

## Total Costs of IBS: Employer and Managed Care Perspective

*Brooks Cash, MD, FACP; Sean Sullivan, JD;  
and Victoria Barghout, MSPH*

### **Abstract**

Irritable bowel syndrome (IBS) is a common gastrointestinal motility disorder that typically affects persons of working age and is costly to employers. The financial burden attributable to the direct (use of healthcare resources) and indirect (missed days from work [absenteeism] and loss of productivity while at work [presenteeism]) costs of IBS is similar to that of other common long-term medical disorders, such as asthma, migraine, hypertension, and congestive heart failure. The symptoms of IBS are significantly bothersome and place a substantial burden on the personal and working lives of patients. As with other long-term medical conditions that have a significant impact on productivity, directed efforts by employers can address IBS in the workplace and thereby potentially decrease its impact. In this article, the symptoms of IBS and its impact on patients and on society as a whole are discussed; options are outlined by which employers can help reduce the total costs of IBS, including lost productivity (both absenteeism and presenteeism), in the workplace.

*(Am J Manag Care. 2005;11:S7-S16)*

Irritable bowel syndrome (IBS) is a common gastrointestinal (GI) motility disorder, characterized by abdominal pain or discomfort and altered bowel function, that has been estimated to affect up to 10% to 15% of North Americans.<sup>1</sup> IBS can affect persons of all ages, but it is most often diagnosed in working-aged persons, typically those between the ages of 30 and 50 years.<sup>2</sup> Although IBS is estimated to affect millions, only 25% of persons with IBS actually seek medical treatment for their symptoms.<sup>3</sup>

Partly because of its chronicity, many patients with IBS experience symptoms for years before they seek medical attention.<sup>4,5</sup> For example, 42% of respondents to the IBS in the Real World Survey reported that they had IBS symptoms for an average of 10 years

before diagnosis.<sup>5</sup> Similar results were obtained from the IBS Bulletin Survey, in which 50% of respondents reported that they had IBS symptoms for 11 years or longer.<sup>4</sup>

Given its prevalence and epidemiology, it is not surprising that IBS has the potential to impose a substantial financial burden on society.<sup>6-8</sup> IBS has been shown to be associated with significant direct (use of healthcare resources) and indirect (absenteeism [missed days of work] and presenteeism [loss of productivity while at work]) costs. In fact, indirect costs appear to account for most of the financial burden associated with IBS.<sup>9,10</sup>

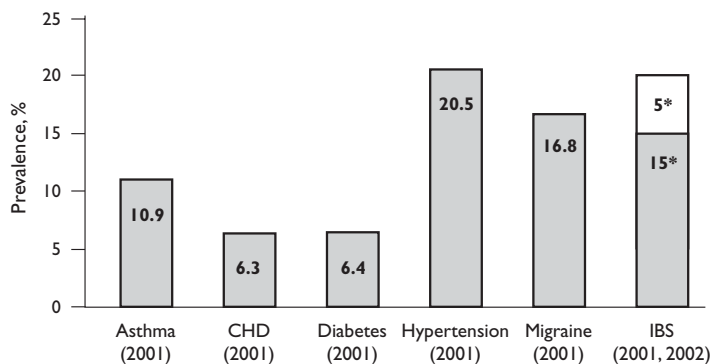
Recently, interest in the relationship between this burden and employers has grown—perhaps, in part, because of the availability of newer agents for treatment—and substantial employer costs have been identified.<sup>11</sup> Because IBS remains a poorly recognized and understood condition, formally addressing IBS in the workplace and educating employers and employees about the disorder may reduce the burden of IBS by improving the delivery of effective therapies to employees with IBS.

### **Total Costs of IBS**

Total costs attributable to any medical condition are composed of direct (ie, physician visits, outpatient care, inpatient/emergency care, diagnostic tests) and indirect (ie, lost worker productivity—both absenteeism and presenteeism) costs.

Previously, the socioeconomic impact of IBS on the workforce was difficult to measure objectively—researchers had to rely on observations of crude absenteeism rates. Several studies have demonstrated that these rates are significantly higher for IBS patients than for matched controls.<sup>12,13</sup> For

**Figure 1.** Prevalence of Common Long-term Conditions in the United States



\*IBS prevalence is depicted as a range, with 15% as an accepted consensus value and an additional 5% to total 20%, as has been found in some studies. CHD indicates coronary heart disease; IBS, irritable bowel syndrome.

example, a survey of 5430 persons from a random sample of US households found that illness caused the average patient with IBS to miss 13.4 days per year from work or school, whereas the average subject without a GI disorder missed only 4.9 days per year because of illness.<sup>12</sup> In another survey of identified IBS patients in the United States (n = 287), 30% of respondents reported that they had missed work completely because of their IBS symptoms, and 46% reported that their symptoms had forced them to leave early or to report late for work.<sup>13</sup>

Direct costs attributable to IBS have been estimated to be approximately \$1.5 billion<sup>6,14,15</sup>; however, based on an estimate of \$8 billion in 1992, one report estimated the adjusted direct costs to be as high as \$10 billion, excluding the costs of prescription and over-the-counter (OTC) drugs. In addition, the indirect costs of IBS, which are largely borne by the employer, have been estimated to be as high as \$20 billion.<sup>6</sup> However, given that this estimate is based on costs associated with IBS patients who sought medical attention—only a minority of patients with IBS—unmeasured indirect costs may be significantly higher than current best estimates.

