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INTRODUCTION — Functional abdominal pain disorders (FAPDs), also called pain-predominant functional gastrointestinal disorders (FGIDs), are the most common cause of chronic abdominal pain in children and adolescents. FAPDs involve interplay among regulatory factors in the enteric and central nervous systems [1]. FAPD may be associated with visceral hyperalgesia, reduced threshold for pain, abnormal pain referral after rectal distension, or impaired gastric relaxation response to meals [2-6]. In addition, persistent experiences of pain may have an adverse effect on psychologic symptoms. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on 'Pathogenesis'.)

The management of children and adolescents with FAPDs is reviewed here. The evaluation of children and adolescents with chronic abdominal pain and functional abdominal pain in adults are discussed separately. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)" and "[Functional dyspepsia in adults](#)" and "[Clinical manifestations and diagnosis of irritable bowel syndrome in adults](#)" and "[Treatment of irritable bowel syndrome in adults](#)".)

TERMINOLOGY — Functional abdominal pain (FAP) may be diagnosed in children who have chronic (≥ 2 months) abdominal pain, no alarm findings ([table 1](#)), normal physical examination, and a stool sample negative for occult blood [7]. Several pain-predominant functional gastrointestinal disorders (FGIDs) of childhood have recognizable patterns of symptoms and include functional dyspepsia, irritable bowel syndrome (IBS), abdominal migraine, and FAP-not otherwise specified (FAP-NOS) ([table 2](#)) [8]. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on 'Diagnosis of functional abdominal pain'.)

Terms that have been used interchangeably with FAP-NOS (often referred to as FAP) include "nonorganic abdominal pain," "psychogenic abdominal pain," and "recurrent abdominal pain." The 2005 American Academy of Pediatrics and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition clinical report on chronic abdominal pain recommended that the term "recurrent abdominal pain" not be used as a synonym for functional, psychologic, or stress-related abdominal pain, but this use persists [7,9].

MANAGEMENT APPROACH

Overview — The goal of management of functional abdominal pain disorders (FAPDs) in children and adolescents is return to normal function (ie, rehabilitation) rather than complete elimination of pain [1.7.10-12].

The management of FAPDs is challenging because of their heterogeneous clinical subtypes and incompletely understood pathophysiology. Individuals with functional gastrointestinal disorders (FGIDs) may have similar troublesome symptoms (eg, abdominal pain, nausea, changes in bowel movements), but different underlying causes. Thus, management is individualized according to child and family behaviors, triggers, and symptoms. Regardless of the type of FAPD identified, the management approach typically involves a combination of the following interventions [13,14]:

- A therapeutic relationship (see '[Therapeutic relationship](#)' below)
- Patient education (see '[Patient education](#)' below)

- Behavior modification (see ['Behavior modification'](#) below)
- Strategies to improve pain tolerance and coping (see ['Improved coping'](#) below)
- Avoidance of triggers (see ['Management of triggers'](#) below)
- Symptomatic management (see ['Management of symptoms'](#) below)

More intensive initial intervention (eg, referral to a mental health provider for counseling or therapy and rehabilitation) generally is warranted for children and adolescents with abdominal pain-associated disability (eg, missed school or extracurricular activities, anxiety, depression). (See ['Indications for referral'](#) below.)

Most cases can be managed in the primary care setting [15]. Referral may be necessary for children and adolescents who do not improve with primary care interventions. (See ['Indications for referral'](#) below.)

Among patients with visceral hypersensitivity and FAPD, the act of eating may be associated with onset of pain. As a result, it is common for patients, especially adolescents, to skip meals on a recurrent basis in order to avoid symptoms [16]. This practice should trigger suspicion of an eating disorder when the adolescent also has weight loss and constipation. (See ["Anorexia nervosa in adults and adolescents: Medical complications and their management"](#), section on ['Gastrointestinal'](#).)

Randomized and observational studies provide relatively compelling but limited evidence that psychologic interventions (eg, cognitive-behavioral therapies such as relaxation and guided imagery) are associated with improved pain tolerance, reduced anxiety, increased nonpain behavior, and improved self-management [17-31]. Although there are few studies directly comparing psychologic interventions to "standard pediatric care" (which varies from study to study, but typically involves education and reassurance with or without dietary interventions or pharmacotherapy), psychologic interventions appear to be more effective [17,20,22,25-27]. (See ['Behavior modification'](#) below and ['Improved coping'](#) below.)

Evidence that dietary interventions (eg, carbohydrate restriction, fiber supplementation, probiotics) or medications (eg, H₂ receptor agonists, proton pump inhibitors) are helpful is even more limited [32-35]. Nonetheless, on a case-by-case basis, a time-limited trial of dietary or pharmacologic interventions may be warranted to address specific triggers or symptoms, as part of an overall treatment plan [1]. (See ['Management of triggers'](#) below and ['Management of symptoms'](#) below.)

"Response" to any intervention may reflect the natural history of improvement over time or placebo response as FAPDs resolve with time in the majority of children [34,36,37]. In a meta-analysis of 17 placebo-controlled randomized trials in children age 4 to 18 years with abdominal pain-related FGID, the pooled placebo response rate for improvement (as defined by the study authors) was 41 percent (95% CI 34-49 percent) and the pooled placebo response rate for no pain was 17 percent (95% CI 8-32 percent) [38]. (See ['Prognosis'](#) below.)

