

Gastrointestinal Illness in Managed Care: Healthcare Utilization and Costs

Dorothy Lim, PharmD; Christina Farup, MD; Bryan J. Lawrence, PharmD; Levi Sorrell, PhD; Robert W. Dubois, MD, PhD; and Jerome B. Zeldis, MD, PhD

Abstract

Identification of inefficiencies is a first step to improving the quality of gastrointestinal (GI) care at the most reasonable cost. This analysis used administrative data to examine the healthcare utilization and associated costs of the management of GI illnesses in a 2.5 million-member private managed care plan containing many benefit designs. An overall incidence of 10% was found for GI conditions, with a preponderance in adults (patients older than 40 years) and women. The most frequently occurring conditions were abdominal pain, nonulcer peptic diseases, lower GI tract diseases, and other GI tract problems. These conditions, along with gallbladder/biliary tract disease, were also the most costly. Claims submitted for care during GI episodes averaged \$17 per member per month. Increasing severity of condition was associated with substantial increases in utilization and costs (except for medication use). For most GI conditions, approximately 40% of charges were for professional services (procedures, tests, and visits) and 40% of charges were for facility admissions. The prescription utilization analysis indicated areas where utilization patterns may not match accepted guidelines, such as the low use of anti-*Helicobacter pylori* therapy, the possible concomitant use of nonsteroidal anti-inflammatory drugs in patients with upper GI diseases, and the use of narcotics in treating patients with lower GI disease and abdominal pain. Also, there was no clear relationship between medication utilization and disease severity. Thus, this analysis indicated that GI disease is a significant economic burden to managed care, and identified usage patterns that potentially could be modified to improve quality of care.

(*Am J Man Care* 1997;3:1859-1872)

From Value Health Sciences, Santa Monica, CA (D.L. and R.W.D.), Outcomes Research, Janssen Research Foundation, Titusville, NJ (C.F. and B.J.L.), Outcomes Measurement, Johnson and Johnson Health Care Systems, New Brunswick, NJ (L.A.S.), and Medical Development, Janssen Research Foundation, Titusville, NJ (J.B.Z.).

Address correspondence to: Dorothy Lim, PharmD, Value Health Sciences, 2400 Broadway, Suite 100, Santa Monica, CA 90404. E-mail: dlim@vhsla.com.

Gastrointestinal (GI) diseases include a diverse variety of disorders of the upper and lower GI tract and associated organs, such as the liver and gallbladder. National data on the prevalence and incidence of GI diseases are limited, and estimates largely rely on self-reported information. For example, from the 1993 National Health Interview Survey it was estimated that "chronic indigestion" occurred in 24.6/1000 persons, while others have estimated chronic dyspepsia to affect 25% of persons.¹ The most comprehensive reference for national estimates of prevalence, incidence, and health services utilization associated with digestive diseases is a compilation of self-report and other National Center for Health Statistics survey data, largely from the mid-1980s. Acute and chronic GI diseases have been estimated to have a substantial impact on individuals and on the utilization of healthcare services in the United States, resulting in more than 200 million days of restricted activity, 50 million visits to physicians, 10 million hospitalizations, and 5 million procedures annually.² The annual cost of treating digestive diseases in the United States was estimated to be \$56 billion in 1985; adjusting for inflation, that figure would translate to a yearly cost of more than \$100 billion today.¹

In addition to GI disorders being associated with high costs and high morbidity, studies of healthcare utilization show marked variability in care patterns from one geographic region to another; these studies also show that a substantial amount of inappropriate care occurs for specific procedures.³⁻⁶ Other than differences in rates of reimbursement, variations in the expenditures for physician services have been associated with variations in the rates of hospital admissions and the proportion of primary care practitioners in an area.⁷

Besides the specific procedures cited in these studies, additional "drivers" that contribute to variation in the management of GI conditions are not well defined. The extent to which other procedures, specialists, hospitalizations, and medications contribute to

differences in practice patterns is unknown. What is known is that identification of current practice patterns and the potential inefficiencies in the delivery of care are the first steps to improving the quality of GI care at the most reasonable cost.

The objective of this analysis was, therefore, to examine healthcare utilization patterns and associated costs in the management of patients with GI conditions in a 2.5 million-member managed care organization. The analysis of healthcare utilization and costs allows determination of the specific conditions and/or practices where opportunities may exist for improvements in efficacy and quality of care.

... MATERIALS AND METHODS ...

Data Source and Patient Population

The data source consisted of claims data held in a proprietary health services research database. The database contains claims submitted for reimbursement and includes the following for each patient: demographic information, inpatient and outpatient diagnoses by International Code of Diseases-9-CM (ICD-9-CM) codes, inpatient and outpatient procedure information, charge information, outpatient drugs dispensed, and dates of service for drug and medical information. These data are arrayed in chronologic order to provide a longitudinal profile of medical and pharmacy services used by a patient. Because the purpose of this analysis was to review GI care patterns in a managed care environment, only claims data from a private benefit plan were selected. Geographically, the plan analyzed has a national representation, with the largest segments being the southeastern and central regions of the United States. Approximately 75% of eligible members were enrolled in commercial health maintenance organization and preferred provider organization contracts, while the remaining members were in Medicare, specialty, or administrative services only contracts.

From the dataset, enrollees with eligibility in calendar years 1993 or 1994, and with claims listing a GI-related ICD-9-CM code, were identified. Eligibility was not continuous. The ICD-9-CM codes included upper and lower GI tract diseases, including cancers, and GI-related symptoms, such as abdominal pain and nausea. The codes did not include diseases of the pancreas. Of the 2.5 million enrollees with eligibility, 248,766 patients were identified as having a GI-related claim. A random sample of 20% of these patients, or 50,000 patients, was selected from the dataset for analyses.

