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Pediatric Irritable Bowel Syndrome Patient and Parental Characteristics Differ By Care Management Type

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Abstract

Objectives—This study evaluate whether certain patient or parental characteristics are associated with gastroenterology (GI) referral vs primary pediatrics care for pediatric irritable bowel syndrome (IBS).

Methods—A retrospective clinical trial sample of patients meeting pediatric Rome III IBS criteria was assembled from a single metropolitan healthcare system. Baseline socioeconomic status and clinical symptom measures were gathered. Various instruments measured participant and parental psychosocial traits. Study outcomes were stratified by GI referral vs primary pediatrics care. Two separate analyses of (1) socioeconomic status measures and GI clinical symptoms and (2) psychosocial measures identified key factors by univariate and multiple logistic regression analyses. For each analysis, identified factors were placed in unadjusted and adjusted multivariate logistic regression models to assess their impact in predicting GI referral.

Results—Of the 239 participants, 152 were referred to pediatric GI, and 87 were managed in primary pediatrics care. Of the socioeconomic status and clinical symptom factors, child self-assessment of abdominal pain duration and lower percentage of people living in poverty were the strongest predictors of GI referral. Among the psychosocial measures, parental assessment of their child's functional disability was the sole predictor of GI referral. In multivariate logistic regression models, all selected factors continued to predict GI referral in each model.

Conclusions—Socioeconomic environment, clinical symptoms, and functional disability are associated with GI referral. Future interventions designed to ameliorate the effect of these identified factors could reduce unnecessary specialty consultations and healthcare overutilization for IBS.

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Keywords

healthcare utilization; gastroenterology referral; socioeconomic status; clinical symptoms; psychosocial distress

INTRODUCTION

Abdominal pain-related functional gastrointestinal disorders (APFGIDs), as defined by the pediatric Rome III working group, encompass a group of conditions afflicting 10-15% of school-age children (1). It is estimated that APFGIDs, with irritable bowel syndrome (IBS) being the most common, constitute 2-4% of all primary care pediatric office visits and comprise about 50% of pediatric gastroenterology (GI) ambulatory consultations (2-4). As is found in adult IBS care (5), healthcare expenditures can increase up to 9-fold when APFGID patients are managed in pediatric GI care versus primary pediatrics care (6).

Among pediatric IBS patients who seek medical care, it is unclear what factors might predict referral to GI. Given the substantial costs associated with referral, identifying potential factors is important. Our group has previously reported that child functional disability as reported by the mother was greater in APFGID patients seen in GI care compared to affected children seen in primary care or healthy control patients (7). In a German pediatric pain center, referral to the center was more common in teenage girls compared with boys, and psychosocial distress was common among all children (8).

Given the paucity of information regarding factors related to GI referral, the aim of this study was to determine whether socioeconomic status (SES), clinical, and/or psychosocial factors were associated with GI referral versus primary pediatrics care for IBS patients.

METHODS

Subjects

We utilized baseline data from participants enrolled in one of three clinical studies for pediatric IBS approved by the Baylor College of Medicine's Institutional Review Board. Written parental consent and child assent were obtained. Of the three studies, two were non-interventional studies and the other was interventional. All data were collected at baseline before any intervention, if applicable. The participant selection process is outlined in the Supplemental Digital Content Text under the Participant Selection Process section.

Outcomes

The study outcome measure was either referral to GI care versus primary pediatrics care. The participant's physician care management group was ascertained at enrollment via chart review. The GI referral group was comprised of participants who had ever been either (1) referred to GI care alone or (2) referred and then evaluated by a pediatric GI physician. All others were categorized as primary pediatrics care.

Socioeconomic Status (SES) and GI Clinical Symptom Measures

Caregivers completed a baseline questionnaire (based on the pediatric Rome III questionnaire) which included the participants' self-reports of demographics including age, sex, and race/ethnicity. Anthropometric data were collected at baseline. Abdominal pain duration also was assessed by the parent and child baseline questionnaire. A validated 2-week stooling/pain diary documented the participants' symptoms and determined their IBS subtype as defined by Longstreth and colleagues (9-12). The diary also provided maximum pain severity, number of pain episodes, and number of bowel movements over 2 weeks (13). The American FactFinder database maintained by the US Census Bureau provides median income salary and percentage of people living in poverty according to zip code (14). These proxy measures were used to examine the role of affluence and physical location on our outcome measures. The baseline questionnaire ascertained other SES measures including the highest maternal education level attained and health insurance coverage type. To determine the distance from each participants' physical address area to each GI clinic in the healthcare system, we used Google Maps (Google, Mountain View, CA). We then assessed which GI clinic was closest to the participant. For those participants in the GI referral group who actually completed a GI clinic visit, we then assessed the concordance between their nearest GI clinic and the actual GI clinic site where they first sought GI care.

