



Multidisciplinary Diagnosis and Management of Irritable Bowel Syndrome: Nursing Care, Pharmaceutical Management, Radiological Assessment, and Emergency Care

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Abstract

Background: Irritable bowel syndrome (IBS) is a common disorder of gut–brain interaction characterized by recurrent abdominal pain and altered bowel habits, including constipation, diarrhea, or both. Its multifactorial pathophysiology and substantial impact on quality of life necessitate individualized, multidisciplinary management involving dietary modification, pharmacological treatment, and psychological interventions.

Aim: This review aims to summarize current evidence regarding the diagnosis and management of IBS, emphasizing dietary and lifestyle interventions, probiotics, symptom-directed pharmacotherapy, and brain–gut behavioral therapies.

Methods: A narrative review approach was used to synthesize the provided literature concerning the diagnosis, investigation, and treatment of IBS. Evidence from systematic reviews, meta-analyses, randomized controlled trials, and observational studies was considered across major therapeutic approaches and IBS subtypes.

Results: IBS diagnosis relies primarily on symptom-based criteria, supported by targeted investigations to exclude relevant organic disorders. Traditional dietary advice is recommended as first-line management, while a low-fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) diet may benefit patients with persistent symptoms under specialist dietitian supervision. Evidence supporting probiotics remains uncertain. Treatment should be tailored to predominant symptoms: laxatives are appropriate first-line options for constipation-predominant IBS, whereas secretagogues may benefit patients with inadequate responses. Antidiarrheals, 5-hydroxytryptamine-3 receptor antagonists, and rifaximin provide options for diarrhea-predominant symptoms. Antispasmodics, peppermint oil, and low-dose tricyclic antidepressants may alleviate abdominal pain. Cognitive behavioral therapy and gut-directed hypnotherapy can improve persistent symptoms and quality of life.

Conclusion: Effective IBS management requires an individualized, multidisciplinary approach combining appropriate lifestyle measures, symptom-directed medications, and behavioral interventions according to treatment response and patient preferences.

Keywords: Irritable bowel syndrome; diagnosis; dietary modification; pharmacotherapy; probiotics; abdominal pain; constipation; diarrhea; cognitive behavioral therapy; gut–brain interaction.

Introduction

Irritable bowel syndrome (IBS) is a common disorder of gut–brain interaction characterized by recurrent abdominal pain associated with changes in bowel habits, including alterations in stool frequency and consistency. The condition is classified according to the predominant bowel pattern into IBS with constipation (IBS-C), IBS with diarrhea (IBS-D), mixed-type IBS (IBS-M), and unclassified IBS when the symptoms do not meet the criteria for the other subtypes. The estimated community prevalence ranges from 5% to 10%, depending on the diagnostic

criteria applied. IBS occurs more frequently in women and younger individuals, although it affects people across different populations and geographical regions [1–4]. Although overall prevalence appears relatively stable over time, the predominant bowel pattern may change during follow-up in approximately one-third of patients, highlighting the variable clinical course of the disorder [5,6]. IBS represents a substantial healthcare and socioeconomic burden. Direct costs arise from consultations, diagnostic investigations, medications, and continuing treatment, while indirect costs result from

absenteeism, reduced workplace productivity, and presenteeism. Furthermore, the impact of IBS extends beyond gastrointestinal symptoms, affecting psychological well-being, social participation, daily activities, and overall quality of life. Studies have indicated that the quality-of-life impairment associated with IBS may be comparable to that experienced by individuals with chronic organic diseases, including stroke and chronic obstructive pulmonary disease [7–9]. These consequences emphasize the importance of accurate diagnosis, effective symptom management, patient education, and coordinated healthcare delivery. The diagnosis of IBS is primarily clinical and should be based on a careful assessment of symptoms, medical history, and physical examination, supplemented by selected investigations when indicated. Current guidelines recommend a positive diagnostic approach in patients without alarm features suggesting serious underlying disease, rather than routinely undertaking extensive investigations to exclude every possible organic condition [10–14]. The Rome IV criteria provide a standardized symptom-based framework for diagnosis and are widely recognized as the principal diagnostic reference [15]. However, their implementation remains inconsistent, particularly in primary care, where some clinicians are unfamiliar with the criteria or continue to regard IBS exclusively as a diagnosis of exclusion [16,17]. Appropriate assessment of alarm features and selective testing remain important to identify patients who require further investigation.