Analyses

The dataset of 50,000 patients was analyzed using proprietary network management and provider profiling software. Within the software, clinically similar ICD-9-CM diagnosis codes were aggregated into approximately 200 conditions; each of the more than 15,000 diagnosis codes are assigned to only one condition. For example, all ICD-9-CM codes for gastric, duodenal, or peptic ulcer (acute or chronic, with and without hemorrhage, and with or without perforation) are aggregated into the condition of "peptic ulcer." Conditions are assigned an episode duration to define discrete periods of time during which the majority of utilization for a condition is expected to occur. A patient who continues to utilize healthcare resources beyond the end of a defined episode may have multiple episodes identified. Current Procedural Terminology-4 (CPT-4) codes are aggregated to service sets, which, in turn, are assigned to relevant conditions. For example, the large number of CPT-4 codes for endoscopic procedures of the esophagus (eg, esophagoscopy or upper GI endoscopy) are aggregated into the service set of "UGI endoscopy." This service set is assigned to conditions such as peptic ulcer, nonulcer peptic disease, abdominal pain, and GI tract hemorrhage, since an UGI endoscopy performed during an episode of these conditions would reasonably be attributed to the condition. National Drug Codes (NDC) are categorized into medication classes, which, in turn, are assigned to relevant conditions. For example, all NDC codes for cimetidine, famotidine, nizatidine, and ranitidine are aggregated into the medication class of histamine H₂-receptor antagonists. This medication class is assigned to conditions such as peptic ulcer and nonulcer peptic disease.

The software also uses algorithms to assign condition severity. The severity measure is primarily based on diagnostic information and comorbid conditions, and with the exception of inpatient hospitalizations, does not rely on the level of utilization of healthcare services. For example, the severity level of peptic ulcer disease is increased by the presence of hemorrhage or perforation and by hospitalization. The system also has algorithms that determine the physician's likely practice specialty (ie, imputed specialty). The system analyzes the age and sex distribution of a physician's patients in conjunction with the mix of conditions and procedures/tests performed by the physician. The results of this analysis are matched to the characteristic "fingerprint" of a specialty to impute the specialty of the physician. Lastly, duplicate claims were rebundled.

After summarizing the data through the software, total healthcare utilization for the 50,000 patients was determined. Nine primary GI conditions (peptic ulcer disease, nonulcer peptic disease, lower GI tract disease, abdominal pain, hepatitis, liver disease, gallbladder and biliary tract disease, GI tract hemorrhage, and other GI tract problems) (see Table 1) were then reviewed in depth for patterns in patient demographics and utilization of specific services, procedures, medications, and specialists. Practice patterns for GI cancers were not analyzed in depth for this report.

Because one objective of the analysis was to determine the total impact of GI conditions on the managed care organization over the 2-year period, all claims were included for estimating total costs associated with GI care. However, for determining utilization associated with an average episode of a specific GI condition, only claims from "closed" or completed episodes were used. Some conditions, such as peptic ulcer disease and nonulcer peptic disease, were assigned episode durations of 3 months, while other conditions, such as colorectal cancer, were analyzed in episodes of 10 months' duration. The purpose of such rules is to create comparable episodes of care in which relevant utilization should be captured for the majority of patients with the condition, thereby allowing comparisons of practice patterns among

Table 1. Gastrointestinal (GI) Diagnoses Used for Patient Selection and Condition Classification

Condition Groups
<p>Peptic Ulcer Disease: Ulcer of esophagus Gastric ulcer; acute, chronic, or not specified; with or without hemorrhage, perforation, or obstruction Duodenal ulcer; acute, chronic, or not specified; with or without hemorrhage, perforation, or obstruction Peptic ulcer; acute, chronic, or not specified; with or without hemorrhage, perforation, or obstruction Gastrojejunal ulcer; acute, chronic, or not specified; with or without hemorrhage, perforation, or obstruction</p>
<p>Nonulcer Peptic Disease: Diseases of the esophagus (includes esophagitis, reflux esophagitis, esophageal reflux) Gastritis or duodenitis Disorders of function of the stomach Heartburn</p>
<p>Lower GI Tract Disease: Regional enteritis, including Crohn's Disease Ulcerative colitis Diverticula of the intestine Functional digestive disorders, not elsewhere classified (includes constipation, irritable colon, functional diarrhea)</p>
<p>Abdominal Pain Abdominal pain</p>
<p>Hepatitis: Viral hepatitis (includes Hepatitis A, Hepatitis B, Hepatitis C; with or without coma) Hepatitis in Viral Disease Acute alcoholic hepatitis Chronic hepatitis Hepatitis not otherwise specified</p>
<p>Liver Disease: Acute necrosis of the liver Chronic liver disorder/cirrhosis Abscess of the liver Other liver disorders Hepatomegaly</p>
<p>Gallbladder/Biliary Tract Disease: Cholelithiasis; with or without cholecystitis; with or without obstruction Choledocholithiasis; with or without cholecystitis; with or without obstruction Other disorders of the gallbladder Other diseases of the biliary tract</p>
<p>GI Tract Hemorrhage: Gastrointestinal hemorrhage</p>
<p>Other GI Tract Problems: Acute appendicitis Other appendicitis Other diseases of appendix Gastroparesis Chronic duodenal ileus Intestinal obstruction Other disorders of the stomach and duodenum Intestinal abscess, ulceration, or perforation GI system symptoms (includes nausea, vomiting, and dysphagia)</p>

providers caring for similar patients. "Open" episodes are those that have not completed the pre-defined time period and therefore may have only captured a portion of utilization. Open episodes were excluded from determining average utilization and costs for a condition.

Claims data were also subjected to rebundling rules for charges. An example of a scenario in which claims would be rebundled is one in which separate claims for both an office visit and an endoscopy are submitted by the same provider for the same date of service. Because the visit is inherently associated with the endoscopy procedure, the claims would be rebundled into a modified single charge, which is less than the sum of the costs for the two unbundled services.

The provider listed on the first professional or facility claim with the earliest date of service for a given episode is considered to be the provider initiating the episode. A provider's medical specialty was imputed from clinical rules applied to practice patterns of the providers. When a given provider did not submit sufficient claims to impute a specialty (ie, there was not enough information about a provider's practice), the provider was classified as "other."

Outpatient medication claims linked to episodes included medications used to treat the condition as well as medications commonly used to treat complications or comorbidities associated with the condition, those used to treat side effects of commonly used therapies, and those used for diagnostic procedures or prophylactic treatments.

... HEALTHCARE UTILIZATION AND COSTS ...

