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# Information retrieval strategy in functional gastrointestinal disorders with emphasis on the sensitivity and precision

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## Abstract:

**BACKGROUND:** To determine functional gastrointestinal disorder (FGID) aspects, there should be a guideline to retrieve documents in this area for researchers with different levels of knowledge about these disorders. The objective of this study was conducted in order to compile different terms related to different categories of these disorders and to determine the sensitivity of them.

**MATERIALS AND METHODS:** To set a proper search, some strategies were used to enhance the precision and sensitivity. After preparing the list of terms according to some sources such as thesauruses, Rome classification, related review articles, and so on, they were divided into seven categories and the queries in each of them were searched on the Scopus.

**RESULTS:** The sensitivity for each of the terms in categories were calculated, and the highest values were as follow: FGIDs with 189 queries (“digestive\* system\* function\* disorder\*”), irritable bowel syndrome with 142 queries (“irritable colon\*”), functional constipation with 13 queries (“function\* disorder\*” and constipation), functional diarrhea with 16 queries (“function\* disorder\*” and diarrhea), functional bloating with 29 queries (“function\* disorder\*” and bloat\*), Functional Dyspepsia with 29 queries (“functional dyspep\*”), and neurogenic bowel with 7 queries (“neurogenic bowel\*”).

**CONCLUSION:** Given the values calculated for sensitivity, and considering the type of study, in order to retrieve documents in this area, it is necessary to apply all or part of the proposed queries to the search strategy.

## Keywords:

Functional gastrointestinal disorders, information retrieval, precision, sensitivity (recall)

## Introduction

Functional gastrointestinal disorders (FGIDs) are common disorders in gastrointestinal (GI) sciences, which can be seen in any part of the GI tract from the esophagus to the rectum. Today’s laboratory and anatomic findings have not yet fully justified the cause of these disorders.<sup>[1]</sup> This is despite the fact that a lot of research has been carried out in this regard. Although FGIDs are not associated with mortality,

they impose high costs on society due to the absence of a definitive diagnosis or treatment. In the meantime, patients with irritable bowel syndrome (IBS) consume a large amount of financial resources of health-care systems, and yet, this disease reduces the daily performance of these patients.<sup>[2]</sup>

IBS is one of the functional GI disorders associated with chronic abdominal recurrent pain, diarrhea, constipation, and bloating (or distension). Like other functional disorders, IBS can be influenced by cultural, social,

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environmental, and behavioral factors.<sup>[3]</sup> For the first time in 1892, Osler called this disease “mucous colitis”. Characteristics that he described about this disease were mucorrhoea and abdominal colic, which had most commonly been seen in patients with psychopathological symptoms. Since then, the said syndrome has been referred to by different terms including spastic, irritable, and nervous colon.<sup>[4]</sup>

Dyspepsia is another GI disease, which encompasses 30%–40% of cases going to gastroenterologists, out of whom 50%–60% suffer from functional or nonulcer dyspepsia.<sup>[5]</sup> Therefore, dyspepsia falls in a different category of functional diseases, which imposes high costs on patients and on the health-care system. This disease, which causes upper abdominal pain and discomfort, is associated with symptoms such as early satiety, feeling full after eating, belching, bloating, and feeling nauseous.<sup>[5]</sup>

Many efforts have so far been made to achieve a unique yet efficient method to diagnose FGID. One of them is the classifications of these disorders in the Rome questionnaire, whose latest version, i.e., the Rome IV questionnaire, presented in 2016, is currently the main tool for diagnosing and categorizing different types of FGID. The early version of it was developed by a group of scientists in 1989 through a questionnaire using the Delphi decision-making method and has been revised several times since then. Diagnosis and classification in this questionnaire are carried out based on a variety of symptoms associated with FGID.<sup>[2]</sup>

Depending on different editions of this classification, FGIDs are divided into seven general categories, each of which consists of several disorders:<sup>[6-8]</sup>

1. Category A: Esophageal disorders
2. Category B: Gastroduodenal disorders
3. Category C: Bowel disorders
4. Category D: Centrally mediated disorders of GI pain
5. Category E: Gallbladder and sphincter of Oddi disorders
6. Category F: Anorectal disorders
7. Category G: Childhood functional GI disorders.