The pathophysiology of IBS is complex and incompletely understood. One recognized precipitating factor is acute infectious gastroenteritis, which may lead to post-infectious IBS, reported in approximately 10% of patients [18–20]. Other proposed mechanisms include genetic susceptibility, impaired intestinal barrier function, alterations in the gut microbiome, abnormal gastrointestinal motility, visceral hypersensitivity, and changes in central pain processing [18]. These interacting mechanisms help explain the diversity of symptoms and the absence of a single underlying abnormality in many patients. Consequently, treatment is generally individualized according to the predominant symptoms, bowel subtype, and patient response. Effective IBS management requires contributions from several healthcare disciplines. Nurses support symptom assessment, patient education, lifestyle modification, treatment adherence, and follow-up. Pharmacists contribute through medication counseling, appropriate selection and monitoring of therapies, identification of adverse effects, and support for safe medicine use. Radiological assessment may be appropriate when clinical findings suggest alternative diagnoses or complications, although imaging is not routinely required to establish uncomplicated IBS. Emergency clinicians play an essential role in

evaluating acute abdominal pain and identifying alarm features or alternative conditions requiring urgent intervention. An integrated, multidisciplinary approach can therefore improve diagnostic accuracy, promote rational treatment, enhance continuity of care, and address the physical, psychological, and socioeconomic effects of IBS.

Diagnosis and Investigation of Suspected Irritable Bowel Syndrome

The diagnosis of irritable bowel syndrome (IBS) requires a systematic clinical assessment to identify characteristic symptoms, evaluate possible underlying gastrointestinal diseases, and determine whether further investigations are necessary. During the initial consultation, the physician should obtain a detailed medical history and perform a comprehensive physical examination. The assessment should establish the nature, duration, frequency, and severity of abdominal pain, changes in stool frequency and consistency, and the relationship between pain and defecation. Additional information regarding dietary habits, medication use, previous gastrointestinal infections, family history, and associated symptoms may help guide the diagnostic process [10]. Physical examination is important for identifying abnormalities that may suggest an alternative diagnosis. Digital rectal examination is particularly valuable because it can detect a rectal mass and identify features of dyssynergic defecation, a condition characterized by inappropriate or paradoxical contraction of the pelvic floor muscles during attempted defecation [21,22]. Identifying this abnormality may help explain persistent evacuation difficulties and guide subsequent clinical assessment. Several organic gastrointestinal conditions can produce symptoms resembling IBS, including celiac disease, inflammatory bowel disease (IBD), microscopic colitis, bile acid diarrhea, and colorectal cancer. Consequently, clinicians must distinguish typical IBS symptoms from findings that warrant additional investigation. Alarm features, including unexplained weight loss, rectal bleeding, and a recent change in bowel habits toward looser stools, should prompt appropriate evaluation for underlying organic disease [23,24]. However, these features have limited accuracy when used individually to predict inflammatory bowel disease or colorectal cancer. Their presence should therefore inform clinical judgment rather than be considered definitive evidence of a specific diagnosis.

Current clinical guidelines recommend a positive, symptom-based diagnostic approach supported by limited, targeted investigations [10–14]. This strategy aims to establish the diagnosis using characteristic clinical features while avoiding unnecessary procedures. Extensive investigations may increase healthcare costs, delay appropriate treatment, and cause additional anxiety for patients who are already concerned about their symptoms

[25]. Nevertheless, the extent of testing should be determined by the clinical presentation, associated risk factors, and the possibility of alternative diagnoses. Several symptom-based diagnostic systems have been developed to support the identification of IBS. These include the Manning criteria, the Kruis scoring system, and the Rome criteria [26–28]. The Rome criteria have undergone several revisions since their introduction in 1990, reflecting efforts to improve diagnostic consistency and accuracy. Rome IV represents the current version described in the source literature and provides a standardized framework for assessing the frequency, duration, and characteristics of abdominal pain associated with altered bowel habits [15]. According to the Rome IV criteria, IBS is characterized by recurrent abdominal pain occurring, on average, at least one day per week during the previous three months. The pain must be associated with at least two of the following features: a relationship with defecation, a change in stool frequency, or a change in stool form. In addition, symptom onset must have occurred at least six months before diagnosis [15]. These requirements help distinguish persistent IBS symptoms from transient gastrointestinal disturbances.