Demographic Distribution

The demographics of the patient population included in the analyzed dataset are presented in Table 2. For all examined categories and divisions, the demographics for the study population were within one percentage point of those for the entire GI population of 248,766 patients. These 248,766 patients were identified from a population of 2.5 million enrollees. Thus, approximately 10% of all enrollees had at least one claim for a GI condition during the 2-year observation period.

As indicated in Table 2, almost 60% of patients with GI conditions were between the ages of 40 and 79 years. When comparing the distribution of patients identified with GI conditions against the total enrollee population, it was seen that GI conditions begin to occur at a disproportionately higher rate at an age older than 50 years. The preponderance of gallbladder diseases, abdominal pain, and lower GI tract conditions occurred in women.

Overall Incidence and Costs

The claims submitted to the healthcare organization for the GI conditions analyzed, excluding cancers, totaled \$152 million for the 50,000 enrollees. Adjusting for enrollment variations and the total enrollee population, the total claims submitted potentially would account for an expenditure of \$17 per member per month by the health plan (not including reduction of reimbursement for contracted discounts or other adjustments).

The most frequently occurring conditions were abdominal pain, nonulcer peptic diseases, lower GI tract disease, and other GI tract problems (Figure 1). These conditions, along with gallbladder/biliary tract disease, were also the most costly. Gallbladder/biliary tract disease was costly because of higher average costs per episode (Figure 2). In contrast, the other most costly GI conditions had lower average costs per episode but were associated with high overall charges because of the high frequency of occurrence. The most frequent diseases for each primary GI condition are listed in Table 3.

For most GI conditions, approximately 40% of charges were for professional services (procedures, tests, and visits) and 40% of charges were for facility admissions (Figure 2). The remaining charges were distributed between the nonadmission facility and pharmacy.

Table 2. Patient Demographics of the Dataset of 50,000 Patients with Gastrointestinal Conditions*

Age Interval (y)	Total (% of total)	Female (%)
<19	4,979 (10)	55
20-29	3,686 (7)	70
30-39	6,224 (12)	63
40-49	6,863 (14)	60
50-59	5,386 (11)	55
60-69	6,698 (13)	53
70-79	10,317 (21)	57
≥80	5,847 (12)	60

*Includes both the nine primary conditions analyzed in detail in the present report and nonprimary conditions (eg, GI neoplasms)

Variables in the Healthcare Utilization and Costs of Gastrointestinal Conditions

Severity of Condition. For most of the GI conditions, approximately two thirds of episodes were categorized as being of usual severity (Table 4). However, for peptic ulcer disease, liver disease, and GI tract hemorrhage, a smaller proportion of episodes were of usual severity and a larger proportion was of moderate severity.

Charges by category were further stratified by episode severity. In general, for most GI condi-

Figure 1. Frequency and Total Cost of Gastrointestinal (GI) Conditions

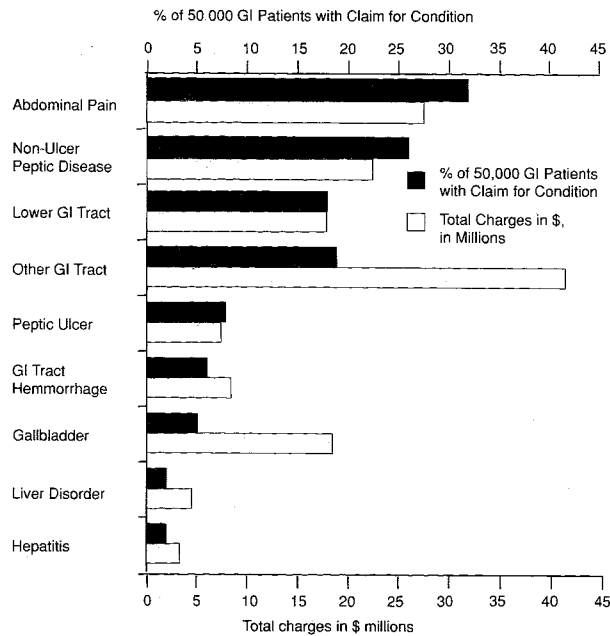
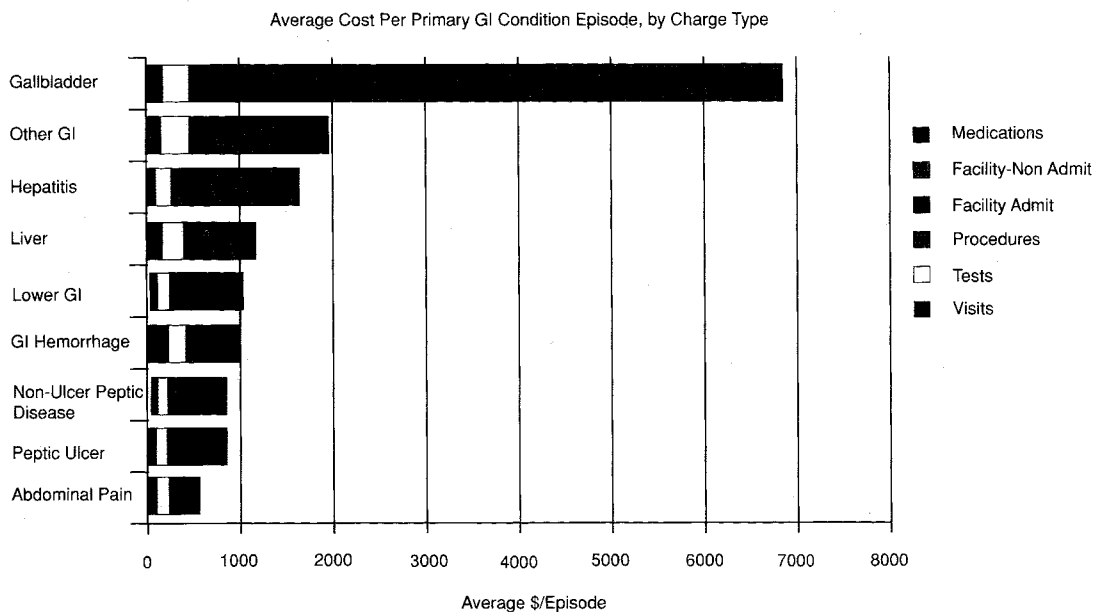


Figure 2. Average Cost per Gastrointestinal (GI) Condition Episode, by Charge Type



Professional charges, which included procedures, tests, and visits, are indicated by hatching. Because only 27% of enrollees had prescription benefits, the costs for prescription charges are under-represented.

tions, the use of services increased as the severity of episodes increased. However, this trend was less evident for medication use than for professional services charges and facility admissions charges. The example of peptic ulcer disease is illustrated in Figure 3. An exception to this trend was seen with hepatitis and with gallbladder/biliary tract disease, in which utilization appeared to be higher in moderate severity disease than in high severity disease.

