

DIRECT COSTS BY POINT OF SERVICE FOR PERSONS WITH AND WITHOUT CONSTIPATION: AN EMPLOYER PERSPECTIVE

Nathan L. Kleinman, PhD¹, Richard A. Brook, MS, MBA², Arthur K. Melkonian, MD¹, and Robert W. Baran, PharmD³

¹Analysis & Research Services, HCMS, Cheyenne, WY

²Retrospective Analysis, The JeSTARx Group, Newfoundland, NJ

³Takeda Global Research and Development, Deerfield, IL

ABSTRACT

PURPOSE: To compare direct healthcare costs by point of service (POS) for persons with and without constipation during the six months post diagnosis.

METHODS: An employer database containing medical claims, payroll, and demographic data for approximately 510,000 US employees from 1/1/01 to 6/30/06 was retrospectively analyzed. Semi-annual healthcare costs were captured based on claims from: doctor's office, inpatient hospital, outpatient hospital or clinic, emergency department (ED), laboratory, other locations, and pharmacy. ICD-9 Codes 564.0 (Constipation), 564.00 (Unspecified), 564.01 (Slow Transit), and 564.09 (Other) were used to distinguish employees with constipation from the non-constipation cohort. The index date in the constipation cohort was defined as the date of first diagnosis during 2001 or later; the average constipation index date was used in the non-constipation cohort. For analysis, propensity scores based on age, gender, marital status, race, salary and other job-related variables, geographic region, existence of a medical cost, and the Charlson Comorbidity Index Score were used to match 24 non-constipation employees to each constipation cohort employee. Per member per month (PMPM) costs were compared for each POS category. All costs were adjusted to 2006 dollars.

RESULTS: Data were available for 1,015 persons with constipation and 24,360 propensity-score matched non-constipation controls. Both cohorts average 41 years of age and 73% female. The constipation cohort incurred \$349 additional PMPM total costs ($P < 0.0001$). Significant ($P < 0.001$) cost differences by category for the constipation versus non-constipation cohorts were: outpatient hospital or clinic (\$264 vs. \$118), doctor's office (\$128 vs. \$94), ED (\$17 vs. \$7), laboratory (\$4 vs. \$2). Prescription drug costs also were significantly higher for the constipation cohort (\$98 vs. \$75, $P < 0.0001$). Findings for inpatient hospital (\$228 vs. \$106, $P = 0.092$) and other locations (\$18 vs. \$6, $P = 0.096$) were not significant.

CONCLUSIONS: Patients with constipation incur greater costs throughout the healthcare system.

DIRECT COSTS BY POINT OF AND WITHOUT CONSTIPATIO

Nathan L. Kleinman, PhD¹, Richard A. Brook, MS, MBA²,

¹Analysis & Research Services, HCMS Group, Cheyenne, WY ²Retrospective Analysis,

INTRODUCTION

- Constipation imposes substantial direct and indirect costs and impairs health-related quality-of-life.¹⁻⁵
- Total direct costs for constipation in the US has been reported to exceed \$235 million annually.²
- Recent research suggests total direct costs for constipation in the US may approximate \$3.12 billion.³
- Understanding how direct costs of constipation are segmented throughout the healthcare system is important to managed care payers for effective cost containment.
- Most previous point-of-service (POS) direct cost analyses have been limited to other GI conditions, such as IBS.⁶⁻⁸
- Few studies have focused on direct medical POS and prescription drug costs of constipation.^{3-4, 9}

Aim

- To examine the direct cost burden of constipation for insured employees, quantifying direct point-of-service costs of illness throughout the healthcare continuum.

METHODS

- A retrospective analysis was performed on data (1/1/2001 to 6/30/2006) 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.
- Semi-annual direct POS costs were captured based on claims from doctor's office, inpatient hospital, outpatient hospital/clinic, emergency department (ED), laboratory, other locations, and pharmacy.
- International Classification of Diseases-9 (ICD-9) codes were used to distinguish employees with a primary, secondary, or tertiary diagnosis of constipation from employees without a constipation-related diagnosis.
 - 564.0 (Constipation)
 - 564.00 (Unspecified)
 - 564.01 (Slow Transit)
 - 564.09 (Other)
- Two cohorts were created for comparison purposes:
 - Constipation (C) cohort. Employees with record of constipation-related diagnosis (ICD-9 codes listed above).
 - Non-constipation (NC) cohort. Employees with no record of constipation-related diagnoses. The NC cohort was defined as the "control" group.
- The index date in the C cohort was defined as the date of first diagnosis of constipation during 2001 or later as noted by ICD-9 code in the claims record.
- The average index date in the C cohort was assigned to the NC cohort.
- Employees with IBS (ICD-9 564.1) were removed from both cohorts.
- C and NC cohorts were compared over the six months following the employee's "index date."

