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Employees With Fibromyalgia: Medical Comorbidity, Healthcare Costs, and Work Loss

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Learning Objectives

- Compare prevalence rates of common comorbid conditions in employees diagnosed as having fibromyalgia (FM) or osteoarthritis (OA).
- Identify trends in the use of medical care and prescription drugs by employees having FM or OA, as compared to control subjects.
- Contrast total dollar costs and their components–medical costs, drug costs, and indirect costs of time lost from work–in employees with FM, those with OA, and control employees having neither of these disorders.

Abstract

Objectives: *To compare 2005 health care resources among matched samples of employees with fibromyalgia (FM), osteoarthritis (OA), and controls.* ***Methods:*** *Using a claims database of privately insured individuals, FM and OA samples were derived from those with two or more disease-specific claims in 1999 to 2005 (≥1 in 2002 to 2005).* ***Results:*** *Total costs for employees with FM ($10,199) approached OA costs ($10,861,* $P = 0.3758$*) and were significantly higher than controls ($5274,* $P < 0.0001$*). Cost components varied across disease-specific samples (direct medical: FM $7286 vs OA $8325,* $P < 0.0287$*; pharmacy: FM $1630 vs OA $1341; indirect: FM $2913 vs OA $2537,* $P < 0.0001$*). Employees with FM had more claims than OA for psychiatric diagnoses, chronic fatigue, and most pain conditions. Use of multiple prescription drug classes was common in both samples.* ***Conclusions:*** *FM imposes significant economic burden. Work loss contributes substantially to the impact.* (J Occup Environ Med. *2008;50:13–24*)

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The primary objective of the research performed for this study was to compare medical, pharmacy, and work loss costs of employees with fibromyalgia (FM) to costs among a matched control sample of employees without FM, and employees with another disabling condition, osteoarthritis (OA). FM can lead to substantial social and economic costs, but little is known about how costs of FM compared with other conditions characterized by pain. Although the societal costs of OA are likely to exceed those of FM simply due to the relative prevalence of the two conditions, from a patient perspective FM may be as costly a condition as OA; nevertheless, the sources of costs are likely to be driven by differences in comorbidity, and medical management, including the use of pharmacotherapy. Thus, secondary objectives of this research included estimating the relative risk of selected medical comorbidities in the research sample, and comparing medical utilization and prescription use to identify predominant cost drivers.

Background

FM syndrome is a complex and often misunderstood condition characterized by persistent and widespread pain.[1] FM patients also may experience fatigue, stiffness, cognitive dysfunction, and depressive and anxious symptoms. These symptoms may be part of FM or may be separate comorbid illnesses. This combination of symptoms may complicate the recognition and treatment of FM, and are likely to magnify the burden associated with FM.[2,3]

FM affects approximately 2% of the general population.[4] Most individuals with FM are women that are typically diagnosed during their working years.[5] FM can severely affect an individual's quality of life and functional status[6,7] and lead to substantial costs.[8–11] Most studies addressing the economic and societal cost of FM have relied on selective samples (eg, in one employer, community samples of rheumatology patients).[8,10] A few recent studies have addressed costs associated with disability and work loss, which are major cost drivers in FM. A comprehensive economic analysis estimated total annual costs of FM (in 1998 US dollars) as $5945, versus $2486 for all claimants in an administrative database of a Fortune 100 manufacturing company.[8] In this study, less than 6% of the total health care costs in patients with FM were attributable to FM-specific claims. This study also found that a substantial portion of total costs was due to work disability and the prevalence of disability was twice as high among employees with FM when compared with the overall employee population. Other studies have shown significant work absence, disability, and loss of time due to labor force exits among persons with FM.[12,13]

Medical management of FM generally focuses on symptom relief and pain modulation, as well as treatment for comorbid conditions such as depression, anxiety, and fatigue. There was no FDA approved indication for FM until the recent approval of the alpha-2-delta ligand, pregabalin, in mid-2007. Despite this fact, clinical recommendations for the management of FM have existed, and a burgeoning literature considers the benefits of various pharmacologic and non-pharmacologic therapies.[9,14–16] Criteria used to develop guidelines suggests that tricyclic antidepressants (eg, amitriptyline, cyclobenzaprine), serotonin norepinephrine reuptake inhibitors (SNRIs) such as duloxetine and milnacipran, selective serotonin reuptake inhibitors (SSRIs), and the drugs pregabalin, gabapentin, and tramadol, have moderate to strong evidence supporting their use in treatment of FM.[15,17] Just as important is the lack of evidence supporting the use of opioid analgesics and benzodiazepines for FM.

