

## CONTINUING MEDICAL EDUCATION

# Recurrent Abdominal Pain in Childhood

Philip Bufler, Martina Gross, and Holm H. Uhlig

## SUMMARY

**Background:** Chronic, recurrent abdominal pain is common among children and adolescents. It interferes with everyday life, causes absence from school, and leads to frequent medical consultations, often involving burdensome diagnostic testing and protracted attempts at treatment.

**Method:** Selective review of the literature.

**Results:** Organic causes should be ruled out with a thorough medical history and physical examination and a small number of laboratory tests. The pediatric Rome III criteria include valid diagnostic criteria for functional abdominal pain in childhood. The available data imply that this condition is best treated with cognitive behavioral therapy, rather than with medications or dietary measures.

**Conclusion:** A systematic approach to chronic recurrent abdominal pain in children and adolescents is key to ruling out organic diseases while avoiding unnecessary tests and treatments.

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Abdominal pain is one of the more common physical complaints in childhood (1). Cross-sectional data on the three-month prevalence of pain among children and adolescents aged 3 to 17 years in Germany were obtained from 14 836 children in the framework of the German Health Interview and Examination Survey for Children and Adolescents (*Kinder- und Jugendgesundheitsurvey*, KiGGS). 20% of these children had two or more episodes of pain in three months (2). Abdominal pain is the most common type of pain in younger children and the second most common type, after headache, in older children and adolescents (e1).

Abdominal pain is sometimes a sign of life-threatening disease. It can also have a harmless cause but nevertheless impair the child's self-perception of health and interfere markedly with everyday activities. The evaluation of acute and chronic abdominal pain includes the ruling out (or in) of a multitude of organic and mental conditions that can cause it. Functional pain, which is not due to any organic cause, often gives rise to prolonged, unnecessary diagnostic testing and protracted attempts at treatment, leading only to more worry for the affected children and their parents (e2, e3). Chronic abdominal pain causes long absences from kindergarten or school and markedly worsens quality of life (e4). It also has major direct and indirect costs. In a recent American study, the diagnostic evaluation of chronic abdominal pain in a tertiary treatment center in the United States was found to cost approximately 6000 dollars per patient (e2). This figure does not include the indirect costs caused by parental absences from work and by the need for additional child care.

Organic causes of abdominal pain must be rigorously excluded. On the other hand, unnecessary diagnostic testing in functional disorders must be avoided, leaving the physician in a dilemma.

Dr. von Haunersches Kinderspital, Ludwig-Maximilians-Universität, Munich; PD. Dr. med. Bufler

Deutsche Morbus Crohn/Colitis ulcerosa Vereinigung – DCCV – e. V., Berlin; Dipl.-Psych. Gross

Translational Gastroenterology Unit, Oxford University; PD Dr. med. Uhlig

## Causes of abdominal pain

Although there are many potential organic causes, chronic abdominal pain in childhood is usually of functional origin.

### Learning objectives

Readers of this article will learn

- the differential diagnosis of chronic abdominal pain in childhood and adolescence;
- algorithms for the diagnosis of organic diseases that cause abdominal pain, whose use can shield children and adolescents with functional chronic abdominal complaints from excessive diagnostic testing and treatment;
- treatment options for children and adolescents with functional abdominal pain.

In this article, we summarize the diagnostic algorithms and current treatment options for functional chronic abdominal pain in childhood on the basis of a selective review of the literature (publications retrieved by a PubMed search on “abdominal pain” and “children” from 2000 to 2010) and current guidelines. In reviewing the literature, we paid special attention to systematic reviews, meta-analyses, and the guidelines of the relevant medical societies.

### The definition of functional chronic abdominal pain in childhood

In 1999, an international committee of pediatricians established diagnostic criteria for functional gastroenterological disorders in childhood and adolescence. The Rome III criteria, published in 2006, are a modification of these original criteria (3). The Rome III criteria encompass a large group of functional gastrointestinal disorders, including (for example) rumination and chronic constipation as well as functional chronic abdominal pain (*eTable 1*).

Functional chronic abdominal pain is defined as pain that

- has been present for more than two months,
- arises more than once per week,
- and cannot be accounted for by any structural or biochemical disease (3).

Functional gastrointestinal complaints were long held to be no more than a diagnosis of exclusion, but the Rome III criteria enabled, for the first time, their positive definition and classification.

The Rome III classification separates these disorders into four entities:

- functional dyspepsia,
- irritable bowel syndrome,
- abdominal migraine, and
- childhood functional abdominal pain.

### A diagnosis of exclusion

When taking the history from children and adolescents with chronic abdominal pain, alarm symptoms must be inquired about to rule out organic disease.

### Functional dyspepsia

The Rome III criteria define functional dyspepsia as persistent or recurrent pain or discomfort located in the upper abdomen that is not relieved by defecation and is not associated with a change of stool frequency (*eTable 1*). Functional dyspepsia is characterized by nausea, vomiting, a feeling of fullness, and early satiety. A study in northern Italy found a 0.3% prevalence of functional dyspepsia, as defined by the earlier Rome II criteria, among children aged 0 to 12 years (e5). There are no current epidemiological data on functional dyspepsia among children and adolescents in Germany.

