Childhood Functional Gastrointestinal Disorders: Child/Adolescent

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The Rome II pediatric criteria for functional gastrointestinal disorders (FGIDs) were defined in 1999 to be used as diagnostic tools and to advance empirical research. In this document, the Rome III Committee aimed to update and revise the pediatric criteria. The decision-making process to define Rome III criteria for children aged 4–18 years consisted of arriving at a consensus based on clinical experience and review of the literature. Whenever possible, changes in the criteria were evidence based. Otherwise, clinical experience was used when deemed necessary. Few publications addressing Rome II criteria were available to guide the committee. The clinical entities addressed include (1) cyclic vomiting syndrome, rumination, and aerophagia; 2) abdominal pain-related FGIDs including functional dyspepsia, irritable bowel syndrome, abdominal migraine, and functional abdominal pain; and (3) functional constipation and non-retentive fecal incontinence. Adolescent rumination and functional constipation are newly defined for this age group, and the previously designated functional fecal retention is now included in functional constipation. Other notable changes from Rome II to Rome III criteria include the decrease from 3 to 2 months in required symptom duration for noncyclic disorders and the modification of the criteria for functional abdominal pain. The Rome III child and adolescent criteria represent an evolution from Rome II and should prove useful for both clinicians and researchers dealing with childhood FGIDs. The future availability of additional evidence-based data will likely continue to modify pediatric criteria for FGIDs.

Functional gastrointestinal disorders (FGIDs) are defined as a variable combination of chronic or recurrent gastrointestinal symptoms not explained by structural or biochemical abnormalities. In 1997, a pediatric working team met in Rome to standardize the diagnostic criteria for various FGIDs in children. The first pediatric Rome II criteria for FGIDs were published in 1999.[1] This publication generated scientific interest and contributed to the recognition of these disorders as diagnostic entities. A limited number of studies has been published since. One study reported a preliminary validation of a questionnaire on pediatric gastrointestinal symptoms and features related to FGIDs, as defined by the Rome II criteria.[2] Two publications using the same questionnaire documented the prevalence of FGIDs in tertiary care clinics,[3,4] and 1 study reported the prevalence of FGIDs in Italian children consulting primary care pediatricians.[5] One paper directly addressed the validation of the criteria.[3] Six studies used the Rome II criteria to select and/or compare children included in their study samples,[6–11] and in 3 reviews on abdominal pain in children, Rome II criteria were discussed.[12–14] These publications have offered valid criticism of some disorders and provided preliminary validation of others.

The goal of the committee members was to revise the Rome II criteria in light of emerging scientific research and on the basis of their own clinical experience. The Rome III process established 2 pediatric committees. This report by the Child/Adolescent Committee focuses on the criteria for FGIDs in children aged 4 to 18 years (Table 1). The committee elected to continue basing the pediatric classification of FGIDs on the main complaints reported by children or their parents rather than on targeted organs. Indeed, the criteria were designed to be used as diagnostic tools, and the committee believed that this symptom-based classification would better serve the clinician. This was particularly true for abdominal pain-related FGIDs when care providers can consider func-

Abbreviations used in this paper: FAP(S), functional abdominal pain (syndrome); FGIDs, functional gastrointestinal disorders; IBS, irritable bowel syndrome.

0016-5085/06/$32.00
doi:10.1053/j.gastro.2005.08.063

Table 1. The Functional Gastrointestinal Disorders

H. Functional disorders: children and adolescents
- H1. Vomiting and aerophagia
  - H1a. Adolescent rumination syndrome
  - H1b. Cyclic vomiting syndrome
  - H1c. Aerophagia
- H2. Abdominal pain–related FGIDs
  - H2a. Functional dyspepsia
  - H2b. Irritable bowel syndrome
  - H2c. Abdominal migraine
  - H2d. Childhood functional abdominal pain
    - H2d1. Childhood functional abdominal pain syndrome
- H3. Constipation and incontinence
  - H3a. Functional constipation
  - H3b. Nonretentive fecal incontinence

tional abdominal pain as a diagnostic option only after having eliminated the other abdominal pain-related FGIDs.