The recommendations in the sections below are generally consistent with those outlined 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](#) [7].

Abdominal migraine — The treatment of migraine headache in children (including the treatment of abdominal migraine) is discussed separately. (See ["Classification of migraine in children"](#), section on ['Abdominal migraine'](#) and ["Acute treatment of migraine in children"](#).)

GENERAL MANAGEMENT STRATEGIES

Therapeutic relationship — A therapeutic clinician-patient/family relationship is an important component of the management of functional abdominal pain disorders (FAPDs). The patient and family must believe that their complaints and concerns are taken seriously [14,39]. Their concerns about specific organic diseases must be addressed (generally by reviewing the symptoms and signs of that disease that are absent from

their child's presentation) before management of FAPDs can proceed [12]. The explanation of a biopsychosocial model of functional disease can be helpful, as it frames the disease in terms of being a positive diagnosis rather than a diagnosis of exclusion (with the inherent expectation for extensive evaluation). The family's ability to accept such a biopsychosocial model of pain may be an important factor in the child's recovery [40]. (See '[Prognosis](#)' below.)

The patient and family may be reassured by the clinician's acknowledging that the pain is real and has affected important activities in the child's or adolescent's life. The patient and family should be assured that the clinician will initiate a treatment plan and continue to follow up with the patient on a regular basis [41]. Periodic follow-up validates the clinician's continued support and interest in the patient and family. (See '[Follow-up](#)' below.)

The therapeutic alliance may be strengthened by focusing on the shared goal of return to normal function – for both the child and family. The child's or adolescent's pain may have become a focal point of the family's life, creating stress for other members. The pediatric care provider can address these effects by prescribing a return to structured activities of daily living, including school attendance (a rehabilitative approach). (See '[Return to school](#)' below.)

Patient education — FAPDs are best treated in the context of a biopsychosocial model of care ([figure 1](#)) [7.42-46]. In small observational study, parental acceptance of a biopsychosocial model of illness was associated with resolution of pain [40].

Before beginning therapy, the pediatric health care provider should define the expectations of the parents and child. Some parents may simply want assurance that the pain is not caused by organic illness. Expectations must be realistic (eg, improved tolerance rather than complete resolution of pain) [7].

Education should include the following points:

- FAPDs are common, occurring in approximately 10 to 20 percent of children. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on '[Epidemiology](#)'.)
- The pain of FAPDs is real; it is thought to be caused by a heightened sensitivity to the normal function of the stomach and bowel. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on '[Pathogenesis](#)'.)
- Like other types of pain, pain in FAPDs can be triggered, exacerbated, or maintained by environmental and psychosocial factors, including stress, anxiety, and social reinforcement (eg, attention, staying home from school) [11,14,47]. Other examples of physiologic responses to stress or anxiety include headaches, churning of the stomach before a test, and nausea when given bad news.
- The pain of FAPDs is not life-threatening and does not require activity restriction.
- Treatment focuses on return to normal activity despite discomfort – rehabilitation [10,12].
- Management of pain involves avoiding triggers and improving coping skills; the pain may persist, but the child's and family's quality of life can be improved [12].
- Goals for management should be realistic (eg, maintenance of normal activities, increased tolerance of symptoms) [14].
- Chronic pain, regardless of the etiology, can be associated with depression or anxiety (both as a cause and an effect) [48,49]. (See '[Prognosis](#)' below.)

Return to school — A plan for return to school is crucial. School absenteeism adds to family stress and can interfere with the child or adolescent's school performance and social functioning. Home-bound schooling is strongly discouraged unless the clinician and school counselor agree that it is necessary (eg, based on academic performance or needs).

In most cases, return to school should immediately follow the diagnosis of FAPD [12]. Parents who are concerned about their child's emotional reaction to returning to school may need help in formulating and implementing a plan for return to school. They can be encouraged to work with the school to develop a part-time schedule to facilitate the transition. The first day back should be sufficiently short to guarantee success and increase the child and family's confidence in the child's ability to attend school [12].

Return to school may be facilitated by [12]:

- Planning ahead for pain episodes at school (eg, being allowed to go to the nurse's office until pain subsides with the caveat that regular use of the nurse's office at school may reinforce symptoms).
- Providing guidelines to help the parent decide when the child is too sick to go to school or sick enough to be allowed to come home (eg, fever, vomiting, diarrhea). Regularly sending the child home from school may reinforce symptoms.
- Providing guidelines for activity restriction when the child remains home from school (eg, bedrest without television or other entertainment).
- Identifying and addressing school-related sources of stress (eg, bullying, social isolation, inappropriate classroom placement, etc).
- For children with FAPD and altered bowel patterns, sending a letter requesting that the child be allowed to use the bathroom whenever necessary.
- For families who have an adversarial relationship with the school related to frequent absence, sending a letter to document that the child has undergone an evaluation for gastrointestinal symptoms that have interfered with attendance.

Behavior modification — Return to normal function is facilitated by reinforcement of nonpain (healthy or adaptive) behaviors and avoiding/stopping reinforcement of pain (sick, illness, or maladaptive) behaviors [12.50]. Suggestions for behavior modification techniques may be provided by the primary care provider and/or, as necessary, in a more formal psychotherapy program (eg, cognitive behavior therapy).