The Rome IV revision introduced two important modifications. First, the term “abdominal discomfort” was removed because of concerns that its meaning could be ambiguous across different languages and cultures. Second, the required frequency of abdominal pain increased from at least three days per month to at least one day per week. These modifications improved the specificity of the criteria in a validation study conducted by the Rome Foundation [31]. Greater specificity may reduce the likelihood of incorrectly classifying individuals as having IBS; however, it may also reduce sensitivity. Consequently, some patients whom clinicians consider to have IBS may not satisfy all the formal diagnostic requirements [32]. Despite their value, symptom-based criteria should not replace clinical judgment. Earlier studies raised concerns about the diagnostic performance of the Rome criteria, prompting subsequent refinement of the framework [29,30]. Independent validation remains important to establish the reliability and generalizability of these criteria across different populations and clinical settings. Accurate diagnosis can reassure both patients and healthcare professionals, support appropriate treatment selection, and reduce unnecessary investigations. In conclusion, the diagnosis of suspected IBS should integrate a detailed clinical history, physical examination, assessment of alarm features, and appropriate use of symptom-based criteria. Digital rectal examination can provide additional information when evacuation disorders or rectal abnormalities are suspected. Targeted investigation is necessary when clinical findings suggest an alternative diagnosis, while routine

excessive testing should be avoided in patients with a typical presentation and no concerning features. Applying this structured approach can improve diagnostic confidence, promote efficient healthcare utilization, and support timely, individualized management.

Diagnostic Accuracy and Further Investigations in Suspected Irritable Bowel Syndrome

The Rome IV criteria provide a structured approach to diagnosing irritable bowel syndrome (IBS) and distinguishing it from other gastrointestinal disorders. An independent validation study involving more than 500 patients referred to secondary care with suspected IBS demonstrated that Rome IV performed better than Rome III in terms of specificity and agreement with a diagnosis established by an experienced physician following limited, targeted investigations. The positive likelihood ratio for Rome IV was 4.82, compared with 2.45 for Rome III, supporting its value in identifying patients likely to have IBS [33]. Diagnostic performance varied by subtype, with positive likelihood ratios of 25.7 for IBS with constipation (IBS-C), 10.6 for mixed-type IBS (IBS-M), and 2.07 for IBS with diarrhea (IBS-D). These findings suggest that diagnostic uncertainty and the possibility of an alternative organic condition are greater in patients with IBS-D. Four-year follow-up data further supported the safety of a positive IBS diagnosis, with organic gastrointestinal disease identified in only 1% of re-referred patients who underwent further investigation [34]. Despite improved specificity, Rome IV may preferentially identify patients with more severe gastrointestinal symptoms and psychological comorbidity [32]. Research has therefore examined whether relaxing the abdominal pain frequency requirement from once weekly to three days monthly could improve sensitivity while maintaining acceptable diagnostic performance. Although this modification reduced specificity, the positive likelihood ratio remained above four in reported studies, suggesting potential value for future revisions of the criteria [35,36].

Laboratory investigations should be selective and guided by clinical presentation. Evidence supporting routine full blood count (FBC), C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) testing in every patient with suspected IBS is limited, with approximately 1% of patients having organic gastrointestinal disease detected following investigation prompted by abnormalities in these tests [37,38]. Conversely, screening for celiac disease is recommended because patients with suspected IBS have higher odds of positive celiac serology and biopsy-confirmed disease than asymptomatic controls [39]. In patients with diarrhea-predominant symptoms, fecal calprotectin (FC) is a useful noninvasive marker for assessing intestinal inflammation. A normal result, interpreted according to local laboratory thresholds, helps exclude inflammatory bowel disease (IBD),

whereas an elevated result warrants further assessment, often including colonoscopy. FC may also increase with infection, malignancy, obesity, older age, and certain medications, including nonsteroidal anti-inflammatory drugs (NSAIDs) and proton pump inhibitors (PPIs). Its interpretation should therefore consider the patient's clinical context and age [40]. Colonoscopy generally has a low diagnostic yield in patients with typical IBS symptoms and no concerning features. In one study of 466 patients with IBS-D or IBS-M, IBD was identified in 0.4%, microscopic colitis (MC) in 1.5%, and no cases of colorectal cancer were detected. The prevalence of MC increased to 2.3% among patients older than 45 years [41]. Nevertheless, colonoscopy with colonic biopsies may be appropriate when chronic diarrhea is accompanied by features associated with MC, including age over 50 years, female sex, autoimmune disease, nocturnal diarrhea, weight loss, recent symptom onset, or exposure to medications such as NSAIDs, PPIs, statins, and selective serotonin reuptake inhibitors [43–45].

