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INTRODUCTION — Chronic abdominal pain is common in children and adolescents. The evaluation of the child or adolescent with chronic abdominal pain requires an understanding of the pathogenesis of abdominal pain, the most common causes of abdominal pain in children and adolescents, and the typical patterns of presentation.

The evaluation of the child or adolescent with chronic abdominal pain will be discussed here. The management of functional abdominal pain in children and adolescents, the causes of acute abdominal pain, and the evaluation of children with acute abdominal pain are discussed separately. (See "Functional abdominal pain in children and adolescents: Management in primary care" and "Causes of acute abdominal pain in children and adolescents" and "Emergency evaluation of the child with acute abdominal pain".)

TERMINOLOGY — In this topic, we will use the term "chronic abdominal pain" to describe intermittent or constant abdominal pain (of functional or organic etiology) that has been present for at least two months [1]. However, in clinical practice, the distinction between acute and chronic abdominal pain is rarely distinct [2].

Our definition is similar to that provided in the 2005 American Academy of Pediatrics and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition clinical report [3]. Although some clinicians require pain of three months' duration to be considered chronic, the Rome IV criteria for functional abdominal pain disorders typically require symptoms for at least two months (table 1) [1].

The term "chronic abdominal pain" encompasses "recurrent abdominal pain," classically defined by four criteria: 1) ≥3 episodes of abdominal pain; 2) pain sufficiently severe to affect activities; 3) episodes occur over a period of ≥3 months; and 4) no known organic cause [4]. In the original case series, "recurrent abdominal pain of childhood" was considered to be the diagnosis [5]. However, clinical and laboratory evaluations suggest that recurrent abdominal pain is not a single entity but a symptom complex with both organic and functional etiologies [6-10]. Thus, it is more accurate to use "recurrent abdominal pain" as a description rather than a diagnosis.

EPIDEMIOLOGY — Complaints of chronic abdominal pain occur in 10 to 19 percent of children [4,11-13]. The prevalence is increased in children age four to six years and early adolescents [11,13]. In a community-based population study, as many as 17 percent of middle and high school students reported weekly episodes of abdominal pain [14]. Among the pupils who reported abdominal pain, approximately 21 percent had discomfort that was sufficiently severe to affect activity. In a 2015 meta-analysis of 58 studies including 196,472 children from around the world, the pooled prevalence of functional abdominal pain disorders was 13.5 percent (95% 11.8-15.3) [15].

PATHOGENESIS — Pain receptors in the abdomen respond to mechanical and chemical stimuli. Stretch is the principal mechanical stimulus involved in visceral pain and is induced by distension, contraction, traction, compression, and torsion [16]. Mucosal receptors respond primarily to chemical stimuli (eg, substance P, bradykinin, serotonin, histamine, prostaglandins), which are released in response to inflammation or ischemia [17,18]. Different types of stimuli may act together to influence the perception of pain. As an example, the gastric mucosa typically is insensitive to pressure or chemical stimuli; however, these stimuli may cause pain if the gastric mucosa is inflamed [19].

The threshold for perceiving pain from visceral stimuli varies among individuals. Pain perception is complex and involves visceral sensitivity and psychologic processing [20]. The central nervous system's interpretation of visceral pain as serious or not serious influences the perception of pain [21,22]. In children with functional abdominal pain, brain-gut communication is altered by a distortion of visceral sensation [23]. Normal processes (eg, peristalsis) may be perceived as painful. Visceral hypersensitivity occurs through peripheral sensitization at the point of inflammation, central sensitization, and recruitment of noninvolved adjacent neurons [24]; these mechanisms may predispose to chronic pain even after the initial stimulus (eg, infection) has resolved. (See "Pathophysiology of irritable bowel syndrome", section on 'Visceral hypersensitivity'.)

Sometimes pain originating in the viscera is perceived to originate at a distant site (ie, referred pain). Referred pain usually is located in the cutaneous dermatomes sharing the same spinal cord level as the visceral inputs (figure 1). As an example, nociceptive stimuli from the gallbladder enter the spinal cord at T5 to T10. Thus, pain from an inflamed gallbladder may be perceived in the scapula. Precise localization of the pain to the right upper quadrant in patients with acute cholecystitis usually occurs once the overlying parietal peritoneum (which is somatically innervated) becomes inflamed.