The main cause of functional dyspepsia is impaired gastric motility, leading to delayed gastric emptying or inadequate postprandial gastric relaxation (e6). Thus, children with functional dyspepsia report discomfort earlier than control subjects when undergoing pressure-controlled volume filling of the stomach (e7). Delayed gastric emptying is correlated with the symptom score in functional dyspepsia (e8). Accelerated gastric emptying, combined with a protracted bowel transit time, can also cause upper abdominal symptoms and a bloated abdomen in children, resulting in the clinical picture of functional dyspepsia (e9). Functional dyspepsia is not associated with *Helicobacter pylori* infection.

### Irritable bowel syndrome

Irritable bowel syndrome is characterized by changes in stool frequency and consistency and by the improvement of symptoms after defecation (*eTable 1*). The following symptoms are typical of irritable bowel syndrome (3):

- changes in stool frequency (with 4 or more stools per day or 2 or fewer stools per week,
- hard or watery stool,
- urgency or a feeling of incomplete evacuation,
- passage of mucus,
- bloating or feeling of abdominal distention.

Irritable bowel syndrome is the most common diagnosis among adults with gastrointestinal complaints. It also accounts for 22% to 45% of cases of functional abdominal pain in children (e10, e11).

Children and adults with irritable bowel syndrome have abnormally high visceral sensitivity, which manifests itself in a lowered pain threshold for stimuli that stretch the gastrointestinal tract (e12–e14). Yet the severity of visceral hypersensitivity is not correlated with the severity of symptoms; thus, visceral hypersensitivity cannot be the

### Classification of functional GI symptoms

- Functional upper abdominal symptoms (dyspepsia)
- Irritable bowel syndrome
- Abdominal migraine
- Functional abdominal pain in childhood

sole reason why irritable bowel syndrome arises (e15). A recent study from the Netherlands provides evidence that sensory hypersensitivity in children with functional abdominal pain, and particularly irritable bowel syndrome, is not restricted to the gastrointestinal tract, but is, in fact, generalized (e16).

Impaired intestinal mobility and infectious/inflammatory conditions may also contribute to the pathogenesis of irritable bowel syndrome. It has been documented that children who have recently suffered from bacterial infections of the gastrointestinal tract develop symptoms of irritable bowel syndrome more frequently than control subjects (e17). Subclinical inflammation of the mucosa is suggested by the finding of borderline elevated concentrations of calprotectin (a fecal marker of inflammation) in the stool of children and adults with irritable bowel syndrome (e18, e19). Mucosal permeability has been found to be increased in the small and large intestines of children with irritable bowel syndrome, but the pathophysiological significance of this finding is unclear (e19).

It is unclear whether psychosocial factors (“social learning”) or genetic causes are responsible for the observed familial clustering of irritable bowel syndrome (e20).

### Abdominal migraine

Abdominal migraine is characterized by paroxysmal attacks of intense periumbilical pain that interfere with the patient’s daily activities and are associated with two or more of the following symptoms (eTable 1):

- anorexia,
- nausea,
- vomiting,
- headache,
- photophobia or pallor.

The symptoms may last from one hour to several days. The diagnosis is established when two or more episodes of pain have occurred in the last 12 months and potential organic causes have been ruled out, especially the following:

- chronic inflammatory bowel disease,
- surgical causes,
- brain tumor.

Typically, there is no abnormality in the frequency or consistency of stool (3).

Abdominal migraine affects 1% to 4% of all children and is more common in girls than in boys (sex ratio 3:2). The average age at diagnosis is 7 years (3).

### Irritable bowel syndrome

**Irritable bowel syndrome is characterized by altered stool frequency and consistency and by the improvement of symptoms after defecation.**

#### BOX 1

### Some organic causes of chronic abdominal pain in childhood and adolescence\*1

- Food intolerance (e.g., lactose maldigestion, fructose/sorbitol malabsorption)
- Celiac disease
- Gastroesophageal reflux disease/esophagitis
- Dysmenorrhea
- Diseases of the urinary tract
- Chronic inflammatory bowel disease (Crohn’s disease, ulcerative colitis, indeterminate colitis)
- Peptic ulcer disease (in *Helicobacter pylori* infection)
- Yersinia infection (*Y. enterocolitica*, *Y. pseudotuberculosis*)
- Pancreatitis
- Hepatobiliary diseases
- Anatomical malformations (e.g., Meckel diverticulum, malrotation, duplication)
- Neoplastic disease

\*1 modified from (3)

The etiology and pathogenesis of abdominal migraine are unclear. Abdominal migraine, migraine headaches, and cyclic vomiting are thought to be due to related causes, in view of their overlapping clinical features (e21).

The mothers and grandmothers of children with abdominal migraine suffer from migraine twice as commonly as control subjects (e22). The pain is often so intense that it awakens the child from sleep and interferes markedly with daily activities.