The committee members changed the required duration of symptoms from to 3 to 2 months for all the disorders except for abdominal migraine and cyclic vomiting syndrome. This decision was based on the following: (1) it allows 4 weeks for acute disease and 4 weeks to establish chronicity; (2) although children presenting to tertiary care centers have symptoms of long duration,[3] it was felt that primary care physicians should be able to make the diagnosis of FGIDs earlier than 3 months of symptom duration; (3) a duration of 2 months is more inclusive and facilitates clinical research of FGIDs in children; and (4) it was the consensus of the committee that 2 months better reflects clinical experience in children compared with adults. Age-appropriate questionnaires have been created as part of the Rome III process, and a threshold of "at least once per week" for inclusion of a diagnostic symptom has been chosen for all the disorders except the 2 cyclical ones: abdominal migraine and cyclic vomiting. The accompanying symptoms have to be present at least "sometimes" (≥25% of the time). The committee members acknowledge that, in some patients, both disorder and disease may coexist (eg, irritable bowel syndrome [IBS] and Crohn's disease). They emphasize that when "absence of disease" is a criterion, a diagnosis of functional disorder can only be made if diseases that could account for the symptoms are absent or inactive.

H1. Vomiting and Aerophagia

H1a. Adolescent Rumination Syndrome

Epidemiology. Rumination syndrome is most common in male infants and female adolescents.[15,16]

H1a. Diagnostic Criteria* for Adolescent Rumination Syndrome

Must include *all* of the following

1. **Repeated painless regurgitation and rechewing or expulsion of food that**
   a. **begin soon after ingestion of a meal**
   b. **do not occur during sleep**
   c. **do not respond to standard treatment for gastroesophageal reflux**
2. **No retching**
3. **No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms**

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Justification for changes in diagnostic criteria. In the context of the Rome criteria, rumination syndrome is defined in children and adolescents for the first time. Although 4 and 6 weeks' duration have been proposed for this age group,[16,17] a period of 8 weeks has been adopted to harmonize with the other pediatric criteria. The item "absence of nausea and vomiting" has been omitted because up to 33% of affected adolescents present with one of these symptoms.[16]

Clinical evaluation. Effortless repetitive regurgitation, reswallowing, and/or spitting within minutes of starting a meal are diagnostic characteristics. The behavior lasts for about an hour and rarely occurs at night.[16] Gastroesophageal reflux, esophageal achalasia, gastroparesis, bulimia nervosa, and obstructive anatomical disorders must be excluded by appropriate diagnostic tests.

Physiological features. The characteristic manometric abnormality is a synchronous increase in pressure ("r" waves) across multiple recording sites in the upper gut. It is attributed to an increase in intra-abdominal pressure generated by the contraction of the skeletal abdominal muscles. These characteristic waves were documented in 40%–67% of adolescents with rumination, and mildly delayed gastric emptying was found in 46% of them.[16,18]

Psychological features. Rumination appears to serve the purpose of self-stimulation in intellectually handicapped children and may be associated with eating disorders in adolescents. Psychological disturbances, including depression, anxiety, obsessive-compulsive behavior, and other disorders, are reported in up to one third of affected individuals.[16]

Treatment. In the absence of nutritional impairment, motivated patients improve with behavioral therapy in up to 85% of subjects,[16] and a multidisciplinary approach is associated with satisfactory recovery in most patients.[18] Tricyclic antidepressants have been used with some success.[18] Postpyloric feedings, either through nasojejunal or gastrojejunal feeding catheters, may be necessary when weight loss is significant.[18]

H1b. Cyclic Vomiting Syndrome

Although cyclic vomiting often presents in children and adolescents, this entity is discussed both in the neonatal/toddler section and the adult section, and this committee did not believe there are enough distinguishing features in children to warrant different diagnostic criteria in this age group. The criteria discussed in the neonatal/toddler section should also be used for children and adolescents.

H1b. Diagnostic Criteria for Cyclic Vomiting Syndrome

Must include *all* of the following:

1. Two or more periods of intense nausea and unremitting vomiting or retching lasting hours to days
2. Return to usual state of health lasting weeks to months

H1c. Aerophagia

Epidemiology. Aerophagia has been observed in 8.8% of the institutionalized mentally handicapped population.[19] By using Rome II criteria, aerophagia was diagnosed in 1.3% of children, aged 4–18 years, presenting to a pediatric gastroenterology clinic.[3]

H1c. Diagnostic Criteria* for Aerophagia

Must include *at least 2* of the following:

1. Air swallowing
2. Abdominal distention because of intraluminal air
3. Repetitive belching and/or increased flatus

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Rationale for changes in diagnostic criteria. The rationale for change in duration of the symptoms has been discussed previously.