Professional Services Utilized

Number of Providers. The use of providers was remarkably consistent across all conditions except for gallbladder/biliary tract disease. For the majority of conditions, most (51% to 72%) condition episodes were initially identified by a primary care provider and approximately 20% to 35% of episodes were initially identified by a specialist. A provider classification was not discernible from the data in 11% to 17% of condition episodes.

Overall, approximately 40% of condition episodes were linked to only one provider. Patients utilizing more than one provider per episode averaged 3 to 3.5 providers per episode. Use of more than one provider resulted in an increase in the average professional charges per episode by a factor of 4 to 8, from a range of \$77 to \$205 with one provider, to a range of \$436 to \$1,075 with more than one provider. The pattern of provider use was not further analyzed to determine if use of multiple providers reflected specialist referral, availability of the same primary care physician on subsequent visits, or "doctor shopping." Gallbladder/biliary tract disease was an exception to this pattern of provider usage, with more condition episodes initially identified by specialists (40%), fewer episodes linked to only one provider (19%), more providers per episode (mean of 4.2 when more than one provider was used), and higher average professional charges (\$269 per episode for those with one provider; \$2,385 per episode for those with more than one provider).

Use of Primary Care Providers Versus Specialists. Among primary care pro-

Table 3. Gastrointestinal (GI) Conditions and Most Frequent Subgroups or Codes Encountered

Condition Groups	Disease Subgroup or ICD-9-CM Code
Peptic Ulcer Disease	Peptic ulcer, acute or not specified Gastric ulcer, acute or not specified Duodenal ulcer, acute or not specified
Nonulcer Peptic Disease	Gastritis or duodenitis Esophagitis Diseases of the esophagus
Lower GI Tract Disease	Diverticula or polyps of the intestine Irritable colon Constipation Regional enteritis, including Crohn's disease Ulcerative colitis Functional digestive disorder*
Abdominal Pain	Abdominal pain
Hepatitis	Chronic Viral hepatitis (Hepatitis A, Hepatitis B, Hepatitis C)
Liver Disease	Liver disorder, not elsewhere classified Liver disorder, nonspecific symptoms Cirrhosis of the liver Hepatomegaly Alcoholic cirrhosis Acute necrosis of liver
Gallbladder/Biliary Tract Disease	Cholelithiasis with other cholecystitis without obstruction Choledocholithiasis without cholecystitis without obstruction Cholelithiasis with acute cholecystitis without obstruction
GI Tract Hemorrhage	GI hemorrhage Blood in stool
Other GI Tract Problems	GI system symptoms Gastroparesis Acute appendicitis

ICD-9-CM = International Classification of Diseases-9-CM.

*No further classification

viders, adult internal medicine providers were the most common (30% to 54% of episodes), followed by family practice practitioners (13% to 21%). Emergency medicine providers also were utilized, most frequently (and more frequently than family practice practitioners) for abdominal pain (21%), gallbladder/biliary tract disease (16%), GI tract hemorrhage (25%), and other GI tract problems (23%).

Radiologists, gastroenterologists, and pathologists were the most frequently consulted specialists, which is consistent with the use of radiology services (eg, x-rays, magnetic resonance imaging [MRI], and echography studies) and GI procedures (eg, endoscopy with tissue biopsy). Although surgeons were involved in less than 5% of most condition episodes, they were involved in 40% of episodes of gallbladder/biliary tract disease. Use of any of the specialties increased the cost per episode. As expected, involvement of a surgeon or anesthesiologist was associated with the highest average cost per episode (approximately \$1000 to \$3000 per episode).

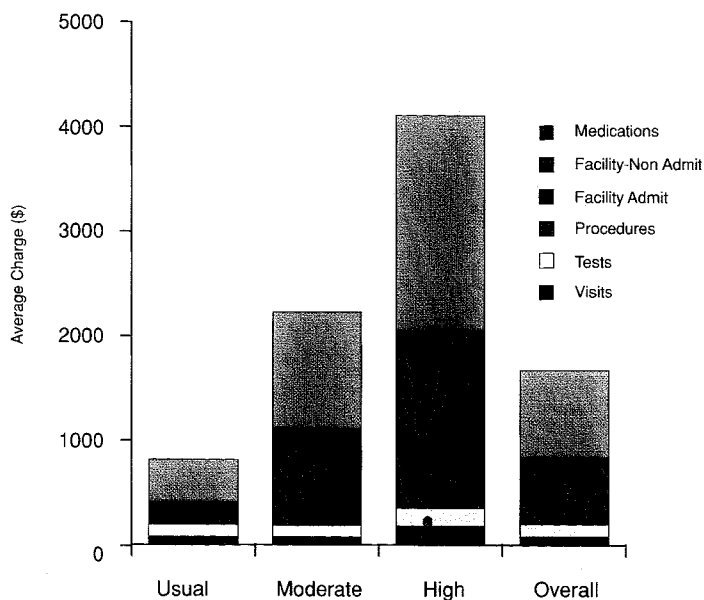
Use of Services. Across all conditions, provider visits (either in an office or in a hospital/facility setting) were the most frequently used "service." As expected, conditions such as peptic ulcer disease, nonulcer peptic disease, and lower GI tract disease more frequently involved office-based services, while conditions such as GI tract hemorrhage and gallbladder/biliary tract disease involved a higher proportion of hospital-based services. Use of emergency

Table 4. Severity of Episodes and Inpatient Admissions

Diagnosis Category	Percentage of Episodes			Inpatient Admission
	Severity Category			
	Usual	Moderate	High	
Peptic Ulcer Disease	46	49	5	3
Nonulcer Peptic Disease	84	8	9	2
Lower GI Tract Disease	65	22	13	2
Abdominal Pain	71	25	4	1
Hepatitis	58	29	13	5
Liver Disease	43	47	10	3
Gallbladder/Biliary Tract Disease	75	17	8	13
GI Tract Hemorrhage	23	71	6	2
Other GI Tract Problems	72	25	3	5

GI = gastrointestinal.