The treatment of FM may be complicated by several factors, all of which may contribute to an inefficient use of resources. First, there is considerable uncertainty surrounding the precise etiology, diagnosis criteria, and clinical management of FM.[16,18–20] Moreover, the extensive comorbidity associated with FM may increase potential for misdiagnosis by attributing painful symptoms to other causes. Given the ambiguity surrounding etiology and relatively recent development of treatment guidelines, management of FM likely has involved multiple visits to many different medical specialists and paraprofessionals, as well as multiple trials of different prescription drugs.[16] Because of these treatment-related factors as well as the condition itself, persons with FM may incur high medical and prescription drug costs.

Little is known regarding how the costs of FM compared with health care and work loss associated with other common pain conditions. A recent analysis using an employer administrative claims database showed that employees with painful conditions, including arthritis, back and neck disorders, and neuropathy incurred 1.5 to 3.5 times higher total (direct and indirect) costs when compared with the average employee.[21] Although the direct costs of painful medical conditions can be high, additional indirect costs of absenteeism and lost productivity place substantial burden on individuals and employers.[21,22]

To compare FM with another pain condition, a sample of OA patients was selected. OA lends itself well as a comparator because the condition causes consistent, debilitating pain, as well as substantial medical care utilization. Although the condition occurs more commonly among older persons, OA is associated with significant work loss and disability among employed populations. Nevertheless, the two diseases are quite different with respect to treatment and medical understanding: the etiology of FM remains relatively unexplained, whereas it is well-known within the medical community that OA is commonly caused by lifetime joint stress.[23] Additionally, because it is a much more common condition, the standards of treatment for OA are well-understood and accepted by most medical providers. Medical management of OA tends to involve non-steroidal anti-inflammatory drugs for moderate to severe pain, and non-opioid analgesics for mild to moderate pain.[23]

Methods

Data

The study sample and comparison samples were derived from a de-identified administrative claims database of 31 large self-insured companies in the United States. The subset used for these analyses was limited to privately insured employees in 16 of the companies in the employer database, where disability insurance information was available. Although not intended to be a statistically valid, nationally representative sample, the 16 companies in the database have national operations, span a broad array of industries and occupations, and cover approximately 850,000 employees (2.6 million covered lives, including employees and dependents).

The database contains enrollment data, medical claims, prescription drug claims, and employee disability claims covering the period January 1999 through December 2005. Enrollment data include monthly eligibility, and demographic information, such as age, gender, and geographic region of residence. Medical claims provide facility and provider specialty categories, diagnosis codes based on the International Classification of Diseases, 9th Edition (ICD-9), provider

TABLE 1
Selection and Inclusion Criteria: Fibromyalgia, Control, and Osteoarthritis Samples

Criterion	FM	Control	OA
All enrollees—31 companies*			
With 2+ fibromyalgia (or osteoarthritis for OA Sample) claims during the period January 1, 1999 to December 31, 2005	101,393	—	270,143
With 1+ fibromyalgia (or osteoarthritis for OA sample) claims during the period January 1, 2002 to December 31, 2005	84,541	—	241,120
Age ≥18 and ≤64 as of January 1, 2005	64,065	—	88,250
Continuously eligible in 2005	48,195	1,391,153	70,682
Matched patient sample of enrollees from 31 companies	38,170	38,170	38,170
Enrollees from any of 16 companies with disability data†	17,206	16,828	16,917
Employees only	8,513	7,260	8,418

*For all 31 companies, the starting population consisted of approximately 5 million persons, 1.8 million of which are employees.

†For the 16 companies with disability data, the starting population consisted of 2.6 million persons, 850,000 of which are employees.

payments, dates of service, and other typical claims data elements. Prescription drug claims provide National Drug Codes, dosage, days supply, prescription fill dates, and payments. All data are de-identified but linkable with encrypted patient identifiers to remain Health Insurance Portability and Accountability Act (HIPAA) compliant.

Matching

Samples from the entire 31 company database were matched on age, gender, employment status, and region of country. Matching on age and gender is frequently used to control for demographically driven differences in costs that might otherwise be attributed to the disease state. Employment status was included as a match variable not only to control for differences between employees and their dependents, but also to conduct subgroup analyses of employees. Including region as match characteristic addressed geographic variation in medical cost and treatment patterns.

Three steps were employed to generate matched samples:

1. Three large samples were obtained for patients (employees and their covered family members) with FM (FM sample), patients with OA but without FM (OA sample), and patients without FM (Controls) (the control sample is meant to be a comparison group of all non-FM patients; to avoid sample selection bias, having OA was not an exclusion criteria for the control sample. Because one-to-one matching was not performed between the control and OA groups, 358 patients overlap between the final OA and control samples).
2. One-to-one matching on gender, employment status, geographic region (geographic regions include: Mid-Atlantic and New England, South Atlantic, Central, and Mountain and Pacific states), and age (±1 year) was performed for the FM and OA sample, as well as the FM and control sample. Only FM patients finding a match in each other sample were kept for the overall sample, as well as their matches in the OA and control samples.
3. A final subset of only employees from the 16 companies with disability data was selected for the research presented in this paper.