Table 2. Alarm Symptoms, Signs, and Features in Children and Adolescents With Noncyclic Abdominal Pain–Related Functional Gastrointestinal Disorders

Persistent right upper or right lower quadrant pain	Pain that wakes the child from sleep
Dysphagia	Arthritis
Persistent vomiting	Perirectal disease
Gastrointestinal blood loss	Involuntary weight loss
Nocturnal diarrhea	Deceleration of linear growth
Family history of inflammatory bowel disease, celiac disease, or peptic ulcer disease	Delayed puberty
	Unexplained fever

Clinical evaluation. Air swallowing often goes unnoticed by parents and children themselves and should be objectively verified by the physician.[20] Excessive air swallowing is often caused by anxiety and may accompany asthma crisis. Because of the concomitant abdominal distention, aerophagia is often confused with motility disorders, such as chronic intestinal pseudo-obstruction and malabsorption syndromes. In patients with aerophagia, the abdominal distention decreases or resolves during sleep. Hydrogen breath tests can be used to rule out sugar malabsorption and/or bacterial overgrowth.

Treatment. Effective reassurance and explanation of symptoms to both parents and child are essential. Often, the clinician can help the child become aware of air swallowing during the visit. Eating slowly, avoidance of chewing gum or drinking carbonated beverages, and various psychotherapeutic strategies for alleviation of anxiety may be helpful.[19]

H2. Abdominal Pain–Related FGIDs

In children with abdominal pain–related FGIDs, the alarm features, signs, and symptoms listed in Table 2 are generally absent. The committee recognized the great variability in the severity and phenotypic presentation of children with abdominal pain–related FGIDs and therefore decided to split the previously inclusive category of functional abdominal pain into 2 separate disorders, childhood functional abdominal pain and childhood functional abdominal pain syndrome (FAPS), so that studies done in this population may include more patients distributed within more homogenous categories. Indeed, in studies performed in tertiary care centers, up to 47% of children with abdominal pain did not receive a Rome II diagnosis, and only a few met the very strict criteria for FAPS.[3,4] The current pediatric criteria for functional abdominal pain differ from the criteria in adults, and further research may take these 2 categories into closer parallelism. The committee decided, much

like the adult group, to omit the category of "unspecified functional abdominal pain" because the new pediatric criteria are more inclusive.

Functional impairment, which is included in the FAPS, can also be observed in other FGIDs such as abdominal migraine and functional dyspepsia or IBS. In abdominal migraine, it is now included in the definition, whereas in the other disorders it is not. Impairment of daily activity, although possibly present, has not traditionally been included in the definition of IBS and functional dyspepsia in adults. Severity of symptoms is addressed in a questionnaire developed as part of the Rome III process. Clinical evaluation and treatment of children with abdominal pain–predominant disorders have been recently reviewed in 2 documents of the American Academy of Pediatrics and the North American Society for Pediatric Gastroenterology, Hepatology and Nutrition and will only be very briefly addressed here.[14,21]

H2a. Functional Dyspepsia

Epidemiology. In community- and school-based studies, the prevalence of dyspepsia varies between 3.5 % and 27% according to gender and country of origin.[22,23] By using the Rome II criteria, the prevalence was 0.3% among children (mean age, 52 months) seen by primary care pediatricians in Italy[5] and between 12.5% and 15.9% among children aged 4–18 years referred to tertiary care clinics in North America.[3,4]

H2a. Diagnostic Criteria* for Functional Dyspepsia

Must include *all* of the following:

1. **Persistent or recurrent pain or discomfort centered in the upper abdomen (above the umbilicus)**
2. **Not relieved by defecation or associated with the onset of a change in stool frequency or stool form (ie, not IBS)**
3. **No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms**

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Rationale for changes in diagnostic criteria. The rationale for change in duration of the symptoms has been discussed in the Introduction section. Duration of 2 months is sufficient to eliminate the likelihood of acute disease and to establish a reasonable degree of chronicity. The committee has eliminated the mandatory use of upper gastrointestinal endoscopy in order to make this diagnosis. In children, the likelihood of finding mucosal abnormalities responsible for dyspeptic symptoms is much lower than in adults.[22] Ulcer-like and dysmotility-like subtypes of functional dyspepsia have been eliminated because epidemiologic data suggest that young children do not fall into either category.[3,4,22] The distinction between discomfort and pain is difficult for young children and their parents,[3,4] and there is no evidence that the symptoms of dysmotility-type dyspepsia originate from disordered motility.

