFIC disorders, cystic fibrosis, bile acid synthetic disorders, mitochondrial disorders
Cholestatic conditions	Biliary atresia, idiopathic neonatal hepatitis, choledochal cyst, other biliary anomalies
Immunologic disorders	Autoimmune hepatitis, PSC
Other liver disorders	Acute liver failure, gallstones, NAFLD, drug-induced liver disease, liver tumors, histiocytosis
Secondary hepatobiliary diseases	Veno-occlusive disease of the liver, secondary PSC, granulomatous hepatitides, drug toxicities, sickle cell hepatopathy, and others

CMV, cytomegalovirus; EBV, Epstein-Barr virus; HSV, herpes simplex virus; LCAD, long-chain acyl-CoA dehydrogenase deficiency; LCHAD, long-chain 3-hydroxyacyl-CoA dehydrogenase deficiency; MCAD, medium-chain 3-hydroxyacyl-CoA dehydrogenase deficiency; NAFLD, nonalcoholic fatty liver disease; PFIC, progressive familial intrahepatic cholestasis; PSC, primary sclerosing cholangitis.

Trainees should understand the comprehensive evaluation of patients suspected to have hepatobiliary diseases, as well as the appropriately targeted evaluation of patients with known liver disease who may be experiencing an exacerbation or complication or who require routine monitoring (eg, recommendations for laboratory and radiologic surveillance for cancer). They should understand both the indications for and potential complications of the various tests that may be required. Knowledge of the indications for performance and interpretation of liver biopsy, percutaneous transhepatic cholangiography and ERCP is a key component of the evaluation of hepatobiliary disease. Trainees should know an approach to liver histopathology and be able to recognize the findings in the common pediatric liver diseases, such as biliary atresia, Alagille syndrome, idiopathic neonatal cholestasis, autoimmune hepatitis, sclerosing cholangitis, chronic viral hepatitis B and C, nonalcoholic fatty liver disease, Wilson disease, metabolic liver diseases (eg, glycogen storage disease, mitochondrial disorders, disorders of fatty acid metabolism), α-1-antitrypsin deficiency, cystic fibrosis, hemochromatosis, and hemosiderosis. Imaging studies (eg, abdominal ultrasound [US], CT scan, MRI, MRCP, and radionuclide cholescintigraphy) also are key components of this evaluation. They also should understand the indications and complications for radiologic intervention, such as hepatic abscess drainage, percutaneous transhepatic cholangiography, and transjugular intrahepatic portosystemic shunt.

Trainees should understand the inheritance patterns of the common genetic disorders of the liver (eg, α-1-antitrypsin deficiency, glycogen storage disease type 1A, Wilson disease, Alagille syndrome), use of genetic testing for diagnoses (eg, in Alagille syndrome, hemochromatosis, Gilbert syndrome, α-1-antitrypsin deficiency, Wilson disease, progressive familial intrahepatic cholestasis disorders), and recommendations for screening of family members (eg, in Wilson disease, in hemochromatosis).

Trainees should understand the management of various acute and chronic liver and biliary diseases and their complications. They should fully comprehend the indications for specific medical interventions in the following diseases/disorders:

- Chronic viral hepatitis
- Autoimmune hepatitis
- Biliary atresia and other biliary anomalies
- Cholestasis from other etiologies
- Alagille syndrome
- α-1-antitrypsin deficiency
- Wilson disease
- Nonalcoholic fatty liver disease
- Primary sclerosing cholangitis
- Gallstone disease and other disorders of the gallbladder
- Other metabolic liver diseases

Trainees should understand the indications for specific treatments of in both newly diagnosed and existing hepatobiliary diseases, including the use of the following:

- Enteral and parenteral nutritional therapy
- Fat-soluble vitamins
- Antibiotics
- Chelation therapies
- Corticosteroids
- Immunomodulators
- Antiviral agents
- Antipruritics

Trainees must understand the efficacy, dosing, adverse effects (eg, growth effects of steroids, renal toxicity of calcineurin inhibitors, common interactions of calcineurin inhibitors with other medications, increased infection risk from Epstein-Barr virus and cytomegalovirus with immunomodulators, hypertension with steroids and calcineurin inhibitors, bone marrow suppression with azathioprine, and posttransplant lymphoproliferative disease), and necessary monitoring when using these medications, particularly regarding the use of immunosuppressant and chelation therapies.

Trainees should be familiar with the complications of acute liver failure and their management, including coagulopathy, encephalopathy, renal and metabolic impairment, and increased risk of infection.

Trainees should know the complications of chronic liver disease and their management, including fat-soluble vitamin deficiency and pruritus in cholestasis, coagulopathy, sequelae of portal hypertension (ascites, variceal hemorrhage, and encephalopathy), hepatorenal syndrome, hepatopulmonary syndrome, nutritional complications, and risk and indications of screening for hepatocellular carcinoma.

Although not all trainees will be directly involved in the care of children who are awaiting or have undergone liver transplantation, they should know the indications, approach to the evaluation, outcomes, and acute complications of liver transplantation,

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especially in the following disorders: biliary atresia, acute liver failure, acute severe Wilson disease, and other metabolic liver disease such as defects of urea cycle metabolism. They also should understand the long-term complications and management issues that arise in these children.

Required Patient Care Experiences/Skills

Trainees should be able to take a thorough history and perform a physical examination of patients with hepatobiliary disease or suspected disease. Trainees should know how to identify symptoms of liver or biliary tract disease, complications of disease, nutritional concerns, psychosocial concerns, and other relevant findings. Trainees should participate in the care of a sufficient number of patients to be exposed to a wide array of presentations, complications, and therapeutic interventions.

Trainees should be able to establish and implement an appropriate evaluation plan, which may include laboratory and imaging studies, liver biopsy, and endoscopic procedures. Trainees should understand the indications, risks, and procedures for performing percutaneous liver biopsy. Trainees should be competent to perform endoscopic procedures and identify pertinent findings. Trainees should be able to assemble the available data, establish a problem list, and assign a diagnosis/diagnoses or define the next steps in the evaluation.

Trainees should then develop a management plan, with consideration of both specific therapy if available (immunosuppression for autoimmune hepatitis) or general management (optimize nutrition, management of complications such as ascites, and encephalopathy). This treatment plan should include not only the primary diagnosis (eg, biliary atresia) but also any related or unrelated problems (eg, anemia, malnutrition, ascites, pruritus, psychosocial concerns). The plan also should consider the natural history of the primary disorder.

Not all pediatric gastroenterologists participate directly in immediate postoperative management in patients who have undergone liver transplantation. Additional training may be needed for trainees whose career plans require extensive expertise in the care and management of children needing a liver transplant.

In addition to the oversight provided by pediatric gastroenterologists, trainees should experience working with surgeons, radiologists, pathologists, dietitians, psychologists, and others who are expert in these fields. When liver biopsy is necessary, any results should be reviewed with a pathologist with experience in hepatobiliary diseases. Trainees also should review any radiology studies and compare their findings with those of the attending radiologist.

Trainees should understand the multidisciplinary care of patients with hepatobiliary disorders and the role of each team member in that process. This should include interaction with surgeons, radiologists, pathologists, dietitians, and psychologists/social workers, as well as collaboration with other specialists. Trainees should understand the role of surgical management and liver transplantation, including appropriate timing of interventions and options for these patients, and should collaborate closely with their surgical colleagues in this process.

Trainees should continue to be involved in the care of hepatobiliary patients, both outpatient and hospitalized patients, during the course of their 3-year training program. The main goal of this continuity is to learn about natural history of the disease, the management of disease exacerbations and complications, and to monitor for complications. They also should be encouraged to develop collaborative arrangements with other specialists who can help provide optimal care for these patients. Given the chronic nature of many of the hepatobiliary disorders, patients with these diseases will require continued expert medical care into adulthood. As such, trainees should be able to follow the sequence of steps to transition their patients' care from the pediatric to the adult gastroenterologist.

Examples of Relevant Competencies—Hepatology

Competency	Relevant areas	Recommended experience	Suggested means of evaluation
Professionalism	Understanding the ethical issues involved in the selection of candidates for liver transplant	Participation on the team evaluating patients for liver transplantation	360° evaluation with the integrated liver care team; direct observation followed by feedback; patient surveys; portfolios used for reflection
Systems-based practice	Coordination of care for complex patients	Participation in management of patients post liver transplant, if available on site; nutritional assessment and management of cholestasis in infants, including ensuring access to appropriate formulas, vitamins; delineation of treatment plan for chronic viral hepatitis	Direct observation; 360° evaluation; chart-stimulated recall; portfolios
Developmental context	Understanding the different causes of cholestasis in children of different ages	Participation in the evaluation of children with cholestasis	Exam MCQ; other written tests of knowledge; direct observation; chart-stimulated recall; use of case vignettes to assess knowledge

MCQ, multiple-choice questions.

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IBD and Immunologic Diseases

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Importance of Area

The IBDs, represented by CD, ulcerative colitis, and IBD-unspecified, are common, complex disorders treated frequently in pediatric gastroenterology practices. Advances in mucosal immunology and mechanisms of inflammation continue to shed new light on immune-mediated diseases such as autoimmune gastroenteropathy, celiac disease, allergic/eosinophilic gastroenteropathy, eosinophilic esophagitis, and GI manifestations of immune deficiency. Trainees in pediatric gastroenterology, therefore, require comprehensive exposure to the diagnosis and treatment of these disorders and their complications and a thorough understanding of their pathophysiology.

Medical Knowledge

Trainees in pediatric gastroenterology should understand the epidemiology, natural history, and complications of IBD, including the pediatric prevalence of these disorders, and the evolving literature on genetic and serologic risk factors. They also should be familiar with the current evidence regarding the pathophysiology of IBD, including the role of genetics, mucosal immunology (both innate and acquired), and the fecal microbiome.

Trainees should understand the varying clinical manifestations of these disorders. Trainees should be able to recognize typical and atypical GI symptoms of IBD, including extraintestinal presentations (growth failure, perianal disease, arthritis, osteopenia/osteoporosis, and sclerosing cholangitis). Trainees should comprehend the issues that are unique to pediatric IBD, namely, its effects on growth, nutrition, puberty, and psychosocial functioning.

