The Prevalence and Costs to Treat Comorbidities in Persons with Constipation and Irritable Bowel Syndrome with Constipation in the 6 Months After Diagnosis: An Employer's Perspective

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Introduction

- Patients with constipation (C) and irritable bowel syndrome (IBS) are known to be costly and can present with a wide range of conditions.
- Prior research has documented the association of both C and IBS with coexisting gastrointestinal medical conditions (comorbidities) as well as other functional gastrointestinal disorders [FGIDs] including functional dyspepsia, gastroesophageal reflux disease [GERD], non-motility gastrointestinal disorders, and somatic conditions.[1-7]
- Frequency of FGID comorbidities occurence and their temporal relationship to C and IBS is not extensively researched.
- Few analyses have compared comorbidities occurring with constipation and IBS, and the analyses that did compare them explored IBS rather than IBS+C.[8]
- Comorbidities inevitably contribute to the overall cost of care for constipation and IBS+C.

Aim

- To evaluate the prevalence and costs of comorbidities [using the 261 categories determined by the Agency for Healthcare Research and Quality[9] (AHRQ)] in a large sample of patients 6 months after diagnoses (DXs) of C and IBS+C (co-occurring diagnoses of IBS and C) and to compare with controls (persons without C and without IBS).

Methods

- A retrospective analysis was performed on healthcare claims data cases (2001 to 2005) extracted from the Human Capital Management Services (HCMS) Research Reference Database consisting of approximately 510,000 employees representative of the US Employed Civilian Labor Force (2004).
- Anonymity of person-level data was maintained according to the Health Insurance Portability and Accountability Act guidelines.
- Healthcare for the entire employee cohort was provided through managed care plans contracted by respective employers.
- International Classification of Diseases-9 (ICD-9) codes were used to identify employees with primary, secondary, or tertiary diagnoses of constipation in claims records:
  - 564.0 Constipation
  - 564.00 Unspecified
  - 564.01 Slow Transit
  - 564.09 Other
- Persons with IBS+C were required to have an ICD-9 code for constipation plus an ICD-9 code for IBS (564.1) in claims records.
- Employee cohorts were identified for comparison purposes as follows:
  - C cohort: employees with a record of constipation-related diagnosis (Constipation ICD-9 codes listed above) and no ICD-9 code for IBS
  - IBS+C cohort: employees with record of constipation-related diagnosis (Constipation ICD-9 codes listed above) plus an ICD-9 code for IBS
  - Control cohort: employees without constipation and without IBS
- For each employee in the IBS+C cohort, 5 C employees and 180 controls were matched using logistic regression and propensity scores for age, tenure (years with current employer), sex, marital status, race, exempt/non-exempt status (exempt employees are not paid on an hourly basis and are not paid for overtime work), full-time/part-time status, salary, Charlson Comorbidity Index score,[10] region (defined by first digit of employee's postal zip code), and existence of a direct medical claim.
- Index dates were established for each cohort as follows:
  - C cohort: the date of first diagnosis of constipation during 2001 or later as noted by ICD-9 code in the claims record
  - IBS+C cohort: the date of first diagnosis of IBS during 2001 or later as noted by ICD-9 code in the claims record
  - Control Cohort: the average index date of the cohorts with disease (C and IBS+C)
- Employees were required to be continuously employed and eligible for health benefits for at least six months before and six months after their index date.
- All medical claims were assigned to the 261 specific AHRQ categories[9] based on the primary ICD-9 codes. Mean costs were calculated over the entire cohort. Prevalence rates were based on persons within the cohort with claims for each category.
- Comorbidity categories were explored within Gastrointestinal Disorders, CNS/Psychiatric Disorders, Other Disorders/Conditions, Musculoskeletal/Connective Tissue, and Neoplasms.