For perspective, the prevalence of IBS<sup>1,8</sup> appears to be similar to that of other long-term conditions, such as asthma,<sup>16</sup> coronary heart disease (CHD),<sup>16</sup> diabetes,<sup>16</sup> hyperten-

sion,<sup>16</sup> and migraine<sup>16</sup> (Figure 1). However, the estimated total cost of IBS<sup>6,7</sup> is greater than that of asthma<sup>17</sup> or migraine<sup>18</sup> (long-term, episodic conditions) and comparable with that of hypertension<sup>19</sup> and congestive heart failure<sup>19</sup> (long-term, persistent conditions) (Figure 2).

**Direct Costs of IBS**

**Healthcare Utilization.** IBS is commonly diagnosed by primary care physicians and gastroenterologists<sup>2,20</sup>; patients with IBS constitute one of the largest diagnostic groups in the gastroenterology setting.<sup>20,21</sup> According to the American Gastroenterological Association, patients with IBS made 3.65 million visits to physicians in 1998.<sup>6</sup>

Many consultations result in interventions, such as diagnostic tests and prescriptions. According to the 1997 National Ambulatory Medical Care Survey, medications for the treatment of IBS symptoms were prescribed at an estimated 2.5 million visits per year, and 89% of IBS-related consultations in 1997 resulted in at least 1 IBS-related prescription.<sup>22</sup> This considerable use of healthcare resources has resulted in high costs to managed care, patients, and employers.

**Costs to Managed Care.** Patients with IBS make a significantly greater number of healthcare visits per year than population controls.<sup>23-25</sup> This substantial use of healthcare resources results in considerable managed care costs. For example, analyses of use and cost data obtained through the computerized information systems of a large, staff-model health maintenance organization (HMO) in western Washington demonstrated that the total costs of all healthcare provided by the HMO during a 12-month period were slightly more than \$4000 for patients with IBS (n = 3153) compared with approximately \$2700 for population controls (a 49% difference).<sup>26</sup>

**Costs to Patients.** A commonly overlooked component of the total cost of IBS is the time and cost expenditure for individual patients with IBS. Many patients report substantial out-of-pocket expenses for IBS therapies.<sup>27</sup> For example, a recent survey of

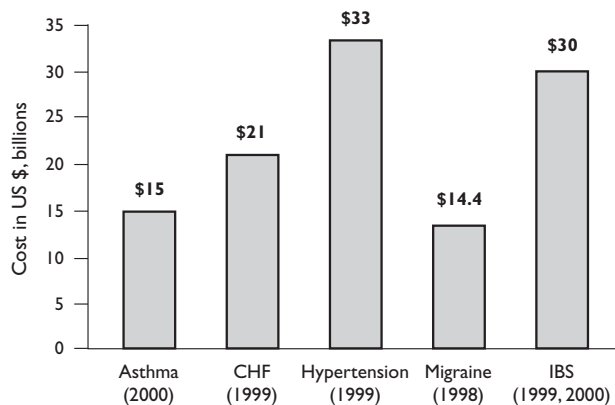
657 members of the Intestinal Disease Foundation found that patients with IBS spent an average of \$288 on OTC and alternative therapies for their IBS symptoms during the 3 months preceding the survey.<sup>27</sup>

**Costs to Employers.** Although IBS imposes a significant financial burden on patients and managed care, employers shoulder a large proportion of the total costs—both direct costs (insurance payments) and indirect costs (absenteeism and presenteeism)—attributable to IBS. Regarding direct costs, a recently published survey of beneficiaries with IBS ( $n = 1509$ ; subset of employees,  $n = 504$ ) who were identified from administrative claims data of a national Fortune 100 manufacturing company found that employees with IBS cost this employer 1.5 times more than employees in a matched control sample (\$6364 [employees with IBS] compared with \$4245 [controls];  $P < .001$ ; **Figure 3**),<sup>11</sup> resulting in an estimated \$1.9 million per year in additional costs to the employer. Presumably, this is an underestimation—because this study analyzed claims data, indirect costs included only absenteeism costs; adding presenteeism costs would probably have increased the total cost estimate substantially. Of note, the most significant incremental costs to the employer in this analysis were related to the greater use of ambulatory care and prescription drugs by IBS patients than by controls. IBS did not appear to result in high levels of disability, nor did it cause substantial use of inpatient care<sup>11</sup>—which employers typically equate with high cost—most likely because this condition waxes and wanes.

#### Indirect Costs of IBS

Although direct costs are more easily quantified and tracked, long-term and episodic conditions, such as IBS, also result in substantial indirect costs. In fact, it is estimated that direct costs account for less than half the total costs of IBS that employers incur.<sup>9</sup> Disease-related indirect costs, including absenteeism from work, disability program use, worker compensation program costs, worker turnover, family medical leave, and presenteeism, account for most of the financial burden for employers.<sup>9</sup>

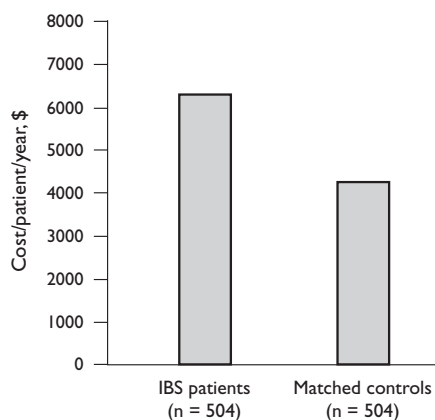
**Figure 2.** Total Costs of Specific Long-term Conditions in the United States



Costs are total and reflect direct and indirect costs. CHF indicates congestive heart failure; IBS, irritable bowel syndrome.

