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Systematic review: the perceptions, diagnosis and management of irritable bowel syndrome in primary care – A Rome Foundation Working Team Report

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SUMMARY

Objective
To review studies on the perceptions, diagnosis and management of irritable bowel syndrome (IBS) in primary care.

Methods
Systematic searches of PubMed and Embase.

Results
Of 746 initial search hits, 29 studies were included. Relatively few primary care physicians were aware of (2–36%; nine studies) or used (0–21%; six studies) formal diagnostic criteria for IBS. Nevertheless, most could recognise the key IBS symptoms of abdominal pain, bloating and disturbed defaecation. A minority of primary care physicians [7–32%; one study (six European countries)] preferred to refer patients to a specialist before making an IBS diagnosis, and few patients [4–23%; three studies (two European, one US)] were referred to a gastroenterologist by their primary care physician. Most PCPs were unsure about IBS causes and treatment effectiveness, leading to varied therapeutic approaches and broad but frequent use of diagnostic tests. Diagnostic tests, including colon investigations, were more common in older patients (>45 years) than in younger patients [<45 years; five studies (four European, one US)].

Conclusions
There has been much emphasis about the desirability of an initial positive diagnosis of IBS. While it appears most primary care physicians do make a tentative IBS diagnosis from the start, they still tend to use additional testing to confirm it. Although an early, positive diagnosis has advantages in avoiding unnecessary investigations and costs, until formal diagnostic criteria are conclusively shown to sufficiently exclude organic disease, bowel investigations, such as colonoscopy, will continue to be important to primary care physicians.

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INTRODUCTION

Irritable bowel syndrome (IBS) is a functional bowel disorder that is characterised by abdominal pain, bloating and disturbed defaecation.[1] IBS affects an estimated 10–15% of people in Western Europe and North America[2–5] and 5–10% in Asia.[6]

Since no specific biological markers for IBS have been identified, clinicians usually rely on symptom-based criteria for diagnosis. A number of diagnostic tools have been developed for use in IBS including the Rome criteria, which were last revised in 2006,[7] and the Manning criteria.[8] Diagnostic criteria have also been developed for use in primary care.[9] The Rome criteria are the most widely accepted among gastroenterologists and are used as research and diagnostic tools. However, according to a recent systematic review, few studies have validated the Rome I or Rome II criteria,[10] and no consistent differences have been observed in the sensitivity or specificity of the Rome I, Rome II and Manning criteria.[11] Furthermore no studies have validated Rome III criteria,[10] and their uptake has been variable in clinical practice, possibly because they were developed partly for research purposes.[10] There is still a need for development and validation of diagnostic criteria in primary care practice, to address patients' and physicians' concerns that organic disease might be missed without endoscopy.

Treatment strategies for IBS are also based on the nature, type and severity of symptoms.[2] Although generally speaking the effectiveness of drug treatment in IBS is limited, several treatments have been shown to be superior to placebo. These include anti-spasmodic agents and drugs acting on the 5-hydroxytryptamine receptor for diarrhoea-predominant IBS (IBS-D), soluble fibre for increasing stool-frequency in constipation-predominant IBS (IBS-C), chloride channel agonists for IBS-C and anti-depressants for chronic pain.[12] In addition, several psychotherapeutic interventions have established effectiveness in IBS.[13, 14] However, there is a need for further consensus and guidance on which treatments should be used for which patients with IBS, as was done recently for probiotics.[15]

Less than half of those suffering from IBS consult a physician.[16] Although most clinical studies on IBS have been performed in patients referred to gastroenterologists, the majority of patients are likely to present in primary care where their diagnosis and management is initiated. Previous reviews of IBS in primary care have focused on the interactions between PCPs and patients with IBS,[17] and on differences/similarities in IBS between primary and secondary care.[18] Here, we aimed to focus on reviewing the literature on PCPs perceptions, understanding and views of IBS, including how they choose to diagnose and manage this challenging problem.

METHODS

Search strategy

We employed broad systematic search terms aimed at identifying any studies mentioning IBS and primary care in the title/abstract, or indexed in PubMed under related Mesh terms (Figure 1). PubMed filters were applied to limit identified articles to those conducted in humans and published in English in the last 20 years (up to 10 November 2013). This search strategy was adapted for use in Embase, which was accessed via the online search platform OvidSP. The results were screened by title and abstract to exclude clearly irrelevant articles and those not specifically examining IBS in primary care. Full papers were obtained for the remaining articles to identify those providing insight into PCPs' perceptions and understanding of IBS in primary care, as well as its diagnosis and management in this setting. Owing to the broad nature of the study question, more specific predefined inclusion criteria were not able to be applied. The literature search was supplemented by relevant papers from the authors' own libraries. Screening of the searches, data extraction and selection of the final articles was conducted by a single reviewer (MM-B) and independently verified by a second reviewer (RC). A formal assessment of the quality of the included studies was not conducted for this review.

RESULTS

Identified studies

Overall, 29 studies were included (Figure 1 and Table S1). Of these, 20 were conducted in Europe, seven in North America, one in the Middle East and one in Southeast Asia. The publication date ranged from 1997 to 2013 (median: 2006) and all studies collected data using questionnaires, interviews and/or medical chart reviews.