ETIOLOGY — The two broad categories of causes of chronic abdominal pain in children and adolescents are organic disorders (table 2) and functional abdominal pain disorders (table 1) [6]. Most children with chronic abdominal pain have functional abdominal pain disorders [8,25,26]. However, the two categories are not mutually exclusive. Functional and organic conditions coexist and interact; psychologic complications of organic disease are common in children and adolescents [27-29]. As an example, irritable bowel syndrome (IBS) is frequently superimposed on inflammatory bowel disease [30].

Organic disorders — Organic disorders are conditions that are associated with physiologic, structural, or biochemical abnormalities (table 2). Organic disorders are more likely in children with "alarm" findings (table 3).

Functional disorders — Functional disorders are conditions in which the patient has a variable combination of symptoms without any readily identifiable or strong suspicion of an organic condition. Functional gastrointestinal pain involves interplay among regulatory factors in the enteric and central nervous systems [31]. It may be associated with visceral hyperalgesia, reduced threshold for pain, abnormal pain referral after rectal distension, or impaired gastric relaxation response to meals [21,32-35]. (See 'Pathogenesis' above.)

Several functional abdominal pain disorders of childhood/adolescence have recognizable patterns of symptoms (table 1) [1]. In a large population-based survey, the prevalences of functional abdominal pain disorders (diagnosed according to Rome III criteria) were as follows [36]:

- Abdominal migraine – 9.2 percent
- IBS – 2.8 percent
- Functional abdominal pain/functional abdominal pain syndrome – 1.1 percent
- Functional dyspepsia – 0.2 percent

The prevalence of functional constipation was 12.9 percent. The Rome classification does not categorize functional constipation as a functional abdominal pain disorder; however, it is a common cause of abdominal pain in children.

In most cases, functional abdominal pain is ill-defined and poorly localized or periumbilical [37]. Episodes of pain usually last for less than one hour, resolve spontaneously, and may be accompanied by autonomic features (eg, pallor, nausea, dizziness, headache, or fatigue) [27,38]. They may be triggered or exacerbated during times of stress (eg, school transitions, parental divorce, emotional trauma). The child is well and functions normally between episodes but may have symptoms of anxiety or depression (separation anxiety,

social phobias, specific phobias, generalized anxiety [39,40]). Alarm symptoms (table 3) are lacking [3,41]. The family history often is positive for gastrointestinal complaints (eg, IBS, reflux, constipation) [14,42].

INITIAL EVALUATION

Overview — The initial evaluation of the child or adolescent with chronic abdominal pain includes history, physical examination, and stool testing for occult blood to determine whether the child has any "alarm findings" (table 3), which help to distinguish organic from functional abdominal pain and direct the need for additional evaluation [3,41,42]. In an observational study, weight loss, hematochezia, and anemia were more common in children with Crohn disease than with functional gastrointestinal disorders (FGIDs), with a cumulative sensitivity of 94 percent. The specifics of the additional evaluation depend upon the diagnostic considerations. (See 'Patients with alarm findings' below.)

Information other than alarm findings obtained in the initial evaluation helps to distinguish among organic etiologies and provides insight into biopsychosocial factors that may trigger or reinforce pain (independent of etiology) and are helpful formulating a management plan [31,43-47]. (See "Functional abdominal pain in children and adolescents: Management in primary care", section on 'Management of triggers'.)

Comprehensive initial history and examination helps to reassure the patient and family that the clinician is taking their complaints seriously. At the time of presentation, the parents and child may be frustrated and anxious; they may have tried over-the-counter or dietary interventions without improvement and may be increasingly concerned that the child has a serious disorder [2]. The parents should be asked what they think is causing the pain (or what they are worried is causing the pain) so that their concerns can be directly addressed. It is important to establish a therapeutic alliance early in the course of evaluation and treatment. (See "Functional abdominal pain in children and adolescents: Management in primary care", section on 'Therapeutic relationship'.)

It may be helpful to introduce the concept and high likelihood of FGIDs as a possible cause at the initial evaluation, even if the pain has not been present long enough to qualify as "chronic" [2,48]. It also may be helpful to educate the patient/family about the biopsychosocial model of pain and possible role of stress (figure 2). Providing examples of how stress can directly cause abdominal pain or other symptoms (ie, churning of the stomach or headache before a test) may help them to understand this relationship.

The patient and family should be assured that the clinician will search for identifiable causes, initiate a treatment plan, and continue to follow the patient on a regular basis [49]. Periodic follow-up validates the clinician's continued support and interest in the child/adolescent and family. (See "Functional abdominal pain in children and adolescents: Management in primary care", section on 'Follow-up'.)

The approach outlined below is largely consistent with that recommended in the 2005 American Academy of Pediatrics and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition clinical report on chronic abdominal pain in children [3].