Finally, the committee decided to specify that there should be no evidence of an inflammatory, anatomic, metabolic, or neoplastic process considered likely to be an explanation for the subject's symptoms. There are children with abdominal pain predominant FGID who may have evidence of mild, chronic inflammatory changes on mucosal biopsies. In view of the evidence that FGID may follow an acute inflammatory event,[24,25] such changes should not impede a diagnosis of a FGID. This terminology is also used for the other childhood FGIDs presenting with abdominal pain or discomfort.

Clinical evaluation. Factors suggesting the presence of disease are listed in Table 2.[13,14,21] Dyspeptic symptoms may follow a viral illness.[24] The committee members agreed that upper gastrointestinal endoscopy is warranted in the presence of dysphagia in patients with persistent symptoms despite the use of acid reducing medications or in those who have recurrent symptoms upon cessation of such medications and to confirm the diagnosis of *Helicobacter pylori*–associated disease.[26]

Physiological features. Disordered gastric myoelectrical activity,[27,28] delayed gastric emptying,[29,30] altered antroduodenal motility,[31] and reduced gastric volume response to feeding[11] have been described in children with functional dyspepsia. Rapid gastric emptying associated with slow bowel transit was found in dyspeptic children with bloating as predominant symptom.[32]

Treatment. Avoidance of nonsteroidal anti-inflammatory agents and foods that aggravate symptoms (eg, caffeine and spicy and fatty foods) is recommended. Antisecretory agents (H2 blockers or proton pump inhibitors) are often offered for pain predominant symptoms and prokinetics (metoclopramide, erythromycin, and domperidone and cisapride where available) for symptoms associated with discomfort. The committee recognizes that the use of all these therapeutic modalities has not been validated by controlled trials.[14,21] Psychological comorbidity should be addressed.

H2b. Irritable Bowel Syndrome

Epidemiology. In Western countries, IBS was diagnosed in 6% of middle school and 14% of high school students by using Rome I criteria.[33] According to Rome II criteria, IBS was diagnosed in 0.2% of children (mean age, 52 months) seen by primary care pediatricians and in 22%–45% of children aged 4–18 years presenting to tertiary care clinics.[3–5]

H2b. Diagnostic Criteria* for Irritable Bowel Syndrome

Must include *all* of the following:

1. Abdominal discomfort (an uncomfortable sensation not described as pain) or pain associated with *2 or more* of the following at least 25% of the time:
   a. Improved with defecation
   b. Onset associated with a change in frequency of stool
   c. Onset associated with a change in form (appearance) of stool
2. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Symptoms that cumulatively support the diagnosis of IBS are (1) abnormal stool frequency (4 or more stools per day and 2 or less stools per week), (2) abnormal stool form (lumpy/hard or loose/watery stool), (3) abnormal stool passage (straining, urgency, or feeling of incomplete evacuation), (4) passage of mucus, and (5) bloating or feeling of abdominal distention.

Rationale for changes in diagnostic criteria. The rationale for change in symptom duration from 3 to 2 months has been discussed earlier.

Physiological features. Visceral hypersensitivity has been documented in children with IBS.[6,7] It may be related to numerous processes, including infection, inflammation, intestinal trauma, or allergy, and may be associated with disordered gut motility.[25,34] Genetic predisposition, early stressful events, and ineffective patient-coping mechanisms are compounding factors.[25,35,36]

Psychological features. Anxiety, depression, and multiple other somatic complaints have been reported by IBS children and their parents.[37] Social learning of illness behavior may contribute to the development of IBS.[38,39]

Clinical evaluation. Symptoms of abdominal pain that meet Rome criteria for IBS in the presence of a normal physical examination and growth curve with the absence of alarm signals (Table 2) substantiate a positive diagnosis. Potential triggering events and psychosocial factors are important to explore. Education about mechanisms leading to IBS avoids unnecessary invasive testing.[13]

Treatment. A confident diagnosis, confirmation, and explanation of pain experience and reassurance can by itself be therapeutic.[13] Specific goals of therapy include modifying severity and developing strategies for dealing with symptoms. Controlled data on therapeutic interventions are limited to peppermint oil that may provide some benefit in children with IBS but not in adults.[14,21] Inversely, the efficacy of some antidepressants and serotonic agents is well shown in adults with IBS, but there are only anecdotal reports concerning their use in children with chronic abdominal pain.

