

# Patterns of Healthcare Utilization and Cost in Patients With Newly Diagnosed Fibromyalgia

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## Abstract

**Objectives:** To compare healthcare utilization and costs in the year preceding and following initial diagnosis of fibromyalgia (FM).

**Methods:** Using a large US health insurance claims database, we identified all persons with newly diagnosed FM (*International Classification of Diseases, Ninth Revision, Clinical Modification* diagnosis code 729.1) between January 1, 2003, and December 31, 2005 ("FM patients"). Each patient's first-noted claim with a diagnosis of FM was designated the "index date," and all pharmacy, outpatient, and inpatient claims were compiled over the 12-month periods preceding and following this date ("prediagnosis" and "postdiagnosis," respectively). Patients with incomplete pre- or postdiagnosis data were excluded. Healthcare utilization and costs were compared between the 2 periods.

**Results:** A total of 1803 patients met all study inclusion criteria; mean (SD) age was 50.4 (9.4) years; 91% were women. Comorbidities were common, including arthritis (21% of study subjects), back pain (20%), and painful neuropathic disorders (16%). The percentage of study subjects receiving various pain-related medications increased from pre- to postdiagnosis, including opioids (51.3% vs 55.9%), antiepileptics (22.6% vs 28.6%), and tricyclic antidepressants (15.5% vs 21.2%) (all  $P < .01$ ). Mean total healthcare costs also increased by \$1725 between these periods (mean [95% confidence interval]: \$9324 [\$8655, \$10,092] vs \$11,049 [\$10,245, \$11,973], respectively;  $P < .01$ ).

**Conclusions:** Patients with FM are often seen for other medical problems prior to initial diagnosis. Levels of healthcare utilization and costs are high during both the pre- and postdiagnosis periods.

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For author information and disclosures, see end of text.

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**F**ibromyalgia (FM) is a widespread disorder of unknown etiology that affects an estimated 2% to 4% of the general population,<sup>1</sup> and more than 5% of patients in general medical practice.<sup>2</sup> Women are approximately 9 times more likely to develop FM than men.<sup>1</sup> Symptoms—predominantly widespread musculoskeletal pain—typically appear between the ages of 20 and 55 years. Other symptoms are often present, including sleep disturbance, fatigue, morning stiffness, paresthesias, headaches, and exercise intolerance. The symptoms of FM can be prolonged and debilitating, and evidence of complete remission is rare.<sup>3</sup>

Information on the etiology of FM is limited. Symptoms and pathophysiologic findings suggest several levels of dysfunction, including peripheral nociceptive input, dorsal horn of the spinal cord, and brain processing. The underlying cause of FM may be some form of immune dysfunction, either triggered or exacerbated by infectious conditions and/or traumatic life events.<sup>4,5</sup> FM also has been linked to abnormal central sensitization,<sup>6</sup> pathologies at the level of the muscles,<sup>7</sup> neuroendocrine abnormalities,<sup>8</sup> and severe traumatic stress.<sup>5</sup> Family members of FM patients are themselves more likely to have FM, suggestive of a genetic predisposition toward the disease.<sup>9</sup>

Although the epidemiology of FM has been widely studied, comparatively little is known about the economic burden of the disease. In a prior study based on US healthcare claims data, we reported that total healthcare costs were significantly higher among FM patients than those of similar age and sex without evidence of this disease (\$9573 vs \$3921 for comparison group;  $P < .01$ )<sup>10</sup>; the prevalence of various comorbidities also was significantly higher among FM patients. More recently, and also using US healthcare claims data, White and colleagues examined healthcare utilization and costs in patients with "established" FM ( $n = 13,588$ ) and newly diagnosed disease ( $n = 27,947$ ), respectively.<sup>11</sup> Among the latter, the authors reported that mean annual healthcare costs increased by \$2099 between the pre- and postdiagnosis periods.

While findings from the White et al<sup>11</sup> study are of interest, the specificity of the algorithm that they used to identify patients with FM (ie, 2 or more encounters with a diagnosis of FM over a 7-year period) was probably quite low. In the present study, we examine

healthcare utilization and costs in the periods immediately preceding and following initial diagnosis of FM, using a case-ascertainment algorithm that we believe has greater specificity than that employed in earlier research. Also in contrast to prior research, we include an examination of absenteeism and short-term disability (ie, indirect costs) during these 2 periods.

## METHODS

### Data Source

Data were obtained from the Medstat MarketScan Health and Productivity Management Database. The database is comprised of information from enrollment files and medical and outpatient pharmacy claims from a variety of private insurers providing healthcare coverage in the United States. The database is a subset of the entire MarketScan Database, which consists of approximately 28 million covered lives enrolled in about 80 health plans from 8 states in the United States. All patient identifiers in the database have been fully encrypted (ie, patients are fully deidentified), and the database is fully compliant with the Health Insurance Portability and Accountability Act of 1996.