While a formal assessment of study quality was not conducted, it should be noted that response rates for study participation in the included studies were generally low, and often not reported (Table S1). Furthermore, while publication dates are included throughout this article so they can be factored into the interpretation of

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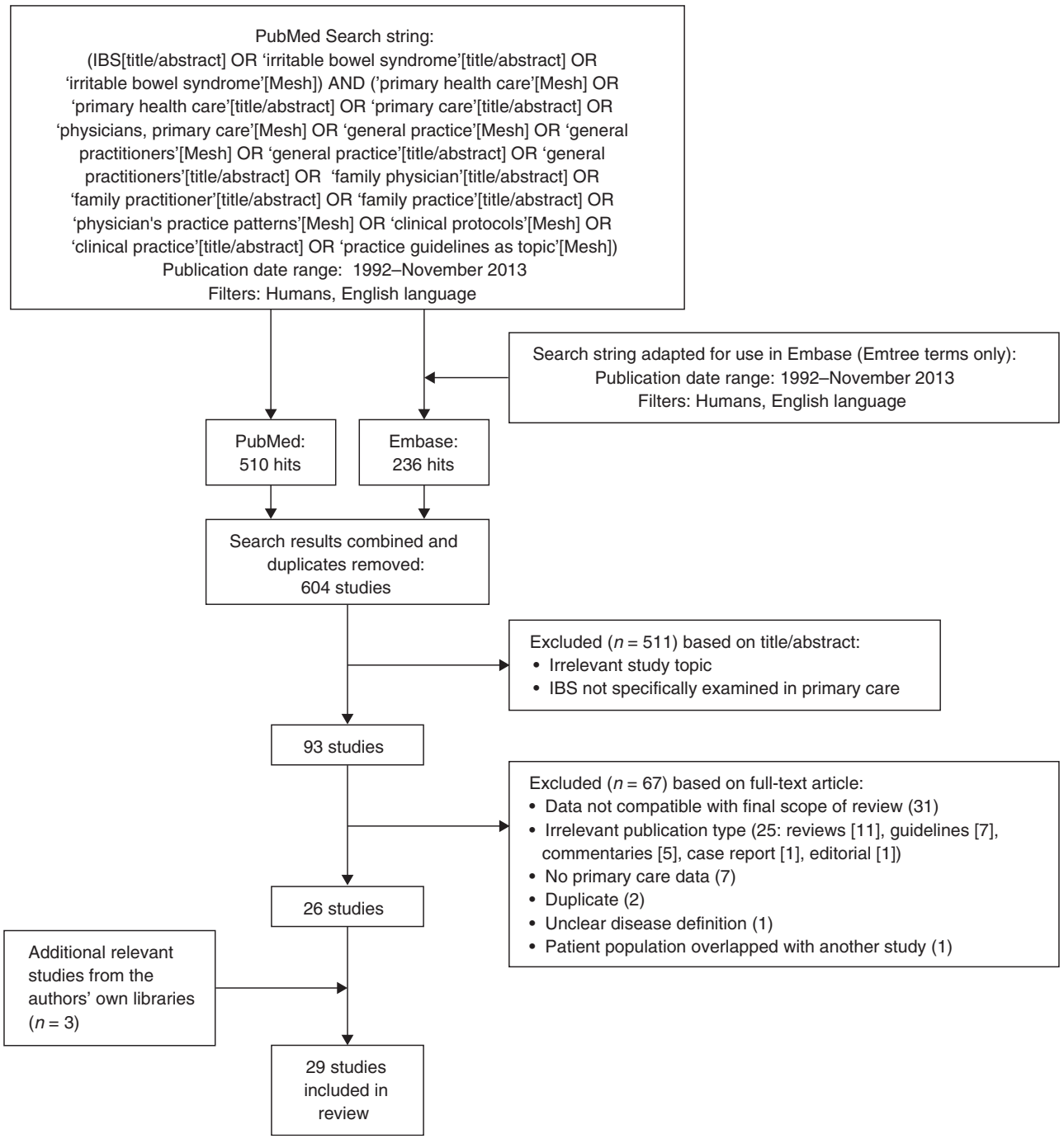

Figure 1 | Flow diagram of literature searches. The PubMed and Embase searches were performed up to 11 Nov 2013, and were limited to those conducted in humans and published in English in the last 20 years.

the data, study periods were rarely reported. Unknown variation in the time between study conduct and publication should therefore be acknowledged. Finally, much of the data presented here pertains to PCPs' perceptions and views of IBS. Such data can only be obtained through surveys, which have obvious limitations in terms of bias. Other data, such as those on the use of diagnostic tests, treatments and referral rates, were collected using methods that vary in terms of their reliability. In general (though not always), data gathered via medical chart review will be less biased than questionnaire data, and prospective questionnaires will be less biased than

those that are applied retrospectively (due to recall bias). Data sources used are thus described throughout the text, when this may aid in interpreting the reliability of the data.

Use of diagnostic tests

Most PCPs in the European survey by Seifert *et al.* (2008) used diagnostic tests for IBS, with 35% of Dutch PCPs, 25% of British PCPs and less than 10% of PCPs in other countries stating that they would not use diagnostic tests for IBS.[19] These results are consistent with other studies that show around two-thirds of patients with IBS in primary care usually undergo some form of diagnostic testing.[20–22]

Substantial variation exists in the types of diagnostic tests used by PCPs for suspected IBS in primary care. Across six European countries, 5–68% of PCPs surveyed said they would employ faecal occult blood tests, 50–75% would request an erythrocyte sedimentation rate test and 5–67% would use colonoscopy (2008).[19] In the US, 74% of PCPs surveyed said they would use faecal occult blood tests, 48% would request erythrocyte sedimentation rate tests and 17% would test for coeliac disease markers (2006).[23] Other tests reported to be commonly used by US PCPs in this study were complete blood count (74% of PCPs), electrolyte (61%), liver (56%) and thyroid function tests (36%).[23] Figure 2 shows the extreme variation in the types of diagnostic tests performed in patients with IBS, based on database records,[21, 24, 25] and prospective questionnaires[22] and interviews.[20] Other common tests not shown in Figure 2 included those for coeliac disease (16%),[24] C-reactive protein (27%),[24] and thyroid function (15%[24] and 36%[22]).