H2c. Abdominal Migraine

It has been suggested that abdominal migraine, cyclic vomiting syndrome, and migraine headache comprise a continuum of a single disorder, with affected individuals often progressing from one clinical entity to another.[40]

Epidemiology. Abdominal migraine affects 1%–4% of children.[41,42] It is more common in girls than boys (3:2), with a mean age of onset at 7 years and a peak at 10–12 years. In pediatric gastroenterology clinics, it was diagnosed in 2.2%–5% of children by using the Rome II criteria.[3,4]

H2c. Diagnostic Criteria* for Abdominal Migraine

Must include *all* of the following:

1. Paroxysmal episodes of intense, acute periumbilical pain that lasts for 1 hour or more
2. Intervening periods of usual health lasting weeks to months
3. The pain interferes with normal activities
4. The pain is associated with 2 or more of the following:
   a. Anorexia
   b. Nausea
   c. Vomiting
   d. Headache
   e. Photophobia
   f. Pallor
5. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process considered that explains the subject's symptoms

**Criteria fulfilled 2 or more times in the preceding 12 months*

Supportive criteria include a family history of migraine and a history of motion sickness.

Rationale for changes in diagnostic criteria. The number of episodes required was changed from 3 to 2. Recurrent can be defined with 2 episodes, and a recent review by experts in the field suggests that 2 episodes are sufficient for diagnosis.[43] The minimum duration of an episode was changed from 2 hours to 1 hour, according to the recommendations of the same experts.[43] Most episodes generally last several hours to days. Pain is now specified in intensity as severe enough to affect activity. Indeed, a hallmark of this syndrome is that the pain is often incapacitating. Adding this terminology to the definition was also recommended in the review previously mentioned.[43] Additional symptoms (anorexia, nausea, vomiting, headache, and pallor) have been added to the definition. These gastrointestinal and vasomotor symptoms are an integral part of the syndrome. The necessity for a family history of migraine and aura was removed. These features are indeed not necessary and are internally somewhat redundant. The presence of a history of migraine in the proband and family is a supporting feature. The decision to change from symptom-free interval between episodes to "return to usual state of health" was made in recognition of the fact that some patients may have other chronic or recurrent symptoms unrelated to abdominal migraine.

Clinical evaluation. The paroxysmal nature of symptoms and the absence of the characteristic abdominal pain between episodes make chronic inflammatory diseases less likely. When appropriate, obstructive processes in the urologic or digestive tracts, biliary tract disease, recurrent pancreatitis, familial Mediterranean fever, and metabolic disorders such as porphyria should be ruled out. A favorable response to medications used for prophylaxis of migraine headaches supports the diagnosis.

Physiological features. Abdominal migraine, cyclic vomiting syndrome, and migraine headache may share pathophysiological mechanisms. Abnormal visual-evoked responses, abnormalities in the hypothalamic-pituitary-adrenal axis, and autonomic dysfunction have been described.[44,45]

Psychological features. It is not known whether psychological features such as anxiety, depression, and somatic complaints described in classical migraine and cyclic vomiting can be applied to abdominal migraine.[46]

Treatment. Potential triggers to be avoided include caffeine-, nitrite-, and amine-containing foods as well as emotional arousal, travel, prolonged fasting, altered sleep patterns, and exposure to flickering or glaring lights. When episodes are frequent, prophylactic therapy may include pizotifen, propanolol, cyproheptadine, or sumatriptan.[47] Limited data on pizotifen suggest its efficacy in children with this entity.[14,21]

H2d. Childhood Functional Abdominal Pain

Epidemiology. By using the Rome II criteria, the prevalence of FAP in 4–18-year-old patients presenting to gastroenterology clinics varied between 0% to 7.5%.[3,4] This low prevalence was not unexpected considering that Rome II criteria were quite restrictive: the pain had to be continuous or nearly continuous, association with physiologic events had to be absent, and there was a requirement for some impairment in daily activities.

