

# The Direct Economic Burden of Diverticulitis Recurrence Among Managed Care Enrollees

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## BACKGROUND

- As the United States (US) population ages and the number of elderly people increases, diverticulitis (DV) will become a larger problem with increasing morbidity, mortality, and cost burden to payers.<sup>1</sup>
- Because DV often requires intensive medical management, the direct cost of the disease per case to payers is high.<sup>2</sup>
- Although previous studies have demonstrated that DV is costly to payers, most research focused on total costs and acute episodes, while the burden of recurrent episodes has not been well documented.

## OBJECTIVE

- To assess the direct economic burden associated with DV recurrence among managed care enrollees with an initial acute DV episode.

## METHODS

### Study Design

- Retrospective analysis of administrative insurance claims data.

### Data Source

- Insurance claims from 40 managed care plans across the US were retrospectively analyzed (1/1/2005–12/31/2008).
- Data included longitudinal medical and pharmacy claims, patient demographic and enrollment information, and fully adjudicated billing information for each claim in the form of dollar amounts paid to providers by the health plans.

### Inclusion Criteria

- Patients had at least one claim with a primary diagnosis of colonic DV (ICD-9-CM diagnosis code 562.11 or 562.13) followed by immediate (within 3 days) antibiotic treatment.
  - First DV claim meeting above criterion defined the study index date.
  - The first 6 weeks postindex date defined the initial acute episode period.
- Patients had continuous plan enrollment for ≥ 6 months pre- and ≥ 12 months postindex date.

### Study Measures and Analytical Methods

- Within a given 6-week period following the initial acute episode, a recurrent episode was defined by the presence of a DV-related hospitalization or emergency room (ER) visit, or a DV-related office visit with antibiotic treatment within +/- 3 days of the visit.
  - Patients with a recurrence were stratified into those with and without a surgical intervention.
- DV-related resource use was defined by medical claims with a colonic DV diagnosis code or prescription claims for antibiotics, 5-aminosalicylates, opioid analgesics, corticosteroids, antilucer drugs, or prescription laxatives.
- DV-related resource utilization and costs (2009 US dollars) were aggregated over 12 months postindex date.

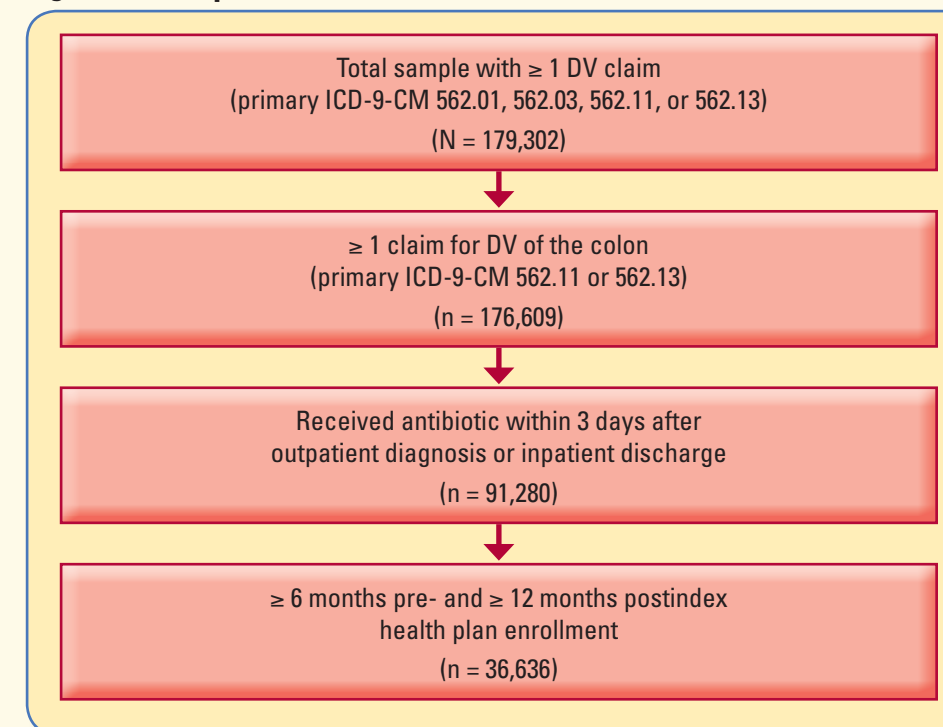
- Recurrence-related costs (2009 US dollars) were evaluated for 12 months postinitial acute episode.
- Cost data were adjusted to 2009 US dollars using the medical care component of the Consumer Price Index.
- Descriptive analyses entailed the tabular display of mean values, medians, ranges, and standard deviations (SDs) of continuous variables of interest (e.g., age) and frequency distributions for categorical variables (e.g., sex).
- Paired t-tests or nonparametric Wilcoxon tests (depending upon the distribution of the study measure) were used to compare univariate differences in continuous outcomes of interest, and McNemar's test was used for categorical measures of interest.
- Analyses were carried out using SAS (Version 9.2) statistical software.