They also should have a complete understanding of the diagnostic criteria that distinguish the various types of IBD, including differences in disease distribution, histology, and disease behavior. Trainees should be able to distinguish IBD from other disorders that can have similar symptoms such as irritable bowel syndrome and other functional GI disorders, infection, and autoimmune disorders.

Trainees must be familiar with the comprehensive evaluation of patients suspected to have IBD and an appropriately targeted evaluation of patients with known IBD who may be experiencing an exacerbation or complication, or who require routine monitoring (eg, colonoscopic surveillance for cancer). They should understand both the indications for and potential complications involved with the various tests that may be required. They should understand the components of an evaluation, including the following:

- Laboratory studies (eg, complete blood count, sedimentation rate, C-reactive protein and albumin, and stool studies for pathogens, white blood cells, and calprotectin or lactoferrin)
- Endoscopic evaluation, including EGD and colonoscopy
- Bowel imaging
- Small bowel series
- CT scan
- MRI
- Tagged white blood cell scans
- Capsule endoscopy

Trainees should thoroughly understand the treatment of IBD and its complications, including indications for specific medical interventions in pediatric IBD, and differences in treatment based on disease type (eg, CD vs ulcerative colitis), disease severity (eg, mild vs moderate to severe), and disease behavior (eg, IBD vs penetrating CD)

Trainees should understand the treatment of both newly diagnosed and existing patients with IBD (including the use of nutritional therapy, mesalamine, antibiotics, corticosteroids, immunomodulators, and biologic agents). Trainees must be familiar with the efficacy, dosing, adverse effects, and necessary monitoring when using these medications, particularly regarding the use of immunosuppressant medications. They should recognize the indications for surgical intervention and understand the types of surgical procedures and possible surgical complications, including pouchitis and its management. Trainees must be familiar with guidelines for cancer surveillance in the setting of chronic intestinal inflammation.

Trainees should comprehend the primary and secondary immunodeficiencies with GI manifestations, including familiarity with the innate and acquired immune mechanisms and other mucosal protective factors that operate in the normal host, as well as the clinical manifestations and diagnostic evaluation for disorders caused by deficiencies in mucosal immunity. Specific clinical entities of importance include the following:

- Antibody deficiencies
- Severe combined immunodeficiency and other defects affecting B and T cells
- Chronic granulomatous disease and other disorders of phagocytosis
- Immunodeficiencies associated with other defects

Trainees also should be aware of the secondary causes of immunodeficiency, including human immunodeficiency virus.

Trainees should have a basic knowledge of the epidemiology, clinical features, and diagnostic evaluation of the following systemic autoimmune and vasculitic processes:

- Hemolytic uremic syndrome
- Henoch-Schonlein purpura
- Behçet disease
- Kawasaki disease
- Dermatomyositis
- Mixed connective tissue disease
- Autoimmune enteropathy (either in isolation or as part of a systemic autoimmune disorder such as the autoimmune polyendocrine syndromes)

Trainees should understand the epidemiology of celiac disease and the numerous intestinal and extraintestinal symptoms and signs associated with this condition. Trainees should have expertise in the interpretation of serological testing and human leukocyte antigen typing. Knowledge regarding endoscopic evaluation, dietary management (eg, gluten-free diet), long-term follow-up, and screening for and managing disease-associated comorbidities and complications also are required.

Trainees should be familiar with the pathogenic mechanisms of food allergy and the varied GI and extraintestinal clinical features of allergic conditions. Expert understanding of the role of various diagnostic strategies should be developed, including the following:

- Elimination and challenge
- Skin tests
- Radioallergosorbent testing
- Other immunologic tests
- Other gastroenterological tests (eg, endoscopy, colonoscopy, interpretation of histological findings)

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Trainees should be familiar with the current classification and guidelines regarding the diagnosis and management of eosinophilic GI disorders. They should be aware of the latest developments in the diagnosis and management of eosinophilic esophagitis.

Trainees should be aware of the presenting signs and symptoms of autoimmune enteropathy and the diagnostic evaluation of this condition, including serum autoantibody testing and the characteristic endoscopic and histological findings. Knowledge regarding the management and prognosis of this condition is required.

Required Patient Care Experiences/Skills

Trainees should be able to take a complete history and perform a physical examination of patients with IBD or suspected IBD. They should know how to identify GI symptoms and extraintestinal manifestations, and they should be alert to nutritional concerns, psychosocial issues, and other relevant findings in these patients. Trainees should participate in the care of a sufficient number of patients with IBD to be exposed to a wide array of presentations, complications, and therapeutic interventions.

Trainees should be able to perform a history and physical examination aimed at identifying red flags for systemic autoimmune disorders or immunodeficiencies that have GI manifestations, including a careful history of prior infections, a family history of relevant hereditary conditions, and a detailed review of symptoms. Trainees should develop the clinical judgment and proper index of suspicion necessary to initiate a more thorough evaluation of these systemic illnesses when clinically appropriate (eg, younger age, suspicious findings in history).

Trainees should be able to identify patients suspected of having celiac disease and allergic GI disorders, and develop the skills to diagnose, treat, and monitor affected children appropriately. Trainees should recognize the need to coordinate multidisciplinary care when required, including consultation with allergy/immunology specialists and registered dietitians with expertise in the dietary management of allergic diseases.

Trainees should be able to recognize children with intractable diarrhea of infancy and conduct a systematic evaluation for underlying etiologies. Management of specific conditions should be initiated, including both nutritional support and medical therapy.

Trainees should be able to establish and implement an appropriate evaluation plan that may include laboratory studies, stool studies, endoscopic procedures, and radiologic imaging. They should be competent to perform endoscopic procedures in these patients, identify pertinent findings, and consult with a pathologist to review biopsy specimens. Trainees should be able to assemble the available data, assign a diagnosis, and classify the disease type, severity, and behavior.

Trainees should then establish a treatment plan, including both induction therapy and maintenance therapy, that considers not only the primary diagnosis (eg, CD) but also other related or unrelated problems (eg, anemia, malnutrition, fistula, psychosocial concerns, osteopenia). Trainees should continue to care for patients with IBD, both outpatient and hospitalized, during the course of their 3-year training program to learn about evolving phenotypes, the management of disease exacerbations, and monitoring for complications. Trainees should develop collaborative arrangements with other specialists who can help provide optimal care for these patients.

Trainees should understand the indication for endoscopy and colonoscopy in the diagnosis of GI and systemic autoimmune conditions, immunodeficiencies, and allergic disorders, and should develop the clinicopathological perspective necessary to interpret laboratory, radiologic, endoscopic, and histologic findings.

Trainees should understand the multidisciplinary care of IBD, and the role of each team member in that care, which should include interaction with dietitians, radiologists, pathologists, and psychologists/social workers. Care also may require collaboration with endocrinologists, specialists in bone metabolism, and others. Trainees should understand the indications for surgical management, appropriate timing of surgical interventions, and the surgical options for these patients, including ostomies and their care, and should collaborate closely with their surgical colleagues.

Given the chronic nature of IBD and certain other immune-mediated diseases, trainees should have the opportunity to provide longitudinal care. Furthermore, trainees should become familiar with the sequence of steps involved in the transition of care from the pediatric to the adult gastroenterologist.

Examples of Relevant Competencies—IBD and Immunologic Diseases

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Discussion of the new diagnosis of IBD with a family; explanation of therapeutic options and demonstration of understanding of patient/family concerns regarding lifelong therapy of IBD	Participation in the evaluation and management of children with newly diagnosed IBD; participation in family meetings	Direct observation by attending physician followed by feedback; patient surveys; 360° evaluation; chart-stimulated recall; OSCE; portfolios for reflection
Systems-based practice	Participating in multidisciplinary care of patients with IBD	Collaboration with surgeons, rheumatologists, endocrinologists, radiologists, pathologists, other subspecialists, nurses, dietitians, social workers, and psychologists in the care of patient; participation in team meetings	360° evaluation; including individuals from other disciplines; chart-stimulated recall
	Understanding the psychosocial, financial, and other impediments for patients with celiac disease consuming a gluten-free diet	Management of patients with celiac disease, including arranging dietary instruction, monitoring compliance, and suggesting support systems for families	Patient survey; 360° evaluation; chart-stimulated recall; portfolios
Developmental context	Understanding the different presentation of GI allergic disorders by age	Lectures, seminars, and case-based discussions, participation in the care of children with GI allergic disorders of different ages	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge

GI, gastrointestinal; IBD, inflammatory bowel disease; MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination.

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Malignancies and Premalignant Conditions of the GI Tract

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Importance of Area

Although the hereditary GI cancers and polyposis syndromes are relatively rare, they can be associated with significant morbidity for the patient and family. Because of this, the pediatric gastroenterologist plays a critical role in the diagnosis and management of patients with these disorders. An accurate diagnosis is vital to determining the prognosis and future surveillance of these children and therefore has serious medical implications for the family.

Medical Knowledge

Trainees in pediatric gastroenterology must understand the molecular genetics of hereditary GI cancer, including inheritance patterns, disease phenotypic expression, and natural history. They also must know that for autosomal dominant conditions, other family members, including parents and siblings, are at risk and should participate in genetic evaluation and screening. Understanding the importance of a multidisciplinary approach to the evaluation, diagnosis, and management of malignant and premalignant conditions of the GI tract that includes the expertise of a cancer genetics counselor, a geneticist, social worker and surgeon, is critical.

Trainees in pediatric gastroenterology should be familiar with the types and locations of malignancies of the GI tract and liver and their relative importance throughout infancy and childhood. They also should be aware of the specific presenting signs and symptoms of GI malignancies, including hormone-secreting tumors of childhood that can be of GI origin, such as carcinoid tumors, insulinomas, pheochromocytomas and other neuroendocrine tumors. With regard to each type of malignancy, they should understand how to formulate an age-specific differential diagnosis for these lesions, the medical and surgical management options, and the strategies used to detect recurrence and prevent complications.