Factors influencing diagnostic approach

The age of both the patient and the PCP appears to have a significant impact on the diagnostic approach to IBS. Yawn *et al.* (2001) found that US patients who were over 50 years of age had colon imaging tests nearly twice as

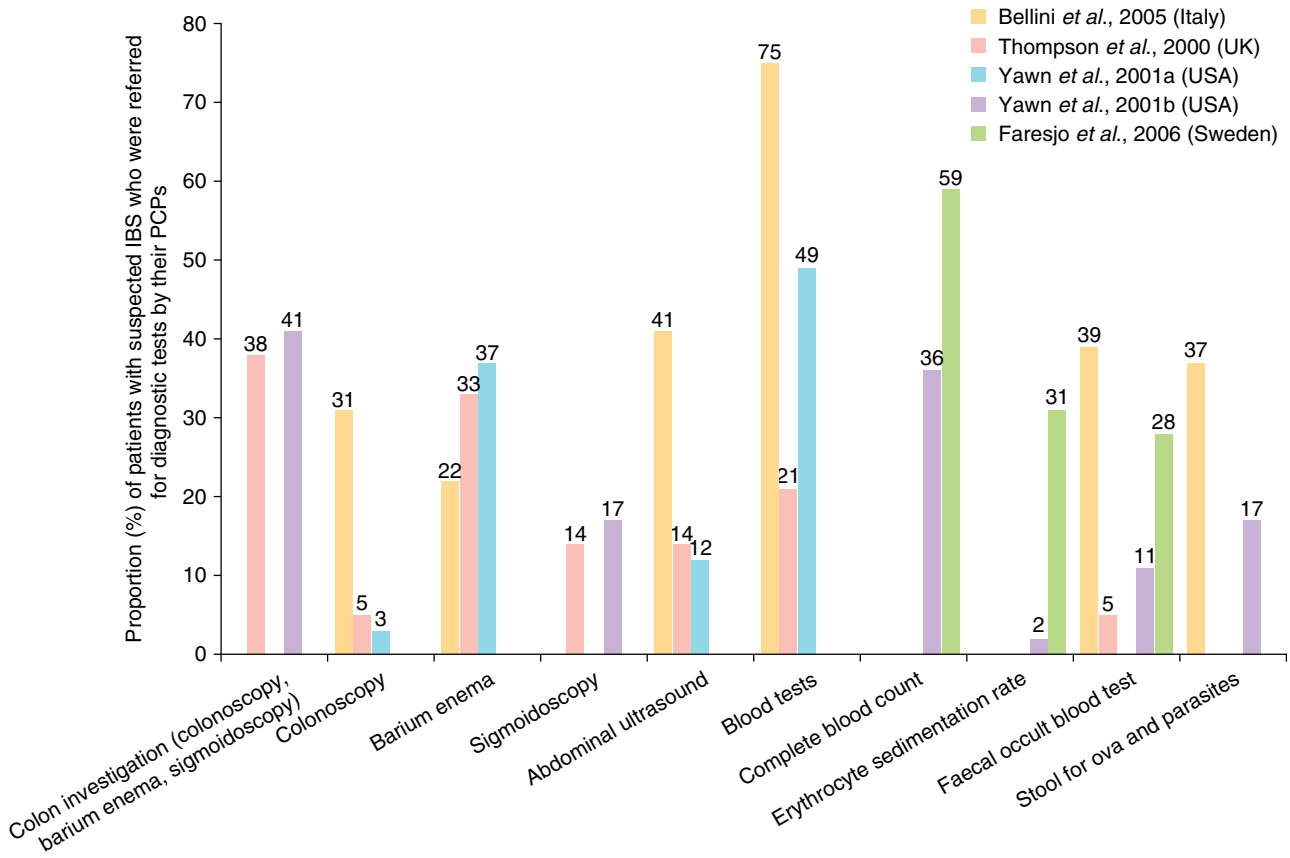

Figure 2 | Diagnostic tests ordered for patients with irritable bowel syndrome by their primary care physician. Only diagnostic tests for which data were available in at least two studies are included.

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often as patients under 50 years of age (based on medical chart review: 74% vs. 38%), an age cut-off often recommended for this diagnostic test.[25] Similarly, 14% of patients under 45 years of age received colon investigations compared with 58% of patients over 45 years of age in a UK study, based on prospective interviews (2000),[20] and Italian PCPs in another study using prospective questionnaires (2005) ordered a barium enema more often for older (>50 years) patients than for younger patients (≤50 years) (35% vs. 11%; $P < 0.001$).[22] In the Netherlands, Bijkerk *et al.* (2003) found that 48% of PCPs did not even consider diagnostic tests in patients younger than 50 years.[26] Rectoscopy was more frequent in older (>45 years) vs. younger (≤45 years) patients ($P < 0.0001$) based on medical chart review in the Swedish study by Faresjo *et al.*[24] Laboratory tests were also more common in older patients, except for C-reactive protein and tests for coeliac disease, which were more frequent among younger patients (2006).[24]

Age (presumably a proxy for experience) also influenced diagnostic testing patterns in UK primary care in the study by Thompson *et al.* (1997), with a higher proportion of PCPs aged under (vs. over) 45 years of age saying they never or rarely use certain tests for excluding organic disease (barium enema: 65% vs. 21%; sigmoidoscopy: 61% vs. 21%; occult blood tests: 56% vs. 26%; small bowel x-ray: 93% vs. 88%; barium meal: 70% vs. 47%; ultrasound: 79% vs. 54%.[27] In contrast, Bellini *et al.* (2005) found that PCPs with more than 20 years of experience requested diagnostic tests less often than those with less experience (20% vs. 5%; $P < 0.001$), based on data gathered using prospective questionnaires.[22]