## RESULTS

### Study Sample (Figure 1)

- After applying study inclusion and exclusion criteria, a total of 36,636 patients remained for analysis.

Figure 1. Sample Attrition



### Patient Characteristics (Table 1, Figures 2 and 3)

- 16.5% (n = 6,045) had at least one DV recurrence.
- Those with a recurrence were slightly more likely to have been initially diagnosed in an inpatient setting (Figure 2).
- Most recurrences happened with the first 6-week period after the initial episode (i.e., week 7 through 12 following conclusion of the initial episode) (Figure 3).
- Among those with a recurrence, nearly 50% had surgery; only approximately 4% of those without a recurrence had surgery.
- No differences in sex composition or CCI score were observed.
- A significantly greater proportion of those with recurrence had surgery, compared with those without recurrence.
- Among those with at least one recurrence, the mean number (SD) of recurrences was 1.3 (0.6).

Table 1. Patient Characteristics

	Overall (N = 36,636)		With Recurrence (n = 6,045)		Without Recurrence (n = 30,591)		P Value
	n	%	n	%	n	%	
<b>Age, years<sup>a</sup></b>							
Mean (SD)	52.78 (10.90)		52.41 (10.38)		52.86 (11.00)		0.0033
Median	53		53		53		
<b>Age distribution</b>							
< 35	1,843	5.03	270	4.47	1,573	5.14	
35-45	6,378	17.41	1,093	18.08	5,285	17.28	
46-55	11,917	32.53	2,103	34.79	9,814	32.08	< 0.0001
56-65	12,309	33.60	1,966	32.52	10,343	33.81	
65+	4,189	11.43	613	10.14	3,576	11.69	
<b>Sex</b>							
Male	18,858	51.47	3,166	52.37	15,692	51.30	0.1255
Female	17,778	48.53	2,879	47.63	14,899	48.70	
<b>Geographic region</b>							
Northeast	15,756	43.01	2,843	47.03	12,913	42.21	
South	11,586	31.62	1,770	29.28	9,816	32.09	
Midwest	5,894	16.09	952	15.75	4,942	16.16	< 0.0001
West	3,388	9.25	480	7.94	2,908	9.51	
National <sup>b</sup>	12	0.03	0	0	12	0.04	
<b>Follow-up duration, days</b>							
Mean (SD)	736.58 (256.39)		745.46 (259.42)		734.83 (255.75)		0.0032
Median	697.5		703.0		696.0		
Range	366-1,279		366-1,278		366-1,279		
<b>Setting of index DV diagnosis</b>							
Hospital	4,512	12.32	979	16.20	3,533	11.55	< 0.0001
ER	8,116	22.15	1,234	20.41	6,882	22.50	
Outpatient	24,008	65.53	3,832	63.39	20,176	65.95	
<b>Surgery</b>							
Yes	4,074	11.12	2,868	47.44	1,206	3.94	< 0.0001
No	32,562	88.88	3,177	52.56	29,385	96.06	
<b>CCI score<sup>c</sup></b>							
Mean (SD)	0.59 (1.26)		0.62 (1.24)		0.59 (1.26)		0.0790
Median	0		0		0		
Range	0-14		0-12		0-14		
<b>Baseline DV severity<sup>d</sup></b>							
Severe	19,609	53.60	4,967	82.17	14,642	47.86	< 0.0001
Mild/moderate	17,027	46.40	1,078	17.83	15,949	52.14	

CCI = Charlson Comorbidity Index.