Trainees also should have knowledge of the diseases and medical circumstances of childhood that predispose to malignancy of the GI tract, liver, and pancreas, including the following:

- Adenomatous polyp syndromes
- Hamartomatous polyp syndromes
- Other syndromes associated with the development of colon cancer
- Disorders/syndromes associated with liver tumors

With regard to polyps and polyposis syndromes, trainees should have an understanding of the following:

- The histologic criteria that differentiate adenomas from hamartomas
- The significance of GI adenomas as premalignant lesions
- How to differentiate patients with simple hamartomas from those who require additional evaluation based on family history, polyp number, or location
- The phenotype of each of the polyposis syndromes, including the genetics, natural history, extraintestinal findings, and psychosocial consequences of these diseases
- The role of endoscopic polypectomy
- The indications and timing of prophylactic colectomy when used to manage the polyposis syndromes
- The surgical options and any potential complications of these options

Trainees should recognize the importance of lifelong surveillance in the identification of new/recurrent disease or disease complications and the impact of noncompliance on these patients.

List of Required Patient Care Experiences/Skills

Trainees should be able to take a careful history, including a detailed family history, and be able to recognize the red flag features that warrant further evaluation. They also should be familiar with the indications, expected outcomes, and limitations of genetic testing and understand the importance of informed consent/assent as part of a genetic evaluation.

Trainees should be able to identify the important physical findings associated with the polyposis syndromes, including skin lesions, cutaneous and abdominal masses, and the like.

Trainees should be comfortable with the use of the following state-of-the-art imaging modalities of the abdomen and intestinal tract for diagnosis:

- UGI series
- CT and MRI
- Nuclear medicine studies
- Capsule endoscopy

Trainees should be competent in upper endoscopy and colonoscopy, both for diagnosis and therapy, including the following:

- Differentiating sessile from pedunculated polyp lesions
- Endoscopic biopsy, polypectomy, and techniques for polyp/biopsy retrieval (eg, brushings, aspirates)
- Managing the complications associated with polyp removal

Trainees must have the opportunity to review biopsies with a pathologist who has expertise in GI malignancy.

Trainees must understand how to evaluate and manage the GI complications of patients receiving therapy for cancer, including bone marrow transplantation.

Because these disorders are uncommon, trainees should use every opportunity to participate in the long-term care of children with polyposis syndromes.

Trainees should master the skills of collaborative patient management and be able to use the expertise and abilities of other team members, including genetic counselors, geneticists, surgeons, pathologists, and social workers, in the diagnosis and multidisciplinary management of malignant and premalignant conditions.

Trainees should recognize the importance of regular follow-up care and surveillance for patients with these disorders. Transition of care from pediatric to adult health care providers is of the utmost importance to ensure continuity and ongoing follow-up treatment for these patients.

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Examples of Relevant Competencies—Malignancies and Premalignant Conditions of the GI Tract

Competency	Relevant area	Recommended experience	Suggested means of evaluation
Professionalism	Discussion of hereditary issues and cancer risk of polyposis syndromes with families	Participation in family meetings, under supervision of attending physician	Patient survey; 360° evaluations; chart-stimulated recall; OSCE; direct observation followed by feedback
Systems-based practice	Participation in the multidisciplinary care of children with polyposis syndromes	Participation in team meetings and interaction with providers of consulting services	360° evaluation; including providers of consulting services; chart-stimulated recall
Developmental context	Understanding differential diagnosis of mass lesions by age and gender	Lectures, seminars, case-based discussions, management of children with possible malignancies	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge

MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination.

Nutrition

Task Force Members
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Importance of Area

Because the primary function of the GI system is as the conduit for nutrient intake, the processes involved in nutrition must be one of the core knowledge sets for the pediatric gastroenterologist.

Medical Knowledge

Pediatric gastroenterology trainees should understand the physiology involved in digestion, absorption, and metabolism of the entire range of nutrients. In addition, they should appreciate the changes in digestion and metabolism that occur during development from neonate to young adult.

Trainees should have a basic understanding of the factors that drive and affect a person's oral intake and the effect that various diseases have on appetite and intake. Knowledge of the development of the oral cavity, the basics of mastication, including teething and chewing, and the mechanisms of swallowing is essential.

Trainees should comprehend the gastric process of homogenization of ingested food with the gastric secretions and the ''grinding action'' of gastric contractions to reduce particle size as preparatory steps of digestion.

Pediatric gastroenterology trainees should understand the small intestinal processes of digestion of macronutrients (protein, fat, and carbohydrate), including the following:

- Function of digestive enzymes: salivary, gastric, intestinal mucosal (disaccharidases), pancreatic, and breast milk enzymes, with regard to site of activity, specific substrates, storage, method of activation, necessary cofactors, products of digestion
- Role of bile acids
- Method of absorption and transport of products of digestion and subsequent cellular processing, if required
- Intestinal location where digestion and absorption occur for different nutrients
- Whether the product of digestion is immediately used, stored, or processed to another form

Trainees also should have an understanding of micronutrient (vitamin and mineral) absorption, including the following:

- The specifics of the site of absorption, carriers, transporters, and subsequent cellular processing
- Dietary agents that can enhance or block absorption
- The postabsorption path of the micronutrient, any further modifications, and the subsequent use or storage of the micronutrient

A crucial nutritional concept for pediatric gastroenterology trainees is the dynamic base daily nutritional requirements for the growing and developing child, including the following (in order of importance):

- Daily fluid needs and the difference between total and intravascular fluid volumes (the most basic information)
- Daily caloric needs
- Basic requirements for protein and fat

Trainees need to know the appropriate requirements for calories, protein, and fat based on the age, nutritional status, and diagnosis of the child, and the recommended daily intakes for vitamins and minerals, as well as the changes that occur in the recommended daily intakes with age and the alterations caused by various diseases. Trainees should be aware of the disease states that can increase nutrient losses and result in deficiencies. Trainees also should comprehend the manifestations and complications of nutritional deficiencies and toxicities. The potential effect of medications on nutrient requirements also should be known.

The diseases associated with inadequate and excess nutrition intake should be understood. The signs and long-term consequences of malnutrition, including kwashiorkor, should be recognized. Fellows should know the physiology of and approach to refeeding syndrome. Understanding the consequences of excess nutrition intake and resultant obesity are crucial for pediatric gastroenterology trainees. Trainees should be familiar with the evaluation of overweight and obese children, the complications of obesity, and the spectrum of options for management, including bariatric surgery for selected adolescents.

Trainees should be able to estimate the nutritional needs of the patient using published recommendations and predictive equations, and synthesize that with a working knowledge of resting

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and total energy expenditure and how this is affected by body composition. Trainees should be aware of how disease can alter nutritional needs in patients and be able to formulate individual nutritional interventional plans, using the appropriate level of intervention for each patient's disease and nutritional status and applying longitudinal assessment, growth measures and anthropometrics, to monitor the patient's ongoing nutritional status.

Trainees should be familiar with the nutritional content of breast milk, infant formulas, and the enteral nutrition products used in pediatrics. Trainees should have a working knowledge of lactation and support of the breast-feeding mother. They also should know the supplements and additives and how to modify breast milk or formulas to meet a recognized nutritional need in a patient. Trainees should understand enteral access devices, their placement (including documentation), care, and complications. Trainees must be able to select the correct formula and know the standard and disease-specific and metabolic-specific formulas. Trainees should know how to administer enteral nutrition, including bolus, and continuous drip, and how to transition feedings. Trainees also should be cognizant of drug–nutrient interactions in patients.

Trainees should understand the indications for parenteral nutrition. They should have a working knowledge of principles of vascular access, including the placement, care, and complications of vascular access devices. Trainees should be familiar with the basic formulations of parenteral nutrition, including the adjustments needed for various disease states. They should be aware of the appropriate monitoring for patients on parenteral nutrition, including acute, chronic, and home administration. Trainees should know the complications of parenteral nutrition, including the following:

- Metabolic complications (including gallstone and bone disease)
- Parenteral nutrition–related liver disease
- Mucosal atrophy
- Micronutrient deficiencies and manifestations
- Central line sepsis and mechanical complications

Pediatric gastroenterology trainees should know the specific nutrition requirements and nutritional interventions in the following disease states:

- Short bowel syndrome
- Cystic fibrosis
- Diarrhea, acute and chronic
- Celiac disease
- Pancreatic insufficiency
- Pancreatitis
- GI allergy
- Hepatobiliary disease
- IBD
- Functional bowel disorders
- Motility disorders
- Immunocompromised disorders
- Eating disorders

Required Patient Care Experiences/Skills

Pediatric gastroenterology trainees should be able to elicit a comprehensive nutritional history and assess the patient's nutritional status on physical examination.

Trainees should be able to apply other tools to assess nutrition status:

- Growth measures (growth charts, including disease specific)
- Anthropometrics
- Laboratory studies (including interpretation and understanding limitations)
- Indirect calorimetry
- Dual-energy x-ray absorptiometry

Pediatric gastroenterology trainees must have longitudinal experience caring for children with nutritional problems. Trainees need to evaluate and treat patients with feeding problems. Fellows must design nutritional interventions for children with malnutrition and obesity and then monitor the responses over time.

Trainees must prescribe appropriate enteral and parenteral nutrition therapy for patients with nutritional needs. They must request the appropriate monitoring for the therapy they have prescribed.

Trainees should be able to participate as a member of a multidisciplinary team (registered dietitians, pharmacists and nursing) and use the team to provide nutrition support to pediatric patients.

Examples of Relevant Competencies—Nutrition

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Informing a family of the need to intervene to provide a child's nutritional needs and selecting intervention in light of a family's abilities and other responsibilities	Trainees will work with pediatric gastroenterology staff and a nutrition support team (if available) in the care of children with nutrition needs and participate in team meetings	Patient survey; direct observation followed by feedback; 360° evaluation; chart-stimulated recall; OSCE; portfolios for reflection
Systems-based practice	Using the data from dietary, nursing, and outside sources to assess patient nutritional status; understanding how to engage home care resources to provide services and monitor patients	Trainees will work with a multidisciplinary team to longitudinally study patients with nutritional difficulties, including patients requiring home nutritional support on a long-term basis	360° evaluation; chart-stimulated recall; portfolio of cases
Developmental context	Trainees will recognize the appropriate changes in nutritional needs with growth and be able to adjust enteral and parenteral nutrition over time	Longitudinal exposure in clinical setting to patients with various disease states and accompanying nutritional needs	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge

MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination.