When conducting a comprehensive review of the literature in this area, it is worth noting that the area of FGID has been studied and investigated from different perspectives, and the role of psychology, neurology, nutrition sciences, traditional and herbal medicine, and most importantly GI sciences can be seen in it. Hence, given that this group of disorders is studied and investigated in different areas in order to determine their aspects, it seems necessary that there should be a guideline to retrieve documents in this area at various stages of these studies and for researchers with different levels of knowledge about these disorders. Based on the searches made, and given the absence of

such a guideline in the literature of this area, even in incomplete search strategies seen in review articles, this study was conducted in order to compile different terms related to different categories of these disorders and to determine the sensitivity (recall) of each of them in order to retrieve relevant documents in databases. So that using these terms, an appropriate search strategy can be set to retrieve documents related to the entire area and/or to each of its subsets in databases. The recovery of information has always been known as one of the most basic needs of specialists for development and progress.<sup>[9]</sup> Hence, this can be useful for different aims such as writing a review article, enhancing advanced knowledge in this field, conducting a scientometric study, and so on. Given that FGIDs are mainly associated with symptoms related to the middle and lower GI tract including irritable bowel syndrome, functional constipation, functional bloating, functional diarrhea, and unspecified functional bowel disorders,<sup>[10]</sup> this study puts emphasis on the terms of these two categories.

## Materials and Methods

This is an applied study, which was conducted using a descriptive method and through providing a protocol for retrieving documents from databases. In order to set a proper search strategy, it is necessary to consider two measures or indicators: sensitivity (recall) and precision, which are decision-making criteria for achieving the best search strategy at different stages.

Sensitivity means a system’s capability of retrieving relevant documents, and precision means the system’s capability of excluding irrelevant documents. These are both used to describe a system’s capability of purifying information, and through that, we evaluate the system’s capability of retrieving what we want and exclude what is not compatible with our needs. Table 1 shows these measures.<sup>[11]</sup>

Hence, the sensitivity (recall) and precision ratios are as follows:

The number of relevant retrieved documents/the total number of relevant documents available in a set = the sensitivity (recall) ratio ( $a/[a + c]$ ).

The number of relevant retrieved documents/the total number of retrieved documents = the precision (relevance) ratio ( $a/[a + b]$ ).

**Table 1: Information retrieval performance measures**

Documents	Relevant	Irrelevant	All
Retrieved	a	b	a + b
Unretrieved	c	d	c + d
All	a + c	b + d	a + b + c + d

The two measures, sensitivity and precision, have opposite effects on the exploration process, which means that any attempt to increase the sensitivity inevitably leads to reduced precision, and the closer the precision is brought to a desirable level, the more the sensitivity decreases.<sup>[11]</sup>

When setting a subject search strategy, the following can lead to increased precision: customizing a search field (subject or title), nonuse of general topic concepts, hybrid searches and optimal use of Boolean operators, and use of phrase searching. The following can lead to increased sensitivity: use of wildcard or truncation operators and use of different synonyms for topics in both keyword searching and controlled searching.

According to what was presented, and considering the purpose of the study, in order to increase the search precision, the subject field (title, abstract, and keywords) was considered for searching for the set terms. Phrase searches within the quotation marks were used for phrases. In order to limit some words in the intended domain, combined searches were carried out using relevant words and the AND operator. General or wide terms or terms with dual meanings were not included in the searches. In order to increase the sensitivity, terms written in different ways were searched for both in full and using truncation operators. Furthermore, synonyms available for each term were extracted as far as possible using the following four steps:

### Step 1: Use of controlled words in thesaurus, Medical Subject Headings, and Emtree

In addition to using controlled vocabularies (at databases where this is possible), the two functions or advantages of using thesauri in detecting terms related to the subject (FGID) are as follows: (a) use of the unselected synonyms (Entry Terms), and (b) the retrieval of articles allocated to the desired heading, and the review of retrieved articles in order to extract keywords related to this subject in previous years.

In Medical Subject Headings (MeSH), there is no independent category for FGID, but part of relevant instances can be sporadically seen in the subheading "Gastrointestinal Disease" under the main heading "Disease > Digestive System Diseases", which is related to this type of disorders. For example, under the subheading (qualifier) "Colonic Disease", the subheading "Colonic Diseases, Functional" is about functional disorders related to the colon, which itself includes the following subheadings:

#### All MeSH categories

- Disease categories
- Digestive system diseases

- Gastrointestinal diseases
- Intestinal diseases
- Colonic diseases
- Colonic diseases, functional
- Colonic pseudo-obstruction
- Irritable bowel syndrome
- Neurogenic bowel.