Age, sex, and dates of medical benefit eligibility and claims availability are available for all patients. Data available for each outpatient pharmacy claim (“prescription”) include the drug dispensed (in National Drug Code format), the dispensing date, and the quantity and number of therapy-days dispensed. Data available for each facility or professional service claim (“medical claim”) include dates of service and *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnosis codes. Facility claims (for selected plans) also include ICD-9-CM procedure codes and discharge disposition. Professional service claims also include procedure codes (in *Current Procedural Terminology, Version 4* and Healthcare Common Procedure Coding System formats). All claims include charged and paid (ie, reimbursed) amounts, including patient deductibles, copayments, and/or coinsurance. For employed enrollees (“primary beneficiaries”), the database also includes information on short-term disability (eg, case days, total payments), as well as dates and times of work absence and reasons thereof (eg, vacation, disability, sick). Using a unique encrypted identifier, all patient-level data can be arrayed chronologically to provide a longitudinal profile of all medical and pharmacy services used by each plan member. The database for this study encompassed the period January 1, 2003, to December 31, 2005.

### Study Sample

The study sample consisted of all persons with 2 or more paid medical claims with a diagnosis of FM (ICD-9-CM diagnosis code 729.1) at least 90 days apart between January 1, 2003, and December 31, 2005, at least 1 of which had to be rendered by a rheumatologist. The date of the first such claim was designated the “index date.” We excluded all patients: (1) aged less than 18 years as of their index date; (2) with less than 12 months of complete data preceding and following their index date (“prediagnosis” and “postdiagnosis,” respectively); (3) enrolled in a Medicaid program; or (4) aged 65 years or more if enrolled in a Medicare supplemental plan (due to possibly incomplete claims histories). All pharmacy, professional service, and facility claims were then compiled for all remaining subjects over 24 months (ie, 12 months preceding their index date to 12 months following this date).

### Measures

We examined the prevalence of selected comorbidities during the prediagnosis period. Patients were deemed to have any of the conditions of interest if, during the 12-month prediagnosis period, they had 2 or more outpatient claims on different days, or any hospitalizations, with a corresponding diagnosis code or prescription (eg, diabetes was defined based on presence of either ICD-9-CM diagnosis codes specific to diabetes or prescriptions for diabetes medications).

We examined the use of both pain-related and non-pain-related medications during the pre- and postdiagnosis periods. Medications were designated as “pain-related” based on their classification as analgesics or adjuvant medications in the World Health Organization’s “analgesic ladder.” Although this algorithm was developed initially for the treatment of cancer pain,<sup>12</sup> published literature has supported the use of these medications for the treatment of neuropathic pain in patients with and without cancer.<sup>13-25</sup> Pain-related medications accordingly were defined to consist of the following: (1) antiepileptic drugs; (2) benzodiazepines; (3) corticosteroids; (4) cyclooxygenase (COX)-2 inhibitors and other prescription non-steroidal anti-inflammatory drugs (NSAIDs); (5) muscle relaxants; (6) sedatives/hypnotics; (7) opioids (both short- and long-acting); (8) antidepressants (including tricyclic antidepressants, monoamine oxidase inhibitors, selective serotonin reuptake inhibitors) and other selected agents (eg, trazodone, bupropion, venlafaxine, duloxetine, buspirone); (9) antimigraine agents; and (10) miscellaneous agents (injectable agents [eg, bupivacaine], topical anal-

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gesics [eg, lidocaine]). All other medications were designated as non-pain-related and were stratified into various categories (eg, angiotensin-converting enzyme inhibitors, antibiotics). Use was examined in terms of the percentage of patients receiving each type of medication.

Use of healthcare services during the pre- and postdiagnosis periods was examined in terms of the following: (1) physician office visits, (2) other outpatient office visits, (3) emergency department (ED) visits, and (4) hospitalizations. Use was examined in terms of the percentage of patients receiving each service, as well as the number of times each service was received; for hospitalizations, we also examined length of stay (LOS).

Healthcare costs were tallied in terms of (1) pharmacotherapy, (2) physician office visits, (3) other outpatient office visits, (4) ED visits, (5) inpatient care, and (6) all other services. Reimbursed amounts (including patient liability, such as copays) were used in all analyses of healthcare costs. No attempt was made to attribute care specifically to the treatment of FM, given inherent difficulties of attribution in electronic healthcare claims databases.

Absenteeism and short-term disability were examined for all study subjects designated in the database as “primary beneficiaries” (productivity information is limited to these persons). For absenteeism, we tallied the number of hours and days absent from work; for short-term disability, we ascertained the total number of days absent from work and total disability payments. We also estimated the number of primary beneficiaries with at least 1 instance of absenteeism and short-term disability, respectively. Total payments for short-term disability also were estimated.