Physical and mental stress are the usual trigger factors for abdominal migraine (e6).

### Childhood functional abdominal pain

Childhood functional abdominal pain is considered an independent entity in the Rome III criteria. Functional abdominal pain in childhood and adolescence differs from functional dyspepsia and irritable bowel syndrome in that the pain is at a different site and the stool is of normal frequency and consistency. Functional abdominal pain, according to the Rome III criteria, is characterized by

### Abdominal migraine

**The etiology and pathogenesis of abdominal migraine remain unknown. Abdominal migraine, migraine headaches, and cyclical vomiting are thought to be due to related causes.**

**BOX 2**

**“Red flags”: historical and clinical warning signs of an organic cause for chronic abdominal pain in childhood and adolescence<sup>\*1</sup>**

- Persistent symptoms in the right upper and lower quadrants
- Dysphagia, heartburn
- Unintended loss of more than 10% of body weight
- Impaired growth
- Recurrent vomiting
- Chronic diarrhea, particularly at night
- Evidence of gastrointestinal blood loss (visible blood in stool or positive occult blood test)
- Fever of unknown origin
- Abnormal physical findings, e.g., palpable mass, hepatomegaly, splenomegaly, guarding
- Family history of chronic inflammatory bowel disease, celiac disease, peptic ulcer disease, or other abdominal conditions
- Arthritis
- Disturbances of micturition
- Delayed puberty
- Disturbances of the female reproductive system (dysmenorrhea, amenorrhea)
- Waking up at night because of pain

<sup>\*1</sup> If any of these red flags are present, further diagnostic tests should be performed to rule out an organic cause; modified from (3, 6).

episodic or continuous abdominal pain arising at least once per week for at least two months (3). The pain is usually periumbilical and does not radiate elsewhere. If the pain is present at least 25% of the time and markedly interferes with daily activities or is accompanied by further functional symptoms not involving the gastrointestinal tract, a diagnosis of childhood functional abdominal pain syndrome is assigned (*eTable 1*). Visceral hypersensitivity has been demonstrated by rectal barostatic testing in children with chronic, recurrent abdominal pain, just as it has in children with irritable bowel syndrome (e14). Mental illness, too, can be associated with functional abdominal pain in childhood and adolescence (e23).

**The diagnostic evaluation of chronic, recurrent abdominal pain**

In the initial clinical assessment of children with abdominal pain, organic causes of the symptoms must be

ruled out (*Box 1*). The many causes of acute abdominal pain in childhood were the subject of a recent review (*eTable 2*) (4).

It can be difficult to distinguish an acute attack of chronic, functional abdominal pain from an acute organic condition, such as appendicitis. Therefore, “red flags” in the history and physical examination must be sought and excluded (*Box 2*) (5). A rough guide to structured history-taking is provided in *Box 3* and the *Figure*. Moreover, the patient’s height and weight must be plotted on the appropriate pediatric growth charts for the early detection of growth deficiency. In the absence of red flags, blood drawing is not routinely indicated in every case. Nonetheless, even if there are no red flags, we recommend a limited number of diagnostic tests to definitively rule out organic disease, including the following:

- complete blood count, inflammatory markers (e.g., erythrocyte sedimentation rate [ESR] and

**Functional abdominal pain**

Functional abdominal pain in childhood and adolescence differs from functional dyspepsia and irritable bowel syndrome in that the pain is at a different site and the stool is of normal frequency and consistency.

**Mental illness**

Mental illness, too, can be associated with functional abdominal pain in childhood and adolescence.

C-reactive protein [CRP]), alanine aminotransferase (ALAT), lipase,

- celiac disease serology (total IgA, transglutaminase antibody IgA or endomysium antibody IgA),
- dipstick urine test,
- stool tests for occult blood and fecal inflammatory markers (calprotectin or lactoferrin).

If the basic diagnostic evaluation yields no red flags or laboratory abnormalities, then further tests such as endoscopy, pH measurement, and imaging studies, including ultrasonography, can be dispensed with (e2, 6). There was once thought to be a definite association of chronic abdominal pain with *Helicobacter pylori* infection, but recent studies have failed to confirm this. Thus, there is no indication for a <sup>13</sup>C breath test for *Helicobacter pylori* or the *Helicobacter pylori* antigen stool test in children, unless peptic ulcer disease is suspected (e24). If the clinical findings suggest *Helicobacter pylori* infection with gastritis or a gastric ulcer, endoscopy is indicated to confirm the diagnosis and determine the antimicrobial resistance spectrum of the organism before antibiotics are given to eradicate it (7). Peptic ulcer is, however, a rare finding in children with abdominal pain and positive *Helicobacter pylori* cultures: in one study, histologically confirmed ulcers were found in only 1% of *Helicobacter pylori*-positive children (n = 111) (e25).

A trial of a lactose- or fructose-free diet can help rule out carbohydrate malabsorption or maldigestion. H<sub>2</sub> breath tests are not always needed for this purpose.