The synonyms related to each of the above subject headings can be retrieved in the Entry Terms section of their catalogs, such that the following are listed for this section under IBS:

- Irritable bowel syndromes
- Syndrome, irritable bowel
- Syndromes, irritable bowel
- Colon, irritable
- Irritable colon
- Colitis, mucous
- Colitides, mucous
- Mucous colitides
- Mucous colitis.

In addition to MeSH, terms related to this type of disorders and their synonyms can also be retrieved in Emtree (related to the EMBASE database). The main category of these disorders is digestive system function disorder, which falls under the following subject hierarchy:

#### Emtree

- Diseases
- Physical disease
- Physical disease by anatomical structure
- Digestive system disease
- Digestive system function disorder.

Synonyms corresponding to the subject are presented under the two subheadings of this category: Intestinal Function Disorder and Stomach Function Disorder. For instance, synonyms corresponding to the main heading are presented as follows: digestion disorder, digestive disorder, digestive disturbance, digestive insufficiency, FGID, GI dysfunction, GI function disorder, GI tract function disorder, and maldigestion.

### Step 2: Using different editions of the Rome classification (the Rome foundation's classification for functional gastrointestinal disorders)

This classification, whose details and related sections were presented in the introduction, has so far had four different editions. The information provided in each of the four editions can be used as a guideline to determine the intended terms.

As mentioned before, given that FGIDs are mainly associated with symptoms related to the middle and

lower GI tract including irritable bowel syndrome, functional constipation, functional bloating, functional diarrhea, and unspecified functional bowel disorders.<sup>[10]</sup> Categories B and C (related to the small intestine, large intestine [colon], and anus) are more prevalent than other categories,<sup>[2]</sup> and this study puts emphasis on the terms of these two categories [Figure 1].

### Step 3: Searching for review articles related to this area and retrieving the words used in it

At this stage, given the high precision of meta-analysis articles in strategy setting, we searched for related articles in PubMed according to the known terms in studied field retrieved from previous steps and limited the types of articles to the aforesaid type. After reviewing the titles of retrieved articles and choosing articles with general subjects in the intended area, we investigated the proposed strategy in a number of these articles and extracted the appropriate terms.

### Step 4: A search using a high-sensitivity strategy for articles and a review of them

At this stage, in order to increase the sensitivity of the retrieval process, and to complete the list of relevant terms, we conducted a search based on more general subjects, and by reviewing the retrieved articles, we determined other specialized terms related to the area of FGID used in the articles and added them to the list. We also added to these list possible combinations of words.

After preparing the list of terms related to the studied area, we divided these terms (or queries) into seven general categories as follows:

- FGIDs
- Irritable bowel syndrome
- Functional constipation
- Functional diarrhea
- Functional bloating
- Functional dyspepsia
- Neurogenic bowel.

In each of the above categories, we carried out the searching of documents on the Scopus database. Scopus is covered all subject areas, and because of the subject diversity of the studied field, it helps us to retrieve the documents in all these subject areas. Furthermore, this database is covered documents in most languages, and the coverage of the journals in this database is more than the Web of Science database. As mentioned before, we considered some tips in search strategy to enhance the sensitivity and precision, such as customizing a search field, nonuse of general topic concepts, hybrid searches and optimal use of Boolean operators, use of phrase searching, use of wildcard or truncation operators, and use of different synonyms for topics in both keyword searching and controlled searching.

Maximum precision was applied while taking account of the intended limitations. Hence, we calculated the sensitivity of each of the terms in this study. In each of these categories, we considered the number of instances, retrieved based on the total number of synonyms, equivalent to all relevant documents in the database, and the number of instances, retrieved for each of the terms, equal to the number of relevant retrieved documents, and then calculated the sensitivity percentage for each of the terms based on these two values. Hence, the value obtained for each of the terms represents its sensitivity and proportionality to the search for documents in that subject.

## Results

The results of queries set in each of the seven categories related to FGID as well as the number of retrieved documents and their sensitivities are presented in this section.