History — The history may provide clues to the etiology of chronic abdominal pain. It must assess possible organic causes for the pain, as well as biologic and psychosocial factors that may be contributing to it [31,43-46].

It is important to ask specifically about alarm findings (table 3). In a 2005 systematic review, alarm findings were helpful in distinguishing organic from functional pain [41]. (See 'Etiology' above.) Alarm findings from the history include:

- Involuntary weight loss or unexplained fever
- Difficulty swallowing or painful swallowing
- Vomiting that is bilious, protracted, projectile, or otherwise worrisome

- Diarrhea that is severe and chronic (≥3 loose or watery stools per day for ≥2 weeks), nocturnal, or bloody
- Urinary symptoms
- Back pain
- Family history of inflammatory bowel disease (IBD), celiac disease, or peptic ulcer disease
- Skin changes (eg, rash, eczema, hives)

Although they may not be helpful in distinguishing organic from functional causes of pain, other aspects of the history may help to distinguish among organic causes or provide insight into exacerbating factors and how the pain affects the child/family (table 4) [41].

Asking the patient to record a pain diary for one week can help to clarify the details of the pain history and possible areas of intervention. The patient, with assistance from family members, if necessary, should be instructed to record the following information at the end of each day:

- Time of day the pain occurred
- Pain location and severity using a scale of zero (no pain) to five (worst pain) or the FACES scale (figure 3) and including whether the pain prevented activities
- Possible triggering factors (eg, foods, activities, stressors, thoughts, feelings, geographic locations [eg, in school, at home])
- Pain duration
- Remedies/interventions that were tried and whether or not they were successful

  Menstrual history (including age of menarche, date of last two menstrual periods, and frequency of menstrual periods) should be obtained in all adolescent females. The relationship between menstrual periods and the pain should be elicited.

The psychosocial history is an important part of the evaluation of children and adolescents with chronic abdominal pain. Psychosocial factors do not help to distinguish organic from functional abdominal pain but may contribute to the perception or maintenance of abdominal pain, regardless of the etiology [31,43-46]. In some children abdominal pain may be reinforced by parental attention or being allowed to stay home from school. Abdominal pain also may be a physiologic response to traumatic events (eg, physical or sexual abuse) [50-52]. This interaction between stress and pain may be mediated by abnormalities in the autonomic nervous system [53]. (See 'Pathogenesis' above.)

The HEEADSSS acronym (table 5) is a psychosocial screening tool that is commonly used for adolescents. The adolescent should be interviewed alone; questions regarding the adolescent's sexual history, psychologic fears and inappropriately high levels of anxiety (prior to onset of pain and during pain), or parental issues should be asked without the parent present.

Physical examination — The physical examination of the child or adolescent with complaints of chronic abdominal pain focuses on the abdominal, pelvic, rectal, and genitourinary regions to identify alarm findings (table 3), which require additional evaluation. (See 'Patients with alarm findings' below.)

Alarm findings from the examination include:

- Deceleration in linear growth
- Oral ulcers or perianal abnormalities (eg, skin tags, fissures, fistulae)

- Localized abdominal pain, suprapubic tenderness, or costovertebral angle tenderness
- Delayed puberty
- Hepatosplenomegaly
- Guaiac-positive stool

Important aspects of the examination include [3,46]:

- The general appearance and level of comfort or discomfort (as an indication of severity)
- Growth parameters, including weight (percentile or percent ideal body weight), height, and growth velocity; height growth of <5 cm (2 inches) per year in a prepubertal child, and/or substantial decrease in height percentile (eg, crossing two major percentile lines [95th, 90th, 75th, 50th, etc]) suggests growth delay (see "Measurement of growth in children")
- Blood pressure; hypertension may indicate organic disease (see "Epidemiology, risk factors, and etiology of hypertension in children and adolescents", section on 'Secondary hypertension')
- Abdominal examination:
  - Position assumed by the patient when in pain
  - Palpation, performed gently and while the patient is distracted, to assess enlarged organs or masses (eg, stool in the left lower quadrant)
  - Guarding typically is absent with deeper sources of pain (eg, pancreatitis, renal colic); however, determining if abdominal tenderness is deep (implicating disease of visceral organs) or superficial may be difficult
  - Carnett sign to differentiate visceral from abdominal wall pain – With the child in the supine position, ask him or her to cross the arms and sit halfway forward (to elicit abdominal muscle contraction); focal tenderness that increases or remains the same during abdominal wall contraction (ie, positive Carnett sign) suggests pain originating in the abdominal wall (eg, hernia, hematoma, abdominal wall musculature, anterior cutaneous nerve entrapment syndrome) [54] (see "Anterior cutaneous nerve entrapment syndrome", section on 'Diagnostic approach')
- Hyperextension of the hip – Pain that is reproduced with hyperextension at the hip (psoas sign) is suggestive of inflammation of the psoas muscle (see "Psoas abscess", section on 'Symptoms and signs')
- Sexual maturity rating (delayed puberty may be a clue to organic disease [eg, IBD]; absence of menarche despite sexual maturity may be a clue to hematocolpos) (see "Normal puberty", section on 'Sexual maturity rating (Tanner stages)')
- Perianal and digital rectal examination with stool testing for occult blood (perianal fistulas or deep fissures may indicate Crohn disease; impacted stool, rectal dilation, and superficial fissures may suggest constipation)
- External genital inspection should be conducted alongside the perianal examination; a pelvic examination (speculum and bimanual exam) may be difficult to perform in a prepubertal or peripubertal girl or an adolescent who is not sexually active; however, the digital rectal examination can assess the posterior pelvic cavity for pain or a mass (which may suggest gynecologic pathology) in addition to gastrointestinal pathology (see "Gynecologic examination of the newborn and child", section on 'History and physical examination')

If gynecologic problems are suspected (eg, hematocolpos, subclinical pelvic inflammatory disease, ovarian mass), a pelvic ultrasound or a referral to a pediatric gynecologist or adolescent medicine specialist can be helpful (see "Diagnosis and management of congenital anomalies of the vagina" and "Pelvic inflammatory disease: Clinical manifestations and diagnosis" and "Ovarian cysts and neoplasms in infants, children, and adolescents")

Laboratory evaluation — Children who are being evaluated for chronic abdominal pain should have stool examined for occult blood [3]. Gross or occult gastrointestinal bleeding is suggestive of organic disease. (See "Approach to upper gastrointestinal bleeding in children" and "Lower gastrointestinal bleeding in children: Causes and diagnostic approach".)

Other laboratory tests may be warranted to evaluate specific diagnoses if the child has alarm findings (table 3) or clinical features that suggest a particular diagnosis (table 2). We do not routinely test for food allergy unless the patient has other symptoms of immunoglobulin E (IgE) or non-IGE mediated food allergy. (See 'Patients with alarm findings' below and "Clinical manifestations of food allergy: An overview" and "Diagnostic evaluation of food allergy".)

Other studies — Gastrointestinal imaging (eg, abdominal/pelvic ultrasonography) and additional studies (eg, endoscopy, esophageal pH monitoring) are not routinely necessary in the initial evaluation of chronic abdominal pain [3]. However, they may be warranted to evaluate specific diagnoses if the child has alarm findings and clinical features that suggest a particular diagnosis (table 2) [55]. (See 'Patients with alarm findings' below.)

A 2005 systematic review found little or no evidence to suggest that ultrasonography, endoscopy, or esophageal pH monitoring increases the yield of organic disease in the absence of "alarm findings" [41]. As an example, in a retrospective review of abdominal/pelvic ultrasonography in 598 children with recurrent abdominal pain (defined as ≥3 episodes during the three months before presentation) and typical features (eg, midline pain; and absence of all of the following: suspicious findings on abdominal palpation, urinary symptoms, significant weight loss, jaundice, and gastrointestinal bleeding), abnormalities were detected in only five (<1 percent) [55]. In contrast, in the 46 children who had atypical features, 5 had ultrasonographic abnormalities (11 percent). Abnormalities included extrahepatic bile ducts (choledochal cysts), ovarian teratoma, and fecal mass.

PATIENTS WITH ALARM FINDINGS — Patients with alarm findings (table 3) require additional evaluation for organic disorders. The components and urgency of the evaluation depend upon the diagnostic possibilities suggested by the initial evaluation (table 2).