Morning sickness (vomiting) calls for neurological evaluation and, where indicated, imaging studies of the brain and spinal cord (computerized tomography or magnetic resonance imaging).

If organic causes have been excluded, but the symptoms persist, consultation with a child psychologist may be helpful.

### Treatment

The treatment of chronic abdominal pain of organic origin is that of the underlying disease (Box 2). The following treatments are both well studied and evidence-based:

- acid suppression with proton-pump inhibitors for the treatment of gastroesophageal reflux disease (and, in rare cases, anti-reflux surgery);
- gluten-free diet for celiac disease;
- polymeric or elemental diet, anti-inflammatory drugs, and immune suppression for chronic inflammatory bowel disease (and surgery when necessary);

### Diagnostic evaluation

If the basic diagnostic evaluation reveals no warning signs or abnormalities, further tests such as endoscopy, pH measurement, and imaging studies, including ultrasonography can be dispensed with.

### BOX 3

#### Structured history-taking from children and adolescents with chronic abdominal pain\*<sup>1</sup>

- Red flags? (Box 2)
- Where is the pain? (periumbilical, epigastric, . . .)
- Nausea and/or vomiting?
- How often do the symptoms arise?
- Bowel habits: tendency to constipation or diarrhea?
- Eating habits: excessive intake of dairy products, fruits or fruit juices, artificially sweetened foods and drinks?
- Other functional disturbances?
- Family history of functional disorders?
- Psychosocial history

\*<sup>1</sup> as performed in the authors' institutions

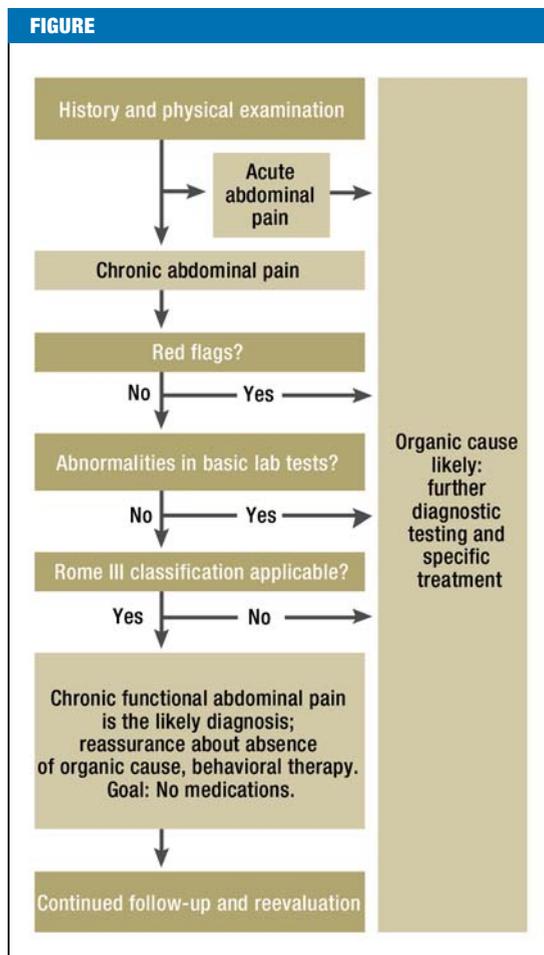
- low-lactose diet (lactase, when indicated, for adult lactose deficiency);
- polyethylene glycol (PEG) for chronic constipation (8). Adequate fluid intake and a high-fiber diet may complement PEG medication (9).

Psychological support of the affected child or adolescent, and of the parents as well, by the treating pediatrician or general practitioner is an important part of the treatment of functional abdominal pain. Psychotherapeutic intervention can also be useful, e.g., in the setting of programs for coping with chronic pain. The goal of treatment is not the total elimination of symptoms, but rather the acquisition of strategies for coping with the pain and getting on with life. For children who miss school because of their symptoms, going back to school is a prime objective (5). The first treatment step is an age-appropriate assessment of the findings that were made on the initial clinical evaluation. Next, the physician discusses the pathophysiological mechanisms of chronic abdominal pain with the patient and family, without any time pressure. It is essential to point out that, although the patient indeed has pain, the pain is not due to any organic cause. Precipitating factors such as stress should be discussed as well. The explanatory model of visceral hypersensitivity with a low individual pain threshold helps children and adolescents understand why they (unlike other people) have pain when the bowel wall

### Further testing

If organic causes have been excluded and symptoms persist, consultation with a child psychologist may be helpful.

Diagnostic algorithm for the assessment of abdominal pain in childhood and adolescence (as practiced at the authors' institutions)



is physiologically stretched. The children and their parents should be reassured that there is no organic disease. However, this does not mean that abdominal pain is not a real problem (or imply that the pain is “just in your head”). This explanation itself usually leads to a marked improvement of symptoms (10). Empathy on the part of the physician and parents is important, yet too much medical and parental attention can reinforce functional pain symptoms. A controlled trial revealed that children’s symptoms were best relieved by diversionary behavior on the parents’ part (e26). Medications, dietary changes, and alternative/complementary medicine have no, or only a marginal, effect on chronic, functional abdomi-

**The treatment of chronic functional abdominal pain**

There is little evidence for the efficacy of medications and dietary treatments for chronic functional abdominal pain.

nal pain. Cognitive behavioral therapy, however, is an effective form of treatment.