Bile acid diarrhea (BAD) is another important alternative diagnosis, particularly in patients with IBS-D. Excess bile acids entering the colon can stimulate fluid and electrolyte secretion and accelerate colonic transit. Up to one-third of patients with suspected IBS-D may have BAD on diagnostic testing [49,50]. Diagnosis may involve a seven-day SeHCAT retention scan, with retention below 15% considered abnormal in the source literature, or alternative testing such as fecal bile acid measurement and serum 7 α -hydroxy-4-cholesten-3-one. SeHCAT availability varies between settings. Treatment commonly involves bile acid sequestrants, including cholestyramine or colesevelam, although a poor response to treatment does not reliably exclude BAD [46–48]. The condition should be considered particularly in patients with severe or nocturnal diarrhea, elevated body mass index, or previous cholecystectomy [51]. Routine screening for small intestinal bacterial overgrowth (SIBO) is not recommended on the evidence reviewed. Although lactulose- and glucose-based hydrogen breath tests have reported high positivity rates among patients with IBS, studies using jejunal aspirate and culture have not consistently demonstrated a higher prevalence than in healthy controls [52–54]. Rapid intestinal transit may explain some positive breath-test results, limiting their specificity for SIBO [55]. Overall, when Rome IV criteria are fulfilled and appropriate initial investigations—including celiac serology and, in suspected IBS-D, fecal calprotectin—are reassuring, IBS is the most likely diagnosis. Further testing should be individualized according to subtype, age, alarm features, and risk factors for conditions such as IBD, colorectal cancer, MC, and BAD. Patients should receive a clear explanation of the diagnosis, the gut–brain interaction

underlying symptoms, and the likely chronic course of the condition. Treatment can then be directed toward predominant symptoms, with realistic expectations and ongoing support for long-term management [33,34].

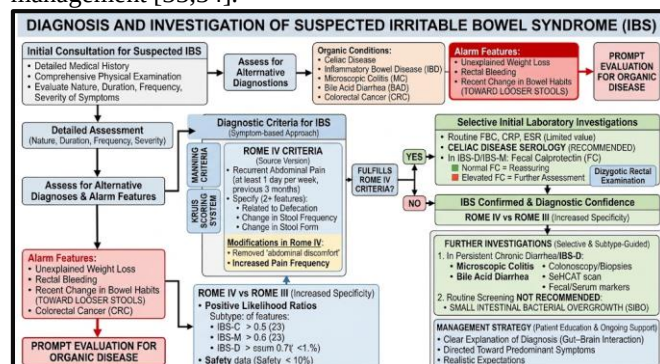


Figure-1: Diagnosis of irritable bowel syndrome.

Treatment of Irritable Bowel Syndrome: Diet and Lifestyle Measures

Dietary and lifestyle modification represents a cornerstone of irritable bowel syndrome (IBS) management because many patients associate their gastrointestinal symptoms with food intake, particularly after meals [56,57]. Initial management should emphasize traditional dietary advice, including regular meals, adequate hydration, and reduced consumption of caffeine and alcohol [58]. Patients with diarrhea should avoid sugar-free products and beverages containing sugar alcohols, such as sorbitol, mannitol, and xylitol. Those experiencing bloating or flatulence may benefit from limiting gas-producing foods, including legumes. Fiber intake should be individualized according to bowel habits, increasing it in constipation-predominant symptoms and reducing it when diarrhea predominates. Dietary fiber is classified into soluble and insoluble forms. Insoluble fiber, such as bran, increases stool bulk and water content but may aggravate bloating and abdominal discomfort [59]. Soluble fiber, particularly ispaghula, forms a gel in water and may influence intestinal transit through interactions with gut bacteria, short-chain fatty acid production, enteric nerves, and immune pathways [60,61]. A systematic review and meta-analysis of 14 randomized controlled trials (RCTs), involving 906 patients, demonstrated an overall benefit of fiber for global IBS symptoms. However, subgroup analysis showed that this benefit was limited to ispaghula, with no convincing evidence supporting bran [62]. Fiber should therefore be introduced gradually to minimize flatulence, bloating, and abdominal pain.

For patients whose symptoms persist despite initial measures, referral to a specialist dietitian is recommended to consider exclusion diets. The low-fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) diet is the most widely used approach. These poorly absorbed or slowly digested carbohydrates can increase