**Productivity Costs.** The effects on worker productivity caused by the symptoms and treatment of several long-term (ie, diabetes, asthma, hypertension, heart disease, mood disorders)<sup>28</sup> and acute (ie, influenza)<sup>29</sup> conditions have been documented. The **Table**,<sup>30-38</sup> which shows baseline Work Productivity and Activity Impairment (WPAI) scores for several common long-term and episodic conditions, illustrates this point. WPAI is a productivity questionnaire that was devel-

**Figure 3.** Healthcare and Disability Costs for Patients with IBS in the United States



$P < .001$ .  
IBS indicates irritable bowel syndrome.  
Source: Reference 11.

**Table.** Baseline WPAI Outcome Scores by Disease

Disease	Work time missed (%)	Work impairment (%)	Activity impairment (%)
Allergic rhinitis <sup>30</sup> (n = 1948; n = 1425 employed)	3.5	33.4	42.4
Allergic rhinitis <sup>31</sup> (n = 819; n = 614 employed)	3.3	39.8	45.4
Asthma <sup>32</sup> (n = 785 employed)	2.4	10.1	13.2
Chronic hand dermatitis <sup>33</sup> (n = 256; n = 201 employed)	0.3	17.7	33.0
GERD <sup>34</sup>			
Mild (n = 30 employed)	1.1	16.1	19.2
Moderate (n = 61 employed)	5.9	24.7	30.3
Severe (n = 15 employed)	18.4	31.9	47.7
GERD <sup>35</sup>			
With GERD symptoms (n = 273 employed)	2.7	14.5	19.3
Without GERD symptoms (n = 683 employed)	1.0	5.2	5.7
IBS <sup>36</sup>			
None/mild (n = 42 employed)	2.5	22.2	25.0
Moderate (n = 72 employed)	3.7	36.6	45.3
Severe (n = 21 employed)	10.1	38.6	59.0
Nocturia patients <sup>37</sup> (n = 203 employed)	1.5	12.3	18.1
Nocturia controls (n = 80 employed)	4.4	3.5	5.2
Social phobia <sup>38</sup> (n = 65; n = 48 employed)	8.3	23.3	27.7

WPAI indicates Work Productivity and Activity Impairment; GERD, gastroesophageal reflux disease; IBS, irritable bowel syndrome. Nocturia study used the general health version of the WPAI (WPAI-GH). All other studies used a disease-specific version.

oped as a general health measure and has been modified and validated for specific health conditions, including IBS.<sup>10</sup> It is designed to measure work impairment attributed to absenteeism (missed days from work) and presenteeism (reduced productivity at work) and impairment in daily activities, such as housework, shopping, child care, and exercising.<sup>10</sup> WPAI outcomes are expressed as impairment percentages, with higher numbers indicating greater impairment and less productivity (ie, worse outcomes). Another measure of lost productivity, the work productivity score, enumerates reduced productivity attributed to IBS symptoms as a percentage of potential total work productivity during a full-time workweek.

Indirect costs associated with absenteeism and presenteeism as a result of IBS are substantial. In 1992, IBS was the second

leading cause, behind the common cold, of workplace absenteeism,<sup>39</sup> and recent data suggest that the gap may be shrinking.<sup>40-42</sup> In a study of 2143 patients with IBS identified from 47 074 telephone screening interviews in the United States and in 8 European countries (United Kingdom, Netherlands, Italy, Switzerland, Germany, Belgium, Spain, and France), Europeans with IBS reported missing an average of 4 to 10.9 days of work during the previous year compared with 1.5 to 5.6 days reported by control subjects; Americans with IBS reported missing, on average, 6.4 days compared with 3 days reported by matched controls.<sup>41</sup> These findings are consistent with previous surveys, which indicate that patients with IBS miss more than 6 days of work per year because of their symptoms.<sup>42</sup> By way of comparison, a recent analysis concluded that affected

workers lost roughly 1 day of work (9 hours) per common cold episode.<sup>43</sup> Another survey found that 67% of adults experience at least 1 cold per year and that among those adults the average is 2.2 cold episodes per year.<sup>44</sup>

In addition to absenteeism, IBS symptoms are responsible for significant presenteeism. In fact, because IBS symptoms wax and wane, presenteeism actually results in greater costs for employers than absenteeism.<sup>10</sup> Patients with IBS tend to miss work sporadically rather than for long stretches of time.<sup>11</sup> A 2-part survey of the employees of Comerica Incorporated (N = 11 806)—a nationwide bank with major branches in Michigan, California, Texas, and Florida—examined worker productivity (both absenteeism and presenteeism) using the WPAI. Results showed a reduced work productivity rate of 21.1% among employees with IBS, which is equivalent to working only 4 days of a 5-day workweek.<sup>10</sup> Another study surveyed members of a managed care organization who had IBS (n = 574) and found that the average indirect costs incurred for productivity losses caused by the restriction of normal activities (ie, presenteeism) was \$2837 per year among employed respondents (n = 151). Average costs resulting from absenteeism were estimated to be \$996 per year.<sup>45</sup> These data clearly indicate that IBS symptoms result in a significant loss of productivity.