Psychosocial Instruments

Most participants in the three studies completed the parental and child self-assessment of the Behavior Assessment System for Children, Second Edition (BASC-2) (15). These instruments included the Children's Somatization Inventory (CSI), Functional Disability Inventory (FDI), Adult Responses to Children's Symptoms (ARCS), Symptom Checklist-90-Revised (SCL-90-R) global severity index total score and somatization subscore, and Pediatric Quality of Life Inventory™ (PedsQL™) total scores (16-20). These instruments are outlined and described in Supplemental Digital Content Table 1 and the Supplemental Digital Content Text under the Psychosocial Instruments Description section, respectively.

Statistical Analyses

All study variables were initially compared by care management group (GI referral vs primary pediatrics care). Categorical variables were compared with the Pearson chi-squared test. All continuous variables were compared by either the Student's *t* test or the Mann-Whitney rank-sum test. Due to sample size variation, two separate analyses were conducted between participants who completed the SES and clinical symptoms measures versus those who also completed the psychosocial surveys.

The next phase of analysis constructed factor models predicting care management type (GI referral vs primary pediatrics care) using logistic regression analysis. We first utilized univariate logistic regression models for each variable to determine whether a specific characteristic was predictive of GI referral vs primary care. Each factor effect was measured by its odds ratios (OR), 95% confidence interval, and P-value. Factors with a P-value < 0.20 in univariate logistic regression were selected for multiple logistic regression analysis to identify the most promising candidates.

To determine which variables from the univariate logistic regression were most important in predicting GI referral, we used multiple logistic regression analysis to sequentially and systematically eliminate variable candidates with a $P > 0.10$ based on the Wald statistic using backward stepwise progression. The result(s) of the multiple logistic regression model then were placed in an unadjusted and adjusted multivariate logistic regression model controlling for age, body mass index (BMI) classification, race/ethnicity, and IBS subtype. The Cox and Snell R-squared method calculated the variance of the adjusted multivariate logistic regression model. All tests were two-tailed with statistical significance set at 0.05. Statistical analyses were performed in SPSS Statistics 23 for Windows software (IBM Corporation, Armonk, New York).

RESULTS

Data from 239 participants were analyzed in this study of which 87 participants were from the two non-interventional studies and 166 were from the interventional study. Among our overall sample, 152 of the participants were referred to GI, and 87 remained in primary pediatrics care. Of those referred to GI, about 6% were not evaluated by a GI clinician. Inclusion/exclusion of these specific study participants in the analysis did not affect the overall results so they are included in the data presented.

Children with GI referral were significantly older (Table 1); univariate logistic regression also identified older age (adolescence) as a significant predictor of GI referral in this sample (Supplemental Digital Content Table 2). Sex, BMI classification, race/ethnicity, and the proportion of IBS subtypes did not differ between groups (Table 1). However, univariate logistic regression noted a significant increased likelihood of GI referral for the IBS-Diarrhea subtype when compared to IBS-Constipation subtype (Supplemental Digital Content Table 2). There were no differences noted for the other IBS subtypes (Supplemental Digital Content Table 2). Shortest distance to the nearest GI clinic did not correlate to the actual GI clinic visit (34% concordance). Thus, distance to GI care was not included as a baseline characteristic in the upcoming analyses.

Socioeconomic Status (SES) Measures and GI Clinical Symptoms Analysis

There was a trend for a higher median salary and a lower percentage of people living in poverty by zip code in the GI referral group vs primary care (Supplemental Digital Content Table 3 and 4). There were no associations between care management type and insurance type or highest maternal education attained (Supplementary Digital Content 3).

In regard to clinical GI symptoms, parental and child-self assessment of abdominal pain duration were significantly longer in the GI referral group compared to the primary care group (Supplementary Digital Content Table 3). Maximum abdominal pain severity, number of abdominal pain episodes, and number of stools over 2 weeks were significantly greater in the GI referral group vs the primary care group (Supplementary Digital Content Table 3). Univariate logistic regression analysis of all SES and clinical symptom measures confirmed the above results and also selected patient insurance type ($P = 0.14$) as an additional candidate for a total of 8 factors to be considered for further analyses (Supplemental Digital Content Table 4).

There were 93 GI referral and 50 primary care participants with complete data for these selected 8 candidate factors. Multiple logistic regression analysis identified longer abdominal pain duration as assessed by the child and lower percentage of people living in poverty by zip code as the strongest predictors for GI referral. Both the unadjusted and adjusted multivariate models are presented in Supplementary Digital Content Table 5. This adjusted multivariate logistic regression model accounted for 25% of the variance observed.