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Pancreatic Disease

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Importance of Area

Pancreatic diseases are a combination of congenital, genetic, and acquired disorders that are becoming more prevalent in pediatric GI practice. Therefore, trainees should understand the normal development and physiology of the pancreas and should have a comprehensive knowledge of the diagnosis and treatment of acute and chronic pancreatitis and of pancreatic insufficiency.

Medical Knowledge

Trainees in pediatric gastroenterology should have a clear understanding of basic pancreatic exocrine physiology and changes with development, including the following:

- Development of pancreatic secretion
- Age-related differences in pancreatic enzyme secretion
- Mechanisms of pancreatic enzyme activation
- Cofactors important for enzyme function
- Hormonal and dietary stimulants of pancreatic secretion

Trainees should comprehend the normal development of pancreatic structures with a particular focus on important clinical variants, such as the following:

- Pancreas divisum
- Annular pancreas
- Pancreatic agenesis
- Pancreatic rests
- Other anatomic variants (eg, congenital cysts, long common channels)

Trainees should be familiar with the clinical presentations that would raise clinical suspicion for these entities and understand diagnosis using imaging and endoscopic techniques and surgical or medical interventions to treat these abnormalities, when needed.

Trainees should be familiar with genetic causes of pancreatic insufficiency, including syndromic disorders (eg, Johanson-Blizzard, Shwachman-Diamond, and Ivemark) and metabolic disorders (eg, Pearson and other mitochondrial disorders, organic acid disorders).

Particular attention should be paid to cystic fibrosis (CF), its epidemiology, natural history, and GI complications, with a strong focus on pancreatic insufficiency. Knowledge of this area should include understanding the evaluation and diagnosis of pancreatic insufficiency, clinical consequences of pancreatic insufficiency, and appropriate treatment strategies, including understanding the appropriate dosing of enzymes and relating this to the normal physiology of enzymatic action.

Trainees should be aware of the specific GI complications of CF and the treatment options for each. This should include knowledge of the natural history of liver disease and portal hypertension and the specific role of liver transplantation and treatments for portal hypertension in CF. They should be aware of fibrosing colonopathy, meconium ileus, distal intestinal obstruction syndrome, rectal prolapse, and acute pancreatitis, including evaluation and treatment options for each of these.

Trainees should understand and be able to develop a comprehensive approach to diagnosis and treatment of acute pancreatitis. This approach requires knowledge of potential causes, including the following:

- Age-appropriate considerations
- Assessment of potential acute complications (eg, hemorrhage, necrosis, shock, pleural effusion, peripancreatic fluid collections, hypocalcemia, lipid abnormalities, insulin insufficiency)
- Clinical (and radiographic) assessment of severity (eg, Atlanta criteria, Ranson's criteria, modified Glasgow scale)

They should be knowledgeable about the potential predictors of prognosis (recognizing that these have not been validated in children) and understand the indications for different methods of nutritional support, treatment with antibiotics, and surgery.

Trainees should understand and develop a comprehensive approach to the diagnosis and treatment of chronic pancreatitis. They should be well versed in the methods of diagnosing morphological changes in the pancreas and for diagnosing pancreatic insufficiency. Particular attention should be paid to the following findings:

- Chronic pain
- Pancreatic exocrine and endocrine insufficiency
- Progressive pancreatic ductal changes and pseudocyst formation,
- The role of MRCP, ERCP, endoscopic ultrasound (EUS), and surgery in the management of these problems

Trainees should be familiar with the influence of genes on pancreatitis (both acute and chronic) and knowledgeable about hereditary or familial pancreatitis, including the following:

- Epidemiology
- Pathophysiology
- Genetic basis
- Natural history and complications
- Potential interventions or treatments for complications

This would include knowledge of appropriate approaches to diagnosis, uses of imaging modalities, and long-term treatment and monitoring. They should understand the role of other genetic risk factors for the development of pancreatitis. Trainees should be taught the ethics and ramifications of genetic testing in patients and their relatives for those diseases.

Required Patient Care Experiences/Skills

Caring for patients with CF, acute pancreatitis, and chronic pancreatitis by mentored teaching and oversight by pediatric gastroenterologists is desirable. Trainees should be able to perform a complete history and physical examination to identify issues relevant to the clinical problems of acute and chronic pancreatitis, and pancreatic insufficiency (eg, CF). For patients with acute pancreatitis, trainees should be able to provide careful consideration of the following:

- Potential etiologies and complications
- Pain assessment
- Evaluation for potential complications on examination
- Assessment of potential psychosocial or nutritional issues that are relevant (eg, obesity, severity of pancreatitis)

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They should be able to establish an appropriate evaluation plan that includes laboratory studies to identify complicating factors, imaging studies, and diagnostic tests. Trainees should be able to define areas of concern or a problem list and develop a clear and specific approach for treatment and evaluation of each entity.

Trainees also should be able to develop appropriate evaluation plans for patients having pancreatic insufficiency and chronic pancreatitis, and they should be able to apply and synthesize the findings for these patients, and provide specific care plans for these patients. Patient care also should include emphasis on appropriate collaborations with surgeons, radiologists, pulmonologists, intensivists, dietitians, mental health professionals, and pain management specialists, as indicated by disease severity or complications.

Trainees should have the opportunity to manage patients with chronic pancreatitis over time and to reevaluate patients with acute or recurrent pancreatitis after the acute episode has subsided.

Examples of Relevant Competencies—Pancreatic Disease

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Approach to life-threatening acute pancreatitis or genetic disorders, with possible long-term implications	Participation in family meetings under supervision of attending physician	Patient survey; direct observation followed by feedback; 360° evaluation; chart-stimulated recall; OSCE; use of portfolios for self-reflection
Systems-based practice	Participating in the multidisciplinary care of children with CF	Participation in team meetings, consultation with other services	360° evaluation, including members of other services; chart-stimulated recall
	Coordination of the care of patients with acute pancreatitis	Consultation with other services, discussion with support services	360° evaluation, including members of other services; chart-stimulated recall
Developmental context	Understanding the different presentations of CF at different ages	Lectures, seminars, or case-based discussions; participation in the care of patients with CF of different ages	Exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge

CF, cystic fibrosis; MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination.

Peptic Disease

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Importance of Area

Because acid peptic diseases are among the most common conditions treated in pediatric gastroenterology practice, trainees in pediatric gastroenterology require comprehensive exposure to the diagnosis and management of these conditions and should have a thorough understanding of their pathophysiology.

Medical Knowledge

Trainees in pediatric gastroenterology should understand the anatomy, physiology, and development of the esophagus, stomach, and duodenum as they relate to acid peptic conditions. They also should have a clear understanding of the pathophysiology of acid peptic disease in the esophagus, stomach, and duodenum, including the following:

- Developmental factors
- Hypersecretory states, such as those resulting from derangements in the secretion of GI hormones
- Disruption of mucosal protective mechanisms

Trainees should understand the natural history, epidemiology, presentation, and complications of acid peptic diseases, including peptic ulcer disease, *H pylori*–associated gastritis, and GERD. They should be familiar with the extraesophageal manifestations of GERD. Trainees should be knowledgeable regarding differences in presentation of conditions in the differential diagnosis of acid peptic diseases, including the following:

- Functional dyspepsia
- Other causes of vomiting, including serious disorders such as brain tumors
- Eosinophilic esophagitis
- Infectious esophagitis, gastritis
- Other causes of GI tract inflammation (eg, CD, celiac disease)
- Eating disorders
- Symptom falsification (by the patient or the patient's caregiver)

Trainees must be proficient in the evaluation of acid peptic diseases and should have a complete understanding of all diagnostic approaches for acid peptic disorders in children, including indications, contraindications, benefits, costs, limitations, and interpretation. These diagnostic approaches include the following:

- Empiric therapeutic trials
- Esophageal pH and impedance monitoring
- UGI fluoroscopy
- Gastric scintiscans
- Tests for *H pylori*
- Interpretation of gross endoscopic findings (eg, ulcers, nodular gastritis, eosinophilic esophagitis)
- Mucosal histopathology

Trainees should understand the treatment of acid peptic diseases and their complications and should be knowledgeable about the nonmedical options for treating acid peptic diseases (eg, positioning, lifestyle modifications, pharmacotherapy). Trainees should have a clear understanding of the effects of body weight and age on drug dosing, pharmacology, efficacy, adverse reactions, interactions, and contraindications of medications, including the following:

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- Antacids
- H2-receptor antagonists
- Proton pump inhibitors
- Mucosal protective agents
- Prokinetic drugs
- Antibiotic regimens used to treat *H pylori*

Trainees should comprehend the roles of therapeutic endoscopy and surgery in the treatment of acid peptic disease and their complications. They should be knowledgeable about surgical approaches for the treatment of GERD and endoscopic approaches to the management of complications of GERD, including the various procedures, risks, benefits, and short- and long-term complications.

Required Patient Care Experiences/Skills

Trainees should be able to take a complete history and perform physical examinations on patients with suspected acid peptic diseases. They should be able to identify clinical symptoms of acid peptic diseases, including typical symptoms of peptic ulcer disease and GERD, as well as symptoms of possible complications, such as respiratory; ear, nose, and throat; and behavioral manifestations of GERD. Trainees should participate in the evaluation and management of a sufficient number of patients with acid peptic disease to be exposed to a wide array of presentations, complications, and therapeutic interventions.