Laboratory evaluation — We suggest the following initial tests for most children and adolescents with chronic abdominal pain and alarm findings (table 6) [38,56]:

- Stool for occult blood (if not performed as part of the initial evaluation) (see 'Laboratory evaluation' above)
- Complete blood count with differential
- Erythrocyte sedimentation rate and/or C-reactive protein
- Metabolic panel (ie, electrolytes, glucose, blood urea nitrogen, creatinine, calcium, total protein, albumin, alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase) (see "Liver biochemical tests that detect injury to hepatocytes" and "Enzymatic measures of cholestasis (eg, alkaline phosphatase, 5'-nucleotidase, gamma-glutamyl transpeptidase)" and "Tests of the liver's biosynthetic capacity (eg, albumin, coagulation factors, prothrombin time)")
- Lipase
- Urinalysis with urine culture as indicated

- Serologic tests for celiac disease (eg, immunoglobulin A antitissue transglutaminase) (see "Diagnosis of celiac disease in children", section on 'Antibody testing')

- Thyroid stimulating hormone and free thyroxine (T4) to evaluate hypothyroidism as a cause of chronic constipation (see "Acquired hypothyroidism in childhood and adolescence", section on 'Diagnosis')

Additional laboratory evaluation may be warranted if specific organic conditions are suspected; as examples:

- Pancreatitis (eg, epigastric pain that radiates to the back) – Serum amylase and lipase (abnormal results support a diagnosis of chronic pancreatitis, but normal results to not exclude it).

- Enteric parasitic or protozoal infection (eg, in patients with diarrhea, eosinophilia, relevant exposures) – Stool for ova/parasites and Giardia antigen; giardiasis can cause abdominal pain without diarrhea. In a series of 220 children with chronic abdominal pain, protozoal infections accounted for the pain in 6 to 11 percent [57]. (See "Giardiasis: Epidemiology, clinical manifestations, and diagnosis", section on 'Acute giardiasis'.)

- Enteric bacterial infections – Stool testing for *Clostridium difficile* and stool cultures (eg, for salmonella, shigella, yersinia, campylobacter, and *Escherichia coli*) [2,38]. (See "Clostridium difficile infection in children: Clinical features and diagnosis", section on 'Stool tests' and "Approach to diarrhea in children in resource-rich countries", section on 'Chronic diarrhea (duration >1 month)'.)

- *Helicobacter pylori* (eg, in children with upper abdominal or epigastric pain or discomfort, refractory iron deficiency anemia) – *H. pylori* stool antigen or urea breath test [58]. *H. pylori* serology may be helpful if the prevalence of *H. pylori* in the population is ≥20 percent. However, if the prevalence of *H. pylori* is <20 percent, as in much of the United States, most positive tests will be falsely positive. (See "Indications and diagnostic tests for Helicobacter pylori infection", section on 'Serology' and "Evaluating diagnostic tests", section on 'How well does the test perform in specific populations?'.)

- Pregnancy – Urine test for human chorionic gonadotropin. (See "Pregnancy in adolescents", section on 'Diagnosis of pregnancy'.)

Imaging — The radiologic evaluation of the child and adolescent with chronic abdominal pain and alarm findings depends upon the diagnostic possibilities that are being considered [2,41]:

- Abdominal ultrasonography may be indicated to evaluate gallstones, extrahepatic bile ducts (choledochal cyst), pancreatic pseudocyst, hydronephrosis (eg, due to ureteropelvic junction obstruction), or retroperitoneal mass.

- Pelvic ultrasonography may be indicated to evaluate ovarian masses or pregnancy. (See "Ovarian cysts and neoplasms in infants, children, and adolescents" and "Ultrasound examination in obstetrics and gynecology".)

- An upper gastrointestinal series may be warranted to evaluate bowel obstruction (eg, late presentation of malrotation, surgical adhesions, etc) in patients with significant vomiting (eg, bilious, protracted); small bowel follow-through may be added if inflammatory bowel disease (IBD; particularly Crohn disease) is suspected, but magnetic resonance enterography is often preferred to avoid radiation exposure. (See "Clinical presentation and diagnosis of inflammatory bowel disease in children", section on 'Imaging'.)

- Magnetic resonance enterography may be warranted if IBD is suspected. (See "Clinical presentation and diagnosis of inflammatory bowel disease in children", section on 'Diagnosis'.)

- Computed tomography (CT) of the abdomen with contrast may be warranted to evaluate retroperitoneal or intra-abdominal abscess (eg, associated with IBD). CT usually is reserved for urgent evaluation (eg,

abscess, mass), given concerns about radiation exposure. (See "Clinical presentation and diagnosis of inflammatory bowel disease in children", section on 'Imaging'.)