Figure 3. Average Charge per Episode by Severity: Peptic Ulcer Disease



department services ranged from less than 6% of episodes for peptic ulcer, nonulcer peptic disease, and lower GI tract disease, to 21% to 22% of episodes of abdominal pain, GI tract hemorrhage, and other GI tract problems.

In terms of diagnostic-type services provided, patients frequently received clinical laboratory tests (urine and blood). Chest x-rays and electrocardiograms were also commonly utilized, presumably for differential diagnosis. The GI-specific services rendered were consistent with the condition being treated. For example, upper GI endoscopy (and surgical pathology) was associated with 13% to 16% of episodes of upper GI diseases, while colonoscopy (and surgical pathology) was utilized in 14% of episodes of lower GI diseases. Of the upper GI episodes where an upper GI endoscopy was performed, 20% to 25% of episodes were associated with two endoscopies and 10% were associated with more than two endoscopies. Of the lower GI episodes where a colonoscopy was performed, 20% were associated with two colonoscopies and 7% were associated with more than two colonoscopies. Additional procedures seen more than occasionally included abdominal x-rays ($\leq 25\%$ of episodes), abdominal echography studies (34% of gall-

bladder/biliary tract disease episodes and $\leq 15\%$ of episodes of other conditions), and computerized tomography/MRI studies of the abdomen ($< 15\%$ of episodes). Gallbladder/ biliary tract disease was associated with laparoscopic cholecystectomy in 38% of episodes and open cholecystectomy in 12% of episodes.

Facility Utilization. Facility claims are submitted by sites such as hospitals, hospital-based clinics, and outpatient surgery centers. Facility utilization may involve hospitalization or nonadmission utilization, such as use of the emergency department, an endoscopy suite, or radiology facilities. Facility admissions were relatively infrequent, resulting in low admission charges per patient when considering the entire patient population. However, when looking at the charges per patient admitted, the average charges were substantial (Table 5). For example, for peptic ulcer disease, the average charge for professional fees, which would include office visits and most procedures, was \$353 per episode. If procedures involved use of a facility (such as an endoscopy or an MRI), the average episode cost increased by an additional \$2,108, for a total of \$2,461 per episode. Although relatively few peptic ulcer patients (less than 3%) are admitted to the

Table 5. Comparison of Average Charges Per Episode

GI Condition	Average Charge/Episode (total number of episodes)		
	Professional Charges*	Nonadmission Charges [†]	Admissions Charges [‡]
Peptic Ulcer Disease	\$353 (N=3,855)	\$2,108 (N=265)	\$10,981 (N=102)
Nonulcer Peptic Disease	\$297 (N=12,968)	\$2,047 (N=1,696)	\$10,654 (N=236)
Lower GI Tract Disease	\$389 (N=9,202)	\$1,557 (N=972)	\$18,496 (N=206)
Abdominal Pain	\$307 (N=20,127)	\$1,527 (N=2,624)	\$7,570 (N=100)
Hepatitis	\$317 (N=1,101)	\$2,357 (N=109)	\$21,002 (N=56)
Liver Disease	\$549 (N=1,253)	\$2,826 (N=96)	\$14,664 (N=32)
Gallbladder/Biliary Tract	\$1,974 (N=2,200)	\$9,259 (N=579)	\$18,366 (N=292)
GI Tract Hemorrhage	\$726 (N=3,548)	\$1,520 (N=202)	\$10,686 (N=58)
Other GI Tract Problems	\$865 (N=3,827)	\$1,664 (N=439)	\$16,846 (N=205)

*For episodes using no facilities other than office visits and most procedures.

[†]For episodes using facilities such as an emergency department, an endoscopy suite, or radiology facilities.

[‡]For episodes involving hospitalization (includes room and board).

hospital, the charges associated with the admission alone average an additional \$10,981 per patient admitted.

The population of patients with GI conditions analyzed in this study had a number of concomitant conditions, such as cardiovascular and cerebrovascular conditions, pulmonary diseases, and diabetes, which led to proportionately more admissions than those based on GI condition alone (Table 6). However, the non-GI data for the analyzed population may not necessarily be the same as for the entire population.

Prescription Utilization. Pharmacy utilization was analyzed for peptic ulcer disease, nonulcer peptic disease, lower GI tract disease, abdominal pain, hepatitis, and liver disease. Outpatient drug utilization for gallbladder/biliary tract disease, GI tract hemorrhage, or other GI tract problems was not analyzed.

Approximately 27% of enrollees in the health plan had outpatient prescription coverage included in their benefits in 1993 and 1994, and therefore only these enrollees would have had pharmacy claims data available for analysis. Within most drug classes, there was little variation detected in the use of medications according to severity of condition. For example, there was little difference in the percentage of episodes and costs per episode associated with the use of histamine H₂-receptor antagonists across conditions of increasing severity, for either peptic ulcer disease (usual severity: 74% of episodes, \$99/episode; moderate severity: 69% of episodes, \$86/episode; and high severity: 62% of episodes, \$80/episode) or for nonpeptic ulcer disease (usual severity: 60% of episodes, \$69/episode; moderate severity: 53% of episodes, \$69/episode; and high severity: 61% of episodes, \$74/episode). The average number of providers linked to a prescription of a specific medication or medication class during an episode was often slightly greater than one, indicating that some patients were receiving medications from more than one provider.