### Analyses

The statistical significance of differences in the measures of interest between the pre- and postdiagnosis periods was ascertained using either paired *t* tests or Wilcoxon signed-rank tests (for continuous measures), or McNemar’s and Bowker’s tests for categorical variables, as appropriate. All analyses were conducted using PC-SAS Proprietary Software, Release 8.4 (SAS Institute Inc, Cary, NC).

## RESULTS

There were 120,685 patients in the study database with 2 or more medical encounters with a diagnosis of FM at least 90 days apart. After applying all inclusion/exclusion criteria, the total number of study subjects was 1803; the most common reason for exclusion was no visit to a rheumatologist resulting in a diagnosis of FM.

The mean (SD) age of the study subjects was 50.4 (9.4) years; 90.5% were women (Table 1). Numerous comorbidities and encounters for various physical complaints were noted during the prediagnosis period, including arthritis (21.2% of study subjects), back pain (20.2%), hypertension (17.5%), respiratory infections (17.4%), painful neuropathic disorders (15.8%), hyperlipidemia (14.1%), and cervical pain (13.8%); 11.4% had depression, 4.1% had sleep disorders, and 3.5% had anxiety. Fifty-two percent of patients had diagnoses categorized as “symptoms, signs, and ill-defined conditions,” including abdominal pain (12.6%), chest pain (9.5%), and fatigue (9.3%). In addition, 46.3% of study subjects had diagnoses of “other body/joint pain,” including “pain in soft tissues of limb” (ICD-9-CM diagnosis code 729.5) (16.7%), “pain in joint, site unspecified” (719.40) (13.3%), “pain in joint, multiple sites” (719.49) (11.9%), “pain in joint, lower leg” (719.46) (9.3%), “pain in joint, pelvic region, and thigh” (719.45) (7.9%), and “pain in joint, shoulder region” (719.41) (6.6%) (data not presented).

Seventy-nine percent of patients received pain-related medications during the prediagnosis period (Table 2)—most commonly, NSAIDs (including COX-2 inhibitors) (54.1% of study subjects), opioids (predominantly short-acting agents) (51.3%), and antidepressants (53.0%); 24.1% received benzodiazepines, and 22.6% received antiepileptics. Receipt of a number of pain-related medications was somewhat higher following diagnosis of FM (82.8% vs 78.6% during the prediagnosis period;  $P < .01$ )—especially, opioids (predominantly short-acting agents) (55.9% vs 51.3%), antiepileptics (28.6% vs 22.6%), antidepressants (61.7% vs 53.0%), muscle relaxants (46.3% vs 37.0%), and sedatives/hypnotics (22.3% vs 18.9%) (all  $P < .01$ ). Use of NSAIDs, benzodiazepines, and other agents was substantially unchanged, as was that of non-pain-related medications (Table 3).

Relative to prediagnosis, FM patients averaged 3.9 more office visits during the postdiagnosis period (mean [SD]: 23.6 [17.0] vs 19.7 [15.9];  $P < .01$ ) (Table 4). The percentage of patients with 1 or more office visits increased during the 12 months preceding diagnosis, from 58.2% in the first month to 68.9% during the last; it decreased slightly following diagnosis, from 76.6% during the first month to 71.2% in the last. While the mean number of ED visits was unchanged between the 2 periods (1.3 [1.8] prediagnosis vs 1.5 [2.7] postdiagnosis;  $P = .30$ ), the percentage of patients with 1 or more ED visits was highest around the time of initial FM diagnosis. A similar phenomenon was noted with respect to hospitalization.

Mean total healthcare costs were \$1725 higher in the postdiagnosis period versus prediagnosis (mean [95% confidence

**Table 1.** Demographic and Clinical Characteristics of Study Subjects<sup>a</sup>

Characteristic	Value (N = 1803)
<b>Mean (SD) age, y</b>	50.4 (9.4)
<b>Female sex</b>	1631 (90.5)
<b>Comorbidities</b>	
<b>Infectious and parasitic diseases</b>	99 (5.5)
<b>Neoplasms</b>	190 (10.5)
<b>Endocrine, nutritional and metabolic diseases, and immunity disorders</b>	
Hyperlipidemia	255 (14.1)
Hypothyroidism	118 (6.5)
Diabetes	200 (11.1)
Obesity	16 (0.9)
All other	411 (22.8)
Any of above	595 (33.0)
<b>Diseases of the blood and blood-forming organs</b>	98 (5.4)
<b>Mental disorders</b>	
Anxiety	63 (3.5)
Depression	205 (11.4)
Tension headache	6 (0.3)
Personality disorders	4 (0.2)
Other	85 (4.7)
Any of above	299 (16.6)
<b>Diseases of the nervous system and sense organs</b>	
Epilepsy	3 (0.2)
Migraine	168 (9.3)
Any of above	466 (25.8)
<b>Diseases of the circulatory system</b>	
Hypertension	315 (17.5)
Ischemic heart disease	61 (3.4)
Valve disease	21 (1.2)
Cardiac dysrhythmias	23 (1.3)
Congestive heart failure	8 (0.4)
Cerebrovascular disease	20 (1.1)
Other	90 (5.0)
Any of above	437 (24.2)
<b>Diseases of the respiratory system</b>	
Asthma	73 (4.0)
Respiratory infections	314 (17.4)
Allergic rhinitis/sinusitis	160 (8.9)
Other	122 (6.8)
Any of above	510 (28.3)
<i>(Continued)</i>	