**Medications**

A recent meta-analysis of randomized clinical trials of drugs for children and adolescents identified three well-designed studies, each of which tested a different medication for a different target group of patients (11). The authors concluded that pharmacotherapy generally cannot be recommended for children with functional abdominal pain, except in the context of clinical trials. Drugs should only be given in exceptional cases (11).

A randomized, double-blind, controlled clinical trial of peppermint oil for children in the acute phase of irritable bowel syndrome revealed a positive benefit; there were 50 children in the treatment arm of the trial (e27). Various neuroactive medications are currently being tested in the light of pathophysiological considerations and therapeutic success in adults, but minimal or no effect has been found with the serotonin antagonist pizotifen (e28), the histamine H<sub>2</sub>-receptor antagonist famotidine (e29), or the tricyclic antidepressant amitriptyline (12). All studies of treatments for childhood functional abdominal pain are marred by low case numbers. Often, significant effects can only be demonstrated by post-hoc subgroup analysis. Thus, the available studies to date are only partially informative.

Up to 40% of children with functional abdominal pain undergo alternative or complementary treatments such as phytotherapy, dietary supplementation, manual therapies, or homeopathy (e30). The putative benefit of such methods has not been documented by controlled clinical trials.

A positive response to placebo does not indicate that the patient really has no pain. Functional abdominal pain typically fluctuates in intensity; this fact alone implies that such an interpretation is neither correct nor helpful.

**Dietary interventions and probiotics**

A meta-analysis failed to reveal any therapeutic benefit from a low-lactose (two randomized clinical trials with a total of 90 patients) or high-fiber (two randomized clinical trials with a total of 83 patients) diet for children with functional abdominal pain (13). There have been no systematic studies of the temporary elimination of various foods or food ingredients from the diet, e.g., caffeine, spicy foods, fatty foods, or carbonated drinks.

A meta-analysis of two randomized clinical trials involving a total of 168 patients revealed no benefit of the

**The goal of treatment for chronic functional abdominal pain**

The goal is not the total elimination of symptoms, but rather the acquisition of strategies for coping with the pain and getting on with life.

probiotic substance *Lactobacillus rhamnosus* GG in children with chronic functional abdominal pain (13). Two newer trials, however, have shown a benefit of probiotic substances in children with irritable bowel syndrome. In one, *Lactobacillus rhamnosus* GG was given to a total of 85 patients; in the other, the probiotic mixture VSL#3 was given to a total of 59 patients (e31, e32).

### Psychotherapy

In the last few years, psychotherapeutic treatments have been systematically tested in children and adults with chronic functional abdominal pain. Several meta-analyses of well-designed clinical trials have documented the efficacy of cognitive behavioral therapy for this indication (14–16). In a recent trial, 200 children and adolescents aged 7 to 17 years were randomized to receive either three sessions of cognitive behavioral family therapy, or else nothing more than basic patient education about the anatomy of the gastrointestinal tract and the essentials of proper nutrition (control group). Cognitive behavioral family therapy was found to be associated with significantly less pain and lower symptom severity six months after the intervention (e33). A few studies have also revealed a benefit from the use of hypnosis to treat chronic functional abdominal pain in childhood (e34).

The use of cognitive behavioral therapy is based on the idea that patients' pain behavior is caused not just by increased nociception, but also by possible secondary gain (e.g., increased attention or an excuse to miss school). The goal of treatment is not just to relieve symptoms, but also to promote appropriate coping with the disease to improve the patient's quality of life. Effective behavioral-therapeutic components include psychoeducation, relaxation methods, cognitive techniques, and behavior-oriented measures (Table) (e35).

Psychoeducation is necessary to secure the patient's active cooperation and assumption of responsibility. Important topics for psychoeducation, aside from a general introduction to the subject of pain, include the causes and epidemiology of the patient's condition as well as coping strategies not just for dealing with acute pain, but also for general stress reduction (e36). Relaxation techniques such as progressive muscle relaxation, imagery (imaginary travels), and autogenic training can help counteract the tension caused by pain and rapidly bring about a state of reduced tension. The main cognitive methods used are distraction techniques and cognitive restructuring. The aim of the latter is to get the patient to view the continually recurring pain not as an uncontrollable event, but

TABLE

Overview of cognitive behavioral therapeutic methods for the treatment of chronic functional abdominal pain<sup>1</sup>

| Element                      | Examples  | Goal   |
|------------------------------|---|--|
| Psychoeducation              | – Education about the causes of abdominal pain<br>– Teaching of coping strategies | – Promoting patient cooperation and supporting self-responsibility |
| Relaxation                   | – Progressive muscle relaxation<br>– Autogenic training                           | – Reduction of tension due to pain and creation of a relaxed state |
| Cognitive techniques         | – Distraction techniques<br>– Cognitive restructuring                             | – Learn to deal with the pain with a positive attitude             |
| Behavior-oriented techniques | – Make activity plans   | – Restoration of functional ability in everyday life               |

<sup>1</sup>modified from (e35)

rather as a trigger for the use of pain coping strategies. The patient thus learns a new, positive way to deal with the pain (e37). Among behavior-oriented methods, the most important is reduction of passive or avoidant behavior (e.g., staying home from school, lying down and taking it easy). The aim is to improve patient's resilience and support their coping with daily life at home and in school.