intestinal luminal distension and contribute to abdominal pain, diarrhea, and bloating [63]. Their restriction may reduce colonic fermentation and modify gut microbial activity [64]. A network meta-analysis of 13 RCTs involving 944 patients found that the low-FODMAP diet ranked first for improving global IBS symptoms, abdominal pain, bloating, distension, and bowel habits. It also outperformed traditional dietary advice for bloating and distension [65]. Nevertheless, FODMAP restriction should be personalized. In a blinded reintroduction study, symptoms recurred in 85% of patients, with fructans and mannitol being frequent triggers; individual responses varied considerably [66]. Dietitian supervision is therefore essential to support subsequent food reintroduction and long-term dietary personalization [67]. Although emerging evidence suggests that the gut microbiome may predict dietary response and inform artificial intelligence-assisted personalized diets [68,69], microbiome testing currently lacks sufficient evidence for routine clinical use. Commercial tests may also present risks because of limited regulatory oversight [70]. Other dietary approaches have less established evidence. In patients without celiac disease, two RCTs found no significant difference between continuing a gluten-free diet and consuming gluten, although nocebo effects may have influenced outcomes [71,72]. The Mediterranean diet shows preliminary promise, but larger studies are required [73,74]. A recent RCT found that traditional dietary advice, a low-FODMAP diet, and a gluten-free diet were similarly effective for global symptoms in non-constipated IBS, with traditional advice being more convenient and affordable [75]. Another short-term trial found symptom improvement with dietary interventions and optimized medical treatment, although dietary approaches produced larger effects [76].

Probiotics and Pharmacological Treatment of Constipation in Irritable Bowel Syndrome

Probiotics are live microorganisms that provide health benefits when administered in adequate amounts [77]. Their potential role in irritable bowel syndrome (IBS) is supported by evidence of altered intestinal microbiota in affected patients, the occurrence of post-infectious IBS, and experimental findings suggesting that certain probiotics reduce visceral hypersensitivity and pro-inflammatory cytokine levels [19,78–81]. A systematic review and meta-analysis of 82 randomized controlled trials (RCTs), involving 10,332 patients, found that probiotics may improve global IBS symptoms, abdominal pain, and bloating. However, the certainty of evidence was very low for most outcomes because of substantial heterogeneity, possible publication bias, and a high risk of bias in many studies [82]. Some evidence supports *Escherichia* strains for global symptoms, while *Lactobacillus plantarum* 299V and other

Lactobacillus strains may also be beneficial. *Saccharomyces cerevisiae* I-3856 and *Bifidobacterium* strains may alleviate abdominal pain, whereas combination probiotics and certain *Bacillus* strains may improve bloating. Nevertheless, confidence in these findings remains limited. Patients wishing to try probiotics may consider a trial lasting up to 12 weeks, with clear counseling regarding uncertain efficacy. Larger, well-designed RCTs are needed to establish strain-specific benefits and optimal treatment regimens.

Treatment of Constipation-Predominant IBS

Laxatives are widely available, relatively inexpensive, and generally considered appropriate first-line pharmacological treatment for IBS with constipation (IBS-C). Evidence specifically evaluating polyethylene glycol (PEG) in IBS-C remains limited. In one trial involving 42 patients, PEG and placebo produced similar improvements in symptoms and bowel movement frequency [83]. Conversely, a second study of 139 patients demonstrated that four weeks of PEG significantly increased spontaneous bowel movements compared with placebo, although abdominal pain and bloating did not improve [84]. Evidence from studies of chronic idiopathic constipation supports the broader use of laxatives, and these findings can reasonably be extrapolated to IBS-C because the conditions share constipation-related features, differing primarily in abdominal pain frequency [15,85,86]. Patients with inadequate responses to laxatives may require second-line therapies. Secretagogues improve constipation by increasing intestinal electrolyte secretion and luminal water content, thereby softening stools and accelerating transit. Lubiprostone, a chloride channel activator, was evaluated in two placebo-controlled trials involving 1,171 patients. Treatment with 8 µg twice daily significantly improved moderate or substantial IBS symptom relief, although nausea occurred in approximately 8% of patients [87]. Linaclotide and plecanatide activate guanylate cyclase-C receptors, promoting intestinal fluid secretion. Linaclotide 290 µg once daily was superior to placebo in trials lasting 12 and 26 weeks [88,89]. Plecanatide, administered at 3 or 6 mg daily, also improved IBS-C outcomes, with no significant difference between doses [90]. Tenapanor, which inhibits intestinal sodium absorption through the sodium-hydrogen exchanger-3, demonstrated superior efficacy to placebo at 50 mg twice daily over 12 weeks [91]. Diarrhea was the most frequently reported adverse effect of linaclotide, plecanatide, and tenapanor. A network meta-analysis found broadly comparable efficacy among secretagogues, although linaclotide ranked highest for composite symptom improvement, abdominal pain response, and complete spontaneous bowel movements [92]. Overall, secretagogues are appropriate second-line options for patients who obtain insufficient relief from laxatives, subject to

availability, tolerability, and individual treatment response.