- Employees from C and NC cohorts were required to be continuously employed and eligible for health benefits for at least six months after their index date.
- The following outcomes measures were compared between C and NC cohorts:
 - POS direct costs
 - POS direct medical costs: doctor's office; inpatient hospital; outpatient hospital or clinic; ED; laboratory; other
 - Prescription drug (Rx) costs.
 - Per member per month (PMPM) costs for each POS category.
 - Total direct costs: direct medical costs + Rx costs.

Statistical Analysis

- Employees in the C and NC cohorts were matched 1:24 using logistic regression and propensity scores for age, tenure (years with current employer), sex, marital status, race, exempt/nonexempt 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.
- All costs were adjusted to 2006 dollars.
- Significant differences in costs between C and NC cohorts were defined via *t*-tests at *P*<0.05.

RESULTS

- Data were available for 1,015 persons with constipation and 24,360 propensity-score matched non-constipation controls. (**Table 1**)

Table 1. Descriptive statistics of employees with constipation and without constipation.

Variable	C Cohort			NC Cohort			Comparison	
	N	Mean	Standard Error	N	Mean	Standard Error	Difference in Means	P-value for Difference
Age (at index date)	1,015	40.83	0.34	24,360	40.63	0.07	-0.02%	0.5415
Tenure (at index date)	1,015	7.47	0.23	24,360	7.45	0.04	0.2%	0.9166
Female	1,015	73.1%	1.4%	24,360	73.3%	0.3%	-0.1%	0.8917
Married	995	49.0%	1.6%	23,900	48.9%	0.3%	-0.1%	0.9303
White	1,015	56.7%	1.6%	24,360	57.4%	0.3%	0.6%	0.7033
Black	1,015	12.2%	1.0%	24,360	11.9%	0.2%	-0.3%	0.7729
Hispanic	1,015	15.8%	1.1%	24,360	15.7%	0.2%	-0.1%	0.9354
Exempt	1,015	36.7%	1.5%	24,360	37.0%	0.3%	0.3%	0.8672
Full Time	1,015	97.1%	0.5%	24,360	97.0%	0.1%	-0.1%	0.7868
Annual Salary	1,015	\$51,913	\$1,070	24,360	\$52,221	\$232	\$308	0.7782

- Following propensity score matching, both cohorts averaged 41 years, were predominately female (73%), and were predominantly full-time workers (97%). The majority of employees in both cohorts were white (57%).

SERVICE FOR PERSONS WITH CONSTIPATION: AN EMPLOYER PERSPECTIVE

Arthur K. Melkonian, MD¹, and Robert W. Baran, PharmD³

The JeSTARx Group, Newfoundland, NJ ³Takeda Global Research and Development, Deerfield, IL

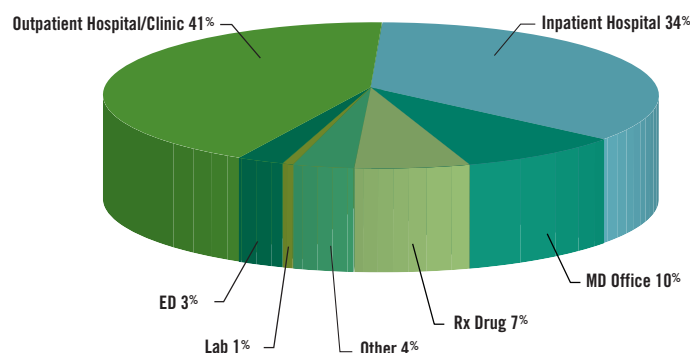
- Comparison of total direct PMPM costs showed many highly significant differences between employees with and without constipation. (**Table 2**)