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Statistical Analysis

- All costs were adjusted to March 2006 dollars using the non-seasonal Consumer Price Index adjustment factors for the month in which each medical claim occurred.[11]
- Prevalence comparisons used z-scores of log odds ratios (Woolf method).
- Cost comparisons used Satterthwaite *t* tests.
- Comparisons were performed between (C vs. IBS+C vs. Control) cohorts in the 6 months after the index date.
- Differences were considered significant at $P<0.05$.

Results

- Data were available for 309 IBS+C, 1,545 matched C persons and 55,620 matched controls, for which there were no significant differences in characteristics (**Table 1**).
- Prevalences (**Table 2**) for the reported AHRQ categories were all significantly higher ($P<0.05$) for both disease groups compared with controls, except for sprains and strains (0.2% non-significantly lower for C than controls) and cancer of the colon (0.3% non-significantly higher for IBS+C than controls).
- Prevalences were similar ($P>0.05$) between the C and IBS+C comorbidities for 9 of the 16 reported categories and different ($P<0.05$) for 7 of the reported categories.
- For overall prevalence, including non-reported categories comparing groups, C vs. IBS+C had 16 significant categories (all 16 higher for IBS+C); C vs. controls had 102 significant categories (101 higher for C); and IBS+C vs. controls had 69 significant categories (all higher for IBS+C).
- Costs (**Table 3**) for the reported AHRQ categories were higher for all comorbidities in both C and IBS+C cohorts vs. controls after diagnosis and were similar ($P>0.05$) between the C and IBS+C comorbidities except for the "Residual codes undefined symptoms" category which was significantly lower for the IBS+C cohort.
- For overall cost, including non-reported categories comparing groups, C vs. IBS+C had 15 significant categories (1 higher for IBS+C); C vs. controls had 70 significant categories (23 higher for C); and IBS+C vs. controls had 118 significant categories (10 higher for IBS+C).

Table 1. Descriptive statistics for propensity matched Study Cohorts[1]

Variable	IBS+C Cohort N=309 Mean (S.E.), % or $	C Cohort N=1,545 Mean (S.E.), % or $	Control Cohort N=55,620 Mean (S.E.), % or $
Age (at index date[2])	40.2 (0.6)	41.0 (0.3)	40.9 (0.04)
Tenure (at index date[2])	8.5 (0.4)	8.7 (0.2)	8.7 (0.03)
Female	77%	74%	74%
Married[3]	49%	50%	50%
White[4]	63%	60%	61%
Black[4]	12%	14%	13%
Hispanic[4]	13%	15%	15%
Exempt	33%	30%	31%
Full Time	95%	94%	94%
Annual Salary	$49,676 ($1,513)	$48,900 ($720)	$49,194 ($232)
Charlson Index	0.194	0.223	0.209
Less than High School[15]	0%	1%	1%
High School Diploma or GED[5]	33%	42%	41%
Some College or Trade School[5]	12%	12%	9%
Associate's Degree of Trade School Degree[5]	7%	4%	4%
Bachelor's Degree[5]	37%	30%	32%
Master's or MBA[5]	10%	9%	10%
JD (Law Degree)[15]	0%	0%	0%
PhD or MD or PharmD[115]	0%	3%	2%

[1] $P\geq0.0001$ (IBS+C vs. Control) $1P\geq0.01$ (IBS+C vs. C)
[2] Cohorts matched based on propensity scores built from age, tenure, gender, married, white, exempt, full time, salary; zip code, existence of a medical claim, and pre-index date Charlson Index score.
[3] For subjects with disease, the index date is the date of the first diagnosis in the study period.
[4] Ns: IBS+C=285; C=1,411; Control=50,861
[4] Ns: IBS+C=239; C=1,187; Control=42,757
[5] Ns: IBS+C=72; C=253; Control=4,378

Table 2. Between-group prevalence comparisons of Selected Agency for Health Research and Quality Specific Categories