Pharmacological Treatment of Diarrhea-Predominant Irritable Bowel Syndrome

Loperamide is an over-the-counter antidiarrheal that reduces intestinal motility and improves stool frequency and consistency. However, evidence supporting its use in diarrhea-predominant IBS (IBS-D) remains limited. Two small randomized controlled trials (RCTs), involving fewer than 50 patients, reported improvements in stool frequency and form, but effects on global IBS symptoms and abdominal pain were inconsistent [93,94]. Pooled evidence found no significant benefit for overall IBS symptoms compared with placebo [95]. Nevertheless, loperamide may provide symptomatic relief of diarrhea, although patients may remain dissatisfied with its overall effectiveness [96]. Eluxadoline is a mixed opioid receptor agent that activates intestinal μ -opioid receptors to reduce motility and chloride secretion while antagonizing δ -opioid receptors to help alleviate abdominal pain [97]. Two placebo-controlled trials involving more than 2,400 patients demonstrated that eluxadoline, at doses of 75 or 100 mg twice daily, improved the composite endpoint of abdominal pain and stool consistency, although the overall clinical benefit was modest [98]. It may be considered for patients inadequately controlled by first-line treatments, including loperamide. However, availability is restricted in many countries because of safety concerns, particularly sphincter of Oddi spasm. Network meta-analysis ranked eluxadoline behind 5-hydroxytryptamine-3 (5-HT₃) receptor antagonists, which may be preferred where available [96,99].

Serotonin regulates gastrointestinal motility and sensation, and altered serotonin levels have been reported in IBS [100,101]. Alosetron has demonstrated efficacy, particularly in women with IBS-D, but its use is restricted because of serious adverse effects, including ischemic colitis and severe constipation [102]. In the United States, it is available under restricted prescribing conditions for women with severe IBS-D. Although clinical studies suggest effectiveness, constipation and ischemic colitis remain important safety considerations [103–106]. Ramosetron is another effective 5-HT₃ antagonist that improves global IBS symptoms without a significant increase in adverse events in pooled trials. However, its availability is limited to Japan and selected Asian countries [107]. Ondansetron is more widely available and has a favorable safety profile. Evidence from three RCTs involving 327 patients indicates that it improves stool consistency and reduces loose stools and urgency, although it does not significantly relieve abdominal pain [108]. Network meta-analysis identified alosetron and ramosetron among the most effective medications for IBS-D, with ondansetron findings further supporting the potential benefits of this drug class [99,109]. These

agents are generally reserved for patients who do not respond adequately to first-line treatment.

Rifaximin is a minimally absorbed antibiotic investigated for IBS-D and mixed-type IBS (IBS-M), based on the potential contribution of intestinal microbiota alterations [110]. However, the role of small intestinal bacterial overgrowth remains controversial, and positive breath tests may reflect rapid intestinal transit rather than pathological bacterial overgrowth [55,111]. Two large RCTs demonstrated that rifaximin 500 mg three times daily for two weeks improved global IBS symptoms compared with placebo, although the therapeutic benefit was modest, approximately 8% [112]. Retreatment studies also demonstrated modest benefits among patients experiencing symptom recurrence, with response rates of 33% versus 25% after the first retreatment course [113]. Rifaximin is licensed for IBS treatment in North America and ranked below 5-HT₃ antagonists and eluxadoline in comparative analyses [99]. Overall, it may be considered for selected patients with persistent symptoms when other treatments are insufficient.

Treatment of Abdominal Pain in Irritable Bowel Syndrome

Abdominal pain in irritable bowel syndrome (IBS) is primarily associated with gastrointestinal dysmotility and visceral hypersensitivity, making smooth muscle relaxants and gut-brain neuromodulators important therapeutic options [114,115]. Antispasmodics relieve gastrointestinal spasms by relaxing intestinal smooth muscle. A systematic review and meta-analysis of 22 placebo-controlled trials evaluating 12 antispasmodic agents demonstrated improvements in global IBS symptoms and abdominal pain, although significant heterogeneity existed between studies [116]. Adverse effects, including dizziness, dry mouth, and blurred vision, occurred more frequently with these medications. Hyoscine demonstrated comparatively consistent evidence of efficacy across three trials involving more than 400 patients. In contrast, commonly used agents such as mebeverine and alverine did not demonstrate superiority over placebo, although evidence was limited to one small trial for each drug [116]. Peppermint oil may provide similar benefits by antagonizing calcium channels in gastrointestinal smooth muscle and reducing contractility. A meta-analysis of 10 randomized controlled trials (RCTs) found that peppermint oil improved global IBS symptoms and abdominal pain compared with placebo [117]. However, adverse effects, including dyspepsia, gastroesophageal reflux, and flatulence, were more common, although generally mild. The evidence was limited by low certainty and substantial heterogeneity. Furthermore, two newer, methodologically rigorous trials found no significant difference between peppermint oil and placebo [118,119]. Therefore, antispasmodics and

peppermint oil remain potential first-line treatments for IBS-related abdominal pain, but their benefits should be considered alongside the limitations of the available evidence.