Table 2 separately presents all results retrieved through all queries of the seven categories after removing the overlaps, and the last row provides the total number of results related to the area of FGIDs in a pure form after removing the overlaps.

The 189 are instances that were generally related to the entire domain of FGIDs, and which could not be included in any of the other six categories. The highest value (40.75%) was related to the query “digestive\*"

**Table 2: The total number of the results of subcategories related to functional gastrointestinal disorders**

Category number	Category name	Number of queries	Number of documents
1	FGID	189	11,046
2	IBS	142	21,781
3	Functional constipation	13	2683
4	Functional diarrhea	16	1647
5	Functional bloating	29	751
6	Functional dyspepsia	29	5375
7	Neurogenic bowel	7	535
Sum		425	35,521

IBS=Irritable bowel syndrome, FGID=Functional gastrointestinal disorders

B. Gastroduodenal Disorders	
B1. Functional dyspepsia	B3. Nausea and vomiting disorders
B1a. Postprandial distress syndrome (PDS)	B3a. Chronic nausea vomiting syndrome (CNVS)
B1b. Epigastric pain syndrome (EPS)	B3b. Cyclic vomiting syndrome (CVS)
B2. Belching disorders	B3c. Cannabinoid hyperemesis syndrome (CHS)
B2a. Excessive supragastric belching	B4. Rumination syndrome
B2b. Excessive gastric belching	
C. Bowel Disorders	
C1. Irritable bowel syndrome (IBS)	C2. Functional constipation
IBS with predominant constipation (IBS-C)	C3. Functional diarrhea
IBS with predominant diarrhea (IBS-D)	C4. Functional abdominal bloating/distension
IBS with mixed bowel habits (IBS-M)	C5. Unspecified functional bowel disorder
IBS unclassified (IBS-U)	C6. Opioid-induced constipation

**Figure 1: Functional gastrointestinal disorders – Groups B and C<sup>[8]</sup>**

system\* function\* disorder\*", through which 4502 documents out of 11,046 relevant documents of this category were retrieved. Eighty-six queries set in this category did not match any of the documents of this database and/or have not been presented in any of the articles. The queries which have any result are presented in Table 3.

The 142 queries are instances belonging to the "Irritable Bowel Syndrome" category. The highest value (78.8%) was related to the query "irritable colon" and/or "irritable colon\*", through which 17,164 documents out of 21,781 relevant documents of this category were retrieved. Forty-nine queries did not match any of the documents of this database and/or have not been presented in any of the articles. The queries which have any result are presented in Table 4.

In this category, given that IBS is used as an acronym for "Irritable Bowel Syndrome" in articles, it may be possible that this instance will also be taken into consideration in the retrieval of documents in this area. Given that this abbreviation is also applicable to other domains and related terms like integrated Brier score (IBS), it is considered in retrieval processes in combined forms.

Instances retrieved through IBS on the Scopus database included 10,890 documents, and if matched 21,781 retrieved documents in related category [Table 4], there will be 3,177 documents unrelated (in other domains) and 7,713 documents related to Irritable Bowel Syndrome. With the sensitivity formula applied to this amount, its sensitivity will be 70.83%.

The 13 queries are instances belonging to the "Functional Constipation" category. The highest value (48.86%) was related to the query "function\* disorder\*" and constipation, through which 1,311 documents out of 2,683 relevant documents of this category were retrieved. Five queries did not match any of the documents of this database and/or have not been presented in any of the articles. The queries which have any result are presented in Table 5.

The 16 queries are instances belonging to the "Functional Diarrhea" category. The highest value (77.6%) was related to the query "function\* disorder\*" and constipation, through which 1,278 documents out of 1,647 relevant documents of this category were retrieved. Nine queries did not match any of the documents of this database and/or have not been presented in any of the articles. As it can be seen in this table, the results retrieved through the term "diarrhea" were completely similar to those retrieved through "diarrhea" which is the other way of writing the term, so it did not mention in final queries.

The queries which have any result are presented in Table 6.

The 29 queries are instances belonging to the "Functional Bloating" category. The highest value (44.74%) was related to the query "function\* disorder\*" and bloat\*, through which 336 documents out of 751 relevant documents of this category were retrieved. Sixteen queries did not match any of the documents of this database and/or have not been presented in any of the articles. The queries which have any result are presented in Table 7.