In two studies [Italy (2005): prospective questionnaire[22] and the US (2001): medical chart review[21]] there was no difference in the frequency of requests for diagnostic tests between men and women. However, rectoscopy was more frequent among women ($P < 0.005$) than among men based on medical chart review in the study by Faresjo *et al.* (2006).[24] Laboratory tests were more common for men than for women (78% vs. 71%; $P < 0.05$, adjusted for age), with the exception of thyroid hormone tests which were more frequent among women.[24]

In US primary care, physicians who believed IBS to be a diagnosis of exclusion ordered 1.6 more tests on average for IBS-D patients than those who did not, and consumed $364 more on average per patient (2010).[28] Similarly, in primary care in Denmark (2013),[29] a strategy of exclusion for diagnosing IBS cost more per patient than a positive diagnostic strategy ($5075 vs. $3160)

Knowledge of symptoms and diagnostic criteria

Primary care physicians appear to be guided by key symptoms of IBS (abdominal pain, altered bowel habits and bloating). In a study conducted in Saudi Arabia (2012), 97% of PCPs recognised abdominal pain as a symptom of IBS, followed by 83% for altered bowel habit and 77% for bloating.[30] Bijkerk *et al.* (2003) found that 63% of PCPs in the Netherlands considered recurrent abdominal pain lasting more than 3 months as crucial for diagnosing IBS.[26] PCPs in the UK and the Netherlands (2009) defined IBS as a combination of symptoms with no explained organic cause, focusing on changed defaecation pattern and abdominal pain.[31] Similarly, Bellini *et al.* (2005) found that PCPs in Italy considered the most important symptoms for diagnosing IBS to be changes in bowel habits (96%), abdominal pain/discomfort relieved by evacuation (82%) and abdominal bloating (79%).[22] Nearly half of US PCPs could identify typical IBS symptoms in another study (2003).[32] Across nine studies, few PCPs (2–36%, median 20.5) had heard of formal criteria for IBS (Rome I, Rome II or Manning; Figure 3a).[19, 22, 26, 27, 32–36]

Use of diagnostic criteria

The proportion of PCPs saying that they used formal diagnostic criteria to diagnose IBS was low across six studies (Figure 3b),[19, 22, 27, 33–35] with one exception from a survey of Romanian PCPs (2006) in which 99% stated that they used Rome II diagnostic criteria for IBS; the participants had recently attended courses on IBS and functional bowel disorders (study not included in Figure 3).

Five European studies assessed the proportion of IBS diagnoses made by PCPs that also met Manning or Rome criteria for IBS (Table 1).[20, 26, 37–39] The highest specificity was observed for Rome III criteria in a study conducted in Denmark by Engsbro *et al.* (2013), with 75% of 499 patients diagnosed with IBS by their PCP meeting these criteria.[38] However, the methodology used in this article may have biased towards a high specificity for Rome III criteria. PCPs who participated were asked to recruit all patients aged 18–50 years who they considered to have IBS. While not formally provided with information about diagnostic criteria by the investigators, it is hard to imagine that PCPs would not seek out criteria for IBS upon entry into such a study. Furthermore, PCPs who are already confident in diagnosing IBS may be more inclined towards participation than those who are not. Interestingly, the lowest specificity for IBS diagnostic criteria was also reported for the Rome III criteria

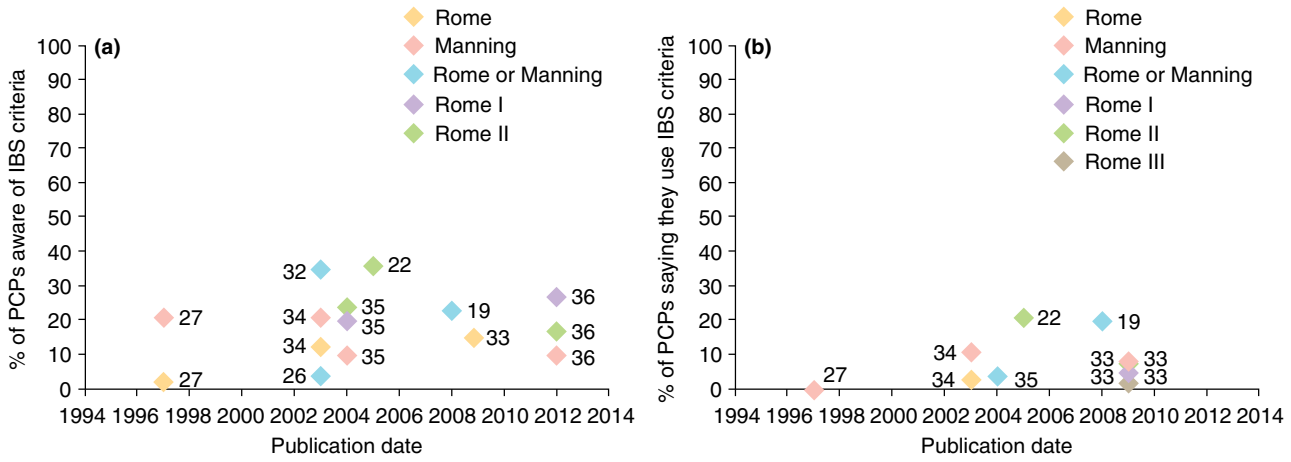

Figure 3 | (a) Awareness and (b) use of formal diagnostic criteria for IBS. Reference numbers of the corresponding studies are shown beside data points.

(24%).[37] The data-collection period for this study occurred before Rome III criteria were published, and may thus provide a truer reflection (though only in one country) of the extent to which formal diagnostic criteria for IBS line up with how PCPs tend to diagnose this disease.

The sensitivity of the Rome II criteria was low (18–39%) in the three studies reporting these data.[26, 37, 39] In two studies, 20% (Norway)[39] and 0% (Thailand)[40] of patients meeting Rome II criteria and Rome III criteria, respectively, were subsequently diagnosed with IBS by their PCP.