Trainees should be able to establish and implement an appropriate evaluation plan that may include the following:

- Empiric medication trials
- Laboratory studies
- Esophageal pH and/or impedance monitoring
- Endoscopic procedures
- Radiologic imaging

Trainees should perform and interpret esophageal pH and impedance monitoring. They should perform supervised endoscopic procedures in these patients, and identify pertinent findings. In conjunction with the pediatric gastroenterologist, trainees should then assemble the available data, assign a diagnosis, and assess the severity and complications of the disease or disorder. Following assessment and diagnosis, trainees should then establish a treatment plan.

Trainees should be encouraged to collaborate with other specialists who can help provide optimal care for these patients. If a biopsy is indicated, biopsy specimen findings should be reviewed with a pathologist experienced in the interpretation of histopathologic findings in acid peptic diseases. Trainees should review any radiologic studies in conjunction with a radiologist experienced in interpreting these findings in acid peptic diseases. Trainees should participate in combined conferences (eg, GI pathology, GI radiology) to provide additional education regarding these unique aspects of the diagnostic evaluation.

Trainees should continue to be involved in the care of patients with acid peptic disease during their course of their training to learn about the long-term course and manifestations of these conditions, including evolving complications.

Examples of Relevant Competencies—Peptic Disease

Competency	Relevant area	Recommended experience	Suggested means of assessment
Systems-based practice	Participation in the multidisciplinary care of patients with complicated GER	Observation of and discussion with providers of other services relevant to care (eg, radiology, pathology, surgery, nutrition, nursing, social work)	360° evaluation, including providers of consulting services; chart-stimulated recall
	Providing cost-effective care of patients with acid peptic disease, including diagnosis and management, especially with regard to proton pump inhibitor prescription	Evaluation and management of patients with peptic disease, with knowledge of insurance company guidelines on endoscopy preapprovals and medication use	Chart-stimulated recall; portfolios
Developmental context	Understanding the different presentations of GERD by age and appropriate management	Lecture, seminars, or case-based discussion, management of patients with GERD across ages and stages of development	Direct observation; exam MCQ; chart-stimulated recall; use of case vignettes to assess knowledge

GERD, gastroesophageal reflux disease; MCQ, multiple-choice questions.

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Short Bowel Syndrome and Intestinal Failure

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Importance of Area

Although the congenital and acquired lesions that result in short bowel syndrome (SBS) are rare, children continue to experience this complication, and optimal medical care can make a substantial impact on the child's quality of life. This also is a disorder for which a multidisciplinary approach is critical. Finally, understanding the approach to patients with SBS can be useful in the evaluation and management of other patients with malabsorption or maldigestion.

Medical Knowledge

Trainees should understand that intestinal failure is the result of an insult to the bowel that occurs either as a result of congenital anomalies (eg, gastroschisis, intestinal atresia, malrotation and volvulus, Hirschsprung disease) or as a result of an acquired catastrophe (eg, necrotizing enterocolitis, mesenteric thrombosis, trauma, CD). The loss of bowel obligates nutrition support for a variable period to allow for adaptation of the intestine. Failure of this process may result in permanent intestinal failure and a long-term requirement for parenteral nutrition and prompt consideration of intestinal transplantation. Trainees should be aware that there are other conditions that result in intestinal failure that require similar multidisciplinary diagnostic and management skills (eg, intestinal pseudoobstruction syndromes, inflammatory disorders), but these are covered elsewhere in these training guidelines.

Trainees should thoroughly comprehend the following:

- Basic embryology and anatomy of the GI tract
- The processes of rotation and fixation of the gut during fetal development
- The physiology, cell biology, immunology, endocrinology, and biochemistry of intestinal absorptive, secretory, motor, and sensory functions and how these change with development
- The regulation of growth of the intestine and of the processes of gut adaptation after acute and chronic injury

Trainees in pediatric gastroenterology should understand the epidemiology and natural history of intestinal failure and recognize the complications of this syndrome, particularly in relation to the overall prognosis for rehabilitation of the gut. Trainees should be aware of the importance of such factors as the following:

- The length of the small intestine
- The physiologic significance of loss of the ileum in terms of adaptation versus loss of the jejunum
- The role of the colon and of the ileocecal valve
- The contribution of bowel obstruction, bloodstream infection, percentage of enteral feeding, and the composition and delivery of parenteral nutrition in the genesis and evolution of cholestasis

Trainees should be familiar with the early postsurgical consequences of the syndrome (eg, fluid–electrolyte imbalance in the ostomy patient), surgical (eg, obstruction, fistulas) and medical complications (eg, hypergastrinemia, total parenteral nutrition [TPN]–associated cholestasis), and the long-term consequences of a short bowel (eg, intestinal failure, nutritional deficiencies, bloodstream infection, bacterial overgrowth, difficult vascular access, GI bleeding, portal hypertension, liver failure). Because patients with intestinal failure require nutritional support, including both parenteral and enteral nutrition using defined formulas, trainees must become thoroughly conversant with the indications for and composition and prescription of parenteral nutrition solutions and formulas as developmentally appropriate.

Trainees should understand the indications, technique, and interpretation of the various diagnostic modalities used in the evaluation and management of the patient with intestinal failure. Diagnostic modalities include the following:

- Endoscopy of the UGI and LGI
- Capsule endoscopy
- Liver biopsy
- UGI and LGI contrast imaging
- CT and MRI scanning
- US techniques, including Doppler imaging

Trainees should comprehend the histopathologic interpretation of surgical specimens, endoscopic mucosal biopsies, and liver biopsies.

Trainees should also be familiar with the medical management of the patient in terms of the provision of nutritional support, prevention of nutritional deficiencies, monitoring and interpretation of growth parameters, and the use of pharmacologic interventions to treat the various complications of SBS. Trainees should have a specific understanding of the management of bacterial overgrowth (including D-lactic acidosis), cholestasis and chronic liver disease, and central venous lines (including prevention and treatment of bloodstream infections).

Because the management of SBS involves close collaboration with the pediatric surgical team, trainees should know the surgical management options for SBS and be thoroughly cognizant of the indications for their use. Relevant surgical procedures include the following:

- Ostomy creation and management
- Bowel reanastomosis
- Fistula management
- Tapering and lengthening operations
- Assessment and management of bowel obstruction
- Vascular access techniques
- Gastrostomy insertion
- Management of strictures (both anastomotic and otherwise)

Trainees also must understand the factors that affect the timing and selection of patients for intestinal transplantation, such as TPN-associated cholestasis, difficult vascular access, and recurrent bloodstream infection. Trainees should be cognizant of the current indications for the various types of intestinal transplantation available and understand the anatomic considerations involved in the choice of operation. Trainees also should be aware of the common complications following transplantation of the bowel, including surgical postoperative issues (eg, bleeding, thrombosis, wound infection, compartment syndrome), rejection, infection, and long-term complications (eg, renal dysfunction, growth failure, hypertension, diabetes, and posttransplant lymphoproliferative syndrome). Trainees should also understand the histopathologic diagnoses of intestinal rejection and opportunistic infections.

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Trainees should recognize that the chronic nature of this syndrome requires an understanding of the influence of SBS or intestinal failure on the growth and development of the child, and on the child's functioning within the context of family and society. Care for these patients involves a multidisciplinary hospital and community-based team (eg, GI physicians, general surgeons, transplant surgeons, infectious disease specialists, dietitians, nurse practitioners, pharmacists, social workers, psychologists, home care providers, and rehabilitation specialists [eg, feeding specialists, physiotherapy, occupational therapy]).

Required Patient Care Experiences/Skills

Trainees should be able to take complete histories and perform thorough physical examinations of patients with intestinal failure in sufficient numbers to allow them to be comfortable and competent in assessing such patients. Trainees should be able to identify all of the relevant problems, including GI symptoms, extraintestinal manifestations (eg, liver disease), and nutritional, growth, and psychosocial concerns. They should have exposure to a sufficient number of patients that they are able to assess underlying pathophysiology and potential complications and decide on appropriate diagnostic and therapeutic modalities.

Trainees should be able to formulate a comprehensive evaluation and treatment plan for the patient that encompasses the complete problem list. Trainees should be able to apply and synthesize the findings from laboratory studies, urine and stool testing, endoscopic procedures, liver biopsy, radiologic imaging, and pathologic interpretation. Supervised by an attending pediatric gastroenterologist or surgeon, trainees should perform endoscopic and biopsy procedures in these patients and identify pertinent findings. Trainees should review all radiology and pathology studies and compare their findings with the official radiology or pathology report.

Trainees should participate in multidisciplinary diagnostic conferences with experts from surgery, radiology, and pathology. They should have the opportunity to lead the multidisciplinary team as their training and level of competence increases. Trainees should then assemble the available data to refine the diagnosis and problem list, classifying it in the order of priority assigned. Trainees should then develop a comprehensive treatment plan, taking into account all of the problems defined on the problem list, ordered as to priority. The treatment plan should therefore encompass both the primary diagnosis (eg, admission for line-associated bloodstream infection in SBS) and other problems (eg, malabsorption, nutritional support, TPN-associated cholestasis, psychosocial concerns).

Trainees should be involved in the care of patients having intestinal failure over time, including both inpatients and outpatients, and they should be allowed to participate in the coordination of the community care of such patients. Treatment and care should be carried out by pediatric gastroenterologists, by all members of the multidisciplinary team, and by families in a comprehensive manner, always based on patient-centered care in the context of the family.

Examples of Relevant Competencies—Short Bowel Syndrome and Intestinal Failure

Competency	Relevant area	Recommended experience	Suggested means of assessment
Professionalism	Presentation of the diagnosis of intestinal failure and implications to the family; discussion of the option of transplantation, if appropriate	Participation in family meetings under the supervision of attending physician	Patient survey; direct observation followed by feedback; 360° evaluation; chart-stimulated recall; OSCE; portfolios for self-reflection
Systems-based practice	Participating in multidisciplinary care of patients with intestinal failure	Participation in, discussion with, and, ultimately, leadership of the multidisciplinary care team; interaction with consultants	360° evaluation, including consulting providers; chart-stimulated recall
	Effective use of community resources in the management of patients with intestinal failure	Communication with members of the community team and home care services/companies (eg, nursing, TPN, enteral feeding, rehabilitation team, insurance companies); telephone consultation; follow-up clinics; videoconferencing	360° evaluation, including consulting providers; chart-stimulated recall; portfolios
Developmental context	Understanding of the age-related psychosocial issues (eg, school attendance)	Participation in discussion of these issues in multidisciplinary team and family meetings; interaction with psychologists and social workers; lectures, seminars, and case-based discussions	Chart-stimulated recall; 360° evaluation; use of case vignettes to assess knowledge/understanding
	Understanding of changing nutritional requirement with growth and development	Lectures, seminars, and case-based discussions; participation in the long-term nutritional management of patients with SBS; ongoing nutritional assessment and monitoring of growth	Exam MCQ; chart-stimulated recall; case vignettes

MCQ, multiple-choice questions; OSCE, Objective Structured Clinical Examination; SBS, short bowel syndrome.