The 29 queries are instances belonging to the "Functional Dyspepsia" category. The highest value (64.18%) was related to the query "Functional dyspep\*", through which 3,450 documents out of 5,375 relevant documents of this category were retrieved. Ten queries did not match any of the documents of this database and/or have not been presented in any of the articles. The queries which have any result are presented in Table 8.

The 7 queries are instances belonging to the "Neurogenic Bowel" category. The highest value (97.38%) was related to the query "Neurogenic Bowel" and/or "Neurogenic Bowel\*", through which 521 documents out of 535 relevant documents of this category were retrieved. One query did not match any of the documents of this database and/or has not been presented in any of the articles. The queries which have any result are presented in Table 9.

## Discussion

Searching queries based on the seven subject headings, showed that the main terms related to each of the seven subject headings when applying the necessary precision, only retrieved part of the relevant articles. So that in the category "Functional Gastrointestinal Disorders" the search using this exact term only retrieves 21.01% of relevant documents and is located in the fourth place in terms of frequency. In "irritable bowel syndrome/syndromes", the search for this term falls in row 4 in terms of frequency and retrieves 67.29% of articles in this area. In the heading "Functional Constipation", this term falls in the second row in terms of frequency and retrieves 48.19% of the relevant articles. The term "Functional Diarrhea/Diarrhea" is the fourth category, where the search for the exact term only retrieves 13.05% of the related documents, and which falls in row 6 in terms of frequency. The search for "Functional Bloating" in the related category only retrieves 9.05% of relevant documents and falls in the seventh row. In the heading "Functional Dyspepsia", the search for this term, which falls in the second row in terms of frequency, retrieves 63.79% of articles in this heading. The search for "Neurogenic

**Table 3: Values for queries related to functional gastrointestinal disorders**

n	Query	Documents	Sensitivity (%)	n	Query	Documents	Sensitivity (%)
1	"Digestive* system* function* disorder**"	4502	40.757	53	"Digestive functional disorder**"	14	0.127
2	"Functional gastr**"	3142	28.445	54	"Functional disorder* of gastrointestinal"	14	0.127
3	"Functional gastrointestinal"	2887	26.136	55	"Functional disease* of the gastrointestinal"	13	0.118
4	"FGID"	2321	21.012	56	"Functional disease* of the stomach"	13	0.118
5	"Functional bowel**"	1261	11.416	57	"Functional intestin* disease**"	13	0.118
6	"Intestin* function* disorder**"	925	8.374	58	"Functional intestinal disease**"	13	0.118
7	"Functional bowel* disorder**"	893	8.084	59	"Gastr* function* disease**"	13	0.118
8	"Functional abdom**"	717	6.491	60	"Functional disease* of the digestive"	11	0.1
9	"Functional abdominal"	715	6.473	61	"Bowel* function* disorder**"	10	0.091
10	FGID	573	5.187	62	"Functional disorder* of digestive"	9	0.081