**Impact on Patients.** Patients with IBS often tolerate the symptoms for years before they seek diagnosis.<sup>4,5</sup> IBS symptoms restrict or otherwise negatively impact many aspects of patients' lives, including diet, travel, sleep, intimacy, and leisure activities.<sup>4,5,13,42,46,47</sup> It has been demonstrated that the quality of life of IBS patients is substantially diminished compared not only with the general population but also with patients who have gastroesophageal reflux disease, asthma, diabetes, or migraine.<sup>48,49</sup> Patients with IBS report that symptoms often cause them to be late for work or to leave work early.<sup>5,46,50</sup> Because of their IBS symptoms, many have made job decisions they would not otherwise have made, such as cutting back on days of work, working fewer hours,

turning down promotions or advancements, and working from home.<sup>4,5,13,42,46</sup>

Because of the nature of IBS symptoms and the fact that some employers do not accept these symptoms as valid reasons for work absence, patients often do not disclose that they have IBS. For example, in the IBS Bulletin Survey, 47% of respondents reported that they had not informed their employers of their IBS.<sup>4</sup>

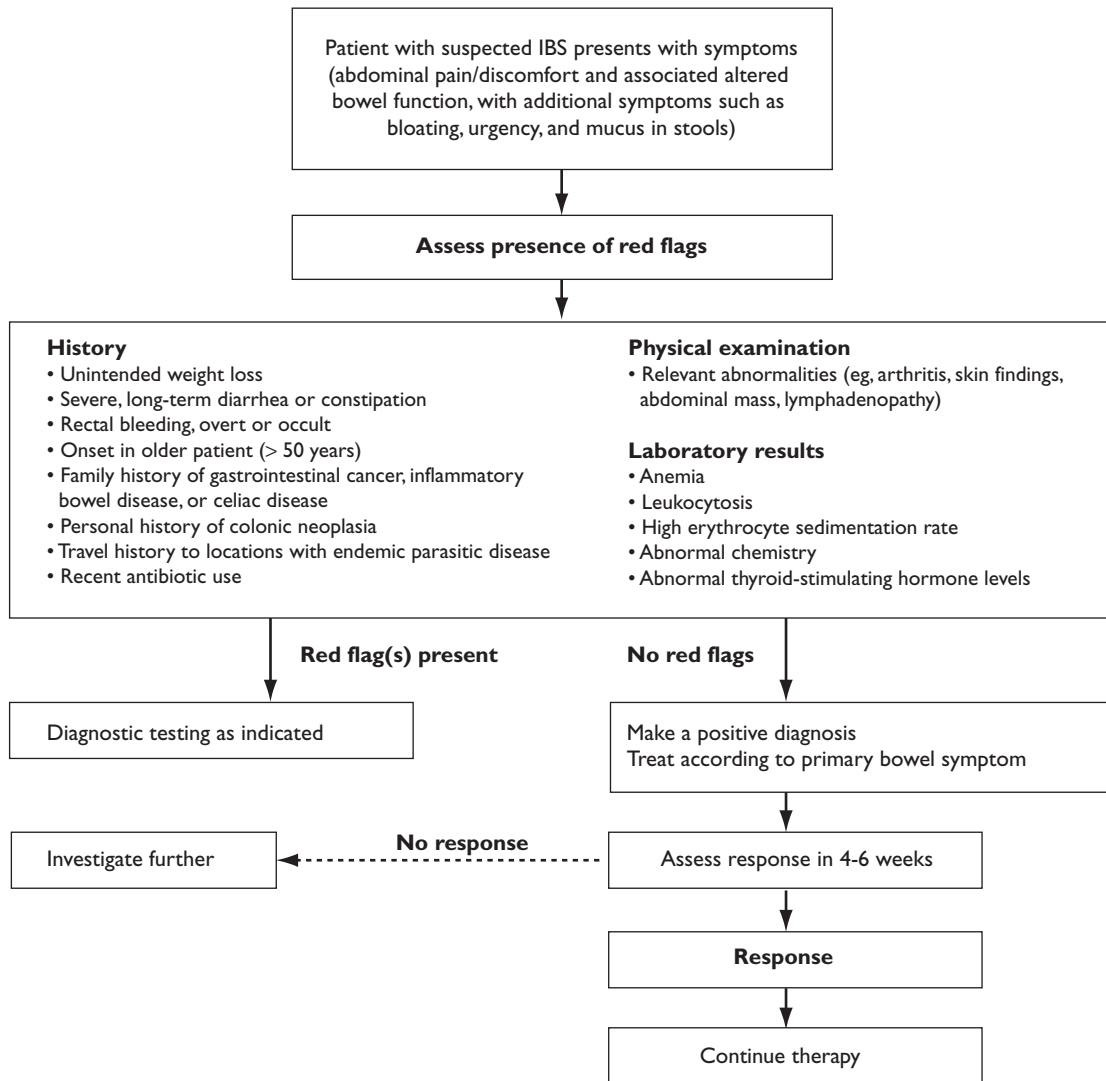
All of these factors contribute to the complexity of managing IBS and have important ramifications for the implementation of IBS educational programs in the workplace. Developing and implementing an appropriate program for IBS awareness, similar to that for other long-term medical disorders, requires that employers be cognizant of the potential presence and scope of the problem in their workforces and that they understand the specific issues surrounding the diagnosis and treatment of this prevalent and costly disorder.