Across the majority of conditions, the most frequently prescribed medication class was the histamine H₂-receptor antagonists. They were used in approximately 60% to 70% of episodes of peptic ulcer disease and nonulcer peptic disease where medication was prescribed. Histamine H₂-receptor antagonists were also used in approximately 40% of episodes of abdominal pain, hepatitis, and liver disease where medication was prescribed. For peptic ulcer disease, other frequently used medications included proton pump inhibitors (19% of medication

episodes) and nonsteroidal anti-inflammatory drugs (NSAIDs; 16% of medication episodes). Anti-*Helicobacter pylori* medications (eg, metronidazole, amoxicillin, tetracycline, and clarithromycin) were used in less than 10% of episodes where medication was prescribed. Other frequently prescribed medications in nonulcer peptic disease included anxiolytics, calcium channel blockers, proton pump inhibitors, and NSAIDs. Further analysis of prescription use patterns for peptic ulcer and nonulcer peptic conditions revealed that a histamine H₂-receptor antagonist alone is used in approximately 50% of

Table 6. Hospitalizations for Various Conditions Among Patients Selected for Having a Gastrointestinal (GI) Condition

Condition	Percentage of Episodes With an Admission
Other Hematologic Disease	40.70
Colorectal Cancer	35.94
Diabetes	28.72
Ischemic Heart Disease/Angina	20.11
Thyroid Disease	15.00
Cerebrovascular Disease	14.05
Gallbladder/Biliary Disease	13.27
Conduction/Rhythm Problem	12.66
Other Heart Disease	11.51
Benign Neoplasms	10.92
Congestive Heart Failure	10.16
Hypertension	8.76
Other GI Tract Problems	5.38
Hepatitis	5.09
Seizure Disorder	5.08
COPD, Bronchitis, Emphysema	5.03
Lower Respiratory Tract Infections	3.34
Asthma	3.07
Peptic Ulcer	2.65
Rheumatoid Arthritis	2.34
Lower GI Tract Disease	2.24
Nonulcer Peptic Disease	1.82
Urinary Tract Infection	1.06
Abdominal Pain	0.50
Upper Respiratory Infections	0.14

COPD = chronic obstructive pulmonary disease.

episodes, a proton pump inhibitor alone in 8%, a cytoprotectant alone in less than 2%, and (for nonulcer peptic disease) a motility agent alone in less than 2%

of episodes. Two or more of these medications prescribed, either in combination or sequentially, were used in 35% to 50% of episodes of peptic ulcer and nonulcer peptic disease.

Table 7. Outpatient Pharmacy Utilization for Selected Medications

Condition*	% of Total Prescriptions	% of Total Prescription Charges	Average Charge/Prescription (\$)
Peptic Ulcer Disease			
H ₂ -blockers	36	53	64
PPIs (eg, omeprazole)	9	21	102
NSAIDs	5	5	63
Nonulcer Peptic Disease			
H ₂ -blockers	26	44	64
PPIs (eg, omeprazole)	7	19	99
Calcium channel blockers	11	10	33
Benzodiazepines	10	4	14
NSAIDs	6	6	34
Lower GI Tract Disease			
Systemic antibiotics	14	21	32
Anxiolytics	12	9	15
Antidepressant-SSRI	3	10	62
Antispasmodics	11	4	13
Anti-inflammatory:			
Mesalamine	3	10	69
Rectal steroids	1	2	28
Sulfasalazine	3	2	14
Oral steroids	4	1	7
Abdominal Pain			
H ₂ -blockers	19	41	60
PPI	4	15	94
NSAIDs	8	9	31
Hepatitis			
H ₂ -blocker	21	37	58
PPI	3	14	131
Interferon	3	18	213
Corticosteroids	11	3	8
Diuretics and K ⁺ supplements			
Loop diuretics	14	2	6
K ⁺ supplements	13	4	9
K ⁺ -sparing diuretics	8	2	10
Liver Disease			
H ₂ -blockers	15	33	69
PPI	3	10	108
Lactulose	10	13	41
Diuretics and K ⁺ supplements			
K ⁺ -sparing diuretics	20	16	26
Loop diuretics	14	4	8
K ⁺ supplements	9	2	9

*Pharmacy utilization was not analyzed for gallbladder/biliary tract disease, GI tract hemorrhage, and other GI tract disease.
H₂-blockers = H₂-histamine; H₂ = receptor antagonists; PPI = proton pump inhibitor; NSAIDs = nonsteroidal anti-inflammatory drugs; SSRI = selective serotonin receptor inhibitor; K⁺ = potassium.

For lower GI tract disease, the most frequently used medications were systemic antibiotics (53% of medication-associated episodes), narcotic analgesics (28% of episodes), antispasmodics and anxiolytics (26% of episodes, each), and anti-inflammatory drugs (20% of episodes). Frequently used medications in abdominal pain included analgesics (NSAIDs, 15%; codeine, 22%; and propoxyphene, 15% [of medication-associated episodes]) and antispasmodics (18% of medication-associated episodes). Corticosteroids were used in approximately 20% of associated episodes of hepatitis where medication was prescribed, and lactulose was used in approximately 20% of medication-associated episodes of liver disease; diuretics and/or potassium supplementation were also used frequently in the latter conditions.

Of patients having pharmacy claims, the highest average medication cost per episode was associated with prescriptions for proton pump inhibitors (for those with peptic ulcer disease, nonulcer peptic disease, or abdominal pain), and rectal corticosteroids (for those with lower GI tract disease).

For selected medications, the percentage of total prescriptions, percentage of total prescription charges, and average charge per prescription are presented in Table 7. Although proton pump inhibitors accounted for only 9% and 7%, respectively, of prescriptions for peptic ulcer disease and nonulcer peptic disease, they accounted for 21% and 19%, respectively, of prescription charges. Other costly medications, such as H₂RAs, interferons, and antidepressants also display a similar disproportionate cost-to-utilization ratio.

Further analysis defined the patterns of utilization of specific procedures (upper GI endoscopy or upper GI contrast study) and specific medications

(histamine H₂-receptor antagonists, proton pump inhibitors, or cytoprotectants) for peptic ulcer and for nonulcer peptic disease (Table 8).

... DISCUSSION ...

This analysis examined healthcare utilization patterns and associated costs in the management of patients with GI conditions. Specifically, an attempt was made to answer questions regarding the incidence and costs associated with GI conditions in a managed care population and to identify "drivers" of practice variation, including use of specialists, procedures, hospitalization, and medications. The similarity in demographics between the entire GI population of 248,766 patients and the dataset of 50,000 patients supports the validity of the dataset as a representative sample.

The major impact of GI conditions on healthcare utilization is evidenced by the occurrence of claims from approximately 10% of all 2.5 million enrollees in this managed care organization during the 2-year observation period. Furthermore, charges billed to the healthcare organization of \$17 per member per month (excluding charges related to pancreatic and cancer diseases) are not insignificant for GI conditions.