11	"Stomach function* disorder**"	478	4.327	63	"Functional disorder* of the bowel"	9	0.081
12	"Functional intestin**"	412	3.73	64	"Colon* function* disorder**"	8	0.072
13	"Functional intestinal"	389	3.522	65	"Functional colon disease**"	8	0.072
14	"Functional gi"	330	2.988	66	"Functional colorec**"	8	0.072
15	"Functional bowel* disease**"	249	2.254	67	"Functional disease* of the colon**"	8	0.072
16	"Gastr* functional"	224	2.028	68	"Colonic functional disorder"	7	0.063
17	"Functional colon**"	138	1.249	69	"Functional colorectal"	7	0.063
18	"Functional disorder* of the gastr**"	125	1.132	70	"Functional disease* of gastr**"	6	0.054
19	"Functional disorder of the gastrointestinal"	116	1.05	71	"Gastrointestinal functional disease**"	6	0.054
20	"Functional disorders of the gastrointestinal"	116	1.05	72	"Functional disorder* of stomach"	5	0.045
21	"Functional gastric"	115	1.041	73	"GI functional disorder**"	5	0.045
22	"Gastrointestinal functional"	115	1.041	74	"Functional disease* of gastrointestinal"	4	0.036
23	"Functional intestin* disorder**"	101	0.914	75	"Functional disorder* of intestin**"	4	0.036
24	"Gastr* function* disorder**"	90	0.815	76	"Functional git"	4	0.036
25	"Functional colonic"	74	0.67	77	"Bowel functional disorder**"	3	0.027
26	"Functional dis* of the diges**"	68	0.616	78	"Digestive functional disease**"	3	0.027
27	"Gastric functional"	57	0.516	79	"Functional abdom* disease**"	3	0.027
28	"Functional disorder* of the digestive"	53	0.48	80	"Functional abdominal disease"	3	0.027
29	"Gastrointestinal functional disorder**"	53	0.48	81	"Functional colon disorder**"	3	0.027
30	"Functional disorder* of the stomach"	45	0.407	82	"Functional disorder* of gastric"	3	0.027
31	"Functional megacolon**"	35	0.317	83	"Functional disorder* of bowel"	3	0.027
32	"Functional colon* disease**"	34	0.308	84	"Gastric functional disease**"	3	0.027
33	"Functional disorder* of the colon**"	33	0.299	85	"Intestine* functional disorder**"	3	0.027
34	"Functional colon"	29	0.263	86	"Colorectal functional disorder**"	2	0.018
35	"Functional colonic disease**"	27	0.244	87	"Digestive system functional disorder**"	2	0.018
36	"Intestinal functional disorder**"	27	0.244	88	"Functional disease* of the gi"	2	0.018
37	"Diges* function* dis**"	25	0.226	89	"Functional disease* of digestive"	2	0.018
38	"GI functional"	22	0.199	90	"Functional disorder* of intestinal"	2	0.018
39	"Nonulcer* colit**"	21	0.19	91	"Functional disorder* of intestine**"	2	0.018
40	"Nonulcerative colitis"	21	0.19	92	"Functional disorder* of the abdominal"	2	0.018
41	"Functional abdom* disorder**"	20	0.181	93	"Functional disorder* of the intestinal"	2	0.018
42	"Functional abdominal disorder**"	20	0.181	94	"Intestinal functional disease**"	2	0.018
43	"Functional colon* disorder**"	20	0.181	95	"Stomach functional disorder**"	2	0.018
44	"Functional disorder* of gastr**"	19	0.172	96	"Abdominal functional disorder**"	1	0.009
45	"Functional disorder* of the intestin**"	19	0.172	97	"Bowel functional disease**"	1	0.009
46	"Functional intestine**"	19	0.172	98	"Colon* function* disease**"	1	0.009