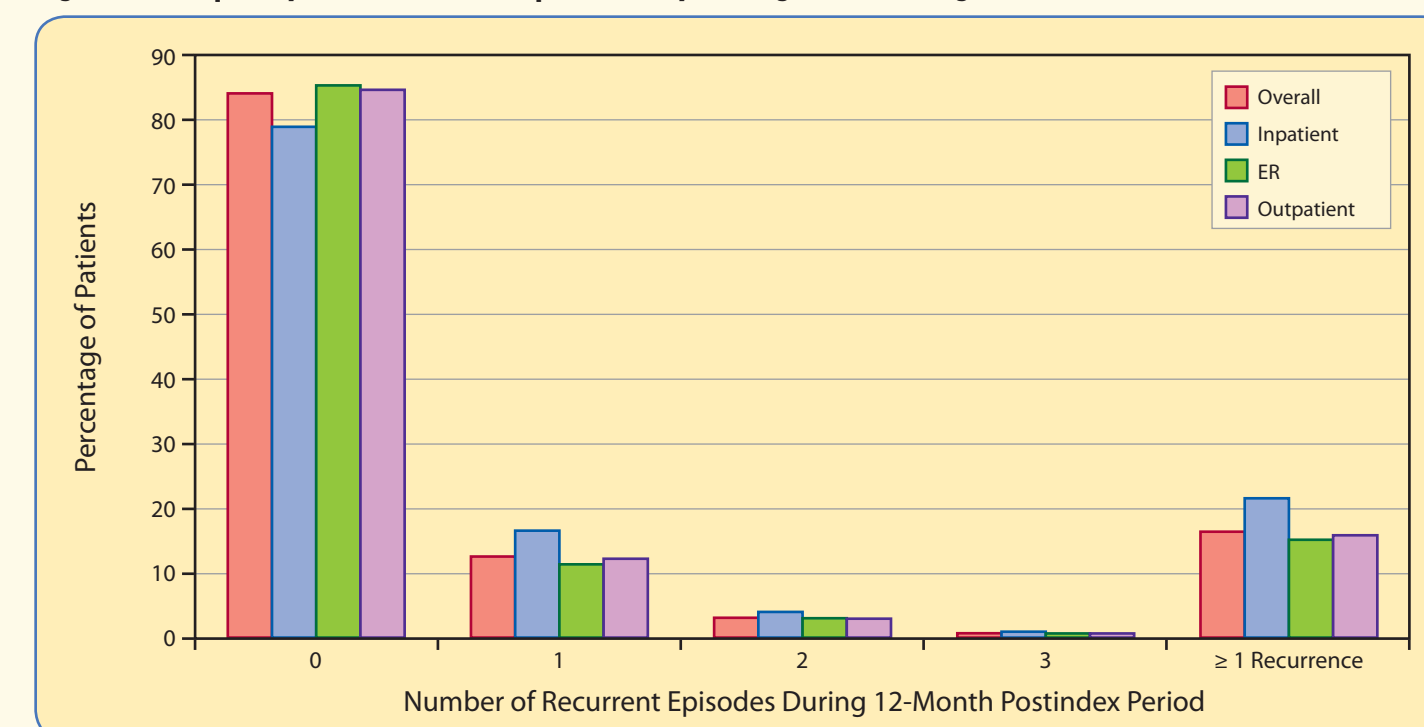
<sup>a</sup> Although DV typically does not occur in children, 12 patients under the age of 18 were identified as having DV (via diagnosis code). Accuracy of diagnoses or other coding could not be verified in the study database.

<sup>b</sup> To protect patient anonymity, some individuals in the study database who are at high risk of identification based on geographic region are assigned to a generic region category of "National."

<sup>c</sup> CCI based on diagnoses observed during the 6-month preindex period.