In routine clinical practice, behavioral therapy is necessary only for some affected children and should then be provided under the guidance of a psychologist, e.g., in the setting of a training program (e38). In Germany countries, several psychologically oriented group training programs have been developed for children with functional chronic abdominal pain, including the “belly dancer” program of the Kinderklinik Datteln for children with recurrent abdominal pain (e39) and the “stop the pain” training program of the University of Potsdam (e38).

Many physicians feel unsure how to deal with functional complaints. Possible organic causes are usually worked up quite meticulously. Patients with chronic abdominal pain need a calculated but restricted diagnostic evaluation. The physician can best prevent doctor-hopping by communicating his or her assessment of the situation clearly and thereby giving patients and their

### Dietary measures

Neither a low-lactose nor a high-fiber diet has been found to have any benefit for children with chronic functional abdominal pain.

### Behavioral-therapeutic approaches

Medications, dietary changes, and alternative/complementary medicine have no effect on chronic functional abdominal pain; cognitive behavioral therapy, however, is an effective form of treatment.

parents a sense of security. The above discussion of the diagnostic and therapeutic options implies that further research in this area is still needed (3, 6): for example, the pediatric Rome III classification needs to be further simplified in order to ease the differentiation of the various functional conditions from one another and to lessen inter-observer variability (e40, e41). The classification often seems little more than academic when a condition is diagnosed for which there is no specific treatment.

### Conclusion

Abdominal pain is among the more common types of pain affecting children and adolescents. For most patients with chronic abdominal pain, no organic cause is found. Among the possible treatments for chronic functional abdominal pain, cognitive behavioral therapy is the most likely to yield lasting benefit. Drugs and diets are of limited use against chronic functional abdominal pain.

### Further Information

The German Society for Child and Adolescent Medicine (*Deutsche Gesellschaft für Kinder- und Jugendmedizin*, DGKJ) and the Society for Pediatric Gastroenterology and Nutrition (*Gesellschaft für pädiatrische Gastroenterologie und Ernährung*, GPGE) have jointly issued an information sheet for parents, written by A. Ballauff and S. Koletzko [available in German language only]. It can be read on the DGKJ website ([www.dgkj.de/uploads/media/Mein\\_Kind\\_hat\\_Bauchschmerzen\\_01.pdf](http://www.dgkj.de/uploads/media/Mein_Kind_hat_Bauchschmerzen_01.pdf)) or ordered free of charge from the DGKJ office.

A validated questionnaire is available on the website [www.romecriteria.org](http://www.romecriteria.org). This questionnaire serves as an aid to the structured diagnostic assessment and classification of functional gastrointestinal disturbances in childhood and adolescence in accordance with the pediatric Rome III criteria.

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### Conflict of Interest Statement

PD Bufler has received reimbursement of travel expenses and lecture fees from the Abbott, Roche Pharma AG, The Binding Site GmbH, Essex Pharma, and Given Imaging companies. He also holds a patent (no. 7820156) on a method that could be used to treat Crohn's disease.

PD Uhlig has received reimbursement of travel expenses from the Glaxo-Smith-Kline Foundation and Essex Pharma and project financing from the Hexal Childrens' Medications Initiative. He holds a patent (DE 10065932 B4) on a method that might possibly be used to diagnose celiac disease. Dipl-Psych. Gross declares that she has no conflict of interest.

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### Behavior-oriented methods

Psychologically oriented group-therapy programs are beneficial for children with chronic functional abdominal pain.

### Clear patient information

The physician can best prevent doctor-hopping by communicating his or her assessment of the situation clearly and giving patients and their parents a sense of security.

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**Corresponding author**

PD Dr. med. Philip Bufler  
 Abteilung für Pädiatrische Gastroenterologie und Hepatologie  
 Dr. von Haunersches Kinderspital  
 Ludwig-Maximilians-Universität München  
 Lindwurmstr. 4  
 80337 München, Germany  
 philip.bufler@med.uni-muenchen.de



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**Further information on CME**

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The solutions to the following questions will be published in issue 25/2011. The CME unit “The Management of Psychiatric Emergencies” (issue 13/2011) can be accessed until 13 May 2011.

For issue 21/2011, we plan to offer the topic “Hearing Impairment.”