Contd...

**Table 3: Contd...**

<i>n</i>	Query	Documents	Sensitivity (%)	<i>n</i>	Query	Documents	Sensitivity (%)
47	"Functional disease* of the gastr**"	18	0.163	99	"Functional disease* of the bowel"	1	0.009
48	"Functional dis* of diges**"	17	0.154	100	"Functional disease* of the intestin**"	1	0.009
49	"Functional disorder of the intestine**"	17	0.154	101	"Functional disorder* of colon**"	1	0.009
50	"Functional disorders of the intestine**"	17	0.154	102	"Functional disorder* of the colorect**"	1	0.009
51	"Functional colonic disorder**"	16	0.145	103	"GI function* disease**"	1	0.009
52	"Gastric functional disorder**"	16	0.145	-	-	-	-
Sum							11,046

FGID=Functional gastrointestinal disorders

**Table 4: Values for queries related to irritable bowel syndrome**

<i>n</i>	Query	Documents	Sensitivity (%)	<i>n</i>	Query	Documents	Sensitivity (%)
1	"irritable colon**"	17164	78.803	48	"Spast* colit**"	34	0.156
2	"Irritable bowel**"	15075	69.212	49	"Spastic colitis"	33	0.152
3	"Irritable bowel"	15071	69.193	50	"Irritable intestin**"	23	0.106
4	"IBS**"	14658	67.297	51	IBS-u	22	0.101
5	IBS and all (gastric* OR gastro*)	7172	32.928	52	"Irritable intestine**"	20	0.092
6	IBS and bowel*	7146	32.808	53	"Irritable bowel disorder**"	17	0.078
7	IBS and bowel	7145	32.804	54	"Irritable bowel"	17	0.078
8	IBS and colon*	6474	29.723	55	"Bowel* irritable"	13	0.06
9	IBS and colon	6322	29.025	56	"Bowel irritable"	12	0.055
10	IBS and all (gastric OR gastrointestinal)	6304	28.943	57	"Bowel irritation"	12	0.055
11	IBS and gastr*	4285	19.673	58	"Colon* spast**"	11	0.051
12	IBS and gastrointestinal	3517	16.147	59	"Irritable digestive**"	11	0.051
13	IBS and abdom*	2810	12.901	60	"Colon spasm"	8	0.037
14	IBS and abdominal	2789	12.805	61	"Irritative bowel**"	8	0.037
15	IBS and intestin*	2729	12.529	62	"Colit* spast**"	7	0.032
16	IBS and diarrhea	2516	11.551	63	"Spasm* intestin**"	7	0.032
17	IBS and constipation	2090	9.596	64	"Intestine* irritation"	5	0.023
18	IBS and intestine*	2026	9.302	65	"Spasm* colon**"	5	0.023
19	IBS and intestinal	1646	7.557	66	"Colit* spasm**"	4	0.018
20	IBS and colonic	1587	7.286	67	"Piibs"	4	0.018
21	IBS and bloat*	947	4.348	68	"Colitis spastic"	3	0.014
22	IBS and bloating	942	4.325	69	"Colon spastic"	3	0.014
23	IBS and distension	862	3.958	70	"Irritable inflammat* bowel**"	3	0.014
24	IBS and unclassified	804	3.691	71	"Irritable inflammatory bowel"	3	0.014
25	IBS and dyspep*	607	2.787	72	"Irritable intestinal"	3	0.014
26	IBS-D	602	2.764	73	"Spasm* colit**"	3	0.014
27	IBS and dyspepsia	601	2.759	74	"Spasmodic colitis"	3	0.014
28	IBS-C	488	2.24	75	"Spastic colonic"	3	0.014
29	IBS and colorec*	277	1.272	76	"Bowel irritability"	2	0.009
30	IBS and colorectal	273	1.253	77	"Intestin* irritability"	2	0.009
31	IBS and gastric	214	0.983	78	"intestinal irritability"	2	0.009
32	"Irritable bowel disease**"	202	0.927	79	"Irritable spastic colon**"	2	0.009
33	"intestin* spasm**"	183	0.84	80	"Irritative intestin**"	2	0.009
34	Pi-lbs	172	0.79	81	"Irritative intestinal"	2	0.009
35	"Intestinal spasm"	137	0.629	82	"Spasm intestinal"	2	0.009
36	"Spast* colon**"	125	0.574	83	"Colit* mucomembran*s**"	1	0.005
37	"Spastic colon"	120	0.551	84	"Intestin* spast**"	1	0.005
38	IBS-m	92	0.422	85	"Intestine* spastic"	1	0.005
39	IBS and abdomen	75	0.344	86	"Irritable digestion"	1	0.005
40	"Muc*s* colit**"	69	0.317	87	"Irritative colit**"	1	0.005
41	"Colon* spasm**"	53	0.243	88	"Irritative colitis"	1	0.005
42	"Intestin* irritation"	53	0.243	89	"Mucomembran*s colo**"	1	0.005

Contd...

**Table 4:Contd...**

n	Query	Documents	Sensitivity (%)	n	Query	Documents	Sensitivity (%)
43	"Mucous colitis"	52	0.239	90	"Mucomembranous colitis"	1	0.005
44	"Intestinal irritation"	48	0.22	91	"Spasm colonic"	1	0.005
45	IBS and dyspeptic	48	0.22	92	"Spast* intestin**"	1	0.005
46	"Colonic spasm"	44	0.202	93	"Spastic intestinal"	1	0.005
47	"Intestine* spasm"	35	0.161	94	"Unstable bowel**"	1	0.005
	Sum						21,781

IBS=Irritable bowel syndrome

**Table 5: Values for queries related to functional constipation**

n	Query	Documents	Sensitivity (%)
1	"Function* disorder**" and constipation	1311	48.863
2	"Functional constipation"	1293	48.192
3	"Function disorder**" and constipation	955	35.594
4	"Functional disorder**" and constipation	386	14.387
5	"Function* disease**" and constipation	326	12.151
6	"Functional disease**" and constipation	324	12.076
7	"Functional intestin* constipation"	9	0.335
8	"Functional bowel* constipation"	1	0.037
	Sum		2683