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3. TRAINING IN ENDOSCOPY AND RELATED PROCEDURES

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Significance, Goals of Training, and Definitions

Pediatric GI endoscopy is a fundamental tool for the diagnosis and management of pediatric patients with GI disorders. All pediatric gastroenterologists must have the cognitive and technical expertise to diagnose and treat disorders of the GI tract, hepatobiliary system, and pancreas.

In the past, routine diagnostic and particularly therapeutic endoscopic procedures were less commonly performed in pediatric patients because of patient size and equipment-related issues in addition to the infrequent occurrence of certain disease states in the pediatric age group. The current practice of pediatric gastroenterology, however, necessitates that such training occur routinely during fellowship.

Diagnostic competence is defined as the ability to recognize abnormalities and to understand the pathologic features of the lesions that can occur. *Therapeutic competence* is the ability to recognize whether a therapeutic procedure is indicated in a given patient and the ability to perform that procedure safely and successfully in pediatric patients.

Routine pediatric upper and lower endoscopy for diagnostic or therapeutic purposes, including treatment of a bleeding lesion if indicated, requires appropriate pediatric specialty training to achieve the basic and clinical knowledge, judgment skills, and technical competence that enable safe and effective performance of these procedures in pediatric patients. Three levels of endoscopic training are recognized:

- Level 1 trainees should achieve competence in the procedural skills of diagnostic and therapeutic endoscopy in pediatric patients to provide comprehensive care to pediatric patients with GI disorders.
- Level 2 training encompasses new, advanced, or higher-risk endoscopic or related procedures performed primarily by pediatric gastroenterologists to care for children with complex conditions.
- Level 3 training is recommended for those who plan to perform specialized endoscopic procedures required for the care of patients with particularly complex disorders. In some cases level 3 procedures are required for the care of a pediatric gastroenterology patient, but a pediatric gastroenterologist may not be the physician performing the procedure because of specialized training or equipment required for the procedure.

Procedures that fall under the categories of level 1 (routine) and level 2 (complex) and level 3 (advanced) training are shown in Table 1.

A fully trained pediatric gastroenterologist must have both diagnostic and therapeutic competence for the procedures outlined for the level 1 trainee. Advanced endoscopic procedures should be mastered by level 2 or level 3 trainees who seek to become experts in pediatric endoscopy. Competence in some of these procedures may require additional training that is not available in many pediatric gastroenterology training programs. This in large part relates to the infrequent occurrence in pediatric patients of some of the conditions that require therapeutic endoscopy. As a result, collaboration with adult or pediatric expert endoscopists either during or after training may be required at some institutions for pediatric endoscopists to have adequate experience in some advanced endoscopic procedures.

Training Process

Level 1: Basic Training for All Trainees

Level 1 trainees should demonstrate excellence in general clinical pediatric gastroenterology, including cognitive and technical skills. The training program should provide a balanced view of the relation between diagnostic and therapeutic procedures and clinical problem solving and should enable development of excellent skills in conducting pediatric endoscopic procedures.

Expertise in pediatric endoscopic procedures requires technical, diagnostic, and therapeutic competence in routine endoscopic procedures. Trainees should perform endoscopic procedures with pediatric gastroenterologists primarily and learn the indications for and the technique of performing each procedure, documenting the results, and understanding the clinical significance of the findings. Essential components of patient safety during endoscopic procedures must be mastered, including the intravenous administration of medications that produce conscious sedation, if this method of sedation is used at the training site or will be used in practice, and the application and interpretation of noninvasive patient monitoring devices. In institutions in which general anesthesia is used primarily or routinely, trainees also should be familiar with the indications for and the risks, benefits, and alternatives of general anesthesia, including an understanding of the American Society for Anesthesiology classification as it applies to pediatric patients. Trainees should be competent in basic life support and have the opportunity to achieve certification in pediatric advanced life support. Trainees must be familiar with the current American Heart Association guidelines for antibiotic prophylaxis for pediatric patients undergoing endoscopic procedures (1). Trainees should be familiar with the care, cleaning, and proper maintenance of endoscopy equipment and be aware of procedures and policies for the prevention of transmission of infection by endoscopy.

Technical skills for endoscopic procedures must be acquired in a sequential fashion. Proficiency develops as an incremental process through performance of a sufficient number of procedures under direct supervision in a methodical sequence of increasing complexity. After suitable supervision, trainees should be capable of independently performing routine endoscopic procedures, including specific therapeutic maneuvers (eg, polypectomy, foreign body removal) when indicated (Table 1).

After completion of a training program in pediatric gastroenterology, level 1 trainees should be able to do the following:

- Recommend endoscopic procedures on the basis of personal consultation and consideration of specific indications, contraindications, and diagnostic and therapeutic alternatives
- Counsel the pediatric patient and family on bowel preparation and other preprocedure requirements as indicated
- Select and apply appropriate sedation as indicated
- Identify age-, size-, and condition-appropriate endoscopy equipment
- Perform each indicated procedure safely, completely, independently, and expeditiously
- Interpret and describe endoscopic findings accurately
- Integrate endoscopic findings or therapy into the management plan

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- Understand the inherent risks of endoscopic procedures, and counsel the patient and family on the expected risks of, benefits of, and alternatives to various procedures
- Recognize personal and procedural (including equipment) limitations and know when to request assistance
- Recognize and manage complications, including requesting assistance from colleagues in related disciplines such as pediatric anesthesia, critical care, pediatric surgery, or adult gastroenterology as required
- Know how to clean and maintain endoscopic equipment and be familiar with The Joint Commission and institutional standards for quality improvement, infection control, sedation, and monitoring
- Understand how an endoscopy unit is run, including how the unit interfaces with the inpatient and outpatient gastroenterology practice and other services (including pediatric anesthesiology)

All trainees should achieve competence in procedures, including EGD, EGD with foreign body removal, EGD with control of variceal and nonvariceal bleeding, diagnostic colonoscopy (including intubation of the terminal ileum [TI]), and colonoscopy with polypectomy before completion of fellowship training. It is desirable that additional experience and training in some level 2 procedures be obtained during or after the completion of the fellowship to achieve minimal threshold experience in certain procedures. These procedures may include percutaneous endoscopic gastrostomy tube placement, percutaneous liver biopsy, pneumatic dilation for achalasia, endoscopic dilatation of strictures, wireless capsule endoscopy, and endoscopic placement of feeding tubes and catheters. Other level 2 or 3 procedures such as ERCP, balloon enteroscopy, and advanced hemostatic techniques may require additional training to achieve minimal threshold numbers to achieve competence. The minimum number of procedures recommended to be performed by all trainees before competence can be achieved is noted in Table 1. These numbers supersede the numbers recommended previously (2). In addition, it is the consensus of the guidelines task force that performance of a sufficient number of procedures alone is not the sole criteria for competence. Competence comprises an adequate knowledge base, adequate procedural performance, and judgment by the evaluator or training program director in the case of trainees that an individual has sufficient skills for appropriate and safe performance of a given procedure.

Specific Issues in Procedural Training

Competency in Colonoscopy

Technical competency in colonoscopy has been variably defined and includes a 90% to 95% cecal intubation rate based on published success rates of staff gastroenterologists (3,4). Early adult and pediatric endoscopy training guidelines recommending a minimum of 100 supervised colonoscopies for competency were estimates based on expert opinion. Since publication of these guidelines, a number of prospective studies have been performed to address the validity of these recommendations. The majority have involved procedures performed in adults. In 1 study, trainees could reach the cecum without assistance >80% of the time after 50 colonoscopies, but the success rate did not increase significantly by 100 procedures (5). Another study showed an 84% success rate of trainees at 120 colonoscopies (6). A large, multicenter study involving 135 trainees determined that the 90% success rate was not achieved until 140 colonoscopies (3). Regression analysis of 10 adult studies involving 189 trainees showed that a 90% success rate was reached at 341 colonoscopies (7).

Care must be exercised when establishing rigid guidelines for competency in pediatric colonoscopy. Although desirable, it is unlikely that trainee competency will reach that of experienced endoscopists during a 3-year fellowship program (8). Although this guideline recommends a minimal number of procedures to achieve competency, the committee recognizes the limitations of recommending a minimum number because of variable technical abilities among trainees. This is further complicated because the indications for colonoscopy and number of colonoscopies performed in children are much fewer than those in adults. Some pediatric programs may be challenged to have a sufficient numbers of colonoscopies available for trainee participation to reach a minimum number of procedures. Despite these limitations, large pediatric gastroenterology training programs have reported cecal intubation success rates of > 90% in colonoscopies involving fellows in their second and third year of training commensurate with the adult standard (9). Methods to augment training are described below. Use of a simulator before performing procedures on patients has been shown to increase success rates of complete colonoscopic examination by 36% (10). Despite the challenges outlined above, adequate training in pediatric colonoscopy is a requisite for trainees in pediatric gastroenterology, and the committee recommends that a minimum of 120 colonoscopies or a consistent 90% cecal intubation rate be achieved by the completion of fellowship training.