**Solutions to the CME questionnaire in issue 9/2011:**

Teichgräber UK, et al.: Central Venous Port Systems as an Integral Part of Chemotherapy.

Solutions: 1a, 2b, 3e, 4a, 5c, 6d, 7e, 8b, 9d, 10e

Please answer the following questions to participate in our certified Continuing Medical Education program. Only one answer is possible per question. Please select the answer that is most appropriate.

**Question 1**

**What percentage of children and adolescents aged 3 to 17 years in the KiGGS Study stated that they had two or more episodes of pain in three months?**

- a) 10%
- b) 20%
- c) 30%
- d) 40%
- e) 50%

**Question 2**

**How do the Rome III criteria define chronic abdominal pain?**

- a) Weekly episodes of abdominal pain over at least 2 months
- b) Three episodes of abdominal pain in 3 months
- c) Persistent abdominal pain for 1 month
- d) Persistent abdominal pain for more than 6 months
- e) Two episodes of abdominal pain in 4 months

**Question 3**

**A 15-year-old girl complains of recurrent projectile vomiting and undesired weight loss over the last two months. What should be done as the next diagnostic step?**

- a) Computerized tomography of the head
- b) Rotavirus culture
- c) Exclusion of a hernia
- d) Gynecological consultation to rule out ovarian cancer
- e) <sup>13</sup>C breath test for *Helicobacter pylori*

**Question 4**

**Which of the following is a part of the basic diagnostic evaluation of children and adolescents with chronic abdominal pain?**

- a) Helicobacter stool test
- b) Abdominal ultrasonography
- c) Blood count and C-reactive protein
- d) Sweat test
- e) Test for rotavirus

**Question 5**

**Which of the following findings suggests an organic cause for chronic abdominal pain?**

- a) Prolonged sleep phases
- b) Weight loss of less than 5%
- c) Chronic bronchitis
- d) Delayed puberty
- e) Persistent discomfort in the left upper quadrant

**Question 6**

**What is the main cause of functional dyspepsia?**

- a) A congenital heart defect
- b) An immune disorder
- c) Impaired gastric motility
- d) Arterial hypertension
- e) Contusion of the spleen

**Question 7**

**Irritable bowel syndrome is typically associated with which of the following?**

- a) Altered stool frequency and consistency
- b) Headache
- c) Prior upper respiratory infections
- d) Autosomal dominant inheritance
- e) *Helicobacter pylori* infection

**Question 8**

A 7-year-old girl complains of recurrent, intense abdominal pain. She suffers from lack of appetite, nausea, vomiting, headaches, and photophobia. Her stool frequency and consistency are normal. A search for an organic cause did not reveal any. Her mother is also under your care and regularly takes sumatriptan.

**What is the most likely diagnosis of this girl's problem?**

- a) Diabetes
- b) Dyspepsia
- c) Irritable bowel syndrome
- d) Food allergy
- e) Abdominal migraine

**Question 9**

**What method of treatment has been found to be effective for chronic functional abdominal pain?**

- a) Gestalt therapy
- b) Psychoanalysis
- c) Depth-psychological techniques
- d) Cognitive behavioral therapy
- e) Hypnosis

**Question 10**

**What percentage of children with chronic abdominal pain receive a diagnosis of irritable bowel syndrome?**

- a) 1% to 23%
- b) 11% to 34%
- c) 22% to 45%
- d) 33% to 56%
- e) 44% to 76%

## CONTINUING MEDICAL EDUCATION

# Recurrent Abdominal Pain in Childhood

Philip Bufler, Martina Gross, and Holm H. Uhlig

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**eTABLE 1**

**Classification and diagnostic criteria for functional gastrointestinal diseases including functional abdominal pain in children and adolescents aged 4 to 18<sup>1</sup>**