AHRQ Specific Category	Prevalence (%) IBS+C	C	Controls	*P*-Value IBS+C vs. C	C vs. Control	IBS+C vs. Control
Gastrointestinal Disorders						
Abdominal Pain	44.7	35.9	6.9	<0.01	<0.001	<0.001
Anal and Rectal Conditions	3.2	4.9	0.5	NS	<0.001	<0.001
Hemorrhoids	17.8	12.5	1.1	<0.05	<0.001	<0.001
Intestinal Obstruction	2.9	1.5	0.1	NS	<0.001	<0.001
CNS/Psychiatric Disorders						
Affective Disorders	11.3	6.7	3.6	<0.01	<0.001	<0.001
Other Mental Conditions	8.4	6.6	4.1	NS	<0.001	<0.001
Dissociative/Personality Disorders	12.3	7.3	3.7	<0.01	<0.001	<0.001
Other Disorders/Conditions						
Residual Codes III-defined Symptoms	15.5	16.6	10.2	NS	<0.001	<0.01
Malaise and Fatigue	14.2	11.1	5.3	NS	<0.001	<0.001
Nausea and Vomiting	8.4	5.3	1.4	<0.05	<0.001	<0.001
Musculoskeletal/Connective Tissue						
Other Connective Tissue Disorders	18.8	14.8	11.5	NS	<0.001	<0.001
Intervertebral Disc Disorders	17.8	17.7	11.7	NS	<0.001	<0.01
Other Non-Traumatic Joint Disorders	15.5	10.9	8.4	<0.05	<0.001	<0.001
Sprains and Strains	10.4	6.2	6.8	<0.01	NS	<0.05
Neoplasms						
Cancer of Rectum and Anus	0.6	0.3	0.1	NS	<0.01	<0.001
Cancer of Colon	0.3	0.4	0.1	NS	<0.01	NS

IBS+C Cohort (N=309); C Cohort (N=1,545); Control Cohort (N=55,620); NS = Non-significant ($P>0.05$)

Table 3. Between-group adjusted mean costs comparisons of Selected Agency for Health Research and Quality Specific Categories Research and Quality Specific Categories

AHRQ Specific Category	Cost ($) IBS+C	C	Controls	*P*-Value IBS+C vs. C	C vs. Control	IBS+C vs. Control
Gastrointestinal Disorders						
Abdominal Pain	357	236	36	NS	<.0001	<0.001
Anal and Rectal Conditions	13	56	3	NS	<0.05	NS
Hemorrhoids	83	46	5	NS	<.0001	<0.01
Intestinal Obstruction	23	22	3	NS	NS	NS
CNS/Psychiatric Disorders						
Affective Disorders	68	45	19	NS	<0.05	<0.001
Other Mental Conditions	24	12	11	NS	NS	NS
Dissociative/Personality Disorders	17	12	8	NS	NS	NS
Other Disorders/Conditions						
Residual Codes III-defined Symptoms	9	24	16	<0.001	<0.05	<0.001
Malaise and Fatigue	8	10	5	NS	<0.05	NS
Nausea and Vomiting	39	18	3	NS	<0.001	<0.05
Musculoskeletal/Connective Tissue						
Other Connective Tissue Disorders	92	53	41	NS	NS	NS
Intervertebral Disc Disorders	280	227	116	NS	<0.01	NS
Other Non-Traumatic Joint Disorders	40	18	27	NS	<0.01	NS
Sprains and Strains	28	14	29	NS	<.0001	NS
Neoplasms						
Cancer of Rectum and Anus	4	2	3	NS	NS	NS
Cancer of Colon	0	21	9	NS	NS	<0.001

IBS+C Cohort (N=309); C Cohort (N=1,545); Control Cohort (N=55,620); NS = Non-significant ($P>0.05$)

Limitations

- Both Constipation and IBS+C may be underreported in healthcare databases due to ICD-9 coding in healthcare claims data.
- The methodological requirement of a medical visit in all cohorts may have produced a clinically non-significant increase in comorbidity prevalence and costs for the controls.
- The C and IBS+C cohorts may have been comprised of both mild and severe patients.