Diagnostic confidence

Several lines of evidence suggest that most PCPs consider IBS to be a diagnosis of exclusion (i.e. organic causes should be excluded before diagnosing IBS). These include: structured interviews where this view was given by PCPs (2009 and 2013),[31, 41] including one study (2010) in which 72% of PCPs expressed this view;[28] the high proportion of PCPs across studies (49–65%; 1997–2006) that rank the exclusion of organic disease as their primary concern;[23, 26, 27] and the high frequency of diagnostic testing among PCPs (see previous section 'Use of diagnostic tests').[19–21]

Despite the prevalent belief among PCPs that IBS is a diagnosis of exclusion they are largely confident that they can make a diagnosis of IBS themselves. In the US study by Longstreth *et al.* (2003), PCPs ranked IBS as fourth behind heartburn, back pain and headache in terms of diagnostic confidence,[32] while UK PCPs did not regard IBS as more difficult to distinguish from organic

Table 1 | Overlap between primary care physician (PCP)- and criteria-based diagnosis of irritable bowel syndrome (IBS)

	Country	Dates conducted	Manning (1978)	Rome I (1992) or Manning (1978)	Rome II (1996)	Rome III (2006)
% of patients with PCP IBS diagnosis who met IBS criteria						
Bijkerk *et al.*, 2003	The Netherlands	NS	62	–	18	–
Thompson *et al.*, 2000	UK	1995	–	82	–	–
Anastasiou *et al.*, 2008	Greece	1996–2000	69	–	32	24
Vandvik *et al.*, 2004	Norway	2001	–	–	39	–
Engsbro *et al.*, 2013	Denmark	2008–2010	–	–	–	75
% of patients meeting IBS criteria who were diagnosed with IBS by PCP						
Thompson *et al.*, 2000	UK	1995	–	58	–	–
Vandvik *et al.*, 2004	Norway	2001	–	–	20	–
Thanapirom *et al.* 2012 (abstract)	Thailand	2012	–	–	–	0

NS, not specified.

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disease than pelvic pain, headache or backache in the study by Thompson *et al.* (1997).[27] In the latter study, 37% of PCPs felt able to diagnose IBS over 50% of the time at the initial visit without further testing. In the study by Lacy *et al.*, 53% of PCPs in the US felt 'very comfortable' making a new IBS diagnosis at the initial visit in the absence of alarm signs.[23]

Referral rates

In the European survey by Seifert *et al.* (2008), the proportion of PCPs who would seek specialist referral before making a diagnosis of IBS was 7% in the Netherlands, 10–15% in England, 15–20% in Spain, and 25–32% for Greece, Poland and the Czech Republic.[19]

The proportion of patients with IBS referred by their PCP to a gastroenterologist was similar based on prospective questionnaires in two European studies reporting data [20% (2000)[20] and 23% (2005)[22]], but lower in one US study [4% (2001)].[25] In Saudi Arabia, 40% of PCPs surveyed said that they would eventually refer an IBS case to a gastroenterologist.[30] The proportion of PCPs referring patients with IBS to a mental health provider was similar in two studies using prospective questionnaires that reported these data [9% (2004)[42] and 12% (2005)[22]]. Referral to a dietician was also common in these studies (7%[22] and 8%[42]) as was referral to a gynaecologist in one of the studies (19%).[22]

Factors influencing referral

A variety of reasons for referral of patients with IBS by PCPs were reported across studies. In one US (2006)[23] and two European studies [Germany (2009)[33] and the UK (1997)[27]], 18–64% of patients were referred because of an unclear diagnosis and 24–54% were referred owing to insufficient therapeutic response or patient dissatisfaction. Less than a quarter of the US patients (2006)[23] and 16% of Italian patients in another study (2006)[43] were referred to a specialist because they needed reassurance, while 3% and 34% of referrals were at the request of the patient in the studies conducted in Germany (2009)[33] and Italy (2006),[43] respectively. The most common reason for referral for the US patients was the presence of alarm features, while the three most common reasons for referral to a psychiatrist were co-existing anxiety or depression, history of physical or sexual abuse and symptoms refractory to therapy.[23] Denial of a role for stress in IBS was a significant predictor of referral to a specialist by UK PCPs after logistic regression, as was multiple diagnostic testing and the presence of frequent bowel movements, in a study by Thompson *et al.* (2000).[20]

Thompson *et al.* (1997) found a higher proportion of male doctors than female doctors said they referred their patients (18% vs. 7%) based on retrospective questionnaires administered in the UK, and referral rates were also higher for older doctors (43–60 years old) compared with younger doctors (31–42 years old) in this study (19% vs. 10%).[27] PCPs' decisions regarding referrals did not seem to vary with clinical presentation or patient age in Italian patients (2005),[22] or in relation to IBS subtype in US patients (2006),[23] according to prospectively applied questionnaires.

Views on aetiology and pathophysiology

Most PCPs recognise that psychological comorbidities are common in IBS but opinions vary about their aetiological significance. Across three studies [Saudi Arabia (2012), the Netherlands (2003) and the US (2006)], 55–71% of PCPs identified stress, anxiety (or 'nervousness') and depression as being associated with symptoms of IBS,[23, 26, 30] while 45% of UK PCPs agreed that IBS is a nervous complaint in another study (2004).[44] Casiday *et al.* (2009) reported that PCPs frequently saw IBS as a consequence of disordered bowel activity in response to stress.[31]