| Disorder  | Subgroup  | Diagnostic criteria   |
|---|---|---|
| H1.<br>Vomiting and aerophagia                                      | H1a.<br>Adolescent rumination syndrome                | <b>All criteria must be fulfilled:</b><br><i>(criteria fulfilled at least once per week for at least two months before diagnosis)</i><br>1. Repeated painless regurgitation and rechewing or expulsion of food that<br>a) begin soon after ingestion of a meal<br>b) do not occur at night<br>c) do not respond to standard treatment for gastroesophageal reflux<br>2. No retching<br>3. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process  |
|   | H1b.<br>Cyclic vomiting syndrome                      | <b>Both criteria must be fulfilled:</b><br>1. Two or more periods of intense nausea and unremitting vomiting or retching lasting hours to days<br>2. Return to usual state of health lasting weeks to months  |
|   | H1c.<br>Aerophagia                                    | <b>At least two criteria must be fulfilled:</b><br><i>(criteria fulfilled at least once per week for at least two months prior to diagnosis)</i><br>1. Air swallowing<br>2. Abdominal distention due to intraluminal air<br>3. Repetitive belching and/or increased flatus  |
| H2.<br>Abdominal pain-related functional gastrointestinal disorders | H2a.<br>Functional dyspepsia                          | <b>All criteria must be fulfilled:</b><br><i>(criteria fulfilled at least once per week for at least two months prior to diagnosis)</i><br>1. Persistent or recurrent pain or discomfort centered in the upper abdomen (above the umbilicus)<br>2. Not relieved by defecation or associated with the onset of a change in stool frequency or stool form (i.e., not irritable bowel syndrome)<br>3. No evidence of an inflammatory, anatomic, metabolic or neoplastic process  |
|   | H2b.<br>Irritable bowel syndrome                      | <b>Both of the following criteria must be fulfilled:</b><br><i>(criteria fulfilled at least once per week for at least two months prior to diagnosis)</i><br>1. Abdominal discomfort or pain associated with two or more of the following at least 25% of the time:<br>a) Improvement with defecation<br>b) Onset associated with a change in frequency of stool<br>c) Onset associated with a change in form (appearance) of stool<br>2. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process  |
|   | H2c.<br>Abdominal migraine                            | <b>All criteria must be fulfilled:</b><br><i>(criteria fulfilled two or more times in the preceding 12 months)</i><br>1. Paroxysmal episodes of intense, acute periumbilical pain that lasts for 1 hour or more<br>2. Intervening periods of usual health lasting weeks to months<br>3. The pain interferes with normal activities<br>4. The pain is associated with at least two of the following:<br>a) Anorexia<br>b) Nausea<br>c) Vomiting<br>d) Headache<br>e) Photophobia<br>f) Pallor<br>5. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process |
|   | H2d.<br>Childhood functional abdominal pain           | <b>All criteria must be fulfilled:</b><br><i>(criteria fulfilled at least once per week for at least two months prior to diagnosis)</i><br>1. Episodic or continuous abdominal pain<br>2. Insufficient criteria for other functional gastrointestinal disorders<br>3. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process  |
|   | H2d1.<br>Childhood functional abdominal pain syndrome | <b>All criteria must be fulfilled:</b><br><i>(criteria fulfilled at least once per week for at least two months prior to diagnosis)</i><br><b>Must satisfy criteria for childhood functional abdominal pain and have at least 25% of the time one or more of the following:</b><br>1. Some loss of daily functioning<br>2. Additional somatic symptoms such as headache, limb pain, or difficulty sleeping  |

|  |   |   |
|--|---|---|
| H3.<br>Constipation<br>and fecal<br>incontinence | H3a.<br>Functional<br>constipation              | <p><b>At least two criteria must be fulfilled:</b><br/>(<i>criteria fulfilled at least once per week for at least two months prior to diagnosis</i>)<br/><b>Must include two or more of the following in a child with a developmental age of at least 4 years with insufficient criteria for diagnosis of inflammatory bowel syndrome:</b></p> <ol style="list-style-type: none"> <li>1. Two or fewer defecations in the toilet per week</li> <li>2. At least one episode of fecal incontinence per week</li> <li>3. History of retentive posturing or excessive volitional stool retention</li> <li>4. History of painful or hard bowel movements</li> <li>5. Presence of a large fecal mass in the rectum</li> <li>6. History of large diameter stools which may obstruct the toilet</li> </ol> |
|  | H3b.<br>Nonretentive<br>fecal inconti-<br>nence | <p><b>All criteria must be fulfilled by a child with a developmental age of at least 4 years:</b><br/>(<i>criteria fulfilled for at least two months prior to diagnosis</i>)</p> <ol style="list-style-type: none"> <li>1. Defecation in a socially unacceptable place (not in the toilet) at least once per month</li> <li>2. No evidence of an inflammatory, anatomic, metabolic, or neoplastic process</li> <li>3. No evidence of fecal retention</li> </ol>   |

<sup>†1</sup> This classification corresponds to that of the official Rome III criteria, modified from (3)

**eTABLE 2**

**Some organic causes of acute abdominal pain in children aged 2 and older<sup>†1</sup>**

| 2–5 years                | 6–11 years               | 12–18 years                |
|--------------------------|--------------------------|----------------------------|
| Acute gastroenteritis    | Gastroenteritis          | Gastroenteritis            |
| Tonsillopharyngitis      | Constipation             | Constipation               |
| Urinary tract infection  | Urinary tract infection  | Dysmenorrhea               |
| Constipation             | Trauma                   | Ovulatory pain             |
| Mesenteric lymphadenitis | Tonsillopharyngitis      | Appendicitis               |
| Henoch-Schönlein purpura | Appendicitis             | Pyelonephritis             |
| Intussusception          | Pneumonia                | Urinary tract infection    |
| Volvulus                 | Henoch-Schönlein purpura | Basilar pneumonia          |
| Diabetes mellitus        | Mesenteric lymphadenitis | Internal genital infection |
|                          | Diabetes mellitus        | Ectopic pregnancy          |
|                          |                          | Ovarian/testicular torsion |
|                          |                          | Diabetes mellitus          |
|                          |                          | Gallstones                 |

<sup>†1</sup>modified from (4)