Psychosocial Measures Analysis

Comparison of all psychosocial measures by care group revealed differences in some measures. Similar to the overall study sample demographics in Table 1, the subset of participants who completed the BASC-2 instrument was statistically older in the GI referral group compared to the primary care group (data not shown). Other demographic variables did not vary between the GI referral and primary care group in this subset (data not shown).

The number of participants who completed other psychosocial instruments was smaller, and we did not detect a difference in age between the GI referral vs the primary care group as observed previously. This specific subset also did not have any differences in the other baseline characteristics measured. Data in Supplemental Digital Content Table 6 illustrate the demographics of those participants who completed the SCL-90-R global severity index total score, which was representative of those who completed the CSI, FDI, SCL-90-R, ARCS, and PedsQL™ instruments.

The BASC-2 parental assessment of internalizing problems, parental assessment of CSI total score, and parental and child self-report of FDI total score were statistically more severe in the GI referral vs primary care group (Supplementary Digital Content Table 7). The univariate models similarly identified these same measures and 7 additional candidates for further consideration: parental BASC-2 externalizing problems, parent SCL-90-R global severity index total score and somatization subscore, parental assessment of ARCS minimize and distract/monitor, child self-assessment ARCS distract/monitor, and parental assessment of PedsQL™ (Supplemental Digital Content Table 8). These 11 factors were entered into a multiple logistic regression analysis (Supplemental Digital Content Table 8).

Of these selected psychosocial factors, there were 116 GI referral and 50 primary care participants included for multiple logistic regression. This analysis identified parental assessment of FDI total score as the best and sole predictor of GI referral among these selected factors. When this factor was placed in unadjusted and adjusted multivariate logistic regression models, higher levels of functional disability as gauged by the parent increased the likelihood of GI referral vs primary care management (Supplementary Digital Content Table 5). The adjusted multivariate logistic regression model accounted for 32% of the variance observed.

DISCUSSION

This study analyzed a variety of IBS patient and parent characteristics to determine whether they were associated with GI referral versus primary pediatric care. We first used univariate logistic regression to identify which patient and parental characteristics were associated with

GI referral and then placed the most promising factors into a multiple logistic regression model. Multiple logistic regression models systematically eliminated noncontributory candidates so that the most important factor(s) were identified among the group. The results identified longer abdominal pain duration (as assessed by the participants themselves) and living in areas with fewer people living in poverty as the two best factors associated with GI referral. Of all the psychosocial measures assembled, greater functional disability as assessed by the parent was associated with GI referral. To our knowledge, this is the first study to examine such a diverse range of pediatric Rome III-defined IBS patient and parental characteristics and their potential association with GI referral.

The demographic data identified increasing age as a significant factor in predicting the GI referral group vs primary care (Table 1 and Supplemental Digital Content Table 2), but the clinical significance of this observation is questionable as the overall difference between these two groups was less than two years. The literature does not explicitly explore GI referral compared to primary care in regard to age, but Saps et al. observed that older pediatric patients with abdominal pain sought more healthcare services compared to younger children (21). We hypothesize that older children may be more persuasive to their parents in seeking specialty healthcare compared to younger children. Future research supporting the needs of older IBS children could improve patient outcomes and decrease healthcare utilization.

The proxy SES measure of percentage of people living in poverty by zip code suggests that more affluence and even perhaps local environmental factors could promote GI referral in pediatric IBS. This finding is unique, as no studies to our knowledge have addressed SES and its relationship to GI referral in pediatric IBS. Historically, SES and its general association to IBS diagnosis are inconclusive. There are studies associating an affluent childhood environment with adult IBS, yet another study suggests lower income is associated with functional abdominal pain symptoms (22-24). Lower rates of referral in lower SES groups could be attributed to external barriers of pursuing medical care (e.g., lost time from employment, transportation costs) or recognition of the futility of advanced testing in functional gastrointestinal disorders.

Clinical GI symptom severity appears to play a significant role in GI referral, specifically longer abdominal pain duration as assessed by the child. Patient symptom severity has been shown to be associated with increased healthcare utilization in pediatric functional abdominal pain patients (8, 25). Adult functional abdominal pain studies similarly associate more severe symptoms with more primary care visits and health utilization (26). These observations are intuitive but warrant further investigation, exploring possible early process of care interventions to ameliorate abdominal pain symptoms.