■ **Table 1.** Demographic and Clinical Characteristics of Study Subjects<sup>a</sup> (*Continued*)

Characteristic	Value (N = 1803)
<b>Comorbidities</b>	
<b>Diseases of the digestive system</b>	
Irritable bowel syndrome	27 (1.5)
Gastroesophageal reflux disease	75 (4.2)
Gastritis	8 (0.4)
Other	252 (14.0)
Any of above	301 (16.7)
<b>Diseases of the genitourinary system</b>	
	424 (23.5)
<b>Diseases of the skin and subcutaneous tissue</b>	
	212 (11.8)
<b>Diseases of the musculoskeletal system and connective tissue<sup>b</sup></b>	
Back pain	364 (20.2)
Cervical pain	249 (13.8)
Arthritis	383 (21.2)
Other body/joint pain	835 (46.3)
Other	446 (24.7)
Any of above	1252 (69.4)
<b>Painful neuropathic disorders</b>	
	284 (15.8)
<b>Symptoms, signs, and ill-defined conditions</b>	
Fatigue	167 (9.3)
Headache	128 (7.1)
Chest pain	171 (9.5)
Abdominal pain	227 (12.6)
Anxiety-related symptoms	176 (9.8)
Gastric-related symptoms	87 (4.8)
Other	591 (32.8)
Any of above	944 (52.4)
<b>Injury and poisoning</b>	
	294 (16.3)
<b>Sleep disorders</b>	
	74 (4.1)
<b>Number of comorbidities</b>	
0	98 (5.4)
1	157 (8.7)
2	207 (11.5)
3	241 (13.4)
≥4	1100 (61.0)

<sup>a</sup>Unless otherwise indicated, values are number of patients (%); percentages were calculated using all patients with fibromyalgia as the denominator.

<sup>b</sup>Excluding fibromyalgia.

interval (CI): \$11,049 [\$10,245, \$11,973] vs \$9324 [\$8655, \$10,092];  $P < .01$ ) (Table 5); corresponding median (interquartile range) values were \$6186 (\$3028, \$12,404) versus \$5019 (\$2193, \$10,763) ( $P < .01$ ), or an increase of \$1167 (data not shown). The mean cost of pain-related medication increased pre- to postdiagnosis (\$1088 [\$1012, \$1164]

vs \$1417 [\$1322, \$1524]), as did the mean cost of outpatient services (\$5493 [\$5101, \$5869] vs \$6231 [\$5857, \$6626]) (both  $P < .01$ ). The cost of non-pain-related medications, hospitalization, and all other services were unchanged between the 2 periods. Pain-related medications comprised about 12% of total healthcare costs during both the pre- and

**Table 2.** Use of Pain-Related Medications Immediately Before and After Initial Fibromyalgia Diagnosis<sup>a,b</sup>

Number Receiving	Prediagnosis (N = 1803)	Postdiagnosis (N = 1803)	P <sup>c</sup>
<b>Antiepileptic drugs</b>	408 (22.6)	516 (28.6)	<.01
<b>Benzodiazepines</b>	435 (24.1)	443 (24.6)	.64
<b>Corticosteroids</b>	523 (29.0)	555 (30.8)	.15
<b>Nonsteroidal anti-inflammatory drugs</b>			
Cyclooxygenase-2 inhibitors	550 (30.5)	421 (23.3)	<.01
Other nonsteroidal anti-inflammatory drugs	660 (36.6)	808 (44.8)	<.01
Any of above	975 (54.1)	1016 (56.4)	.05
<b>Muscle relaxants</b>	668 (37.0)	834 (46.3)	<.01
<b>Sedatives/hypnotics</b>	340 (18.9)	402 (22.3)	<.01
<b>Opioids</b>			
Short-acting opioids	921 (51.1)	1000 (55.5)	<.01
Long-acting opioids	100 (5.5)	138 (7.7)	<.01
Any of above	925 (51.3)	1008 (55.9)	<.01
<b>Antidepressants</b>			
Tricyclic antidepressants	280 (15.5)	380 (21.1)	<.01
Monoamine oxidase inhibitors	0 (0.0)	1 (0.1)	<.01
Selective serotonin reuptake inhibitors	588 (32.6)	689 (38.2)	<.01
Other antidepressants	460 (25.5)	529 (29.3)	<.01
Any of above	955 (53.0)	1112 (61.7)	<.01
<b>Antimigraine</b>			
Triptans	128 (7.1)	137 (7.6)	.30
Other antimigraine	43 (2.4)	38 (2.1)	.48
Any of above	161 (8.9)	166 (9.2)	.62
<b>Miscellaneous</b>	1 (0.1)	2 (0.1)	.56
<b>Any of above</b>	1417 (78.6)	1493 (82.8)	<.01
<b>None of the above</b>	386 (21.4)	310 (17.2)	<.01
<b>1 of the above</b>	141 (7.8)	98 (5.4)	<.01
<b>2 of the above</b>	202 (11.2)	177 (9.8)	.15
<b>3 of the above</b>	230 (12.8)	220 (12.2)	.59
<b>≥4 of the above</b>	844 (46.8)	998 (55.4)	<.01