The preponderance of GI conditions in patients between the ages of 40 and 79 years illustrates the increase in incidence of GI conditions with increasing age, as noted previously.² Similarly, the high frequency of gallbladder diseases occurring in women has also been noted previously.² In addition, a high incidence of abdominal pain and lower GI tract conditions occurred in women, which might possibly reflect crossover of symptoms with gynecologic problems.

The GI conditions having the greatest impact on healthcare utilization and costs were abdominal pain, nonulcer peptic disease, lower GI tract disease, and other GI tract problems (high costs via high incidence, despite a low cost per episode), and gallbladder/biliary tract disease (high costs via high cost per episode, despite a low incidence). The per episode cost of the latter condition was high presumably because of frequent use of surgical procedures and inpatient care. Although admissions were associated with less than 3% of episodes in most conditions, the charges associated with admissions were high (approximately 40% of total

charges for most conditions). Thus, admission is associated with disproportionately greater costs.

Not surprisingly, the use of services generally increased as the severity of episodes increased. However, we were surprised to find little relationship between the cost of medication and disease severity. This observation may indicate that outpatient therapy for this population does not significantly change. For example, a patient with moderately severe peptic ulcer disease requiring hospitalization will possibly receive the same outpatient drug regimen as a patient with a peptic ulcer of usual severity, resulting in no detectable difference in outpatient medication utilization. Overall, medication treatment constituted a relatively small proportion of costs, even after adjusting for pharmacy benefits.

Another observation warranting further examination is the proportion of patients undergoing a procedure, such as endoscopy or colonoscopy, who had two or more of the same procedures performed during the episode. Whether repeat procedures are used to assess efficacy of treatment or to re-evaluate a patient not responding to therapy cannot be ascertained from claims data.

In contrast to most conditions, the average number of services and the average cost per episode associated with moderately severe hepatitis and gallbladder/biliary tract disease were higher than those of highly severe disease. This appears to be due to the fact that the majority of hospitalizations occurred in episodes categorized as moderate severity, and inpatient admissions are a major cost driver. Factors that would cause episodes to be clinically categorized as high severity disease, such as hepatic coma, may add a disproportionately smaller cost

Table 8. Specific Procedure Versus Specific Medication Use Patterns for Peptic Ulcer Disease and Nonulcer Peptic Disease

Order of Service	Peptic Ulcer Disease (n = 192)*	Nonulcer Peptic Disease (n = 598)*
Medication filled first	72 episodes (36%)	260 episodes (43%)
Procedure performed first	100 episodes (52%)	250 episodes (42%)
Medication and procedure on same date	20 episodes (10%)	88 episodes (15%)

*Total number of episodes for which both a procedure (upper gastrointestinal endoscopy or contrast study) and medication (H₂ histamine, H₂-receptor antagonist, omeprazole, sucralfate, or cisapride) were recorded.

increment to the episode. For example, the cost of supportive care, as may be used for end-stage liver disease, will be less than the more aggressive therapies used for moderate severity liver disease.

Not surprisingly, the utilization of specialized facilities had a substantial impact on costs. Use of a facility, such as a hospital-based clinic, outpatient surgery center, emergency department, endoscopy suite, or radiology facility, increased the average cost per episode up to seven times the cost of an episode managed with an office visit and most nonfacility procedures. For most conditions, hospital admission further increased the cost per episode by an additional factor of 5 to 10. There was also a range of use of emergency services for GI conditions, with a higher rate of use (21% to 22%) for abdominal pain, GI tract hemorrhage, and other GI tract problems.

Pharmaceutical charges appear lower than expected because only approximately 27% of patients in the plan had pharmacy benefits, and out-of-pocket expenses for prescription or nonprescription medications are not captured in claims data. If a similar level of prescription drug usage is assumed for patients without pharmacy benefits, it can be extrapolated that actual pharmacy costs are approximately four times higher than reported. For example, for peptic ulcer disease, the sum of pharmacy charges would actually be closer to \$775,000 and account for approximately 20% of average charges per episode instead of the 6% observed in this study. By way of comparison, medication costs represent approximately 13% of the total direct costs associated with the treatment of diabetes in the United States (1993 estimate)⁸ and approximately 40% of the total direct costs associated with the treatment of asthma.^{9,10}

The medication utilization analysis revealed that patients received anti-*H pylori* therapy in less than 10% of peptic ulcer disease episodes with pharmacy claims. This rate of use appears lower than expected if the guidelines of the American College of Gastroenterology¹¹ regarding *H pylori* were followed. This discrepancy probably reflects the fact that anti-*H pylori* guidelines were not widely disseminated during a portion of the study period.

Our analysis linked the use of specific medications to episodes of GI disorders. However, the analysis did not separate use at the beginning of the episode (perhaps causing the pathologic condition) versus use during the episode (perhaps exacerbating the condition). With this caveat, we noted that NSAIDs (which pose the risk of GI ulceration, bleeding, and perforation¹¹) were prescribed in 15% to 17% of episodes among patients with peptic ulcer disease, nonulcer peptic

disease, or abdominal pain who received medication. Narcotic analgesics (which could contribute to constipation and cause complications in inflammatory bowel conditions) were used in 28% of lower GI tract episodes where medication was prescribed. Among episodes of abdominal pain for which medications were prescribed, codeine-containing analgesics were prescribed in 22% and propoxyphene-containing analgesics were prescribed in 15%; these analgesics may contribute to complaints of abdominal pain. Further analysis of temporal patterns of prescriptions would be necessary to determine whether the above medications were associated with (ie, implicated in) the initiation of the GI condition episode or were prescribed inappropriately during the episode.

The high utilization rate of systemic antibiotics among patients with lower GI tract disease may be related to the frequency of diverticular diseases and the use of antibiotics in supportive care. The high utilization rate of antidepressants and anxiolytics among patients with lower GI tract disease might reflect the psychologic component of chronic diseases such as Crohn's disease, ulcerative colitis, and irritable bowel syndrome, or may simply reflect the occurrence of concomitant conditions.