Indications for referral — Referral to a gastroenterologist may be warranted for children and adolescents with chronic abdominal pain, alarm findings (table 3), and any of the following [27,56]:

- Suspicion of a serious organic condition such as IBD (eg, involuntary weight loss, growth deceleration, delayed puberty, oral ulcers, perianal abnormalities) (see "Clinical presentation and diagnosis of inflammatory bowel disease in children", section on 'Clinical manifestations')
- Persistent alarm symptoms without a clear diagnosis after evaluation by primary care provider
- Suspicion of acid-peptic disease with persistent pain despite a trial (at least four weeks) of treatment with H_2-blockers or proton pump inhibitors
- Desire to confirm lactose intolerance (eg, before long-term continuation of a lactose-free diet)
- Need for upper or lower endoscopy (eg, persistent vomiting, gastrointestinal bleeding, chronic diarrhea, etc)
- Constipation that has not responded to primary care interventions (see "Chronic functional constipation and fecal incontinence in infants and children: Treatment")

Referral to a pediatric surgeon may be warranted for children with conditions that require surgery (eg, gallstones) or diagnostic laparoscopy (eg, persistent right lower quadrant pain and tenderness of unclear etiology affecting quality of life) [56].

Referral to an adolescent medicine specialist may be warranted to conduct a detailed biopsychosocial evaluation to elicit potential triggers.

Referral to an adolescent medicine specialist or gynecologist may be warranted for adolescents with suspected eating disorders or gynecologic causes of chronic abdominal pain (eg, endometriosis, dysmenorrhea) [27,56].

Referral to a mental health specialist may be warranted for severe symptoms of anxiety or depression and/or a close temporal relation between abdominal pain and emotional stressors.

Additional referral indications depend upon the condition identified or suspected (eg, posterior urethral valves, angioedema, etc).

PATIENTS WITHOUT ALARM FINDINGS

Evaluation — Additional evaluation usually is not necessary for children and adolescents who have chronic abdominal pain and no alarm findings (table 3). In children without alarm findings, abnormal studies rarely change management but may cause anxiety or lead to more testing [56,59].

In observational studies and systematic reviews, the yield of diagnostic investigations (eg, complete blood count [CBC], metabolic panel, inflammatory markers, celiac antibodies, pancreatic enzymes, stool studies, urinalysis, abdominal ultrasonography etc) in patients without alarm findings is poor [9,41,59-61]. A 2005 systematic review found no evidence that laboratory or imaging tests were helpful in identifying organic disease in patients without alarm findings [41]. A 2008 systematic review of 18 prospective cohort studies (1331 children) confirmed that, in the absence of alarm findings, diagnostic testing did not influence the prognosis of chronic abdominal pain [61].

Abnormal results for common gastrointestinal disorders (eg, *H. pylori*, abnormal breath test) may not be causally related to the pain [41]. In a 2010 meta-analysis of five population-based studies, the prevalence of *H. pylori* was the same among children with and without chronic abdominal pain (approximately 30 to 40

percent) [62]. A prospective community-based study found no difference in the prevalence of positive serology for celiac disease between children with chronic abdominal pain and controls (approximately 1 percent in both groups) [63]. In a case control study, the prevalence of lactase deficiency was similar among children with recurrent abdominal pain and controls (8 of 26 [31 percent] and 16 of 61 [26 percent], respectively) [64].

The 2005 American Academy of Pediatrics and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition clinical report on chronic abdominal pain in children suggests that testing may be performed to "reassure the patient, parent, and physician of the absence of organic disease, particularly if the pain significantly diminishes the quality of life of the patient" [3]. However, it is not clear that additional testing is reassuring; some authors suggest that it may reinforce the child's and/or parent's fears of serious organic disease and negatively affect the therapeutic alliance [44,59]. Testing for the purpose of reassurance or facilitation of acceptance of a diagnosis of functional abdominal pain should be balanced with education about the frequency of functional disorders as a cause of chronic abdominal pain in children. (See "Functional abdominal pain in children and adolescents: Management in primary care", section on 'Patient education'.)

Diagnosis of functional abdominal pain — The diagnosis of functional abdominal pain can be made without additional diagnostic testing in children and adolescents with chronic abdominal pain who meet the following criteria [1,3,31]:

- No alarm findings (table 3)
- Normal physical examination
- Stool sample negative for occult blood

In some cases, limited testing (eg, CBC, inflammatory markers [erythrocyte sedimentation rate, C-reactive protein], urinalysis) may be necessary to facilitate acceptance of the diagnosis of functional abdominal pain [27,44,60]. When such testing is performed, it may be helpful to set the expectations for normal results (if appropriate) [44]. Extensive evaluation to exclude organic disease should be avoided; the yield is low, the costs are high, appropriate management may be delayed, and parental concerns about an undiagnosed organic disease may be reinforced [9,38,61,65]. (See 'Evaluation' above.)