<sup>a</sup>Unless otherwise indicated, all values are number (%).

<sup>b</sup>Magnitude of use of each pain-related medication examined among subgroup of patients receiving ≥1 prescription for such medications during the pre- and/or postdiagnosis.

<sup>c</sup>McNemar test for difference between pre- and postdiagnosis periods.

postdiagnosis periods. Mean monthly healthcare costs during the 2-year study period are displayed in the [Figure](#).

Relatively few (approximately 2%) patients had absences from work during either the pre- or postdiagnosis periods. The mean (95% CI) number of days of work absence was unchanged (0.4 [0.1, 0.7] for prediagnosis vs 0.6 [0.1, 1.0] for postdiagnosis;  $P = .85$ ); corresponding values for hours of work absence were 3.3 (1.1, 5.4) and 4.6 (1.0, 8.2) ( $P = .85$ ),<sup>3</sup> respectively. Very few patients (approximately 1%) were absent from work due to short-term disability during either period; the mean (95% CI) number of days absent from work due to short-term disability

was similarly unchanged following diagnosis of FM (1.8 [0.1, 3.5] for prediagnosis vs 1.4 [0.2, 2.6] for postdiagnosis [ $P > .99$ ]). Mean disability payments among all primary beneficiaries increased from \$44 (\$2, \$86) prediagnosis to \$100 (\$0, \$200) postdiagnosis ( $P < .01$ ) (data not presented).

## DISCUSSION

In the 1-year period preceding initial diagnosis of FM, patients in our study averaged 20 office visits for a range of medical problems and complaints, including arthritis, back

■ **Table 3.** Use of Non-Pain-Related Medications Immediately Before and After Initial Fibromyalgia Diagnosis<sup>a,b</sup>

Number Receiving	Prediagnosis (N = 1803)	Postdiagnosis (N = 1803)	P
Hormones	116 (6.4)	110 (6.1)	.54
Gastrointestinal agents	116 (6.4)	127 (7.0)	.31
Antihistamines	113 (6.3)	85 (4.7)	<.01
Antihyperlipidemics	71 (3.9)	67 (3.7)	.61
Eyes, ears, nose, and throat agents	142 (7.9)	136 (7.5)	.65
Sympathomimetics	71 (3.9)	73 (4.0)	.84
Unclassified	30 (1.7)	30 (1.7)	>.99
Cardiac agents	27 (1.5)	14 (0.8)	<.01
Skin agents	57 (3.2)	32 (1.8)	<.01
Antipsychotics	12 (0.7)	15 (0.8)	.41
Calcium channel blockers	9 (0.5)	18 (1.0)	<.01
Antineoplastics	11 (0.6)	11 (0.6)	>.99
Urinary agents	53 (2.9)	4 (0.2)	<.01
Antibiotics	42 (2.3)	28 (1.6)	.07
Central nervous system agents	7 (0.4)	12 (0.7)	.20
Immunosuppressants	7 (0.4)	12 (0.7)	.13
Parasympathomimetics	5 (0.3)	11 (0.6)	.08
Angiotensin-converting enzyme inhibitors	6 (0.3)	5 (0.3)	.65
Vitamins	5 (0.3)	6 (0.3)	.56
Antivirals	19 (1.1)	22 (1.2)	.63
Anticholinergics	14 (0.8)	13 (0.7)	.83
Miscellaneous skin agents	10 (0.6)	12 (0.7)	.67
Antitussives	12 (0.7)	9 (0.5)	.49
Antifungals	5 (0.3)	10 (0.6)	.20
Anticoagulants	4 (0.2)	9 (0.5)	.10
None of the above	1131 (62.7)	1165 (64.6)	.11
1 of the above	452 (25.1)	453 (25.1)	.97
2 of the above	163 (9.0)	145 (8.0)	.23
3 of the above	45 (2.5)	35 (1.9)	.25
≥4 of above	12 (0.7)	5 (0.3)	.03
Any of above	672 (37.3)	638 (35.4)	.11

<sup>a</sup>Unless otherwise indicated, all values are number (%).