#### **IBS in the Workplace—Steps for Developing an IBS Program**

Despite the absence of biochemical or structural markers for IBS, a positive diagnosis of IBS can be confidently made when a stepwise, symptom-based approach is followed.<sup>1</sup> A recent systematic review<sup>50</sup> suggests that in the absence of “red flags” (Figure 4), which may be indicative of organic GI disease, routine diagnostic tests are not required or even particularly discriminatory for making a positive and durable diagnosis of IBS.<sup>50,51</sup> These findings corroborate those of an early study by Hamm and colleagues.<sup>51</sup> However, early and accurate diagnosis is essential for the cost-effective management of IBS. The diagnosis of IBS is often delayed, causing patients to consult multiple physicians, make multiple office visits, and undergo unnecessary and often repetitive diagnostic testing and procedures, including, in some cases, unnecessary abdominal surgeries.<sup>5,52,53</sup>

Effective therapies that are well tolerated and treat the multiple symptoms of IBS are also essential to cost-effective management.<sup>54</sup> Many patients are dissatisfied with traditional IBS therapies such as fiber, antispasmodics, antidiarrheals, and laxatives,

**Figure 4.** Stepwise, Symptom-based Diagnostic Approach



IBS indicates irritable bowel syndrome.

which typically address only individual IBS symptoms (eg, constipation, diarrhea, bloating, or abdominal pain) and often switch medications or use multiple medications to alleviate all of their IBS symptoms.<sup>55</sup> Additional effective, well-tolerated agents that provide global relief of the multiple symptoms of IBS could help diminish the use of polypharmacy and thus reduce the total costs of prescription and OTC medications.

Preliminary evidence suggests that the use of novel IBS therapies, such as the sero-

tonergic agent alosetron, a serotonin (5-HT) type 3 (5-HT<sub>3</sub>) receptor antagonist indicated for the treatment of women with severe IBS with diarrhea, and tegaserod, a 5-HT<sub>4</sub> receptor agonist indicated for use in women with IBS with constipation (IBS-C), may help decrease worker absenteeism and improve worker productivity. Tegaserod has also been shown to be cost-effective.<sup>56</sup> An economic model of the indirect costs associated with IBS and their reduction with treatment intervention found that in the base case scenario of employees with IBS-C, tegaserod

therapy results in an annual cost savings of \$1882 in avoided lost productivity per treated female employee with IBS.<sup>57</sup> In addition, in a randomized, double-blind, placebo-controlled, multicenter study of 2600 women with IBS-C, tegaserod treatment was found to significantly reduce work productivity and daily activity impairment.<sup>58</sup>

In addition to these therapeutic advances, innovative tools are now available for use in workplace educational awareness programs designed to help employees better manage their IBS symptoms.<sup>59</sup> Such interventions hold promise for significantly decreasing the impact of this condition in the workplace.

**Step 1: Implement an IBS Educational Awareness Campaign.** An educational awareness campaign in the workplace would help address the need for awareness about the causes and consequences of IBS. IBS is associated with numerous misconceptions on the part of employers, physicians, and patients. For example, many patients with IBS fear that their IBS could progress to a more serious disease, such as cancer.<sup>60</sup> Others believe that their symptoms are caused by lifestyle factors or that they are psychosomatic.<sup>46</sup>

Many patients with IBS believe they have insufficient information about their disorder.<sup>60</sup> When respondents in a recent telephone survey conducted in the United States were asked to select from a list of long-term disorders that included asthma, depression, CHD, and diabetes, almost 50% ranked IBS as the medical disorder about which they knew the least.<sup>61</sup> Similar results were found in Europe.<sup>60</sup>

Evidence also suggests that healthcare providers should acquire a greater understanding of IBS. A study involving 36 general practitioners and 3111 patients in the United Kingdom found that IBS was identified in only 58% of patients whose symptoms warranted the diagnosis.<sup>62</sup> Even physicians who recognize and treat IBS seem unaware of the degree to which IBS disrupts and debilitates affected patients. When describing on a scale of 1 (“barely noticeable”) to 10 (“completely incapacitating”) the pain associated with IBS, IBS patients, on aver-

age, rated their pain as 6.3, whereas physicians rated it as 5.1<sup>63</sup>; these results indicate that there is a disconnection between physicians and patients regarding IBS.

Although these observations from the workplace appear bleak, an IBS educational awareness campaign may prove to be an effective intervention. It has been well demonstrated that workplace health improvement programs are effective in managing other long-term conditions.<sup>64</sup> Patients who have participated in these programs report that they feel healthier and more in control of their disease; this outcome has resulted in measurable reductions in medical care costs and absenteeism and in enhanced productivity in patients with depression and diabetes.<sup>64-66</sup>

**Step 2: Implement Incentive Programs.** Employers may consider implementing incentive programs to encourage employees with IBS to seek and comply with treatment. For example, the educational campaign and incentives program for depression management initiated by First Chicago Corporation in the 1980s resulted in reduced behavioral healthcare costs in each subsequent year after its inception, and, by 1996, the mental health share of total healthcare costs had decreased from 14% to less than 5%.<sup>64</sup>

It can be seen from the previous discussion that on-site educational or incentive programs can help employees better manage long-term medical disorders and be more productive at work and that employers who provide such programs can reduce total direct healthcare costs and costs resulting from absenteeism and presenteeism.

**Step 3: Reevaluate and Monitor Program Impact.** Effective programs require reevaluation and monitoring. Reevaluation allows for program updates and for the introduction of new information, such as details about newly available therapies. For example, whereas sumatriptan was once the cost-effective choice for migraine management,<sup>67-69</sup> the cost/benefit model shifted when almotriptan was introduced to the market. Almotriptan was found to be as effective and as well tolerated as sumatrip-

tan, but its acquisition cost was lower, making it the more cost-effective choice.<sup>70</sup> For them to be most effective, educational programs must be kept current with new developments in disease management, and treatment recommendations should be continually monitored to ensure that they stay current and relevant.