When conveying the diagnosis of functional abdominal pain, it may be helpful to emphasize that functional abdominal pain is diagnosed by symptoms rather than specific laboratory or radiographic tests and to review the diagnostic criteria, highlighting the child's overall health (ie, normal growth and development, well-being between episodes, absence of symptoms or signs suggestive of organic disease) [56,66]. Education regarding the proposed mechanisms for functional disorders (eg, visceral hyperalgesia, reduced pain threshold, or impaired gastric relaxation response to meals [21,32-35]) validates the patient's pain and sets the basis for therapeutic interventions [3]. Understanding may be facilitated by using headache as an example of pain that does not necessarily result from organic disease [56]. (See "Functional abdominal pain in children and adolescents: Management in primary care", section on 'General management strategies'.)

Functional abdominal pain in children and adolescents can be classified according to recognizable patterns of symptoms (table 1) [1]:

- **Functional dyspepsia** – Dyspepsia is pain or discomfort that is centered in the epigastric region. Discomfort may be characterized by fullness, early satiety, bloating, nausea, retching, or vomiting [1]. The pain or discomfort may be exacerbated by eating. Children with dyspepsia and alarm findings should be evaluated for an organic disorder (eg, acid peptic disease).

  The Rome IV classification of functional gastrointestinal disorders in children includes two subtypes of functional dyspepsia [1]:

- **Postprandial distress syndrome** is characterized by postprandial fullness or early satiety that prevents finishing a regular meal; supportive features include upper abdominal bloating, nausea, and excessive belching.

- **Epigastric pain syndrome** is characterized by bothersome epigastric pain or burning not relieved by defecation; supportive features include a burning quality of pain and induction or relief by a meal, although it can occur during fasting.

The pathophysiology of functional dyspepsia is not clear. Abnormalities in gastric electrical rhythm, delayed gastric emptying, reduced gastric volume response to feeding, and antroduodenal dysmotility have been demonstrated in some children and adolescents [67-71]. Abnormal motor function, visceral sensitivity, and psychosocial factors have been studied as possible contributing factors in adults. (See "Functional dyspepsia in adults", section on 'Epidemiology and pathophysiology'.)

- **Irritable bowel syndrome** – Irritable bowel syndrome (IBS) is characterized by chronic abdominal pain and altered bowel habits (diarrhea or constipation) in the absence of any alarm findings. Children with chronic abdominal pain, altered bowel habits, and alarm findings should be evaluated for organic conditions. (See 'Patients with alarm findings' above.)

  The diagnosis of IBS can be made on the basis of symptoms (table 1); it is not a "diagnosis of exclusion" and does not require an extensive evaluation to exclude organic disease [6]. However, it may be reasonable to screen children who meet Rome IV criteria for IBS for celiac disease [72]. In a prospective cohort of 992 children referred for chronic abdominal pain, 270 met criteria for IBS [73]. Among these, 12 (4.4 percent) had positive serology for celiac disease (compared with 0.3 to 1.3 percent in the general pediatric population). (See "Epidemiology, pathogenesis, and clinical manifestations of celiac disease in children", section on 'Epidemiology'.)

  IBS occurs infrequently before late adolescence and may be preceded by a long history of constipation [14,27] or an episode of gastroenteritis (sentinel illness) [74-76]. Compared with healthy volunteers and children with childhood functional abdominal pain syndrome (a Rome III diagnosis, which Rome IV calls "functional abdominal pain – not otherwise specified"), children who have IBS have a lowered rectal pain threshold and disturbed rectal contractile response to meals [77,78]. Compared with control subjects and children with functional dyspepsia, children with IBS have abnormal pain referral after rectal distension (ie, they report pain at a location other than the S3 dermatome) [33]. In addition, adolescents who have IBS-type symptoms have higher anxiety and depression scores than do those without such symptoms [14]. (See "Pathophysiology of irritable bowel syndrome".)

- **Abdominal migraine** – Abdominal migraine is characterized by recurrent episodes of abdominal pain for at least six months, typically midline or poorly localized, dull and moderate to severe in intensity. Abdominal pain is associated with at least two additional features including anorexia, nausea, vomiting, headache, photophobia, and pallor [1]. Family history of migraine headache is common. (See "Classification of migraine in children", section on 'Abdominal migraine'.)

  Children who have recurrent episodes of abdominal pain and alarm findings should be evaluated for an organic cause. (See 'Patients with alarm findings' above.)