H2d. Diagnostic Criteria* for Childhood Functional Abdominal Pain

Must include *all* of the following:

1. **Episodic or continuous abdominal pain**
2. **Insufficient criteria for other FGIDs**
3. **No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms**

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

H2d1. Diagnostic Criteria* for Childhood Functional Abdominal Pain Syndrome

Must include childhood functional abdominal pain at least 25% of the time and 1 or more of the following:

1. **Some loss of daily functioning**
2. **Additional somatic symptoms such as headache, limb pain, or difficulty sleeping**

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Rationale for changes in diagnostic criteria. The rationale for decreasing the duration of symptoms from 3 to 2 months has already been discussed. The requirement for continuous or nearly continuous pain has been eliminated based on the clinical experience that children present with episodic or intermittent pain at least as frequently as they do with more continuous pain. The previous criteria mentioned that the pain had to have *no* or only occasional relation with physiological events. This criterion would exclude children who have some features of IBS or dyspepsia but do not meet criteria for those entities (eg, children who only have 1 of the 2 bowel symptoms required for IBS). Children with FAP

who have continuous abdominal pain will sometimes have pain also in association with physiological events.[3] That the pain is not feigned was a requirement of the Rome II criteria. This was a very challenging criterion to assess because pain is a subjective experience as reported by the individual. The committee has elected to eliminate the requirement for some loss of daily function in the criteria for FAP because such a criterion confounded symptoms and function. It excluded motivated children who continued activity despite the pain and children whose parents insisted that they continue activities. However, it is recognized that there is a subgroup of children in whom loss of daily functioning and/or accompanying somatic symptoms form an important component of their symptom complex. This group is now referred to as having FAPS.

Clinical evaluation. In FAP(S), a limited and reasonable screening includes a complete blood cell count, erythrocyte sedimentation rate or C-reactive protein measurement, urinalysis, and urine culture. Other biochemical profiles (liver and kidney) and diagnostic tests (stool culture and examination for ova and parasites and breath hydrogen testing for sugar malabsorption) can be performed at the discretion of the clinician, based on the child's predominant symptoms and degree of functional impairment and parental anxiety.

Physiological features. In contrast to children with IBS, visceral hypersensitivity of the rectum was not elicited in children with FAPS.[6] This finding does not preclude the possibility that visceral hypersensitivity may exist more proximally in the gastrointestinal tract. The presence of associated features and symptoms such as headache, limb pain, and lower-pressure pain threshold remains to be validated and explained in children who meet the symptom-based Rome criteria for FAPS.[48,49]

Psychological features. The symptoms of anxiety, depression, and somatization described in both children with recurrent abdominal pain and their parents may apply to children with FAP(S) and those with IBS and functional dyspepsia seen in both the primary and specialty care setting.[14,21,50–54]

Treatment. A biopsychosocial approach to children with abdominal pain-related FGIDs is particularly relevant in the case of children with FAP(S). Indeed, because the specific target is pain, it is important to investigate the contribution of psychosocial factors. Reassurance and explanation of possible mechanisms involving the brain-gut interaction should be given to the child and parent. The possible role of psychosocial factors, including triggering events, should be explained. Two reports on children with abdominal pain-related FGIDs suggested possible benefit from behavioral treatments with or without tricyclic antidepressants.[13,55] A more recent open-label trial of citalopram in children with recurrent abdominal pain reported a promising outcome.[54]

H3. Constipation and Incontinence

H3a. Functional Constipation

The term "functional constipation" describes all children in whom constipation does not have an organic etiology. Because functional constipation and functional fecal retention often overlap, the 2 disorders were merged into 1 category named "functional constipation."[3,9]

Epidemiology. Estimates of constipation have varied between 0.3% and 8% in the pediatric population.[56] It represents 3%–5% of general pediatric outpatient visits and up to 25% of pediatric gastroenterology consultations.[3,57] A positive family history has been found in 28%–50% of constipated children, and a higher incidence has been reported in monozygotic than dizygotic twins.[36] Peak incidence occurs at the time of toilet training (between 2 and 4 years of age), with an increased prevalence in boys.[58]