**Summary**

IBS is a long-term, episodic GI motility disorder that is prevalent among adults of working age. It imposes a substantial burden on patients and employers. Although IBS can be confidently diagnosed on the basis of characteristic symptoms, it is often misdiagnosed or underrecognized by patients and physicians, leading to multiple physician visits, multiple medications, and unnecessary diagnostic tests, procedures, and surgeries—all of which contribute to higher direct medical costs. Additionally, employers incur significant costs because of IBS-related absenteeism and presenteeism. Such costs have traditionally been difficult to quantify, but recent efforts have led to better understanding of their magnitude. Educational awareness programs have been used successfully to reduce the costs associated with other long-term disorders; with appropriate implementation, such programs might have similar results for IBS. Finally, ongoing and future development of therapies that effectively and safely provide global relief of the multiple symptoms of IBS may also help to reduce the sizable costs associated with this common condition.

.....  
**REFERENCES**

**1. American College of Gastroenterology Functional Gastrointestinal Disorders Task Force.** Evidence-based position statement on the management of irritable bowel syndrome in North America. *Am J Gastroenterol.* 2002;97(11 suppl):S1-S5.  
**2. Drossman DA, Whitehead WE, Camilleri M.** Irritable bowel syndrome: a technical review for practice guideline development. *Gastroenterology.* 1997;112:2120-2137.  
**3. Drossman DA, Thompson WG.** The irritable bowel syndrome: review and a graduated multicomponent treatment approach. *Ann Intern Med.* 1992;116:1009-1016.  
**4. Silk DB.** Impact of irritable bowel syndrome on personal relationships and working practices. *Eur J Gastroenterol Hepatol.* 2001;13:1327-1332.

**5. International Foundation for Functional Gastrointestinal Disorders.** *IBS in the Real World Survey: Summary Findings.* Milwaukee, Wis: International Foundation for Functional Gastrointestinal Disorders; 2002.  
**6. American Gastroenterological Association.** *The Burden of Gastrointestinal Diseases.* Bethesda, Md: American Gastroenterological Association; 2001:1-86. Available at: <http://www.gastro.org/clinicalRes/pdf/burden-report.pdf>. Accessed November 16, 2004.  
**7. Martin R, Barron JJ, Zacker C.** Irritable bowel syndrome: toward a cost-effective management approach. *Am J Manag Care.* 2001;7(8 suppl):S268-S275.  
**8. Camilleri M, Heading RC, Thompson WG.** Consensus report: clinical perspectives, mechanisms, diagnosis and management of irritable bowel syndrome. *Aliment Pharmacol Ther.* 2002;16:1407-1430.  
**9. Goetzel RZ, Hawkins K, Ozminkowski RJ, Wang S.** The health and productivity cost burden of the "top 10" physical and mental health conditions affecting six large U.S. employers in 1999. *J Occup Environ Med.* 2003;45:5-14.  
**10. Dean BB, Aguilar D, Barghout V, et al.** Impairment in work productivity and health-related quality of life in patients with irritable bowel syndrome. *Am J Manag Care.* 2005;11(suppl):S17-S26.  
**11. Leong SA, Barghout V, Birnbaum HG, et al.** The economic consequences of irritable bowel syndrome: a US employer perspective. *Arch Intern Med.* 2003;163:929-935.  
**12. Drossman DA, Li Z, Andruzzi E, et al.** U.S. household survey of functional gastrointestinal disorders: prevalence, sociodemography, and health impact. *Dig Dis Sci.* 1993;38:1569-1580.  
**13. Hahn BA, Yan S, Strassels S.** Impact of irritable bowel syndrome on quality of life and resource use in the United States and United Kingdom. *Digestion.* 1999;60:77-81.  
**14. Inadomi JM, Fennerty MB, Bjorkman D.** The economic impact of irritable bowel syndrome. *Aliment Pharmacol Ther.* 2003;18:671-682.  
**15. Drossman DA, Camilleri M, Mayer EA, Whitehead WE.** AGA technical review on irritable bowel syndrome. *Gastroenterology.* 2002;123:2108-2131.  
**16. Centers for Disease Control and Prevention.** *Summary Health Statistics for U.S. Adults: National Health Interview Survey, 1998.* Washington, DC: Department of Health and Human Services; 2002:1-114.  
**17. Centers for Disease Control and Prevention.** *Fact Sheets: Facts About Asthma.* Atlanta, Ga: CDC Office of Communication Media Relations; August 8, 1997.  
**18. Hu XH, Markson LE, Lipton RB, Stewart WF, Berger ML.** Burden of migraine in the United States: disability and economic costs. *Arch Intern Med.* 1999;159:813-818.  
**19. American Heart Association.** *Heart and Stroke Statistical Update—1999.* Dallas, Tex: American Heart Association; 1998.  
**20. Mitchell CM, Drossman DA.** Survey of the AGA membership relating to patients with functional gastrointestinal disorders. *Gastroenterology.* 1987;92:1282-1284.  
**21. Russo MW, Gaynes BN, Drossman DA.** A national survey of practice patterns of gastroenterologists with comparison to the past two decades. *J Clin Gastroenterol.* 1999;29:339-343.  
**22. Shih YC, Barghout VE, Sandler RS, et al.** Resource utilization associated with irritable bowel syndrome in