Examples of reinforcement of well behaviors include [12.23]:

- Praising/rewarding the child for attending school or extracurricular activities (eg, using a sticker chart to earn rewards agreed upon in advance for progressively longer periods of consecutive attendance)
- Identifying and supporting the child's interests and skills outside of the sick role (eg, athletic or artistic abilities)
- Parental modeling of healthy responses to abdominal pain (eg, deep breathing) (see '[Improved coping](#)' below)

In attempts to be supportive and nurturing, parents of children with FAPD may inadvertently reinforce pain or illness behaviors [14]. Examples of reinforcement of pain behavior that should be avoided include [51]:

- Providing attention to the pain (eg, asking about symptoms); in a randomized trial, spontaneous complaints of pain during symptom provocation (water load) nearly doubled among children whose parents were assigned to provide attention (eg, "I can imagine it must feel really uncomfortable") compared with children whose parents were not provided with any specific instruction [52].

Scheduling a "symptom report" once per day may be helpful for parents and children who have difficulty with immediate and complete discontinuation of asking about or reporting symptoms [12].

- Allowing the pain to disrupt normal function and activity (eg, by allowing the child to stay home from school or leave school, excusing the child from completing his or her homework) [23].

- Allowing the child who stays home from school to watch television or have access to other forms of entertainment.

Improved coping — Coping is defined as voluntary efforts to regulate emotion, thought, behavior, physiology, and the environment in response to stressful events or circumstances [53]. We suggest incorporation of psychologic treatments to improve coping in the management of children and adolescents with FAPDs. Learning to cope with pain facilitates return to normal function. There is some evidence from small randomized trials that psychosocial therapies improve pain tolerance, reduce anxiety, and encourage nonpain behaviors [17-30,54].

Psychosocial therapies that may improve the ability to cope include relaxation, distraction (including guided imagery/hypnotherapy), cognitive behavioral therapy (CBT), and biofeedback [10,55-57]. Limited evidence from randomized trials supports CBT and guided imagery, but variability in treatment protocols must be taken into account [14,54].

Relaxation and distraction techniques can be taught by trained primary care clinicians; CBT and biofeedback typically require referral to mental health professionals with specialized training [55].

- **Relaxation techniques** – Older children and adolescents can be taught brief muscle relaxation techniques such as deep breathing exercises to be performed at least twice a day (table 3) [10]. A family member can act as "coach" if necessary. The goal is to help the child or adolescent relax when in pain.

Progressive muscle relaxation is another relaxation technique that involves systematic tensing and relaxing of each muscle group, focusing attention on the feeling after the muscles are relaxed (table 3) [14].

In observational studies and meta-analyses, relaxation therapy helped to reduce pain and improve function in children with FAPDs [23,28,30,58,59].

- **Distraction** – Distraction shifts attention away from pain [60]. Distraction techniques include conversation, games, television, and guided imagery. In a randomized trial, spontaneous complaints of pain during symptom provocation (water load) were reduced by one-half among children whose parents were assigned to provide distraction (eg, "What would you like to do this evening?") attention compared with children whose parents were not provided with any specific instruction [52].
- **Guided imagery/hypnotherapy** – Guided imagery (also called hypnotherapy or self-hypnosis) is a distraction technique through which the child enters a state of engagement in imagery and relaxation, which distracts attention from painful stimuli [20,61]. Guided imagery may incorporate imagined pictures, sounds, or sensations to produce a state of increased receptiveness to gut-specific suggestions and ideas, also known as "gut-directed" hypnotherapy (table 3). Guided imagery/hypnotherapy may be self-directed or performed by a qualified therapist [62].

In a 2017 meta-analysis of four small randomized trials including 146 children with recurrent abdominal pain [17,19,20,63], guided imagery/hypnotherapy was more successful (defined as being pain free or an improvement in pain, according to the individual study) than control medical therapy (absolute rate of improvement 53 versus 14 percent, odds ratio 6.8, 95% CI 2.4-19) [54]. Guided imagery/hypnotherapy also was effective in reducing pain intensity and frequency; two of the trials also reported reductions in missed activities [19,20]. In long-term follow-up from another of the included trials [17], the beneficial effects of guided imagery/hypnotherapy were sustained for five years [21].

A subsequent trial, in which 260 children with FAPDs (age range 8 to 18 years) were randomly assigned to three months of self-administered home-based gut-directed hypnotherapy using a compact disc or individual gut-directed hypnotherapy with a qualified therapist, confirmed the effectiveness of both hypnotherapy approaches [62]. Although self-directed hypnotherapy was less effective than

therapist-directed hypnotherapy at three months, outcomes at one-year were similar. Self-directed hypnotherapy may be an appealing option for older children and adolescents accepting of the self-administered approach, particularly if trained therapists are not available.

- **Cognitive behavioral therapy** – CBT is a psychotherapy approach that identifies links between behavior, thoughts, and feelings to effect therapeutic change [44.64]. An individual CBT program may include various combinations of education, relaxation, stress management, and behavior modification techniques [44.64]. Provision of CBT requires specialized training and is usually provided by a psychologist. (See "[Overview of psychotherapies](#)", [section on 'Cognitive and behavioral therapies'](#) and ['Behavior modification'](#) above.)

Thinking positively and avoidance of counterproductive coping strategies appear to be important targets for CBT. In an observational study of 117 children with functional abdominal pain, children's and parents' confidence in the child's potential to cope with abdominal pain (ie, thinking positively) was associated with improved functioning and decreased abdominal pain, whereas passive coping strategies (eg, self-isolation, catastrophizing, and disengagement) were associated with more symptoms of anxiety and depression [65].