H3a. Diagnostic Criteria* for Functional Constipation

Must include *2 or more* of the following in a child with a developmental age of *at least* 4 years with insufficient criteria for diagnosis of IBS:

1. **Two or fewer defecations in the toilet per week**
2. **At least 1 episode of fecal incontinence per week**
3. **History of retentive posturing or excessive volitional stool retention**
4. **History of painful or hard bowel movements**
5. **Presence of a large fecal mass in the rectum**
6. **History of large diameter stools that may obstruct the toilet**

**Criteria fulfilled at least once per week for at least 2 months before diagnosis*

Rationale for changes in diagnostic criteria. The change from 3 to 2 months of symptoms is based on both clinical experience and data from the literature suggesting that the longer functional constipation goes unrecognized, the less successful is the treatment. Loening-Baucke[56] studied the outcome in constipated young children (<4 years old) seen in a general pediatric prac-

tice and found that prognosis was more favorable when the referral had been made before the age of 2 years. She has also reported that recovery in encopretic children was associated with a shorter duration of symptoms.[10] A recent long-term follow-up study of constipated children also found a trend toward a diminished number of successfully treated children in those with a longer period of symptoms before referral to a subspecialty clinic.[59] The previous diagnostic criteria for functional fecal retention put a high premium on retentive posturing, which was 1 of the 2 criteria that had to be present to make a diagnosis. It is now recommended that the history of retentive posturing or volitional stool retention be 1 of the 6 criteria, which may support the diagnosis but without the requirement to be present in all subjects. Children who have been constipated for years may have had withholding behavior long before the visit to the physician, and by the time they are evaluated, the rectum has become dilated and has accommodated to the point that withholding is no longer necessary in order to delay the passage of stools. In other instances, the parents will deny withholding misinterpreting the withholding for attempts to defecate or they have not paid enough attention to the child's behavior to be able to describe it. It has been reported that 14% of parents of constipated children could not adequately answer questions regarding retentive posturing,[9] and in a recent study, adolescents were not able to understand the concept of excessive withholding behavior.[3] In more than 20% of children older than 5 years presenting with incontinence because of constipation, parents do not report withholding behavior.[10] The term excessive volitional stool retention is used to describe older children who still withhold their stools without necessarily displaying retentive posturing. Fecal incontinence (involuntary passage of fecal material in the underwear) is one of the most common presentations of functional constipation, being found in up to 84% of children at presentation.[9] It causes a tremendous amount of distress for patients and their family. The 2 studies that have looked at the applicability of the Rome II criteria for FFR have both recommended fecal incontinence be incorporated in the revised criteria.[9,10] Incontinence may be useful as an objective marker for the severity of functional constipation and in monitoring effectiveness of treatment.[60]

A painful bowel movement has been identified as having an important historical value in causing the retentive behavior.[57] The presence of a large fecal mass either before evacuation (recognized during the physical examination) or after having a bowel movement (obstructing the toilet or causing severe discomfort), although not a symptom, is a critical feature of constipated children. The painful evacuation of such fecal mass often leads the terrified child to trying to avoid further bowel movements. A large fecal mass in the rectum has been found in 98% of children fulfilling the previous Rome II criteria for functional fecal retention.[10] It is acknowledged that the mention of a "large" mass in the criteria introduces a subjective element that can be interpreted differently by different individuals. The mention of stools "clogging the toilet" represents an attempt to provide an objective measure of the size of the fecal mass.

Clinical evaluation. A careful history needs to elicit the time after birth of the first bowel movement, the time of onset of the problem, characteristics of stools (frequency, consistency, caliber, and volume), the presence of associated symptoms (pain at defecation, abdominal pain, blood on the stool or the toilet paper, and fecal incontinence), stool withholding behavior, urinary problems, and neurologic deficits. Fecal incontinence may be mistaken for diarrhea by some parents. Urinary problems are common in these children. During abdominal examination, a fecal mass is commonly found. External examinations of the perineum and perianal area exclude signs of spinal dysraphism. Although controversy exists, the North American Society for Gastroenterology, Hepatology, and Nutrition has recommended that digital rectal examination be performed at least once.[61] An abdominal radiograph can be useful in determining the presence of fecal retention in a child who is obese or refuses a rectal examination.