Two studies, which between them covered seven European countries [Czech Republic, Greece, the Netherlands, Poland, UK and Spain (2008),[19] and Germany (2009)[33]], reported that about a quarter to two-thirds of PCPs believed IBS had a psychiatric or psychological component, while none thought so in another study in Romania (2006).[45] In other studies, 49% of UK PCPs thought IBS was psychosomatic (2003),[34] while psychological and psychiatric factors were ranked second by Italian PCPs (after intestinal motility disorder) as the most probable cause of IBS symptoms (2005).[22] Another study in UK primary care by Thompson *et al.* (1997) found that 87% of PCPs thought IBS aetiology was sometimes physical and sometimes psychological; however, only 14% and 7% would apply a psychological or psychiatric label, respectively.[27]

There are also differences in PCPs' views of the aetiological significance of visceral pain sensitivity, motility, enteric infection and sexual abuse. Gut hypersensitivity was believed to be an aetiological factor for IBS by 26% of Dutch PCPs (2003)[26] and 54% of US PCPs (2006).[23] The latter study also found that most PCPs believed IBS was a disorder of both gut hypersensitivity and gastrointestinal motility.[23] The proportion of PCPs who consid-

ered IBS to be a motility disorder ranged from 2% in Romania (2006),[45] to 62% in the US (2006),[23] and 49% and 62% in Germany (2009)[33] and the Netherlands (2003),[26] respectively. In one study (2009),[31] Dutch PCPs considered smoking, caffeine, diet, 'hasty lifestyle' and lack of exercise as other possible triggers of IBS symptoms, while UK PCPs considered food, infection and travel as other possible triggers.[31] The proportion of PCPs who believe infection or food intolerance causes IBS was low (<5%) in Saudi Arabia (2012)[30] and the Netherlands (2003).[26]

Views on IBS management

Relief of symptoms was rated by US PCPs as their second greatest concern behind excluding organic disease, with only 22% rating this as their main objective (2006).[23] In contrast, 73% believed that symptom relief was the patients' primary concern.

Despite widely held beliefs that IBS has a psychological component [three UK studies (1997–2013); one European study (six countries; 2008); one Italian study (2005) and one German study (2009)],[19, 22, 27, 33, 34, 41] PCPs are often reluctant to consider mental health interventions (2013 and 2004; UK).[41, 46] Reasons for this include a lack of familiarity with such interventions, perceived patient resistance to psychological treatment and doubts of the strength of evidence for psychological intervention (2004; UK),[46] as well as the belief that the condition can be managed effectively and adequately in primary care (2013 and 2004; UK).[41, 46]

In terms of perspectives on the effectiveness of IBS treatment, Cox *et al.* (2004) found that 40% of PCPs in the UK study agreed that IBS responded mainly to the placebo effect of personal care and attention, and most (61%) were unsure about or disagreed with the statement that IBS symptoms mainly respond to medical therapy.[44] Most PCPs were also unsure about or disagreed with the statements that existing treatment regimens (54%) or dietary advice (59%) are effective.[44] In the same study, 73% and 77% of PCPs agreed that hypnotherapy could help patients with physical and psychological problems, respectively.[44]

Management approaches

UK PCPs in the study by Casiday *et al.* (2009) stated that their main focus was managing symptoms and reassuring patients with IBS.[31] In terms of management goals for pharmacotherapy, Bijkerk *et al.* (2003) found that 70% of Dutch PCPs considered global symptom improvement to be their main aim, while 28% aimed mainly to improve predominant IBS symptoms and 2% aimed mainly to improve quality of life.[26] In this study, 93% of respondents said they provided dietary advice to their patients, 77% used counselling, 63% gave routine lifestyle advice, 55% prescribed drug therapy and 4% provided behavioural therapy.[26] A similarly high proportion of 70 PCPs surveyed in the Icelandic study by Olafstdottir *et al.* (2012) said they provided dietary advice (98%) and education about IBS (90%); advice around relaxation and exercise was less common (~15%).[36] Counselling and patient education were only provided for 18% of patients with IBS in the 3 years after diagnosis in one US study (2001).[21] In another study in US primary care (2004) that used prospective questionnaires, 55% of patients with IBS received education about the cause of their symptoms, 63% received dietary advice, 50% exercise advise and 37% lifestyle advice on how to reduce stress.[42]

Among German PCPs, 96% of those surveyed stated that they prescribed drug therapy, while psychotherapy and alternative therapies (such as homoeopathy, acupuncture, phytotherapy dietary therapy or probiotics) were recommended by 55% and 61% of PCPs, respectively (2009).[33] Only 8% of US primary care patients with IBS were referred to naturopaths in the study by Whitehead *et al.* (2004),[42] based on prospective questionnaires.

Most UK and Dutch PCPs surveyed by Casiday *et al.* (2009) said they prescribed fibre for IBS.[31] The UK PCPs said they readily prescribed medications, while the Dutch PCPs preferred not to prescribe any drugs, unless requested by the patient, based on a belief that limited evidence for efficacy exists.[31]

Figure 4 shows the large variation in the types of medications used to treat IBS in primary care in terms of the proportion of PCPs prescribing based on retrospective questionnaires,[26, 30, 36] while Figure 5 shows the actual medications received by patients based on database records,[21, 24] prospective[22] and retrospective[42, 47] questionnaires.

Factors influencing management approaches

In the Swedish study by Faresjo *et al.* (2006), all prescriptions for IBS increased with increasing age except for anti-diarrhoeal agents, which were more common among younger patients based on medical chart review.[24] Prescription of anti-depressants was independently associated with being female ($P < 0.03$).[24] In the only other study reporting such data (2001), which also used data from medical charts, women in the US with IBS were

slightly more likely to use medications for bowel dysfunction (laxatives and antidiarrhoeals) than men ($P = 0.05$), and men were more likely to have prescriptions for histamine blockers ($P = 0.01$), anti-depressants and anti-anxiety medications ($P = 0.03$).[21]

DISCUSSION

Most PCPs consider IBS to be a diagnosis of exclusion, but one that can be reached in primary care. There has been much emphasis recently about the desirability of an initial positive diagnosis. While it appears that most PCPs do make a tentative IBS diagnosis from the start, they still tend to use additional testing to confirm it.