Summary and Conclusions

- Patients with C have comorbidities similar ($P>0.05$) to those with IBS+C. Prevalence was similar in 245 of the 261 categories (94%), and costs were similar in 245 of the 261categories (94%).
- Patients with C or IBS+C are different than controls:
  - Patients with C, when compared with controls, have significantly ($P<0.05$) higher prevalence in 101 of the 261 categories (39%) and costs in 23 of the 261 categories (9%).
  - Patients with IBS+C, when compared with controls, have significantly ($P<0.05$) higher prevalence in 69 of the 261 categories (26%) and costs in 10 of the 261 categories (4%).
- These results suggest that effective management of both Constipation and IBS+C may avert FGID comorbidities and reduce costs from an employer perspective.

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Notes

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Abstract

Purpose:
Both constipation (C) and irritable bowel syndrome with C (IBS+C) are known to be costly. Whether the costs of C are driven by the same factors that drive IBS costs is unknown. We aimed to assess the cost and prevalence of comorbidities for C without and with IBS (IBS+C).

Methods:
A retrospective analysis was conducted using medical, payroll, and demographic data from a database of US-based employers from 2001-2005. ICD-9 Codes were used to include employees in the C cohort: 564.0 (C), 564.00 (Unspecified), 564.01 (Slow Transit), and 564.09 (Other). Employees with C and an ICD-9 for IBS (564.1x) during the study period were assigned to the IBS+C cohort. Propensity scores (PS) based on demographics, job-related variables, region, existence of medical claims, and pre-index-date Charlson Comorbidity Index score were used to match 5 C employees and 180 Controls to each IBS+C employee. The index date was the date of the first C or IBS claim, respectively. Controls used the average index date of the C and IBS+C cohorts. Claims data were adjusted to 2006 dollars.

Results:
Data were available for 309 persons with IBS+C, 1,545 PS-matched C subjects, and 55,620 PS-matched Controls. The table presents the prevalence and costs for C, IBS+C, and control cohort during the 6-month period after the index date for selected Agency for Healthcare Research and Quality (AHRQ) categories.

Conclusion:
Patients with C have comorbidities similar to those with IBS+C, and both are different than controls. Costs for comorbidities are not different between C and IBS+C.

	Prevalence (% of Cohort)[1]			Adjusted Mean 6-Month Costs per Patient ($)[2]		
Category	**C**	**IBS+C**	**Control**	**C**	**IBS+C**	**Control**
Gastrointestinal Disorders						
Abdominal Pain	35.86†‡	44.66†‡	6.90	236†	357†	36
Anal and Rectal Conditions	4.85†	3.24†	0.48	56†	13	3
Hemorrhoids	12.49†‡	17.80†‡	1.10	46†	83†	5
Intestinal Obstruction w/out Hernia	1.49†	2.91†	0.12	22	23	3
CNS/Psychiatric Disorders						
Affective Disorders	6.67†‡	11.33†‡	3.63	45†	68†	19
Other Mental Conditions	6.60†	8.41†	4.12	12	24	11
Other Disorders/Conditions						
Malaise and Fatigue	11.07†	14.24†	5.28	10†	8	5
Nausea and Vomiting	5.31†‡	8.41†‡	1.38	18†	39†	3
Musculoconnective Tissue						
Other Connective Tissue Diseases	14.82†	18.77†	11.47	53	92	41
Other Non-Traumatic Joint Diseases	10.87†‡	15.53†‡	8.41	18†	40	27
Sprains and Strains	6.21†	10.36†‡	6.81	14	28†	29
Neoplasms						
Cancer of Colon	0.39†	0.32	0.05	21	0†	3
Cancer of Rectum and Anus	0.26†	0.65†	0.12	2	4	9

Differences were assessed using Satterthwaite t-tests[1] and z-scores of log odds ratios[2]
Group Comparisons ($P \leq 0.05$): †Cohort vs. Control; ‡IBS+C vs. C