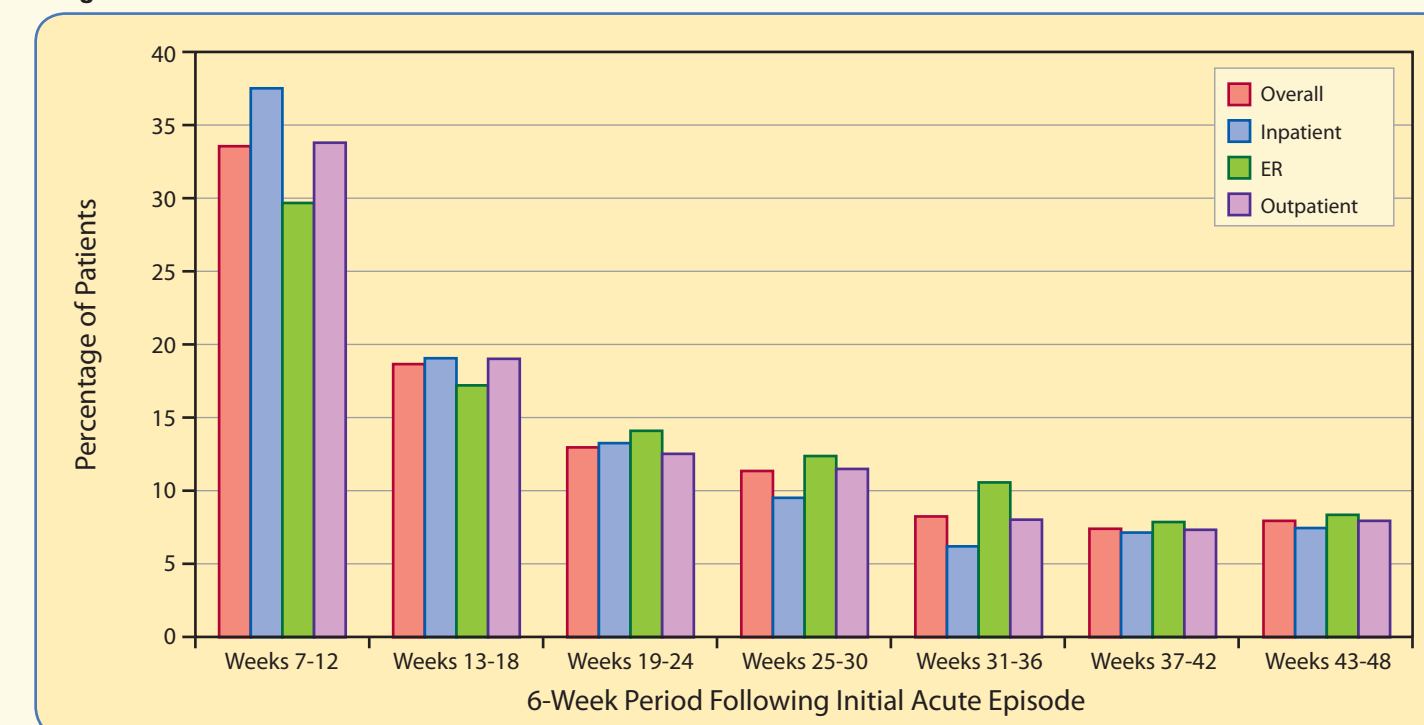
<sup>d</sup> Severe cases defined as patients with at least one DV-related hospitalization, ER visit, peritonitis diagnosis (ICD-9-CM 567.xx), or major surgery (colectomy, colectomy, or abscess drainage) within +/- 45 days of their DV index date. Mild/moderate cases defined by the residual group of patients not identified as having severe disease.

Figure 2. Frequency of Recurrent DV Episodes,<sup>a</sup> by Setting of Index Diagnosis



<sup>a</sup> Following the initial acute episode (weeks 0-6 postindex), we scanned each 6-week period thereafter for recurrences between week 7 and week 48 during the overall 12-month postindex period. Within a given 6-week period, a recurrent episode was defined by the presence of a DV-related hospitalization, ER visit, or DV-related office visit followed by immediate treatment with an antibiotic (± 3 days following the office visit).

Figure 3. Distribution of Time to First DV Recurrence Following Initial Acute Episode,<sup>a</sup> by Setting of Index Diagnosis



<sup>a</sup> Initial acute episode defined by first 6-week period following the index DV diagnosis (i.e., weeks 0-6). All data were generated only for patients with at least one recurrence.

### Cost Data (Table 2)

- Among all patients with a recurrence, the mean initial episode cost was almost \$5,000.
- The mean initial episode cost was approximately 2.6 times greater for those with surgery than those without (\$6,903 vs. \$2,648).
- The total cost of all recurrences was approximately four times the initial acute episode cost (\$12,806 vs. \$3,132).
- For the surgical plus recurrence group (n = 2,868), the difference between the total cost of all recurrences and initial acute episode cost was still approximately four times (\$24,247 vs. \$6,903).
- However, for the nonsurgical plus recurrence group (n = 3,177), the total cost of all recurrences was slightly less than initial acute episode costs (\$2,478 vs. \$2,648).
- Approximately one-third of those with surgery and a recurrence had a subsequent recurrence (1,058/2,868), a substantially greater proportion than in the nonsurgical group (434/3,177).
- The mean cost of the first recurrence was eight times greater for the surgical group than the nonsurgical group (\$16,856 vs. \$2,133).