<sup>b</sup>Magnitude of use of each non-pain-related medication examined among subgroup of patients receiving ≥1 prescription for such medications during the pre- and/or postdiagnosis.

pain, painful neuropathic disorders, respiratory infections, and hypertension; nearly one half had diagnoses of “other body/joint pain,” including nonspecific pain in soft tissues of the limbs and joints. Eleven percent of patients had 1 or more encounters for depression, and 4% were seen for anxiety. During each month of the prediagnosis period, about 1 in 10 patients were seen for “symptoms, signs, and ill-defined conditions.”

Use of pain-related medications was high both preceding and following initial diagnosis of FM, and increased slightly between the former and the latter periods. Use of “traditional” analgesics was common; approximately one half of patients received opioids (primarily short-acting) or NSAIDs (including COX-2 inhibitors). Use of “adjuvant” pain-related medications was also common—approximately one half of patients received antidepressants, and about one quarter

**Table 4.** Use of Healthcare Services Immediately Before and After Initial Fibromyalgia Diagnosis<sup>a</sup>

	Prediagnosis (N = 1803)	Postdiagnosis (N = 1803)	P
<b>Office visits</b>			
0	14 (0.8)	1 (0.1)	<.01
1-3	113 (6.3)	38 (2.1)	<.01
4-6	157 (8.7)	105 (5.8)	<.01
7-10	306 (17.0)	221 (12.3)	<.01
11-15	330 (18.3)	326 (18.1)	.86
>15	883 (49.0)	1112 (61.7)	<.01
Mean (SD) <sup>b</sup>	19.7 (15.9)	23.6 (17.0)	
Median (IQR) <sup>b</sup>	15 (9, 26)	19 (12, 30)	<.01
<b>Emergency department visits</b>			
0	1225 (67.9)	1238 (68.7)	.58
1	355 (19.7)	318 (17.6)	.10
2	112 (6.2)	121 (6.7)	.54
3	45 (2.5)	51 (2.8)	.52
4	19 (1.1)	25 (1.4)	.35
≥5	47 (2.6)	50 (2.8)	.72
Mean (SD) <sup>b</sup>	1.3 (1.8)	1.5 (2.7)	
Median (IQR) <sup>b</sup>	1 (0, 2)	1 (0, 2)	.30
<b>Independent laboratory visits</b>			
0	989 (54.9)	962 (53.4)	.17
1	311 (17.2)	289 (16.0)	.28
2	179 (9.9)	185 (10.3)	.73
3	115 (6.4)	116 (6.4)	.94
4	83 (4.6)	67 (3.7)	.17
≥5	126 (7.0)	184 (10.2)	<.01
Mean (SD) <sup>b</sup>	2.2 (2.4)	2.6 (3.0)	
Median (IQR) <sup>b</sup>	1 (1, 3)	2 (1, 3)	<.01
<b>Hospitalizations</b>			
0	1580 (87.6)	1582 (87.7)	.91
1	169 (9.4)	165 (9.2)	.81
2	41 (2.3)	31 (1.7)	.20
3	9 (0.5)	18 (1.0)	.07
4	2 (0.1)	4 (0.2)	.41
≥5	2 (0.1)	3 (0.2)	.65
Mean (SD) <sup>b</sup>	0.8 (0.8)	0.8 (1.1)	
Median (IQR) <sup>b</sup>	1 (0, 1)	1 (0, 1)	.74
<b>Inpatient days</b>			
0	1580 (87.6)	1582 (87.7)	.91
<7	184 (10.2)	175 (9.7)	.60
7-14	30 (1.7)	26 (1.4)	.59
15-21	5 (0.3)	11 (0.6)	.13
>21	4 (0.2)	9 (0.5)	.13
Mean (SD) <sup>b</sup>	2.7 (5.9)	3.3 (8.0)	
Median (IQR) <sup>b</sup>	1 (0, 3)	1 (0, 3)	.65

IQR indicates interquartile range.

<sup>a</sup>Unless otherwise indicated, all values are numbers (%).