A unique component of pediatric colonoscopy is the need for TI intubation based on the differing indications for colonoscopy in children compared with adults. This is especially important in the evaluation of pediatric inflammatory bowel disease. Because a significant portion of adult colonoscopy procedures relate to colon cancer screening, TI intubation is not mandated by current adult guidelines. This standard may be evolving because recent guidelines for colonoscopy in adults mandate identification of the cecal strap, appendiceal orifice, and ileocecal valve to ensure complete colonoscopy (11). TI intubation is another potential indicator of complete colonoscopy. Less data are available on the rates of TI intubation compared with cecal intubation, with success rates of 72% to 97% reported, depending on the level of training (12,13). A success rate of 88% was achieved in 40 pediatric colonoscopies performed by pediatric gastroenterologists and a single fellow (14). In a single-center study of 60 pediatric colonoscopies, TI intubation was achieved in 83% of patients. In that series, in half of the patients in whom TI intubation was not achieved (8% of the total patients), this was a result of TI narrowing from CD (9). In 5% of the patients, TI intubation resulted in the diagnosis of CD disease that would not have been established by complete colonoscopy alone (9). Although these guidelines do not specify a rate of TI intubation that should be achieved, this technique routinely should be taught to trainees in pediatric gastroenterology and is a component of the suggested colonoscopy evaluation tool at the end of this document.

Training in Percutaneous Liver Biopsy

Percutaneous liver biopsy is an important tool in the management of infants, children, and adolescents with jaundice or abnormal liver function tests. Traditionally, 2 methods of obtaining liver tissue for histologic evaluation have been available. These were percutaneous liver biopsy performed typically by a pediatric or adult gastroenterologist and open liver biopsy performed by a pediatric surgeon or transplant surgeon. US guidance by pediatric and adult radiologists subsequently emerged as a method to mark the biopsy site before or at the time of liver biopsy in attempt to improve the safety of the procedure (15). Percutaneous liver biopsy can be associated with a variety of complications, including bleeding, need for blood transfusion or surgery to control postbiopsy bleeding, pneumothorax, and other severe complications. US

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guidance has been shown to optimize the site in up to 25% of pediatric patients undergoing percutaneous liver biopsy (15). In some centers with advances in interventional radiology, percutaneous liver biopsies have been performed in an increasing fraction of cases by pediatric or interventional radiologists. In other centers, the majority of pediatric liver biopsy procedures are performed by pediatric gastroenterologists, with or without US guidance, depending on historical practice patterns, physician and patient preference, and/or local resources (15–18). Current guidelines for training in pediatric gastroenterology should reflect this variable practice pattern. Guidelines in training for adult gastroenterologists also have been modified because of this trend (19).

All trainees in pediatric gastroenterology, hepatology, and nutrition must understand the indications, contraindications, complications, and interpretation of liver biopsy. In addition, they must understand the limitations of liver biopsy and understand alternative imaging and testing options. They must have adequate exposure to the immediate pre- and postprocedure care of the pediatric patient undergoing liver biopsy. Regardless of whether the liver biopsy is performed by a pediatric gastroenterologist, radiologist, or surgeon (open biopsy) in the vast majority of cases, care of the pediatric patient who has undergone a biopsy will be under the direct supervision of a pediatric gastroenterologist; therefore, even if trainees do not perform the procedure, familiarity with all of the aspects of the procedure is required.

Because percutaneous liver biopsy is a blind procedure even if US or other imaging is performed, the complication rate of this procedure is higher than that associated with diagnostic endoscopy in pediatric patients (15). As such, trainees who elect to perform liver biopsy that has been designated a level 2 procedure as defined above must have an adequate minimal number of procedures to achieve competency as has been outlined for endoscopy. For the purposes of this guideline, the minimal number of procedures that trainees should perform is 15. The majority of these procedures should be performed in patients 21years old or younger.

Some trainees may elect to not perform liver biopsies during their training. Additionally, some programs may elect to not train fellows in the technique of percutaneous liver biopsy. Those trainees must still understand the indications, contraindications, complications, and interpretation of liver biopsy and the periprocedural management. In addition, if individuals wish to perform liver biopsy after completion of training but have not achieved an adequate number of procedures to achieve competency during training, they should be mentored by a pediatric gastroenterologist, adult gastroenterologist, or other appropriate physician, depending on their practice location, until adequate numbers are obtained.

Methods to Augment Training

Training in Collaboration With Adult Endoscopy Units

Although endoscopic competency is reflected more accurately by skill acquisition rather than absolute number of procedures performed, the volume available to trainees may need supplementation, depending on the training environment. Collaboration with endoscopy units serving adult populations is a satisfactory way for pediatric trainees to improve technical skills and increase exposure to certain level 1 procedures such as colonoscopy, polypectomy, and endoscopic hemostasis. If desired, experience in level 2 or 3 advanced endoscopic techniques such as ERCP, EUS, and balloon enteroscopy also can be obtained. Disadvantages of this approach center primarily on resistance in some adult units because of time constraints, unfamiliarity of pediatric gastroenterologists with adult pathology, and priority given to their own trainees. In addition, some techniques learned in an adult setting (eg, loop formation) may be less well tolerated or inappropriate in younger or smaller pediatric patients.

Use of Computer-based Simulators to Augment Training in Pediatric Endoscopy

The use of a computer-based endoscopic simulator is another method that can be used to enhance the technical and cognitive skills required to perform safe, high-quality endoscopy. The concept of skill acquisition in a virtual setting before performance of endoscopy on patients is appealing. In a study of pediatric gastroenterology trainees performing colonoscopy, trainees undergoing virtual training had a significant advantage in the rate of skill acquisition and lesion recognition compared with peers undergoing standard training without simulation (10). Similar results have been reported in a multicenter randomized controlled trial of novice trainees performing colonoscopy in adults (20); however with time, the advantage of simulator training disappeared with an identical number of cases required to achieve competency. In addition, to date, no advantages have been reported in patient comfort level or decreased complication rate as a result of virtual training.

The potential advantages of virtual endoscopy training include offering trainees direct experience in the manipulation of an endoscope without exposing patients to discomfort or risk (21). In addition, learning basic skills outside a clinical setting can decrease the time spent on basic instruction and improve efficiency in the endoscopy unit (22); however, the actual experience of endoscopy on live patients has yet to be reproduced, and questions remain about the authenticity of virtual training with regard to the sensation of resistance, as well as training in traditionally difficult maneuvers for novice endoscopists such as intubating the esophagus and traversing the sigmoid colon. Lastly, the question of whether skills acquired via virtual endoscopy training ultimately benefits patients, trainees and mentors remains unanswered.

Level 2: Training in New, Advanced, or Higher-risk Endoscopic or Related Procedures

Level 2 training encompasses new, advanced, or higher-risk endoscopic or related procedures performed primarily by pediatric gastroenterologists to care for children with complex conditions. All trainees are not required to achieve minimal threshold numbers to achieve competency in these procedures. It is essential, however, for all trainees in pediatric gastroenterology to understand the indications, contraindications, risks, benefits, and potential complications of these procedures. Trainees also are required to be able to interpret the results of these procedures. The performance of the procedures in this category during and after training will have variable necessity based on the style of practice and associated specialist practitioners of the various training and practicing institutions; however, trainees who intend to perform the procedures designated in this category at the completion of training should have achieved the minimal number of procedures outlined in this guideline by completion of training. Level 2 trainees may learn, in addition to the procedures outlined for level 1 trainees, liver biopsy, motility catheter placement, Bravo pH capsule placement, pneumatic dilation for achalasia, interpretation of wireless capsule endoscopy (WCE), endoscopic deployment of a WCE capsule, and performance of motility procedures.

Level 3: Advanced Training for the Expert in Pediatric Endoscopy

Level 3 trainees are those who seek additional training in specific endoscopic procedures. They may function as consultants to other pediatric gastroenterologists when specialized endoscopic procedures are required in pediatric patients. Trainees may learn, in addition to the procedures outlined for level 1 and 2 trainees, diagnostic and therapeutic ERCP, esophageal stent placement,

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endoscopic sonography, balloon enteroscopy, application of the argon plasma coagulator, advanced hemostatic techniques, endoscopic mucosal resection, endoscopic therapy for GERD, and other advanced endoscopic techniques as they develop. Level 3 training is generally obtained after completion of a pediatric gastroenterology training program or during fellowship training by participating in specialized rotations in conjunction with colleagues in adult gastroenterology or surgery. This training also may be obtained gradually after completion of training in collaboration and mentoring by an experienced adult or pediatric gastroenterologist with expertise in the specific procedures or during focused participation in an adult therapeutic endoscopy training program and subsequent mentoring by a pediatric or adult gastroenterologist with experience in performing these procedures in pediatric patients.

Training Program Requirements

The following are considered basic requisites for each training program:

- A program director or designate whose responsibilities include:
  - Ensuring optimal and satisfactory exposure to clinical care and problem solving in pediatric patients with GI disorders by incorporating appropriate conference schedules into the curriculum to cover basic information pertaining to endoscopic procedures in pediatric patients
  - Ensuring that trainees learn appropriate technical and cognitive skills from competent teachers
  - Incorporating endoscopic teaching materials (eg, books, atlases, DVDs, digital or online libraries) into the training program
  - Identifying, if available, local resources that can be used to enhance endoscopic training (eg ''hands-on models'' or endoscopic simulators)
  - Periodically reviewing and updating training methods and the quality of training in the endoscopy unit
  - Periodically reviewing the progress of trainees, including review of trainees' procedure log to determine attainment of competence in a specific procedure
- In addition to the above program director or designee responsibilities, the training program must provide:
  - Modern pediatric inpatient, ambulatory care, clinical laboratory, pathology, and radiology facilities to accomplish the overall educational program
  - An environment for proper training in endoscopy and related procedures; this includes appropriately trained ancillary personnel (eg, endoscopy nurses or technicians), functioning and well-maintained equipment, adequately furnished preparation, endoscopy, and recovery areas, and age-specific equipment and trained personnel to perform cardiopulmonary resuscitation in pediatric patients
  - Access to services provided by certified specialists in pediatric intensive care, pediatric surgery, pediatric anesthesia, pediatric radiology (including experts in interventional radiology), pathology (with expertise in pediatric GI histology), and subspecialists to provide interactive exposure and teaching in these disciplines; these services must be available as a backup for pediatric patients who experience complications during or after procedures

Assessment of Competence

Evaluation of trainees involves 3 phases: direct observation of performance, evaluation to promote improvement and avoid errors, and documentation of clinical and procedural skills.