Table 2. DV Episode and Non-Episode Costs (2009 \$) During 12-Month Postindex Period, Overall and by Surgery Status

Episode Costs <sup>a</sup>	Overall (N = 36,636)	With Surgery (n = 4,074)	Without Surgery (n = 32,562)
<b>Initial acute episode costs, \$</b>			
All patients (with or without recurrence)			
N	36,636	4,074	32,562
Mean (SD)	3,132 (6,019)	10,181 (14,031)	2,250 (3,025)
Patients with ≥ 1 recurrence			
n	6,045	2,868	3,177
Mean (SD)	4,667 (9,281)	6,903 (12,611)	2,648 (3,427)
Patients without a recurrence			
n	30,591	1,206	29,385
Mean (SD)	2,829 (5,081)	17,976 (14,163)	2,207 (2,975)
<b>Recurrent episode costs, \$</b>			
n (patients with ≥ 1 recurrence)	6,045	2,868	3,177
Total recurrent episode costs, mean (SD)	12,806 (17,453)	24,247 (19,034)	2,478 (5,267)
Cost per recurrent episode, mean (SD)	9,376 (10,761)	17,458 (10,223)	2,079 (3,710)
Cost of first recurrent episode, mean (SD)	9,119 (13,318)	16,856 (15,583)	2,133 (3,932)
n (patients with ≥ 2 recurrences)	1,492	1,058	434
Cost of subsequent recurrent episode(s), mean (SD)	11,775 (11,523)	15,764 (11,060)	2,052 (5,001)
<b>Total episode costs (acute + recurrence), \$</b>			
All patients (with or without recurrence)			
N	36,636	4,074	32,562
Mean (SD)	5,245 (11,258)	27,250 (22,180)	2,492 (3,591)
Patients with ≥ 1 recurrence			
n	6,045	2,868	3,177
Mean (SD)	17,472 (21,412)	31,150 (23,731)	5,126 (6,532)
Patients without a recurrence			
n	30,591	1,206	29,385
Mean (SD)	2,829 (5,081)	17,976 (14,163)	2,207 (2,975)
<b>Nonepisode costs, \$<sup>b</sup></b>			
All patients (with or without a recurrence)			
N	36,636	4,074	32,562
Mean (SD)	578 (1,275)	583 (1,128)	578 (1,292)
Patients with ≥ 1 recurrence			
n	6,045	2,868	3,177
Mean (SD)	(565) (1,325)	546 (928)	582 (1,601)
Patients without a recurrence			
n	30,591	1,206	29,385
Mean (SD)	581 (1,265)	673 (1,497)	577 (1,255)

<sup>a</sup> Includes DV-related costs incurred during a given 6-week period in which a recurrent event was observed (see footnote of Figure 2 for definition of recurrent events). Within such periods where the disease was assumed to be active, DV-related costs were defined as claims with an associated ICD-9-CM diagnosis code for DV of the colon (562.11 or 562.13) or prescription claims for a DV-related medication. DV-related hospital admissions were required to have the DV diagnosis code recorded as the primary discharge diagnosis, whereas nonhospital DV-related services were allowed to have DV recorded as a primary or nonprimary reason for the visit. DV-related prescriptions included antibiotics, opioid analgesics, corticosteroids, gastrointestinal and antilucer drugs, digestive aids, pulmonary drugs, and antidepressants.

<sup>b</sup> Includes DV-related office visits (for medical follow-up) and concomitant medications (pain medications, pulmonary drugs, gastrointestinal and antilucer drugs, and antidepressants) observed during a given 6-week period of inactive disease, where inactive disease is defined by no observation within the 6-week period of a DV-related hospitalization, ER visit, or antibiotic prescribed during a DV-related office visit.

## CONCLUSIONS

- Nearly 17% of DV patients experienced at least one recurrence.
- Costs associated with recurrent DV episodes are significant, with recurrences costing substantially more than initial acute episodes.
- Among those with a recurrence, there is significant variation in costs among those with and without surgical intervention.
- Interventions aimed at reducing the incidence of DV-related recurrences may lessen the economic burden placed on patients and society.

## LIMITATIONS

- Events of interest were identified based on diagnosis and procedure codes that, if recorded inaccurately, may cause misidentification of DV or related events (e.g., surgery, recurrence).
- The data used for this study are from privately insured patients, and as such, the results presented here may not be generalizable to other populations (e.g., Medicare-insured patients).

## REFERENCES

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