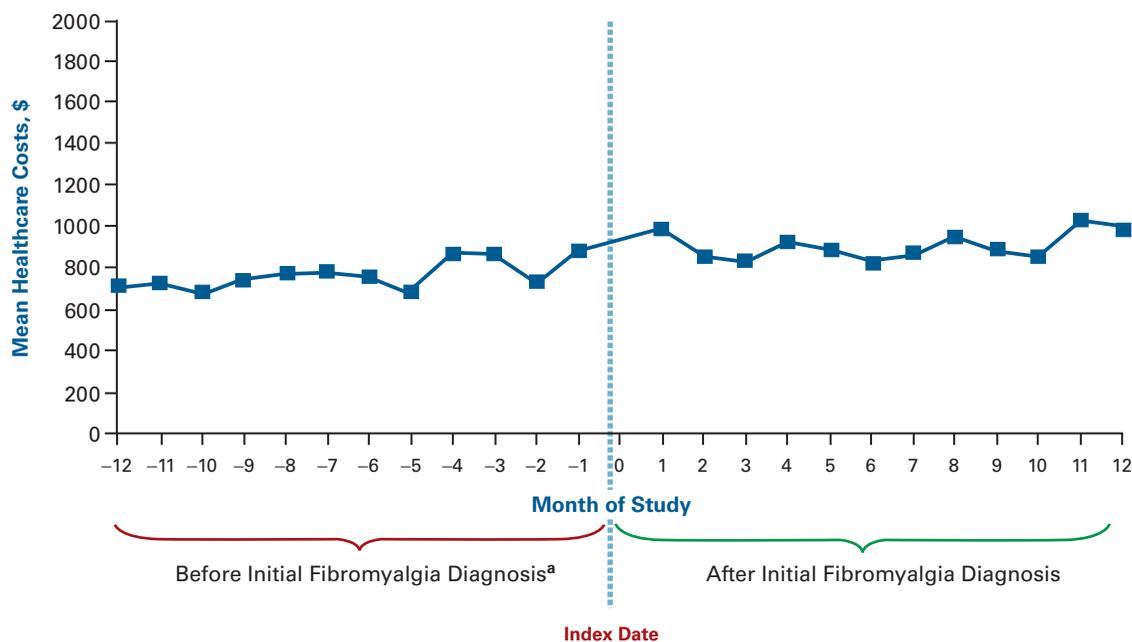
<sup>b</sup>Magnitude of use of each service examined among subgroup of patients receiving ≥1 such service.

■ **Table 5.** Mean Cost of Healthcare Services Immediately Before and After Initial Fibromyalgia Diagnosis

<b>Pharmacotherapy</b>	<b>Prediagnosis, \$ (95% CI) (N = 1803)</b>	<b>Postdiagnosis, \$ (95% CI) (N = 1803)</b>	<b>P</b>
<b>Pain-related pharmacotherapy</b>			
Antiepileptic drugs	140 (120, 162)	214 (188, 242)	<.01
Benzodiazepines	21 (17, 25)	24 (19, 28)	.10
Corticosteroids	17 (13, 22)	19 (15, 23)	.32
<b>Nonsteroidal anti-inflammatory drug</b>			
Cyclooxygenase-2 inhibitors	156 (141, 171)	123 (109,138)	<.01
Other nonsteroidal anti-inflammatory drugs	74 (64, 83)	132 (118, 146)	<.01
Any of above	230 (213, 247)	255 (236, 274)	<.01
<b>Muscle relaxants</b>	77 (67, 89)	109 (97, 121)	<.01
<b>Sedatives/hypnotics</b>	60 (51, 69)	85 (73, 96)	<.01
<b>Opioids</b>			
Short-acting opioids	95 (74, 121)	144 (109, 187)	<.01
Long-acting opioids	80 (55, 106)	131 (94, 169)	<.01
Any of above	175 (137, 215)	275 (213, 346)	<.01
<b>Antidepressants</b>			
Tricyclic antidepressants	9 (7, 12)	11 (9, 13)	.10
Monoamine oxidase inhibitors	0 (0,0)	0 (0, 1)	.32
Selective serotonin reuptake inhibitors	166 (150, 182)	201 (183, 217)	<.01
Other antidepressants	139 (121, 156)	166 (147, 188)	<.01
Any of above	314 (287, 338)	378 (349, 406)	<.01
<b>Antimigraine</b>			
Triptans	52 (40, 64)	57 (44, 71)	.17
Other antimigraine	1 (1, 3)	1 (0, 1)	.25
Any of above	53 (41, 66)	58 (45, 72)	.23
<b>Miscellaneous</b>	0 (0, 0)	0 (0, 0)	.95
<b>All pain-related medications</b>	1088 (1012, 1164)	1417 (1322, 1524)	<.01
<b>Non-pain-related medications</b>	187 (154, 228)	223 (184, 273)	.10
<b>Total pharmacotherapy</b>	1275 (1189, 1365)	1640 (1533, 1759)	<.01
<b>Outpatient services</b>			
Physician office visits	2452 (2234, 2715)	2935 (2758, 3131)	<.01
Other office visits	2697 (2436, 2960)	2946 (2664, 3224)	.11
Total office visits	5149 (4767, 5509)	5880 (5514, 6249)	<.01
Emergency department	343 (295, 400)	351 (303, 401)	.81
Total outpatient services	5493 (5101, 5869)	6231 (5857, 6626)	<.01
<b>Hospitalizations</b>	1903 (1529, 2354)	2420 (1878, 3046)	.11
<b>Other</b>	653 (561, 757)	757 (657, 861)	.05
<b>Total</b>	9324 (8655, 10,092)	11,049 (10,245, 11,973)	<.01

CI indicates confidence interval.