Visceral hypersensitivity is a key feature of IBS, with affected patients experiencing pain at lower thresholds of rectal distension than individuals without the condition [18,120]. Gut–brain neuromodulators, particularly tricyclic antidepressants (TCAs) and selective serotonin reuptake inhibitors (SSRIs), may reduce symptoms through peripheral effects on visceral sensitivity and central modulation of pain perception. Improvements in psychological symptoms and mood may also contribute to their therapeutic effects [121–123]. A systematic review and meta-analysis of 18 RCTs involving 1,127 patients demonstrated an overall benefit of TCAs and SSRIs compared with placebo, although substantial heterogeneity was observed, particularly among SSRI studies [124]. TCAs showed consistent efficacy for global IBS symptoms, but trials differed in the medications and doses evaluated. Their effects on bowel habits remain less certain. Because TCAs can cause constipation, this adverse effect may be advantageous in patients with diarrhea-predominant IBS (IBS-D), although evidence supporting this benefit is limited [125]. Further evidence comes from a large primary-care RCT involving 463 patients with different IBS subtypes. Low-dose amitriptyline, initiated at 10 mg daily and titrated to a maximum of 30 mg according to symptoms and tolerability, was superior to placebo after six months, producing greater improvements in global symptoms and abdominal pain. Adverse-event rates were similar between groups, and psychological symptom scores did not differ significantly, suggesting that therapeutic benefits may partly involve peripheral mechanisms [126]. Serotonin–norepinephrine reuptake inhibitors (SNRIs), including duloxetine, have been less extensively studied in IBS. Nevertheless, evidence from other chronic pain conditions and limited IBS studies suggests potential benefits, particularly in patients with psychological comorbidities [127,128]. SNRIs may therefore be considered when other neuromodulators are ineffective. Overall, low-dose TCAs are the preferred gut–brain neuromodulators when first-line treatments provide insufficient relief, with treatment individualized according to symptom patterns, tolerability, and patient response.

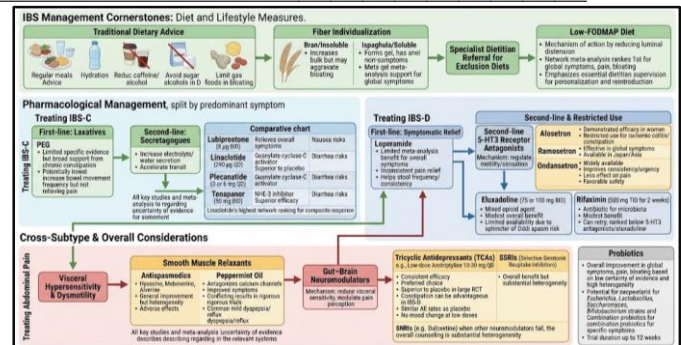


Figure-2: Multi-model treatment of irritable bowel syndrome.

Treatment of Refractory Symptoms in Irritable Bowel Syndrome

Brain–gut behavioral therapies (BGBTs), including cognitive behavioral therapy (CBT), gut-directed hypnotherapy, and relaxation-based interventions, are important treatment options for patients with irritable bowel syndrome (IBS), particularly those experiencing persistent symptoms despite dietary and pharmacological treatment. These approaches target psychological, cognitive, and behavioral factors that influence gastrointestinal symptom perception and the interaction between the brain and gut [129]. Anxiety and depression are more prevalent among patients with IBS than healthy individuals, potentially contributing to symptom development and persistence [130]. Patients with clinically significant mood disorders may require specific antidepressant treatment or referral for psychological or psychiatric care before beginning gastrointestinal-focused behavioral therapy [129]. CBT has demonstrated efficacy in improving IBS symptoms. A meta-analysis of nine randomized controlled trials (RCTs), involving 610 patients, found that CBT was superior to control interventions [124,131]. However, conventional face-to-face CBT requires trained practitioners and multiple sessions, limiting accessibility. Consequently, alternative delivery methods, including minimal-contact programs, telephone-based therapy, and internet-delivered CBT, have been investigated. These approaches have demonstrated improvements in IBS symptoms while reducing the need for frequent therapist involvement [132]. Benefits from telephone and internet-based CBT have persisted for up to 24 months in one study [133]. Digital self-guided CBT applications may further expand access, although engagement remains a challenge. In an uncontrolled study involving 843 patients, an app-based gut-directed CBT program improved symptoms, but only 19% of participants completed the entire eight-week intervention [134].