A 2017 meta-analysis of four trials including 175 children [25.26.66.67] found CBT to be successful (defined by being pain free or by an improvement in pain, according to the individual study) after the intervention but not in the longer term (ie, after 3 to 12 months) [54].

- **Other therapies** – Biofeedback is a technique that provides a visual or auditory display of the physiologic responses to pain/anxiety (eg, heart rate, skin temperature) so the effects of relaxation techniques can be externally validated [45.55.60].

Yoga therapy and written self-disclosure (which involves writing down feelings and thoughts about things that are distressing) have also been studied as strategies to help with symptom coping, but data are limited [68-71]. A 2017 systematic review found no evidence of benefit with yoga or written self-disclosure on pain, quality of life, or daily activities [54].

MANAGEMENT OF TRIGGERS — To the extent that triggers can be identified, avoidance of triggers may be beneficial in the management of functional abdominal pain disorders (FAPDs) in children and adolescents. Triggers may be identified by asking about aggravating and relieving factors or by asking the patient to keep a pain diary. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", [section on 'History'](#).)

Dietary triggers — We do not routinely suggest dietary restriction for children with FAPDs. By definition, children with FAPDs do not have food allergy, which is typically excluded by the absence of other characteristic findings (eg, urticaria, oropharyngeal symptoms). (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)" and "[Clinical manifestations of food allergy: An overview](#)" and "[Diagnostic evaluation of food allergy](#)".)

However, on a case-by-case basis, if there seems to be a correlation of symptoms with specific food triggers, a time-limited trial of elimination of the trigger(s) may be warranted [9]. Specific dietary triggers may include lactose; citrus, spicy, or high-fat foods; caffeinated or carbonated beverages; [sorbitol](#) (found in sugar-free candy and gum); and gas-producing foods (eg, beans, onions, celery, carrots, raisins, bananas, apricots, prunes, Brussels sprouts, wheat germ) [72].

A 2017 systematic review concluded that there is no high-quality evidence that dietary interventions (eg, restricting or eliminating specific sugars or fermentable oligosaccharides, disaccharides, monosaccharides, and polyols [FODMAPs]) are effective in the management of FAPDs in children [35]. Dietary restriction may result in nutrient deficiencies (eg, calcium, vitamin D), and care must be taken to ensure that the restricted diet continued to provide adequate nutrition. Consultation with a dietitian may be warranted.

- **Lactose** – A trial of a lactose-free diet may be warranted if symptoms are consistent with lactose intolerance (eg, cramping pain, bloating, or gas related to ingestion of lactose). A lactose-free diet can be achieved by eliminating milk and milk products or by using lactase enzyme replacements. Patients who eliminate milk and milk products should be educated about adequate calcium and vitamin D intake. Lactose should be reintroduced into the diet if symptoms do not improve with lactose elimination after two weeks. Lactose avoidance may be continued in children whose symptoms improve during a lactose-free diet. For those patients in whom the benefit of lactose avoidance is unclear, it may be helpful to do a lactose hydrogen breath test. (See "[Lactose intolerance: Clinical manifestations, diagnosis, and management](#)", [section on 'Lactose breath hydrogen test'](#) and "[Lactose intolerance: Clinical manifestations, diagnosis, and management](#)", [section on 'Management'](#)".)

The evidence regarding whether a lactose-free diet decreases the frequency of pain attacks for children and adolescents with recurrent abdominal pain is inconclusive [32]. A 2015 systematic review found no evidence that a lactose-free diet was effective in the management of children with FAPDs [56], but the evidence was limited to two small studies [73,74]. In one, symptoms improved in approximately 40 percent of children with FAPDs after 12 months independent of diet or lactase deficiency (ie, milk-free diet in lactase deficient children; milk-free diet in nonlactase deficient children; or regular diet in nonlactase deficient children) [73].

- **Gluten/wheat** – Patients with FAPDs may attribute their symptoms to carbohydrates other than lactose [75]. Gluten-free diets have become more popular with increased concerns about the role of gluten sensitivity or celiac disease in chronic abdominal pain [16,76]. However, celiac disease is a rare cause of chronic abdominal pain in children. In a prospective study, only 1 out of 227 children ≥5 years of age with recurrent abdominal pain was found to have celiac disease [77]. (See "[Diagnosis of celiac disease in children](#)", [section on 'Diagnosis'](#)".)

Nonceliac wheat sensitivity has been suggested as a possible etiology in adults with persistent gastrointestinal symptoms [78,79]. In a blinded randomized trial, adult patients with suspected wheat sensitivity without evidence of celiac disease on endoscopic biopsy had increased symptoms with exposure to gluten compared with placebo [79]. Further understanding of the prevalence and mechanism of nonceliac wheat sensitivity is needed before gluten avoidance can be recommended for children and adolescents with FAPDs. Randomized trials of gluten avoidance in children with FAPDs are lacking [56].

- **FODMAPs** – FODMAPs are another group of carbohydrates that have been evaluated as a possible cause of FGIDs. FODMAPs are short-chain carbohydrates that are poorly absorbed by the gastrointestinal system and can lead to gas production, distention of the large intestine, bloating, and abdominal pain. There is some evidence that a diet low in FODMAPs may be helpful in adults with irritable bowel syndrome (IBS). (See "[Treatment of irritable bowel syndrome in adults](#)", [section on 'Low FODMAP diet'](#)".)