Similar to adult IBS, psychosocial distress appears to promote health utilization in pediatric IBS (27, 28). Our study identified the BASC-2 internalizing problems composite scale, which objectively quantifies pediatric anxiety, depression, and somatization psychopathologies, as a predictor of tertiary GI referral in the univariate logistic regression model (Supplemental Digital Content Table 8). Previous studies also suggest maternal fear as a driving factor for increased health utilization among pediatric IBS patients (6, 29). In

adult IBS patients, Hillilä et al. conducted a similar study and examined various patient psychiatric factors on healthcare utilization (30). Their investigation did associate multiple psychiatric comorbidities with IBS. Furthermore, depression was a predictor for non-GI clinical visits among these IBS patients, and dyspeptic symptoms were associated with more frequent non-GI physician encounters (30). Psychopathology may be an important driver of health utilization in adult IBS, but our results suggest that non-psychosocial factors appear to be more important in predicting GI referral in pediatric IBS.

Greater functional disability previously has been associated with an increased number of office visits in pediatric recurrent abdominal pain (31). Our current study also supports our previous findings that parental assessment of disability severity is associated with GI referral in pediatric functional abdominal pain (7). We speculate that parents are the “gatekeepers” to physicians’ and other healthcare providers’ services, and their assessment of how IBS disables their child is likely to play a key role in escalating medical care from primary pediatrics to GI subspecialty care. Future interventions targeted at improving functional disability could reduce healthcare utilization within this patient population.

Similar to the functional disability results, lower health-related quality of life as assessed by the parent appears to promote GI referral (Supplementary Digital Content Table 7 and 8). This observation suggests parents and/or primary care physicians may advocate for a higher level of medical care when facing a considerable impairment affecting the affected child’s quality of life. We, as well as others, previously identified the relationship between abdominal pain symptoms and interference in daily activities in pediatric IBS (13, 32). Adult IBS studies are unclear regarding a relationship between quality of life and health utilization (33, 34). The association of lower quality of life gauged by the parent and the increased likelihood for GI referral is perhaps unique for pediatric IBS.

Strengths of our study include the relatively large sample size. Participants were closely screened and well-characterized as to their clinical symptoms and psychological profile. In addition, parental reports of the child as well as psychosocial assessments of the parents were included.

The study has some limitations. Given that the participants were part of clinical studies (albeit studied at baseline), they may differ from a general clinic population, which could affect the generalization of our results (35). Furthermore, we cannot analyze the clinical outcome of our cohort as many participants subsequently participated in an interventional clinical study. Lastly, the adjusted multivariate logistic regression models only accounted for up to 30% of the observed variation, meaning other unmeasured factors do impact GI referral in pediatric IBS. Future investigations should evaluate additional factors (e.g., physician and other clinical characteristics) which could affect the decision to refer to GI care. These data are necessary to identify which patient and parent factors are most important in influencing GI referral for pediatric IBS patients. This information could guide future targeted clinical interventions addressing specific pediatric IBS populations who are at risk for unnecessary increased healthcare utilization.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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What is Known

- Irritable bowel syndrome (IBS) managed by pediatric gastroenterology (GI) is associated with significantly higher healthcare expenditures vs primary care management.
- Patient and parental characteristics associated with pediatric GI referral vs primary care are not defined in the pediatric population.

What is New

- Among the socioeconomic status and GI clinical symptom variables measured, individuals living in a zip code with less poverty and endorsing a longer duration of abdominal pain were more likely to be referred to GI.
- In regard to psychosocial measures, children whose parents who identified a higher degree of functional disability were more likely to be referred to GI.

Table 1

Demographics and Irritable Bowel Disease Subtypes by Care Management Group

	Primary Care (n=87)	GI Referral (n=152)	P value
Age (years), mean (SD)	11.0 (2.9)	12.4 (2.8)	<0.001
Sex (Female), n (%)	54 (62.8)	91 (59.5)	0.62
<u>Anthropometrics</u> ¹			
BMI Classification, n (%)			0.80
Underweight	7 (8.2)	16 (10.5)	
Normal	48 (54.8)	88 (57.5)	
Overweight	14 (16.5)	27 (17.6)	
Obese	16 (18.8)	22 (14.4)	
<u>Race/Ethnicity, n (%)</u>			0.66
White	50 (58.1)	95 (62.1)	
Black	19 (22.1)	24 (15.7)	
Hispanic/Latin American	13 (15.1)	27 (17.6)	
Other	4 (4.7)	7 (4.6)	
<u>IBS Subtype, n (%)</u> ²			0.25
Constipation	32 (56.1)	59 (50.0)	
Diarrhea	1 (1.8)	12 (10.2)	
Mixed	1 (1.8)	3 (2.5)	
Unsubtyped	23 (40.4)	44 (37.3)	

GI, Gastroenterology; BMI, body mass index; IBS, irritable bowel syndrome

¹Primary Care (n=86)²Primary Care (n=94) and GI Referral (n=117)