- the United States 1987-1997. *Dig Dis Sci.* 2002;47:1705-1715.
23. **Patel RP, Petitta A, Fogel R, Peterson E, Zarowitz BJ.** The economic impact of irritable bowel syndrome in a managed care setting. *J Clin Gastroenterol.* 2002;35:14-20.
24. **Eisen GM, Weinfurt KP, Hurley J, et al.** The economic burden of irritable bowel syndrome in a managed care organization [abstract]. *Am J Gastroenterol.* 2000;95:2628-2629.
25. **Ofman J, Wilson A, Knight K, et al.** Healthcare utilization and the irritable bowel syndrome—a U.S. managed care perspective [abstract]. *Am J Gastroenterol.* 2001;96(suppl 1):S276. Abstract 879.
26. **Levy RL, Von Korff M, Whitehead WE, et al.** Costs of care for irritable bowel syndrome patients in a health maintenance organization. *Am J Gastroenterol.* 2001;96:3122-3129.
27. **Gore M, Frech F, Yokoyama K, Tai K-S.** Symptom burden and management of irritable bowel syndrome: a patient perspective [abstract]. *Am J Gastroenterol.* 2002;97:S239-S240. Abstract 731.
28. **Druss BG, Marcus SC, Olfson M, Tanielian T, Elinson L, Pincus HA.** Comparing the national economic burden of five chronic conditions. *Health Aff (Milwood).* 2001;20:233-241.
29. **Akazawa M, Sindelar JL, Paltiel AD.** Economic costs of influenza-related work absenteeism. *Value Health.* 2003;6:107-115.
30. **Tanner LA, Reilly M, Meltzer EO, Bradford JE, Mason J.** Effect of fexofenadine HCl on quality of life and work, classroom, and daily activity impairment in patients with seasonal allergic rhinitis. *Am J Manag Care.* 1999;5(suppl):S235-S247.
31. **Meltzer EO, Casale TB, Nathan RA, Thompson AK.** Once-daily fexofenadine HCl improves quality of life and reduces work and activity impairment in patients with seasonal allergic rhinitis. *Ann Allergy Asthma Immunol.* 1999;83:311-317.
32. **Andreasson E, Svensson K, Berggren F.** The validity of the work productivity: an activity impairment questionnaire for patients with asthma (WPAI-asthma): results from a web-based study [abstract]. *Value Health.* 2003;6:780. Abstract PRP11.
33. **Reilly MC, Lavin PT, Kahler KH, Pariser DM.** Validation of the Dermatology Life Quality Index and the Work Productivity and Activity Impairment-Chronic Hand Dermatitis questionnaire in chronic hand dermatitis. *J Am Acad Dermatol.* 2003;48:128-130.
34. **Wahlqvist P, Carlsson J, Stalhammar NO, Wiklund I.** Validity of a Work Productivity and Activity Impairment questionnaire for patients with symptoms of gastroesophageal reflux disease (WPAI-GERD)—results from a cross-sectional study. *Value Health.* 2002;5:106-113.
35. **Dean BB, Crawley JA, Reeves JD, et al.** The cost of gastroesophageal reflux disease: it's what you don't see that counts. *J Manag Care Med.* 2003;7:6-13.
36. **Reilly MC, Bracco A, Ricci JF, Santoro J, Stevens T.** The validity and accuracy of the Work Productivity and Activity Impairment questionnaire—irritable bowel syndrome version (WPAI-IBS). *Aliment Pharmacol Ther.* 2004;20:459-467.
37. **Kobelt G, Borgstrom F, Mattiasson A.** Productivity, vitality and utility in a group of healthy professionally active individuals with nocturia. *BJU Int.* 2003;91:190-195.
38. **Wittchen HU, Beloch E.** The impact of social phobia on quality of life. *Int Clin Psychopharmacol.* 1996;11(suppl 3):15-23.
39. **Weber FH, McCallum RW.** Clinical approaches to irritable bowel syndrome. *Lancet.* 1992;340:1447-1452.
40. **Camilleri M, Williams DE.** Economic burden of irritable bowel syndrome: proposed strategies to control expenditures. *Pharmacoeconomics.* 2000;17:331-338.
41. **Hungin AP, Chang L, Barghout V, Kahler K.** *The impact of IBS on absenteeism and work productivity: United States and eight European countries.* Presented at: 68th Annual Meeting of the American College of Gastroenterology; October 13-15, 2003; Baltimore, Md.
42. **Hungin APS, Tack J, Mearin F, Whorwell PJ, Dennis E, Barghout V.** Irritable bowel syndrome (IBS): prevalence and impact in the USA—the truth in IBS (T-IBS) survey [abstract]. *Am J Gastroenterol.* 2002;97(suppl):S280-S281. Abstract 854.
43. **Bramley TJ, Lerner D, Sarnes M.** Productivity losses related to the common cold. *J Occup Environ Med.* 2002;44:822-829.
44. **Fendrick AM, Monto AS, Nightengale B, Sarnes M.** The economic burden of non-influenza-related viral respiratory tract infection in the United States. *Arch Intern Med.* 2003;163:487-494.
45. **Chiou CF, Wilson A, Longstreth G, et al.** *The relationship between irritable bowel syndrome, abdominal discomfort/pain, and indirect costs.* Presented at: 2002 Digestive Diseases Week Conference; May 19-22, 2002; San Francisco, Calif.
46. **Dancey CP, Backhouse S.** Towards a better understanding of patients with irritable bowel syndrome. *J Adv Nurs.* 1993;18:1443-1450.
47. **Hungin APS, Whorwell PJ, Tack J, Mearin F.** The prevalence, patterns and impact of irritable bowel syndrome: an international survey of 40,000 subjects. *Aliment Pharmacol Ther.* 2003;17:643-650.
48. **Frank L, Kleinman L, Rentz A, Ciesla G, Kim JJ, Zacker C.** Health-related quality of life associated with irritable bowel syndrome: comparison with other chronic diseases. *Clin Ther.* 2002;24:675-689.
49. **Gralnek IM, Hays RD, Kilbourne A, Naliboff B, Mayer EA.** The impact of irritable bowel syndrome on health-related quality of life. *Gastroenterology.* 2000;119:654-660.
50. **Cash BD, Schoenfeld P, Chey WD.** The utility of diagnostic tests in irritable bowel syndrome patients: a systematic review. *Am J Gastroenterol.* 2002;97:2812-2819.
51. **Hamm LR, Sorrells SC, Harding JP, et al.** Additional investigations fail to alter the diagnosis of irritable bowel syndrome in subjects fulfilling the Rome criteria. *Am J Gastroenterol.* 1999;94:1279-1282.
52. **Feld AD, Von Korff M, Levy R, Palsson O, Turner M, Whitehead W.** Excess surgery in irritable bowel syndrome (IBS) [abstract]. *Gastroenterology.* 2003;124(suppl 1):A-388. Abstract M1637.
53. **Barghout V, Yokoyama K, Gause D, Frech F.** IBS-related hospitalizations and procedures. *Gastroenterology.* 2002;122(suppl):A-570. Abstract W1125.
54. **Ofman J, Wilson A, Knight K, et al.** The relationship between symptom severity and healthcare utilization in irritable bowel syndrome patients in a managed care setting [abstract]. *Am J Gastroenterol.* 2001;96(suppl 1):S276. Abstract 880.
55. **Lembo A.** Irritable Bowel Syndrome Medications Side Effects Survey. *J Clin Gastroenterol.* 2004;38:776-781.
56. **Nyhlin H, Jonsson BG, Bracco A, Ricci J, Drummond M.** Tegaserod is cost-effective in the treat-