Physiological features. Functional constipation in children is often the result of repeated attempts of voluntary withholding of feces. Abnormal defecation dynamics or pelvic dyssynergia has been reported in 63% of children with chronic constipation.[62] Progressive fecal accumulation in the rectum eventually leads to pelvic floor muscle fatigue and anal sphincter poor competence leading to fecal incontinence.

Psychological features. Children presenting with constipation have lower quality of life and exhibit poorer self-esteem and often some social withdrawal.[63] Constipated children display more anxiety related to toilet training and often evolve a coping style based on denial.[64]

Treatment. The clinician addresses the myths and fears, and these statements both decrease the child's and the family's anxiety and create an expectation for positive change. A dose of 1–1.5 g/kg/d polyethylene glycol 3350 per 3 days is usually effective in treating fecal impaction.[65] For maintenance, stool softeners are preferred to stimulant laxatives. Rewards for success in toilet learning are often helpful.

H3b. Nonretentive Fecal Incontinence

Nonretentive fecal incontinence represents the repeated, inappropriate passage of stool into a place other than the toilet in a child older than 4 years with no evidence of fecal retention.[1,66]

Epidemiology. Fecal incontinence is reported to be responsible for 3% of referrals to teaching hospitals. Its prevalence has been reported to be 4.1% in the 5–6-year-old age group and 1.6% in the 11–12-year-old age group in the Netherlands and has been noted to be more frequent among boys and children from families with lower socioeconomic status.[67] Interestingly, only 38% of the 5–6-year olds and 27% of the 11–12-year olds who had fecal incontinence had ever seen a physician for this problem. The prevalence of nonretentive fecal incontinence among this group was undefined. Applying the Rome II criteria, 21% of patients attending a subspecialty clinic fulfilled the criteria for functional nonretentive fecal incontinence.[9]

H3b. Diagnostic Criteria* for Nonretentive Fecal Incontinence

Must include *all* of the following in a child with a developmental age at least 4 years:

1. **Defecation into places inappropriate to the social context at least once per month**
2. **No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the subject's symptoms**
3. **No evidence of fecal retention**

**Criteria fulfilled for at least 2 months before diagnosis*

Rationale for changes in diagnostic criteria. The duration of symptoms is 2 months to harmonize with the other criteria.

Clinical evaluation. Pertinent information to be elicited in the clinical history is related to ruling out constipation (see related section). In these children, incontinence is diurnal, and no fecal mass is found on physical examination. An abdominal radiograph may sometimes be obtained to diagnose occult fecal retention because of incomplete passage of stool.

Physiological features. All studies investigating incontinence as a result of constipation are normal, indicating a different pathophysiological mechanism.[66]

Psychological features. Children with functional nonretentive fecal incontinence have significantly more behavioral problems and more externalizing and internalizing problems than the normative sample.[68]

Treatment. Education, a nonaccusatory approach; regular toilet use with rewards; and referral to a mental health professional when appropriate are part of the therapeutic regimen. Successful resolution of symptoms may require prolonged treatment and follow-up.[69]

Recommendations for Future Research

Many of the recommendations listed by the Rome II committee remain valid. Other suggestions for future research topics in this area have recently been formulated by other committees of several pediatric gastroenterology societies.[70,71] The committee identified the following areas that are in need of research in the near future.

1. Further validation studies of the pediatric Rome criteria need to be developed. Such studies need to be performed in a wide range of clinical settings and patient populations by using validated questionnaires. Specifically, the new proposed criteria for subgroups of dyspeptic disorders need to be studied in children.
2. Mechanistic studies will help us understand how clusters of symptoms may be related to different pathophysiological mechanisms, providing better targets for more tailored therapeutic interventions.
3. Large and well-designed studies need to be developed aimed at assessing epidemiology and health care impact of pediatric FGID.
4. The effect of early life events and intercurrent infections on the future development of pediatric and adult FGID will need further investigation.
5. The interaction between central nervous system, enteric nervous system, and immune system needs to be explored.
6. Outcome studies of FGIDs need to explore the effects of different treatments on quality of life.
7. Multisite intervention studies of current and emerging pharmacological agents need to be completed by using standardized diagnostic criteria.
8. Cohort studies need to address the natural history of pediatric FGID.

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Received March 28, 2005. Accepted August 10, 2005.

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