However, information on the role of FODMAPs in FAPDs in children is limited. Several studies that focused on intolerance to fructose in children with FAPDs reported improvement in pain with fructose restriction, but these studies did not include a control group [80-82]. In a randomized crossover trial of 48 hours of a low- versus high-FODMAP diet in 33 children (7 to 17 years) with IBS, the low-FODMAP diet was associated with some improvement in gastrointestinal symptoms (eg, bloating, nausea) and decreased breath hydrogen production [83,84]. Mean pain severity scores decreased on both diets compared with baseline. Although FODMAP restriction appears to be promising for adult patients with IBS, additional pediatric studies are necessary before a low FODMAP diet can be recommended for children. FODMAPs are ubiquitous in foods that are essential to a well-balanced diet (eg, wheat, milk, legumes, various fruits and vegetables) [16]. In addition, adherence to a low FODMAP diet is difficult without the help of a nutritionist.

Anxiety — Identification of co-existing anxiety in patients with FAPDs is critical. Anxiety disorders are estimated to affect 42 to 85 percent of pediatric patients with FAPDs [85-87]. It is important to explain to the patient and parents that screening for anxiety does not imply that the FAPD is a manifestation of a psychologic disorder but rather that anxiety and the FAPD may coexist due to shared causative factors or as a consequence of coping with chronic pain [50]. In addition, there is evidence that anxiety may be associated with higher levels of functional impairment in children and adolescents with FAPDs [36].

Several nonpharmacologic therapies can be used to try to mitigate the physiologic effects of anxiety, including abdominal pain [14]. (See ['Improved coping'](#) above.)

Nonpharmacologic therapies are an excellent way for parents to assess for anxiety and/or depression. Follow-up visits allow the parents and primary care provider, and at times the adolescent, to explore anxiety and/or depression as triggers of abdominal pain and nausea. Confirmation of anxiety and/or depression in this context sets the stage for the next step in management (ie, referral to a therapist for evaluation for anxiety/depression). If a therapist is already involved, discussion between the primary care provider and therapist can facilitate decisions regarding the need for medication (eg, selective serotonin reuptake inhibitor [SSRI]) and/or adjustments to counseling and other psychosocial interventions.

Referral to a psychiatrist is indicated if the therapist suggests medication. Alternatively, the primary care provider may prescribe an SSRI (eg, [fluoxetine](#)) if he or she has experience comanaging anxiety and/or depression in children and adolescents with a therapist. Close follow-up for side effects and response is recommended. (See ["Pediatric unipolar depression and pharmacotherapy: Choosing a medication"](#).)

MANAGEMENT OF SYMPTOMS

Abdominal pain — Medical interventions that may be combined with general behavioral management strategies for the management of abdominal pain in children with functional abdominal pain disorders (FAPDs) include probiotics, supplementation with water-soluble fiber (eg, [psyllium](#)/ispaghula husk), or peppermint oil. Although these interventions have not been well established in treatment algorithms, they have low risk of harm and short-term trials are reasonable. These interventions may be tried in any order or combination. We typically start with probiotics in patients with normal bowel movements and probiotics plus fiber in patients with constipation.

- **Probiotics** – Probiotics combined with general management strategies may be helpful in the management of abdominal pain, but the mechanism of action is not clear. Alterations to commensal bacterial populations have been implicated in dysmotility, visceral hypersensitivity, abnormal colonic fermentation, and immunologic activation. Probiotics may improve gastrointestinal symptoms by restoring the microbial balance in the gut through metabolic competition with pathogens, by enhancing the intestine's mucosal barrier, or by altering the intestinal inflammatory response [88].

The most effective probiotic strain, dose, or treatment duration is not known [89]. Given that probiotics generally are safe, the decision to use a probiotic is typically based on the potential benefits, costs, and patient/family preferences. When the decision is made to try probiotics, we suggest commercial preparations of strains that have some evidence of benefit in gastrointestinal disease (eg, [Lactobacillus rhamnosus](#), [Lactobacillus reuteri](#)). We suggest that the probiotic be tried for four to six weeks before reassessment of symptoms of abdominal pain and/or abnormal bowel movements.

A 2017 systematic review and meta-analysis of seven randomized trials that compared probiotics with placebo in 722 children with recurrent abdominal pain/functional gastrointestinal disorders (FGIDs) found moderate quality evidence that probiotics improve pain at zero to three months (absolute rate of improvement 54 versus 42 percent, odds ratio [OR] 1.6, 95% CI 1.1-2.5) [35]; eight children would need to be treated for one to have improved pain at zero to three months. The meta-analysis also found low quality evidence that probiotics reduce pain frequency and pain intensity. Meta-analysis of four randomized trials comparing probiotics with placebo in 344 children with irritable bowel syndrome (IBS) found moderate quality evidence that probiotics improve pain at zero to three months (absolute rate of

improvement 63 versus 36 percent, OR 3.0, 95% CI 1.8-5.1); four children would need to be treated for one to have improved pain at zero to three months.

Differences in probiotic strains, formulation, and dose make it difficult to generalize about the efficacy of supplementation across available probiotic formulations. Five of the trials included in the systematic review used *L. rhamnosus* GG, three used *L. reuteri*, and one each used *L. plantarum*, VSL#3 (a probiotic mixture of eight species), a mixture of *Bifidobacterium* species, and *Bacillus coagulans* plus fructooligosaccharides (FOS) [35]. The duration of treatment ranged from four to eight weeks.