Table 2. Direct PMPM cost of illness of constipation to employer

Cost Category	C Cohort		NC Cohort		Comparison	
	N	Mean Cost	N	Mean Cost	Difference	P-value
Doctor's Office	1,015	\$128	24,360	\$94	\$34	0.0003
Inpatient Hospital	1,015	\$228	24,360	\$106	\$122	0.0918
Outpatient Hospital or Clinic	1,015	\$264	24,360	\$118	\$145	< 0.0001
Emergency Department	1,015	\$17	24,360	\$7	\$10	< 0.0001
Laboratory	1,015	\$4	24,360	\$2	\$2	< 0.0001
Other	1,015	\$18	24,360	\$6	\$13	0.0960
Prescription Drug	1,015	\$98	24,360	\$75	\$23	< 0.0001
Total Direct PMPM	1,015	\$757	24,360	\$408	\$349	< 0.0001

- Outpatient hospital/clinic and inpatient hospital costs were numerically the largest drivers of total direct and total direct PMPM costs in the C cohort followed by doctor's office costs.
- Significant differences (all $P < 0.001$) between C and NC cohorts in direct PMPM medical costs by category were observed for:
 - Outpatient hospital/clinic (\$264 vs. \$118)
 - Doctor's office (\$128 vs. \$94)
 - Emergency Department (\$17 vs. \$7)
 - Laboratory (\$4 vs. \$2)
- Prescription drug costs also were significantly higher for the C cohort (\$98 vs. \$75, $P < 0.0001$).
- Findings for inpatient hospital (\$228 vs. \$106, $P = 0.092$) and other locations (\$18 vs. \$6, $P = 0.096$) were not significant.
- Constipation was associated with a statistically significant ($P < 0.0001$) incremental total direct PMPM cost of USD \$349 per employee (**Figure 1**):
 - Outpatient hospital/clinic accounted for 41%
 - Inpatient hospital for 34%
 - Doctor's office for 10%

Figure 1. Incremental cost of illness of constipation by point-of-service.



- Thus, hospital costs accounted for approximately three-quarters of incremental direct costs. Prescription drug represented 7% of the total direct incremental costs.

SUMMARY AND CONCLUSIONS

- Constipation is associated with substantial direct cost (burden) of illness, which can be a large financial liability to employers.
- Total direct PMPM costs are approximately 2 times higher in constipated subjects than in non-constipated controls.
- Individuals with constipation incur significantly higher total direct PMPM costs and higher costs across every point-of-service than those without constipation. Thus, individuals with constipation incur greater costs throughout the healthcare system.
- Outpatient hospital/clinic and inpatient hospital costs are the major drivers of incremental total direct costs, together accounting for 75% of the cost increment.
- Total direct medical costs (excluding Rx medications) contribute to 93% of total incremental costs in this study, suggesting an opportunity to manage the major cost driver with therapy.
- Constipation may be underreported in healthcare databases due to ICD-9 coding.
- These results indicate an opportunity for improved management of patients with constipation, which may result in reduced costs from an employer perspective.

REFERENCES

- Dennison C, Prasad M, Lloyd A, et al. The health-related quality-of-life and economic burden of constipation. *Pharmacoeconomics*. 2005;23:461-76.
- Martin BC, Barghout V, Cerulli A. Direct medical costs of constipation in the United States. *Manag Care Interface*. 2006 Dec;19(12):43-9.
- Brook RA, Kleinman NL, Melkonian AK, Baran RW. Cost of Illness for Constipation: Medical, Pharmacy, and Work Absence Costs in Employees With or Without Constipation. *Am J Gastroenterol*. Sep 2006; 101(suppl2):S408.
- Kleinman NL, Brook RA, Melkonian AK, Baran RW. Healthcare Cost Comparisons by Point of Service for Persons With or Without Constipation. The American College of Gastroenterology Annual Scientific Meeting. *Am J Gastroenterol*. Sep 2006; 101(suppl2):S408.
- Frank L, Schmier J, Kleinman L, et al. Time and economic cost of constipation care in nursing homes. *J Am Med Dir Assoc*. 2002;3:215-23.
- Cash B, Sullivan S, Barghout V. Total costs of IBS: employer and managed care perspective. *Am J Manag Care*. 2005;11:S7-16.
- Longstreth GF, Wilson A, Knight K, et al. Irritable bowel syndrome, healthcare use, and costs: a U.S. managed care perspective. *Am J Gastroenterol*. 2003;98:600-7.
- Leong SA, Barghout V, Birbaum HG, et al. The economic consequences of irritable bowel syndrome: a US employer perspective. *Arch Intern Med*. 2003;163:929-35.
- Singh G, Kahler K, Bharathi V, et al. Adults with chronic constipation have significant healthcare resource utilization and costs of care. *Am J Gastroenterol*. 2004;99:S227.
- Charlson ME, et al. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1967;40:373-83.