Direct observation and evaluation are the responsibilities of the supervising attending physician at the time of each procedure. Feedback should be immediate and direct, with constructive and informative discussion between the attending physician and fellow. The conduct and objective assessment of procedural competence should be documented by the attending physicians supervising or mentoring trainees in the performance of endoscopic procedures.

Ongoing progress should be discussed formally with the training director or designate during a periodic review of the procedures performed and the evaluations of each trainee. These reviews should occur at least twice per year. In addition, trainees are required to maintain a training log of all of their procedures, which should be reviewed by the program director and director of endoscopy at regular intervals during the period of training and at the completion of the fellowship. The procedure log also should include documentation, if available, of any significant complications that occurred as a result of the endoscopic procedure.

Certification of competence requires satisfactory performance in a minimum number of cases of each procedure under direct supervision, with independent performance of procedures demonstrated as indicated by proficiency of trainees and the clinical setting. It is expected that independent performance of the majority of a given procedure will be accomplished in most but not all trainees by the end of fellowship training. This recognizes that endoscopic skills continue to accrue in the years after completion of fellowship, that endoscopic learning is a lifelong process, and that some assistance may be required by competent and skilled endoscopists in some pediatric patients because of patient age, size, and underlying medical condition. Because newly acquired endoscopic skills require regular practice to maintain, it is anticipated that most fellows will require some exposure to endoscopy throughout their fellowship, not just in the first year of training, so that they maintain their skills at a sufficient level to enter practice as competent endoscopists at the completion of their training period. Certification also requires proficiency in pediatric patient preparation and sedation and in all aspects of use and maintenance of endoscopy equipment.

Tools for Assessing Competency

The authors recognize that an adequate minimum number of procedures are only 1 aspect of assessing competency in endoscopic procedures. Other components that may determine trainees' competence in a given endoscopic procedure include their training, technical skill, cognitive skill, innate hand–eye coordination, and ability to recognize relevant lesions (23). Cognitive competence requires correct interpretation of abnormal findings, knowing indications and contraindications for endoscopy, knowing how to minimize risk, and knowing how to apply endoscopically derived information in clinical practice (23). These factors must be considered when determining whether a trainee is competent in a given endoscopic procedure.

To date, there have been only limited published objective tools available to assess competency of trainees in endoscopic procedure (19,24,25). The Appendix includes 2 ''scorecards'' that can be used by attending physicians to assess basic measures of competency in trainees performing diagnostic and therapeutic EGD and colonoscopy. The scorecards assess both achievement of appropriate anatomic landmarks during the procedure (eg, cecal intubation) and descriptive skills (eg, scope navigation ability, ability to keep a clear endoscopic field, instrumentation). These types of grading scales when scored by an expert endoscopist may allow the objective differentiation of novice or inexperienced versus expert or experienced endoscopists.

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TABLE 1. Guidelines for endoscopic training in procedures: recommended minimum procedural numbers for achieving competence

	Recommended no.*
Level 1: routine procedures	
Upper endoscopy (EGD)	
EGD diagnostic	100
EGD with foreign body removal†	10
Lower endoscopy	
Colonoscopy‡	120
Colonoscopy with snare polypectomy†	10
Therapeutic endoscopy	
EGD with control of bleeding variceal or nonvariceal—various methods and/or colonoscopy with control of bleeding—various methods†,§	15
Level 2: complex or new procedures	
Percutaneous endoscopic gastrostomy‖	10
EGD with dilation (guidewire and through the scope)†	10
Pneumatic dilation for achalasia	5
WCE	20
Endoscopic deployment WCE	5
Endoscopic placement of transpyloric feeding tubes or catheters, including motility catheters	5
Enteroscopy using colonoscope	10
Colonoscopy with dilation stricture	5
Bravo pH capsule deployment	10
Percutaneous liver biopsy	15
Rectal biopsy	10
Level 3: advanced procedures	
ERCP (diagnostic and therapeutic, includes sphincterotomy, dilation of stricture, stent placement, stone extraction)	200
Endoluminal stent placement	10
Balloon enteroscopy	10
EUS	100

* These numbers represent threshold numbers of procedures that are recommended to be performed and are adapted from recommendations of the 1999 NASPGHAN guidelines for training in pediatric gastroenterology[2] and the gastroenterology core curriculum, third edition, published in 2007 by the American Association for the Study of Liver Diseases, the Accreditation Council for Graduate Medical Education, the American Gastroenterological Assocation, and the American Society for Gastrointestinal Endoscopy (19,24), as well as the available medical literature. The number represents a minimum, and it is understood that most trainees will require more (never less) than the stated number to meet the competency standards based on existing data. The majority of level 1 and level 2 procedures should be performed in pediatric patients defined for this guideline as individuals younger than 21 years old. Initial training in level 3 procedures may occur primarily in adults, but dedicated pediatric experience is required to achieve competency in performance of the procedure in the pediatric age group.

† Therapeutic procedures may be included in overall count of procedures (eg, EGD, colonoscopy) to meet minimal threshold for competence

‡ Separate training in flexible sigmoidoscopy is not required if a sufficient number of colonoscopy procedures to meet minimal standards have been obtained.

§ Methods to control bleeding may include injection, band ligation, electrocautery (eg, heater probe, multipolar probe, *argon plasma coagulator*, loop application, hemostatic clips), or additional methods as they become available.

‖ Refers to the gastric portion of the percutaneous endoscopic gastrostomy tube placement.

These scorecards also can be adapted by individual programs to meet their specific institutional and programmatic needs. Similar tools are available for EUS and ERCP, and certain aspects of the scorecard can be applied to any other endoscopic procedure (eg, informed consent, recognition of normal and abnormal findings, completion of examination within reasonable time frame). It is the hope of the endoscopy guideline task force that use of these types of scorecards will result in further research in this area to determine and subsequently validate competency tools in pediatric endoscopy that have both interobserver and interinstitutional validity that can be used at a variety of training programs. Furthermore, if developed, such tools may enable program directors and directors of endoscopy to compare various methods of teaching endoscopy to both novice or experienced endoscopists, which could result in earlier acquisition of endoscopic competence for a given procedure or improved procedure performance.

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Appendix 1: NASPGHAN Pediatric Upper Endoscopy Training Score Sheet (19,24,25)

Preprocedural Assessment

Displays appropriate knowledge of the indications for the procedure including risks, benefits, potential complications, and alternative testing/ procedures.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Displays appropriate knowledge of the use of preprocedural antibiotic coverage.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Effectively obtains informed consent.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Procedural Assessment

Appropriately selects type of anesthesia for individual patient.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Effectively administers sedation and analgesia if applicable. Uses physiologic monitoring and supplemental oxygen appropriately. If sedation provided by an anesthesiologist, effectively collaborates with team to ensure appropriate patient sedation and monitoring.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Procedural Components

Technical

Passes instrument from oral cavity to hypopharynx.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Intubates the esophagus.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Traverses the pylorus.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

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Able to pass endoscope from bulb to second part of duodenum.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Able to retroflex instrument to examine fundus/gastric cardia.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Ability to keep clear endoscopic field—includes insufflation, suction, and irrigation as required.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Able to perform mucosal biopsy.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Able to perform other required therapeutic intervention—list

_____.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Overall scope navigation—includes tip deflection, advancement withdrawal, and torque.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Cognitive

Appropriately recognizes anatomic landmarks (GE junction, Z- line, etc).

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Recognizes abnormalities.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Postprocedural Assessment

Provides postprocedural effective communication to patient and family, including endoscopic findings and management plan if necessary.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Recognizes and appropriately treats complications.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Overall Assessment of Trainee's Performance

Unsatisfactory				Average					Outstanding	
1	2	3	4	5	6	7	8	9	10	

Total Score_____(maximum 100; maximum of 95 if no therapy performed)

Comments:
Was this reviewed with trainee? Yes_____ No_____

Instructor's signature_____ Trainee's signature_____

Date of Procedure _____

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Appendix 2: NASPGHAN Pediatric Colonoscopy Training Score Sheet (19,24,25)

Preprocedural Assessment

Displays appropriate knowledge of the indications for the procedure, including risks, benefits, potential complications, and alternative testing/procedures.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Displays appropriate knowledge of the use of preprocedural antibiotic coverage.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Effectively obtains informed consent.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Procedural Assessment

Appropriately selects type of anesthesia for individual patient.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Effectively administers sedation and analgesia if applicable. Uses physiologic monitoring and supplemental oxygen appropriately. If sedation provided by an anesthesiologist, effectively collaborates with team to ensure appropriate patient sedation and monitoring.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Procedural Components

Technical

Passes instrument from rectum to splenic flexure.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Passes instrument from splenic flexure to hepatic flexure.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Passes instrument from hepatic flexure to cecum.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Intubates the terminal ileum.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Ability to keep clear endoscopic field—includes insufflation, suction, and irrigation as required.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Able to perform mucosal biopsy.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

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Able to perform other required therapeutic intervention (eg, polypectomy).

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Recognizes loop formation and avoids or reduces appropriately during procedure.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Overall scope navigation—includes tip deflection, advancement withdrawal, and torque.

Instructor intervention required		Prompting required		Independent
1	2	3	4	5

Cognitive

Appropriately recognizes anatomic landmarks (eg, appendix, ileocecal valve).

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Recognizes abnormalities.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Postprocedural Assessment

Provides postprocedural effective communication to patient and family, including endoscopic findings and management plan if necessary.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Recognizes and appropriately treats complications.

Unsatisfactory		Average		Outstanding
1	2	3	4	5

Overall Assessment of Trainee's Performance

Unsatisfactory				Average					Outstanding	
1	2	3	4	5	6	7	8	9	10	

Total Score_____(maximum 100; maximum of 95 if no therapy performed)

Comments:
Was this reviewed with trainee? Yes_____ No_____

Instructor's signature_____ Trainee's signature_____

Date of Procedure _____

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