- **Fiber** – For children with FAPDs and altered bowel movements, supplementation with water-soluble fiber may be warranted in addition to general management strategies. The exact mechanisms by which fiber may improve abdominal pain are not well understood but may include modification of intestinal microbiota, altered composition of stool and gas, and/or accelerated gastrointestinal transit [90]. Benefits of fiber supplementation should be weighed against the low but potential risk of increased bloating and pain.

The optimal dose, fiber type, and treatment duration for use in children with abdominal pain has not been established. We generally suggest using a water-soluble fiber (eg, [psyllium](#) hydrophilic mucilloid [ispaghula husk]) at a dose of 1.5 to 12.5 grams per day, depending upon the patient's size and baseline dietary intake of fiber. A reasonable target for total dietary fiber intake is the child's age in years plus 5 to 10 grams per day. We continue the trial of fiber supplementation for at least four weeks before determining whether there has been an improvement in abdominal pain frequency and severity.

A 2017 systematic review concluded that there was no evidence to support the use of fiber supplementation for treatment of recurrent abdominal pain/FGIDs in children [35]. However, this review identified only four randomized trials (299 patients), with varying methodologic quality, different patient populations, and different types of fiber. No harmful effects were reported.

Recommendations regarding fiber intake in children with chronic functional constipation and fecal incontinence are discussed separately. (See "[Dietary recommendations for toddlers, preschool, and school-age children](#)", section on 'Fiber' and "[Chronic functional constipation and fecal incontinence in infants and children: Treatment](#)", section on 'Fiber'.)

- **Peppermint oil/antispasmodics** – Peppermint oil is another intervention that may be helpful in combination with general management strategies in the management of abdominal pain in children with FAPDs [91,92]. (See '[General management strategies](#)' above.)

Although the evidence is limited, peppermint oil is thought to decrease smooth muscle spasms in the gastrointestinal tract [14]. A 2011 meta-analysis of randomized trials in patients >12 years of age concluded that peppermint oil was effective in the treatment of IBS [91]. A subsequent trial randomly assigned 88 children age 4 to 13 years with FGIDs to one month of treatment with peppermint oil, a synbiotic (*B. coagulans* plus FOS), or placebo ([folic acid](#)) [93]. Peppermint oil decreased pain duration, frequency, and severity compared with placebo and was superior to *B. coagulans*-FOS in decreasing pain duration and severity. No patients developed side effects or intolerance. Peppermint oil was administered as a pH-dependent enteric coated capsule (187 mg three times per day for children weighing <45 kg; 374 mg three times per day for children weighing >45 kg). Peppermint oil capsules are available commercially. Excessive intake of peppermint oil may lead to exacerbation of gastroesophageal reflux and has been associated with interstitial nephritis and acute renal failure [94,95].

While antispasmodic medications are superior to placebo in the treatment of adults with IBS [96], few studies have evaluated the effectiveness of antispasmodics in the treatment of childhood FAPDs. In a single randomized, placebo-controlled trial of mebeverine, a smooth-muscle relaxant with anticholinergic activity, there was no difference in the reduction of pain scores in children with FAPDs after four weeks of treatment [97]. The long-term use of other antispasmodic medications in children

(eg, [hyoscyamine](#) and [dicyclomine](#)) may be limited by anticholinergic side effects (eg, dry mouth, blurred vision, etc) [14]. Additional studies of safety and efficacy are necessary before antispasmodic medications can be routinely recommended for children with FAPDs.

- **Other interventions** — We do not routinely suggest antidepressants for children and adolescents with FAPDs unless they have associated depression by Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition criteria. A significant degree of abdominal pain in functional disorders is believed to be associated with abnormal perception of visceral sensations. Medications initially indicated for the treatment of depression and anxiety have been explored for the management of FAPDs because of their effects on central and enteric nervous system neurotransmitters, such as acetylcholine and serotonin. However, studies of these agents in children and adolescents with FAPDs are limited. A 2017 systematic review of two randomized trials (123 patients) of [amitriptyline](#), a tricyclic antidepressant, for the treatment of FAPDs in children concluded that it does not appear to add benefit over placebo [34]. In the largest trial, the placebo response rate was >50 percent [98]. Low-dose amitriptyline is widely used by both pediatric and adult gastroenterologists to manage refractory IBS. In the only randomized, placebo-controlled trial of selective serotonin inhibitors ([citalopram](#)) in children with FAPDs, there was no difference in the reduction of pain scores after four weeks of treatment [99]. (See "[Treatment of irritable bowel syndrome in adults](#)". section on 'Antidepressants'.)

[Cyproheptadine](#) is a medication with multiple mechanisms, including antihistaminic, anticholinergic, and antiserotonergic properties as well as possible calcium channel blockade effects. It has been used in appetite stimulation and prevention of pain and vomiting in abdominal migraine and cyclic vomiting syndrome. In retrospective studies, cyproheptadine has been reported to be safe and effective for the treatment of FAPDs and dyspeptic symptoms in children [100,101]. In a randomized trial of 29 children and adolescents with FAPD, 86 percent of the group treated with cyproheptadine for two weeks had improvement or resolution of abdominal pain compared with 35.7 percent in the placebo group [102]. These results need to be confirmed with larger, additional trials before cyproheptadine can be routinely recommended for the treatment of FAPDs [34].