To our knowledge, this is the first systematic review of published studies providing insight into the perceptions, diagnosis and management of IBS, specifically from a primary care perspective. The main limitation of this review relates to the large variety of data reported, which make it difficult to draw clearly defined conclusions. Another limitation is that only broad pre-defined selection criteria could be applied owing to the wide scope of the study question. Furthermore, like any review seeking to capture current thinking in an ever-evolving field, it is inevitable that some of the data presented here no longer represent current practice and that newer trends have not yet made it into the literature. In terms of the quality of the included studies, some were based on retrospectively applied questionnaires, which are prone to recall bias, although many studies, including those reporting diagnostic tests used and medications prescribed in patients with IBS, used more reliable methods such as prospective questionnaires and interviews, and medical records. Despite the limitations, this is the most comprehensive assessment yet of this topic and we believe some useful, though tentative, inferences can be drawn.

We have attempted to synthesise papers from across countries – this strengthens the article in scope but reduces the generalisability of conclusions because of locally prevailing factors. In particular, differences in healthcare systems across countries will have a bearing on the way patients are diagnosed and managed further. In settings where there is a clear delineation between primary and secondary care referral is likely to be restricted to patients whose diagnosis is uncertain or to situations where factors such as patient reticence drive towards a specialist opinion or colonoscopy. For example, in the UK, economic pressures to reduce specialist referrals and colonoscopy mean that primary care management of IBS predominates. In countries with a mixed system, whereby specialists work in the community, barriers to specialist investigations may be reduced and the prevalence of such diagnostic strategies is thus likely to be higher. Factors underlying which diagnostic strategies predominate in different countries include the type of reimbursement system, the level of easy (and low cost) access to investigational services and how the consulting clinician is incentivised. These differences may even be localised within countries, for example between those patients who are privately insured and those entirely within the state system.

Primary care physicians have a heterogenous view of the causes of IBS. Their perceptions of the factors associated with IBS were related to the presence of stress and nervousness, with some indicating that gut hypersensitivity plays a role, and a very small fraction identifying food allergies as a factor. No obvious single explanatory model for the symptoms of IBS itself was discernible, which is probably why treatment approaches were found to vary so greatly. Relatively few PCPs had heard of Manning or Rome diagnostic criteria, and still fewer used them in their practice, though recent studies assessing the awareness or use of Rome III criteria were lacking. Despite a lack of awareness and use of formal diagnostic criteria for IBS, most PCPs could identify typical symptoms of IBS.

Contrary to the views of many outside primary care, the literature indicated that PCPs do not, in general, make an immediate, positive diagnosis of IBS but access tests, including colonoscopy, to exclude other problems. This follows the necessarily global approach that PCPs

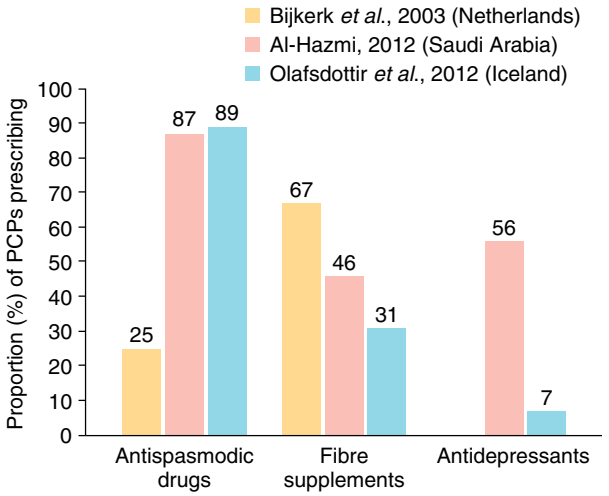

Figure 4 | Proportion of primary care physicians prescribing medications for patients with irritable bowel syndrome. Only medications for which data were available in at least two studies are included.