For upper GI ulcer and nonulcer peptic conditions (dyspepsia) there is controversy regarding whether it is more clinically and economically advantageous to use empiric medication therapy first or to perform a diagnostic procedure first. The American College of Physicians issued a position paper in 1985 recommending the use of empiric therapy first for dyspepsia.¹² However, recent studies have come to the conclusion that diagnostic endoscopy is often an economically justifiable alternative¹³ or actually equivalent¹⁴ to empiric therapy when outcomes for dyspepsia and peptic ulcer are measured over a longer period of time. In the present study, analysis of utilization of specific procedures (upper GI endoscopy or upper GI contrast study) and specific medications (histamine H₂-receptor antagonists, proton pump inhibitors, or cytoprotectants) found that, for peptic ulcer disease, the procedure preceded the use of medication more often than the reverse scenario. For nonulcer peptic disease the order of services was divided equally.

We utilized a large study population and a longitudinal array of claims data. We performed our analysis with a clinical focus, applying health services research to build relevant episodes, adjust for disease severity, and link key services and medications to proper episodes. There are some limitations to the use of claims analysis data for analyzing healthcare utilization and costs. A major limitation is the lack of consis-

tency in coding practices. For example, "peptic ulcer" may be coded by some providers based on an assessment of the patient's history and symptoms, while other providers will use this code only after confirmation of an ulcer by endoscopy. In the latter situation, the provider may code the case as abdominal pain or nonspecific gastritis before confirmation. Such coding practices, combined with the use of several different ICD-9-CM codes, can also result in a pattern of "switching" diagnoses, resulting in the patient appearing to have multiple episodes of different GI conditions (either concomitantly or sequentially). The occurrence of switching may reflect uncertainty during the diagnostic process (ie, as a provider rules out one presumptive diagnosis, leading to a new presumptive diagnosis) or may simply reflect variation in coding by a provider's billing staff.

In addition to the general limitations associated with the analysis of claims data, there were limitations specific to the present dataset for which adjustments could not be made. Approximately 25% of the patients in the dataset were covered under capitated reimbursement plans. Because claims associated with these plans are typically submitted with a charge of \$0.01, the total and average charges are lower than expected for utilization patterns. This limitation, however, does not affect the number of services observed in our analyses. Also, as mentioned previously, because only 27% of enrollees had prescription benefits, the costs for prescription charges are under-represented. However, the relative use of medication types should not be affected, assuming that prescribers do not alter medication use based on drug benefits. Furthermore, over-the-counter medications, such as antacids, were not captured in the claims analysis. It should be noted that during the time period of the study (1993-1994) over-the-counter histamine H₂-receptor antagonists were not yet available.

CONCLUSIONS

This study used administrative data to describe the costs and patterns of care for patients with GI diagnoses. Studies of this type can generally only raise questions for additional research, rather than yield definitive answers. For example, many patients underwent multiple procedures, such as endoscopy, during an episode. Why did this occur? Were proper indications met? This represents an area for more focused evaluation and research. Bearing this limitation in mind, several results from this survey suggest ways of focusing efforts to decrease morbidity and improve quality of care in the management of GI dis-

eases and symptoms. First, the cost (\$17 per member per month) associated with the high incidence (10% of enrollees) of GI symptoms and upper GI conditions indicate that efforts to decrease morbidity and to improve the quality of care of these conditions could have a major economic impact. Secondly, the high relative proportion of costs attributed to professional services (particularly provider and specialist visits) and facility use (particularly hospital admission) in the treatment of GI conditions suggests that, despite the current focus on medication use, medications represent a rather small component in determining overall costs. Finally, the prescription analysis indicated areas where utilization patterns may be inconsistent with accepted guidelines, such as: (1) the apparently low use of anti-*H. pylori* therapy; (2) the possible concomitant use of NSAIDs in patients with upper GI diseases; and (3) the use of narcotics in patients with lower GI disease and abdominal pain. In summary, this study showed a high prevalence of GI disorders in a managed care environment, associated with substantial treatment costs, and identified several potential opportunities to improve care.

REFERENCES

- Holtman G, Talley NJ. Functional dyspepsia: Current treatment recommendations. *Drugs* 1993;46:918-930
- Everhart JE. Summary and Overview. In: Everhart JE, ed. *Digestive Diseases in the United States: Epidemiology and Impact*. US Department of Health and Human Services, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. Washington, DC: US Government Printing Office; 1994; NIH publication no 94-1447, pp. ix-xii; 3-50.
- Drummond MF. Comparing cost-effectiveness across countries: The model of acid-related disease. *Pharmacoeconomics* 1994;5(suppl 3):60-67.
- Kahn KL, Kosecoff J, Chassin MR, et al. The use and misuse of upper gastrointestinal endoscopy. *Ann Intern Med* 1988;109:664-670.
- Chassin MR, Brook RH, Park RE, et al. Variations in the use of medical and surgical services by the Medicare population. *N Engl J Med* 1986;314:285-290.
- Brook RH, Park RE, Chassin MR, et al. Predicting the appropriate use of carotid endarterectomy, upper gastrointestinal endoscopy, and coronary angiography. *N Engl J Med* 1990;323:1173-1177.
- Welch WP, Miller ME, Welch HG, et al. Geographic variation in expenditures for physicians' services in the United States. *N Engl J Med* 1993;328:621-627.
- Thom TJ. Economic costs of neoplasms, arteriosclerosis, and diabetes in the United States. *In Vivo* 1996;10:255-260.

9. Barnes PJ, Jonsson B, Klim JB. The costs of asthma. *Eur Respir J* 1996;9:636-642.

10. Krahn MD, Berka C, Langlois P, Detsky AS. Direct and indirect costs of asthma in Canada, 1990. *Can Med Assoc J* 1996;154:821-831.

11. Soll AH, for the Practice Parameters Committee of the American College of Gastroenterology. Medical treatment of peptic ulcer disease. *JAMA* 1996;275:622-629.

12. American College of Physicians. Endoscopy in the evaluation of dyspepsia. *Ann Intern Med* 1985;102:266-269.

13. Fendrick AM, Chernew ME, Hirth RA, Bloom BS. Alternative management strategies for patients with suspected peptic ulcer disease. *Ann Intern Med* 1996;123:260-268.

14. Bytzer P, Hansen JM, de Muckadell OBS. Empirical H₂-blocker therapy or prompt endoscopy in management of dyspepsia. *Lancet* 1994;343:811-816.