Gut-directed hypnotherapy is another evidence-supported intervention for IBS. Small studies have reported improvements in gastrointestinal symptoms, although effectiveness may depend on the expertise of the treatment center

[135–137]. Remote hypnotherapy offers an alternative for patients unable to attend specialist services, and patient satisfaction with this delivery method has generally been favorable [138,139]. Nevertheless, individual remote sessions continue to require therapist time, potentially limiting service capacity. Group-based hypnotherapy may improve access by allowing more patients to receive treatment. A multicenter RCT found that group hypnotherapy was non-inferior to individual treatment in a per-protocol analysis, with additional evidence supporting comparable outcomes in a study of 119 patients [140,141]. Digital delivery may provide further opportunities to expand treatment availability. In a randomized trial evaluating a 42-session digital gut-directed hypnotherapy program, 81% of participants achieved a reduction of at least 50 points on the IBS Symptom Severity Scale, compared with 63% in an active-control group. The difference was statistically significant, and digital hypnotherapy also produced significant improvements in quality of life [142]. Evidence from comparative analyses supports the use of BGBTs for persistent IBS symptoms. A network meta-analysis of 41 RCTs found that several behavioral interventions improved global IBS symptoms compared with control treatments. CBT-based approaches and gut-directed hypnotherapy had the strongest evidence base and demonstrated sustained benefits, including among patients with refractory symptoms. However, no individual intervention was consistently superior to another [143]. A subsequent network meta-analysis of 42 RCTs focusing specifically on abdominal pain similarly found benefits from several BGBTs, particularly CBT-based interventions and gut-directed hypnotherapy, without establishing the superiority of one approach over another [144]. Overall, BGBTs are valuable components of multidisciplinary IBS management and may improve global symptoms, abdominal pain, and quality of life in patients with persistent symptoms. Although traditionally reserved for refractory cases because of limited availability, these therapies could be incorporated more broadly into care. Group-based interventions, remote delivery, minimal-contact CBT, and self-guided digital programs offer opportunities to improve accessibility and reduce pressure on specialist services. Treatment selection should consider patient preferences, symptom severity, psychological needs, available resources, and willingness to participate, supporting individualized and integrated care [145].

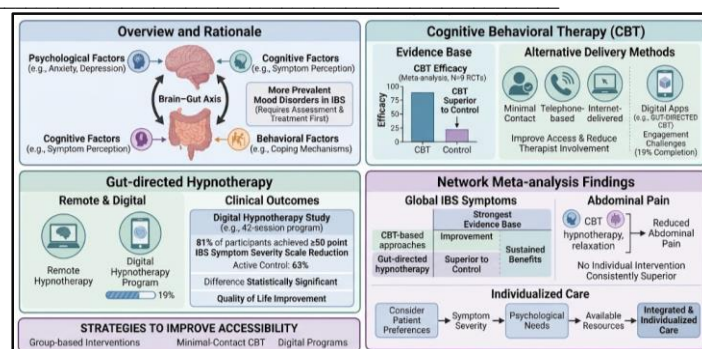


Figure-3: Treatment of refractory irritable bowel syndrome.

Conclusion:

Irritable bowel syndrome is a heterogeneous disorder of gut–brain interaction requiring comprehensive assessment and individualized management. Diagnosis should be based primarily on characteristic symptoms and appropriate clinical criteria, supported by targeted investigations when indicated. Traditional dietary advice represents the preferred initial intervention, while specialist-guided low-FODMAP diets may benefit patients with persistent symptoms. Pharmacological treatment should target the predominant bowel disturbance and associated abdominal pain, with laxatives, secretagogues, antidiarrheals, selected serotonin receptor antagonists, antispasmodics, and low-dose tricyclic antidepressants offering different therapeutic options. Although probiotics may provide symptomatic benefits, the certainty of evidence remains limited. Brain–gut behavioral therapies, particularly cognitive behavioral therapy and gut-directed hypnotherapy, are valuable for persistent or refractory symptoms and may improve quality of life. Digital and group-based delivery models could improve accessibility. Ultimately, shared decision-making, regular assessment of treatment response, and coordination among healthcare professionals are essential to optimize symptom control, minimize adverse effects, and improve patients' daily functioning and overall well-being. Further high-quality clinical trials are needed to clarify comparative treatment effectiveness and support more personalized therapeutic strategies.

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