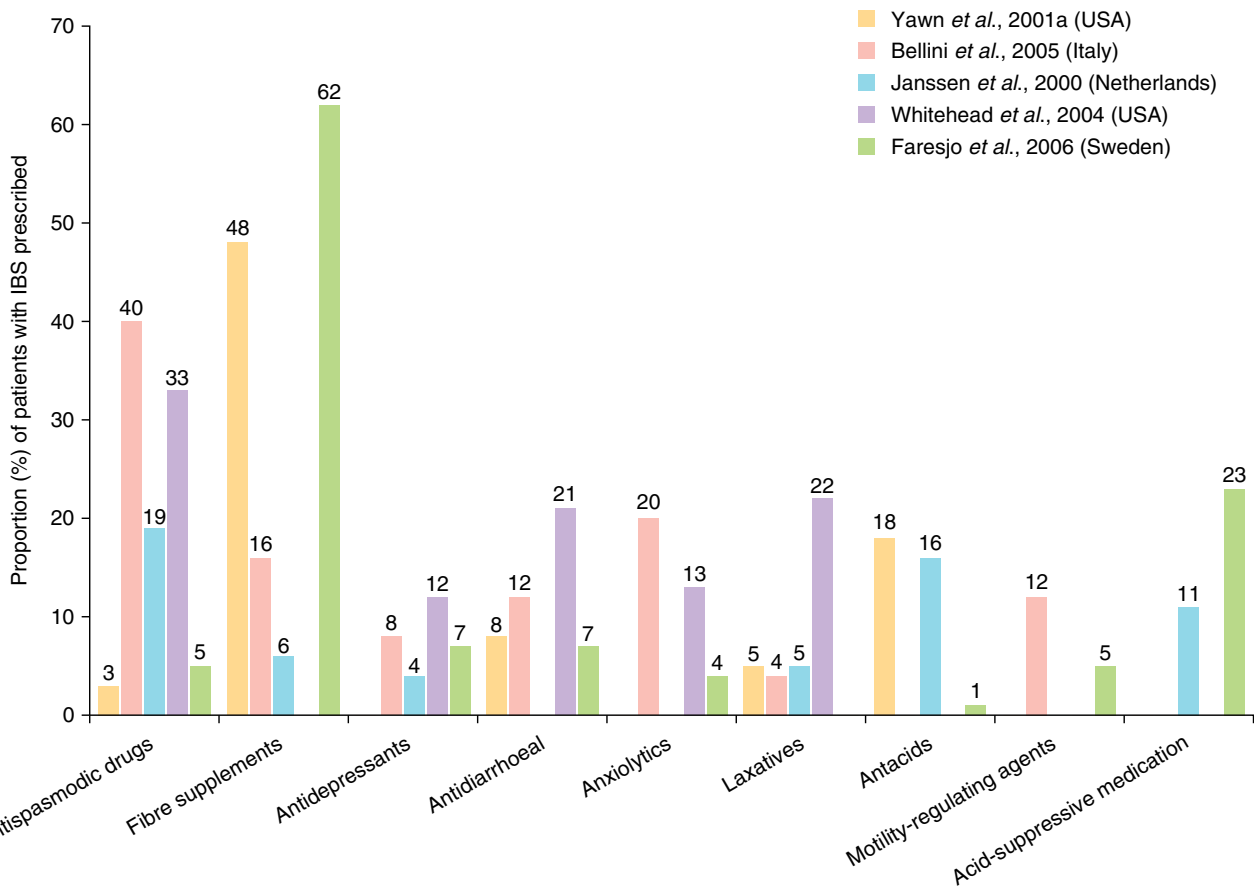

Figure 5 | Proportion of patients with irritable bowel syndrome being prescribed medications by their primary care physician. Only medications for which data were available in at least two studies are included.

need to take in patients presenting with heterogeneous symptoms from different possible causes. An example is cough, which in the vast majority of cases is a simple, self-limiting problem, but for which a lack of vigilance may result in a serious lesion being missed. An equivalent situation exists for IBS and for many PCPs this means they will test early. In this study diagnostic management in IBS varied largely between different healthcare settings, resulting in a wide variation in confidence about diagnosing IBS. Diagnostic testing by PCPs was very common overall, though the types of tests used varied greatly. Taking the above factors into consideration, in combination with the low proportion of PCPs who would seek a specialist referral before making a diagnosis of IBS (7–32%),[19] it appears that most PCPs consider IBS to be a diagnosis of exclusion, but one that can be reached in primary care.

The use of multiple diagnostic tests to exclude IBS and uncertainty around treatment approaches seems to be reflected by patients' experience of primary care, which can leave some feeling confused and frustrated.[48, 49] Only a small proportion of patients with IBS (4–23%)[20, 22, 25] are referred to secondary care. Reasons for referral include an unclear diagnosis, insufficient therapeutic response (which, ironically is a common factor in IBS and not necessarily bettered in secondary care) and patient dissatisfaction. Primary care physicians lack consensus on the best conceptual model for understanding IBS: they exhibit regional differences in their beliefs about aetiology, diagnosis, the role of psychological factors and treatment guidelines. Although much variation exists between PCPs in different settings in terms of their diagnostic and management behaviour, the diagnosis of IBS is mainly based on excluding other problems, even if a tentative diagnosis is made early. Diagnostic criteria, mainly established from secondary care, are largely unknown or not applied in primary care, at least according to the most recent literature. Stress and other psychological factors are considered an important part of IBS in primary care.

Combined with perceived uncertainties and the stress of getting things wrong the PCP is often in a difficult position. It is important to appreciate that uncertainty and a lack of confidence in a symptom-based positive diagnosis of IBS greatly influences clinical behaviour, particularly when progress is not made with the patient and available options are rapidly exhausted. It is therefore not surprising that many PCPs adapt their practice towards early investigation. While a positive diagnosis of IBS by PCPs in low-risk patients would be less costly than a diagnosis of exclusion, this is not the way most PCPs practice. Furthermore, there is evidence that none of the formal diagnostic criteria currently available sufficiently, conclusively distinguish IBS from organic diseases.[50] Until this changes, bowel investigations, such as colonoscopy, will continue to be important for PCPs to exclude organic disease and, paradoxically, there may be calls for this to be made more easily available; often differences in diagnostic strategies are related to health care systems and their limitations. The ongoing development of new diagnostic algorithms, based on symptoms, comorbidity and psychosocial profile, in combination with new biomarker point-of-care tests, such as for calprotectin, should facilitate and support more efficient discrimination between organic and functional bowel disease by PCPs and reduce the use of lower GI endoscopy. Further educational initiatives alone and dissemination of diagnostic criteria may be insufficient – while an early, positive diagnosis of IBS in primary care is likely to be accurate and efficient there are many barriers before this is accepted in pragmatic practice. Specialists, too, will need to align with this ethic if it is not to be undermined.

AUTHORSHIP

Guarantor of the article: A Pali S. Hungin.

Author contributions: A Pali S Hungin took a lead in determining the study concept and design, interpreting the data and critically reviewing the manuscript for important clinical and intellectual content. Michael Molloy-Bland performed the literature searches and played a major role in drafting and critically reviewing the manuscript for important intellectual content. Richard Claes independently verified the literature searches and data extraction and critically reviewed the manuscript for important intellectual content. Joel Heidelbaugh, William Cayley, Jean Muris, Bohumil Seifert, Greg Rubin and Niek de Wit played major roles in interpreting the data and critically reviewing the manuscript for important clinical and intellectual content. All authors have approved the final draft of the manuscript, including the authorship list.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Table S1. Characteristics of the included studies.

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