- ment of patients with IBS: an economic analysis of the TENOR (TEgaserod in NORdic countries) study [abstract]. *Gut*. 2004;53(suppl VI):A211. Abstract TUE-G-295.
57. **Smith DG, Barghout V, Kahler KH.** Tegaserod treatment for IBS: a model of indirect costs. *Am J Manag Care*. 2005;11(suppl):S43-S50.
58. **Reilly MC, Barghout V, Ruegg P, Pecher E, Ricci J-F.** Tegaserod significantly reduces work productivity loss and daily activity impairment in patients with IBS with constipation [abstract]. *Am J Gastroenterol*. 2004;99:S241. Abstract 743.
59. **Shen B, Soffer E.** The challenge of irritable bowel syndrome: creating an alliance between patient and physician. *Cleve Clin J Med*. 2001;68:224-233, 236.
60. **O'Sullivan MA, Mahmud N, Kelleher DP, Lovett E, O'Morain CA.** Patient knowledge and educational needs in irritable bowel syndrome. *Eur J Gastroenterol Hepatol*. 2000;12:39-43.
61. **Verne GN.** The public awareness of the prevalence and impact of irritable bowel syndrome in the United States: perception versus reality. *J Clin Gastroenterol*. 2004;38:419-424.
62. **Thompson WG, Heaton KW, Smyth GT, Smyth C.** Irritable bowel syndrome in general practice: prevalence, characteristics, and referral. *Gut*. 2000;46:78-82.
63. **Heitkemper M, Carter E, Ameen V, Olden K, Cheng L.** Women with irritable bowel syndrome: differences in patients' and physicians' perceptions. *Gastroenterol Nurs*. 2002;25:192-200.
64. **Riotta M.** Depression in the workplace: negative effects, perspective on drug costs and benefit solutions. *Benefits Q*. 2001;17:37-48.
65. **Burton WN, Connerty CM.** Evaluation of a worksite-based patient education intervention targeted at employees with diabetes mellitus. *J Occup Environ Med*. 1998;40:702-706.
66. **Garrett DG, Martin LA.** The Asheville Project: participants' perceptions of factors contributing to the success of a patient self-management diabetes program. *J Am Pharm Assoc (Wash)*. 2003;43:185-190.
67. **Biddle AK, Shih YC, Kwong WJ.** Cost-benefit analysis of sumatriptan tablets versus usual therapy for treatment of migraine. *Pharmacotherapy*. 2000;20:1356-1364.
68. **Lofland JH, Johnson NE, Batenhorst AS, Nash DB.** Changes in resource use and outcomes for patients with migraine treated with sumatriptan: a managed care perspective. *Arch Intern Med*. 1999;159:857-863.
69. **Schulman EA, Cady RK, Henry D, et al.** Effectiveness of sumatriptan in reducing productivity loss due to migraine: results of a randomized, double-blind, placebo-controlled clinical trial. *Mayo Clin Proc*. 2000;75:782-789.
70. **Mayo KW, Osterhaus JT.** Health outcomes evaluations: estimating the impact of almotriptan in managed care settings. *Am J Manag Care*. 2002;8:S85-S93.