Dyspepsia — Dyspepsia is pain or discomfort that is centered in the epigastric region or upper abdomen. Discomfort may be characterized by fullness, early satiety, bloating, nausea, retching, or vomiting [8]. The pain or discomfort may be exacerbated by eating. Dyspepsia is the predominant symptom in children with functional dyspepsia ([table 2](#)).

We suggest the following interventions for symptomatic management of functional dyspepsia [9]:

- Small frequent meals
- Avoidance of foods, beverages, and medications that aggravate symptoms (eg, high-fat foods, caffeinated beverages, nonsteroidal anti-inflammatory drugs) [13] (see '[Dietary triggers](#)' above)

We do not routinely suggest pharmacologic therapy for children and adolescents with functional dyspepsia. A 2017 systematic review found only one randomized trial with inconclusive results [34,103]. However, for children and adolescents with severe symptoms unresponsive to nonpharmacologic therapies, a trial of an H₂ blocker ([cimetidine](#), [ranitidine](#), [nizatidine](#), or [famotidine](#)) or a proton pump inhibitor ([lansoprazole](#), [esomeprazole](#)) for four to six weeks may be warranted [9,104,105]. The medication should be discontinued if there is no improvement.

We do not suggest the routine use of prokinetic agents (eg, [metoclopramide](#), [domperidone](#), [erythromycin](#)) in the treatment of children and adolescents with FAPDs. There is little evidence of efficacy and potential for adverse effects, particularly with metoclopramide and domperidone [9,14].

Diarrhea — Diarrhea may be the predominant symptom in children with IBS ([table 2](#)). Children and adolescents whose diarrhea consists of ≥3 loose or watery stools per day for more than two weeks (which is

an alarm symptom) require evaluation for organic disease. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on 'Patients with alarm findings'.)

From a practical standpoint, it may be helpful for the clinician to provide a note to the school requesting that the child or adolescent with FAPD and diarrhea be allowed to use the bathroom whenever necessary [9,12]. In addition, it is important for the patient to maintain adequate fluid intake.

We do not routinely suggest dietary restriction for children with FAPD and diarrhea. However, on a case-by-case basis, if there seems to be a correlation of diarrhea with a specific food trigger (eg, lactose, [sorbitol](#)), a time-limited trial of elimination of the trigger may be warranted [9]. (See '[Dietary triggers](#)' above.)

We do not routinely suggest antimotility agents for children or adolescents with FAPD and diarrhea. The diarrhea associated with FAPDs is typically of short duration, and antimotility agents generally are not recommended for the management of other types of diarrhea (eg, infectious, antibiotic-associated) in children.

Constipation — Identification of underlying constipation is critical for patients with FAPD. The treatment of constipation in children is discussed separately. (See "[Chronic functional constipation and fecal incontinence in infants and children: Treatment](#)", section on 'Treatment of children'.)

Unproven interventions — A number of other interventions are used in adults with pain-predominant FGIDs or have been tried in children with functional abdominal pain but lack clear evidence of benefit in randomized trials. These include [rifaximin](#) [106,107], [linaclotide](#), [lubiprostone](#), yoga [56], otilonium bromide (available outside the United States), and iberogast (an herbal therapy available in Germany) [108]. (See "[Treatment of irritable bowel syndrome in adults](#)".)

In a single randomized sham-controlled trial in 115 adolescents, neurostimulation via percutaneous electric nerve field stimulation (PENFS) of the external ear reduced abdominal pain severity, frequency, and duration with no serious adverse effects in adolescents with FAPDs [109]. Although these findings are promising, additional studies are necessary to confirm the results, determine the optimal duration of treatment, and determine the optimal target population before PENFS can be recommended for children with FAPDs [109,110].

FOLLOW-UP — Children and adolescents with functional abdominal pain disorders (FAPDs) require regular follow-up to maintain the therapeutic relationship, provide continued education and reassurance, monitor the response to intervention, and monitor the development of alarm findings [11,12,51].

Children with persistent abdominal pain that affects patient and family function may benefit from referral to a mental health provider or other specialist. (See '[Indications for referral](#)' below.)

Children who develop alarm findings ([table 1](#)) require evaluation for organic disease. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on 'Patients with alarm findings'.)

INDICATIONS FOR REFERRAL — Referral to a developmental-behavioral pediatrician (for younger children), adolescent medicine specialist (for teenagers), or mental health provider may be helpful in providing strategies for empathy, encouragement, return to activities of daily living, and avoiding ongoing pain-induced disability [1,10,12,32,39]. Some patients and families, particularly those who continue to focus on the search for an organic etiology, may be resistant to referral to a therapist or counselor. The pediatric care provider can facilitate referral by explaining to the family his or her own limitations in management without further assistance from a therapist. The provider should discuss the potential benefit to the family from counseling sessions with a therapist who can help the child cope with the pain and can support the necessary changes in the child's life (eg, return to school).

Children with constipation that does not respond to primary care interventions may benefit from referral to a gastroenterologist. (See "[Chronic functional constipation and fecal incontinence in infants and children:](#)

[Treatment](#).)

Children who develop alarm findings may require referral to a gastroenterologist or other specialist for evaluation and/or management. (See "[Chronic abdominal pain in children and adolescents: Approach to the evaluation](#)", section on 'Patients with alarm findings'.)