- **Functional abdominal pain – not otherwise specified (formerly childhood functional abdominal pain syndrome)** – The Rome IV criteria use the term "functional abdominal pain – not otherwise specified" to describe chronic abdominal pain (≥2 months' duration) in children without alarm findings who do not meet criteria for other functional abdominal pain disorders (table 1). However, they recognize that the term "functional abdominal pain" will be used for clinical purposes.

  This category most closely resembles, but is not a substitute for, the classically defined recurrent abdominal pain of childhood [5]. "Nonorganic abdominal pain" and "psychogenic abdominal pain" are

terms that are used interchangeably with "functional abdominal pain" [41]. However, we prefer "functional abdominal pain."

- **Functional constipation** – Functional constipation is classified as a functional disorder of defecation but is a common cause of chronic abdominal pain in children. Diagnosis requires two of five criteria describing stool frequency, size, fecal incontinence, or volitional retention (table 1). Functional constipation is discussed separately. (See "Constipation in infants and children: Evaluation" and "Chronic functional constipation and fecal incontinence in infants and children: Treatment".)

INFORMATION FOR PATIENTS — UpToDate offers two types of patient education materials, "The Basics" and "Beyond the Basics." The Basics patient education pieces are written in plain language, at the 5th to 6th grade reading level, and they answer the four or five key questions a patient might have about a given condition. These articles are best for patients who want a general overview and who prefer short, easy-to-read materials. Beyond the Basics patient education pieces are longer, more sophisticated, and more detailed. These articles are written at the 10th to 12th grade reading level and are best for patients who want in-depth information and are comfortable with some medical jargon.

Here are the patient education articles that are relevant to this topic. We encourage you to print or email these topics to your patients. (You can also locate patient education articles on a variety of subjects by searching on "patient info" and the keyword[s] of interest.)

- Beyond the Basics topic (see "Patient education: Chronic abdominal pain in children and adolescents (Beyond the Basics)")

SUMMARY AND RECOMMENDATIONS

- We define chronic abdominal pain as intermittent or constant abdominal pain (of functional or organic etiology) that has been present for at least two months. Chronic abdominal pain is common, occurring in 10 to 18 percent of children. (See 'Terminology' above and 'Epidemiology' above.)

- The two major categories of causes for chronic or recurrent abdominal pain in children and adolescents are organic disorders (table 2) and functional disorders (table 1). (See 'Etiology' above.)

- The initial evaluation of the child or adolescent with chronic abdominal pain generally includes history (table 4), physical examination (focusing on growth and development, and the abdominal, rectal, pelvic, and genitourinary regions), and stool testing for occult blood to determine whether the child has any "alarm findings" (table 3). Alarm findings help to distinguish organic from functional abdominal pain and direct the need for additional evaluation. (See 'Initial evaluation' above.)

- At the time of the initial evaluation, it may be helpful to educate the patient/family about the biopsychosocial model of pain (figure 2) and to introduce the concept and high likelihood of functional gastrointestinal disorders as a possible cause. (See 'Initial evaluation' above.)

- Patients with alarm findings require additional evaluation for organic disorders. The components and urgency of the evaluation depend upon the diagnostic possibilities suggested by the initial evaluation (table 3). (See 'Patients with alarm findings' above.)

    - For most patients with alarm findings, we suggest stool for occult blood (if not already performed), complete blood count with differential, erythrocyte sedimentation rate and/or C-reactive protein, metabolic panel (ie, electrolytes, glucose, blood urea nitrogen, creatinine, calcium, total protein, albumin, alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase), lipase, and celiac serology (antitissue transglutaminase) (table 6). (See 'Laboratory evaluation' above.)

    - Additional laboratory tests, imaging, or referral may be warranted if specific organic conditions are suspected. (See 'Patients with alarm findings' above and 'Laboratory evaluation' above and 'Imaging' above and 'Indications for referral' above.)

- Patients without alarm findings usually do not require evaluation beyond history, physical examination, and stool for occult blood. In children without alarm findings, abnormal studies rarely change management but may cause anxiety or lead to unnecessary additional evaluation. (See 'Patients without alarm findings' above.)

- The diagnosis of functional abdominal pain can be made in children and adolescents with chronic abdominal pain and no alarm findings, normal physical examination, and stool sample negative for occult blood. Functional abdominal pain in children and adolescents can be classified according to recognizable patterns of symptoms (table 1). Education regarding the proposed mechanisms of functional abdominal pain (eg, visceral hyperalgesia, reduced pain threshold, impaired gastric relaxation response to meals) validates the patient's pain and sets the basis for therapeutic interventions. (See 'Diagnosis of functional abdominal pain' above and "Functional abdominal pain in children and adolescents: Management in primary care".)

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