■ **Figure.** Mean Healthcare Costs in the Time Immediately Before and After Initial Fibromyalgia Diagnosis



<sup>a</sup>Includes index date.

each received benzodiazepines and antiepileptics. Of particular note, the percentages of patients receiving antiepileptics, benzodiazepines, and antidepressants were substantially higher than the percentages of patients with encounters for epilepsy, anxiety, and depression, respectively. Our findings therefore are consistent with widespread use of these agents for the treatment of atypical pain syndromes.

Women constituted approximately 90% of all FM patients in our study. In prior studies employing healthcare claims data, only 61% to 75% of patients with FM were reported to be women.<sup>10,25,26</sup> We believe the discrepancy can be explained by our more stringent case-finding criteria. In particular, we required that all study subjects have at least 2 physician encounters with a diagnosis of FM 90 days or more apart, at least 1 of which had to have been rendered by a rheumatologist. Other studies, in contrast, allowed diagnoses of FM to have been rendered by providers of any type. We believe the characteristics of our study population are more in line with information that has been reported from studies based on clinical examination.<sup>1</sup>

Our findings are similar to those reported in 2 prior studies focusing on patients with newly diagnosed FM. In their study of patients with newly diagnosed FM who were identified in a health insurance claims database, White et al reported a mean increase of \$2099 in total healthcare costs in the year following diagnosis versus the year preceding it

(from \$6555 to \$8654 [ $P < .01$ ]).<sup>11</sup> In another study, based on information gathered from more than 350 practices throughout the United Kingdom, Hughes and colleagues reported that general practitioner visits and prescriptions increased in the year following FM diagnosis versus the year immediately preceding it.<sup>27</sup>

Two other studies, however, reported findings at variance with our results. In the first, which was based on information gathered from a detailed health questionnaire, White et al found that persons with newly diagnosed FM ( $n = 56$ ) averaged slightly fewer prescriptions and visits to providers in the year following diagnosis versus the prior one.<sup>28</sup> In the second study, Annemans and colleagues used data reported by Hughes et al<sup>27</sup> and techniques of regression modeling to estimate the economic consequences associated with diagnosis of FM.<sup>29</sup> Their findings suggested that costs decreased by about £66 over 6 months following initial diagnosis. Substantial differences in research design and study methodologies preclude meaningful comparisons between these 2 studies and ours.

A high prevalence of various comorbidities was found during the prediagnosis period, including arthritis (21% of all study subjects), painful neuropathic disorders (16%), neoplasms (11%), and “other body and joint pain” (46%). However, while this observation would be consistent with a high prevalence of secondary and/or concomitant FM, it

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also could reflect patterns of care-seeking behavior for assorted complaints of unknown etiology in the period preceding diagnosis of FM. Limitations of the study database, however, precluded further examination of these issues, or consideration of several postulated “triggers” of FM (eg, muscle pathologies, neuroendocrine abnormalities, severe traumatic stress).<sup>5-8</sup>

Our study has several limitations. First, our case-ascertainment algorithm (ie, at least 2 encounters with a diagnosis of FM 90 days or more apart, at least 1 of which was rendered by a rheumatologist) undoubtedly led to the exclusion of many patients who actually had FM. The generalizability of our findings to the entire population of patients with FM is therefore unknown. Our case-finding algorithm was developed to maximize specificity (ie, to minimize “false-positives”), which we believed to be important, given our objective of determining the impact of clinical recognition on healthcare utilization and costs.

Second, information on medication use in healthcare claims databases is limited to prescription drugs dispensed by retail pharmacies. We suspect that many patients may self-treat with over-the-counter medications (eg, NSAIDs). Since healthcare claims databases do not contain information on the use of such products, we probably underestimated the magnitude of medication use among persons with FM.

Finally, we do not know the precise reason(s) why FM patients received pain-related medications, as diagnoses are not contained in records of pharmacy dispensing. Thus, because some of the medications that we designated “pain-related” also are used to treat conditions that are not typically associated with pain (eg, antiepileptics in seizure disorders, antidepressants in depression), it would be incorrect to infer that all use of such agents was necessarily for the treatment of FM. We note, however, that very few patients (0.2%) had diagnoses of epilepsy, and only 11% had diagnoses of depression. The large numbers of patients who received antiepileptics and antidepressants—as well as more “traditional” analgesics, such as NSAIDs and opioids—suggest that the preponderance of use of these medications was for the treatment of pain.

## CONCLUSIONS

Results from this study suggest that patients with newly diagnosed FM are often seen for other medical problems during the 1-year period preceding clinical recognition of the disease. Levels of healthcare utilization and costs are high in both the prediagnosis and postdiagnosis periods. Absenteeism and short-term disability appear to be infrequent and rare among patients with FM who are employed.

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