**Table 6: Values for queries related to functional diarrhea**

n	Query	Documents	Sensitivity (%)
1	"Function* disorder**" and diarrhea	1278	77.596
2	"Function disorder**" and diarrhea	1064	64.602
3	"Function* disease**" and diarrhea	263	15.968
4	"Functional disease**" and diarrhea	259	15.726
5	"Functional disorder**" and diarrhea	239	14.511
6	"Functional diarrhea"	215	13.054
7	"Function disease**" and diarrhea	3	0.182
	SUM		1647

**Table 7: Values for queries related to functional bloating**

n	Query	Documents	Sensitivity (%)
1	"Function* disorder**" and bloat*	336	44.740
2	"Function* disorder**" and distension	333	44.341
3	"Function disorder**" and bloating	272	36.218
4	"Function disorder**" and distension	261	34.754
5	"Functional disorder**" and distension	84	11.185
6	"Functional disorder**" and bloating	69	9.188
7	"Functional bloating"	68	9.055
8	"Function* disease**" and bloat*	48	6.391
9	"Functional disease**" and bloating	47	6.258
10	"Functional disease**" and distension	44	5.859
11	"Functional abdominal bloating"	28	3.728
12	"Functional distension"	12	1.598
13	"Functional abdominal distension"	5	0.666
	Sum		751

Bowel" has a better status in the seventh category than in the others and retrieves 97.38% of the relevant documents. According to the result of similar studies in other medical

sciences, fields also approved these results. Wilczynski *et al.*<sup>[12]</sup> conducted an analytic survey to comparing hand searches of 55 journals with retrievals from EMBASE for 4843 candidate search terms and 17,004 combinations. The results showed that combinations of search terms reached peak sensitivities of 94.6% with specificity at 63.7%, whereas combinations of search terms to optimize specificity reached peak specificities of 99.3% with sensitivity at 61.4%. Gehanno *et al.*<sup>[13]</sup> showed that locating studies from topics with no single MeSH term requires the use of various MeSH and non-MeSH terms in combination to obtain a satisfactory recall. This factor must be taken into consideration by the end-user in order to improve the cost-effectiveness ratio of the search in Medline.<sup>[13]</sup> Hence, given the values calculated for sensitivity, and considering the type of study, in order to retrieve documents in this area, it is necessary to apply all or part of the proposed queries to the search strategy. So that in the retrieval of articles, in order to conduct a systematic study, it is necessary to apply all proposed queries to enhance the search sensitivity. However, in order to retrieve documents to enhance the knowledge and/or to provide theoretical bases for studies, it is more helpful to consider maximal instances or terms currently used in articles in order to retrieve recent articles.

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**Table 8: Values for queries related to functional dyspepsia**

n	Query	Documents	Sensitivity (%)
1	"Functional dyspep**"	3450	64.186
2	"Functional dyspepsia"	3429	63.795
3	"Non ulcer* dyspep**"	1399	26.028
4	"Non ulcer dyspepsia"	1294	24.074
5	"Function* disorder**" and dyspep*	933	17.358
6	"Function disorder**" and dyspepsia	718	13.358
7	"Function* disease**" and dyspep*	264	4.912
8	"Functional disease**" and dyspepsia	262	4.874
9	"Functional disorder**" and dyspepsia	235	4.372
10	"Function disorder**" and dyspeptic	60	1.116
11	"Functional dyspeptic"	52	0.967
12	"Nonulcerative dyspepsia"	42	0.781
13	"Nonulcer dyspeptic"	38	0.707
14	"Functional disorder**" and dyspeptic	34	0.633
15	"Functional disease**" and dyspeptic	30	0.558
16	"Function disease**" and dyspepsia	2	0.037
17	"Functional abdomen dyspepsia"	1	0.019
18	"Functional intestinal dyspepsia"	1	0.019
19	"Nonulcerative dyspeptic"	1	0.019
	Sum		5375

**Table 9: Values for queries related to neurogenic bowel**

n	Query	Documents	Sensitivity (%)
1	"Neurogenic bowel**"	521	97.383
2	"Neurogenic intestin**"	13	2.430
3	"Neurogenic intestinal"	9	1.682
4	"Neurogenic intestine**"	4	0.748
5	"Neurogenic colon**"	2	0.374
6	"Neurogenic colitis"	1	0.187
	Sum		535

### Conflicts of interest

There are no conflicts of interest.

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