PROGNOSIS — Functional abdominal pain disorders (FAPDs) resolve in the majority of children [[36,37,111](#)]. In a 2008 systematic review of 18 prospective studies including 1331 children with chronic abdominal pain, abdominal pain persisted in 29.1 percent (95% CI 28.1-30.2) at median follow-up of five years (range 1 to 29) [[37](#)]. In a prospective study of 132 children with FAPD followed in a gastroenterology clinic, symptoms improved in approximately 85 percent of patients by two months and improvement was maintained at one and five years [[36](#)].

Factors associated with improvement of abdominal pain in observational studies include parental acceptance of a biopsychosocial model of illness, low levels of symptoms and impairment at the time of presentation, and rapid improvement in symptoms in patients with high levels of symptoms and impairment at the time of presentation [[36,40](#)].

Factors associated with persistent functional pain include parental modeling and reinforcement of the sick role, "painful family" (ie, family members with chronic pain disorders), age younger than six years at the time of diagnosis, more than six months' duration of pain before seeking treatment, negative life events, and increased symptoms of anxiety and depression [[13,14,36,112](#)].

Some longitudinal studies suggest that children with FAP-not otherwise specified (FAP-NOS) go on to have irritable bowel syndrome (IBS) as adults [[113-115](#)]. In a longitudinal study of 392 patients diagnosed with FAP-NOS following a specialty clinic evaluation at age 8 to 16 years, 41 percent met symptom criteria for a functional gastrointestinal disorder (FGID) at follow-up 5 to 15 years later (average 9.2 years) [[115](#)]. IBS and functional dyspepsia were the most frequent FGIDs. After controlling for age, sex, and severity of abdominal pain at the time of diagnosis, FGID at follow-up was associated with extra-intestinal somatic and depressive symptoms.

Other prospective studies indicate that children with a history of FAP-NOS are at risk for anxiety or depression in adolescence and adulthood [[49,116-118](#)]. In a prospective study in which 322 children with FAPD were followed to young adulthood (mean age 20 years), the lifetime risk of anxiety and depression were 51 and 40 percent (versus 20 and 16 percent in controls) [[49](#)].

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

- Functional abdominal pain disorders (FAPD) can be diagnosed in children who have chronic (≥ 2 months) abdominal pain, no alarm findings ([table 1](#)), normal physical examination, and a stool sample negative for occult blood. Several functional gastrointestinal disorders (FGIDs) of childhood have

recognizable patterns of symptoms, including irritable bowel syndrome, functional dyspepsia, and abdominal migraine ([table 2](#)). (See ['Terminology'](#) above.)

- The goal of management of FAPDs in children and adolescents is return to normal function rather than complete elimination of pain – a rehabilitation approach. Management is individualized according to child and family behavior, triggers, and symptoms. Most cases can be managed in the primary care setting. (See ['Overview'](#) above.)
- FAPDs are best treated in the context of a biopsychosocial model of care. The patient and family must believe that their complaints and concerns are taken seriously. Establishing a therapeutic relationship, patient and family education, and a plan for return to school are important components of management. (See ['Therapeutic relationship'](#) above and ['Patient education'](#) above and ['Return to school'](#) above.)
- Return to normal function is facilitated by reinforcement of nonpain (healthy or adaptive) behaviors and avoiding reinforcement of pain or pain (sick, illness, maladaptive) behaviors. (See ['Behavior modification'](#) above.)
- We suggest psychologic interventions (eg, relaxation, distraction, guided imagery ([table 3](#)), cognitive behavioral therapy) to improve coping and decrease stress/anxiety in children and adolescents with FAPDs ([Grade 2B](#)). (See ['Improved coping'](#) above.)
- We do not routinely suggest dietary restriction for children and adolescents with FAPDs ([Grade 2C](#)). However, on a case-by-case basis, a time-limited trial of avoidance of specific dietary triggers (eg, lactose, [sorbitol](#)) may be warranted. (See ['Dietary triggers'](#) above.)
- Medical interventions that may be combined with behavioral interventions include a trial of probiotics, supplementation with water-soluble fiber (eg, [psyllium](#)/ispaghula husk), or peppermint oil. These interventions may be tried in any order or combination. We typically start with probiotics in patients with normal bowel movements and probiotics plus fiber in patients with constipation. (See ['Abdominal pain'](#) above.)
- We suggest small frequent meals and avoidance of foods, beverages, and medications that aggravate symptoms rather than pharmacologic therapy for the initial management of functional dyspepsia ([Grade 2C](#)). (See ['Dyspepsia'](#) above.)
- We do not routinely suggest antimotility agents for children or adolescents with FAP and diarrhea ([Grade 2C](#)). (See ['Diarrhea'](#) above.)
- Regular follow-up is necessary to maintain the therapeutic relationship, provide continued education and reassurance, monitor the response to intervention, and monitor the development of alarm findings. Children with persistent abdominal pain that affects patient and family function may benefit from referral to a mental health provider or other specialist. Children who develop alarm findings require evaluation for organic disease. (See ['Follow-up'](#) above and ['Indications for referral'](#) above and ["Chronic abdominal pain in children and adolescents: Approach to the evaluation"](#), section on ['Patients with alarm findings'](#).)
- FAPDs resolve over several months in the majority of children. (See ['Prognosis'](#) above.)

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Topic 112 Version 35.0