Study Samples

Sample flow counts detailing the sample selection by inclusion criteria are presented in Table 1. The final subset of employees consisted of 8513 employees with FM; 8418 with OA but never diagnosed with FM; and 7260 controls. The FM sample was selected first, according to diagnostic criteria and continuity of enrollment during the period January 1, 2005 through December 31, 2005. Each person in the FM sample had two or more FM diagnoses (ICD-9 code 729.1, myalgia and myositis, not otherwise specified) in the 5-year period from January 1, 1999 to December 31, 2005, with at least one diagnosis occurring in the more recent period from January 1, 2002 through December 31, 2005. Enrollees with OA were selected according to similar criteria: two diagnoses of OA (ICD-9 codes included in 715.xx, osteoarthrosis and allied disorders) in the period from 1999 to 2005, with at least one diagnosis of OA occurring in the period from 2002 to 2005. Persons in the OA and control samples could not have evidence of a FM diagnosis in their observable claims history.

Definition of Medical Comorbidities

Prevalence of selected conditions was computed as the proportion of employees in each sample who had a diagnosis of the specified condition in 2005. Selection of comorbid conditions was based on prior research that identified potential comorbid conditions.[3,8,9] The diagnosis of each comorbidity was not necessarily a first occurrence of that condition. The Charlson Comorbidity Index (CCI) was constructed according to the definition provided by Deyo et al.[24]

Medical Care and Prescription Drug Utilization

Utilization measures included the proportion of employees with claims for visits to medical facilities and provider specialty categories. These were defined as inpatient stays,

emergency department visits, outpatient, and office visits. Outpatient services included hospital outpatient, ambulatory surgery centers, rehabilitation, and services provided in outpatient psychiatric and substance abuse treatment settings. Office visits were categorized by medical specialty: primary care physicians, rheumatologists, other physician specialties, and other non-physician office-based providers. Drug utilization measures included the proportion with use of specified therapeutic classes, as well as use of selected individual drugs known to be used in treating FM. Selection of the drug classes and individual drugs was determined by treatment guidelines for the FM, as well as prior research mentioning commonly used prescription drugs.[9,14,15]

Direct Health Care Costs

Medical care costs were computed as total payments to providers as reported by insurers, reflecting a third-party payer perspective. For this analysis, both total and component medical care costs are reported; component medical care costs are reported for the service categories noted in the previous section. Prescription payments by insurers were added to medical costs to obtain total direct (health care) costs for the calendar year 2005.

Indirect Costs and Employee Work Loss

Indirect costs are computed from disability claims (dates, employer payments), medical claims, and wages. Indirect costs, accounting for work loss, include two components: actual employer payments for extended absence from work due to disability, and imputed medically related work loss days and costs. Medically related work loss days include sporadic work loss related to the use of medical services, plus pre-disability missed days of work (typically 5 to 6 days). Work loss related to medical service use during the time period spent on disability is not included as medically related work loss. This methodology assumes that each hospitalization day accounts for a full day of work loss, whereas an outpatient visit accounts for half a day of work loss.

Statistical Methods

Most of the analyses presented are descriptive comparisons. Relative risk ratios (RR) between FM and OA and FM and control samples were calculated based on the proportion in each sample with comorbid conditions. χ^2 tests were used to compare between-sample differences for dichotomous or categorical variables, and t tests were used to compare continuous variables with minimal skewness in the distribution. Differences in continuous measures of utilization and costs were compared using nonparametric Wilcoxon rank-sum tests.

Sensitivity Analysis

All demographic, utilization, and cost analyses performed for these employee samples were repeated for two larger groups: 1) the group of patients from 31 companies, and 2) the group of patients from 16 companies with disability data, to confirm consistency of findings across covered lives and subsets of employees.

Results

Employee Demographic and Health Characteristics

Employees with FM were approximately 50 years of age on average, and 52% were women. The CCI for this sample (Mean CCI = 0.47) indicates a relatively high level of comorbidity. The OA sample is similar in age (51 years) and gender (53% female), and also shows a high level of morbidity (Mean CCI = 0.46). By contrast, the control sample is slightly younger (49 years), slightly less are female (49%) and this group has a relatively low level of morbidity, on average (Mean CCI = 0.29).

Due to the matching algorithm, which used age, gender, geographic region, and employment status to generate the samples for the 31 companies, the control and OA samples were similar to the FM sample on variables used in the match (Table 2). There were small but statistically significant differences in age distributions across the three groups, and in the gender composition of the control comparison.

Comorbidities

Employees with FM relative to OA had significantly higher prevalence rates of all selected conditions with the only exceptions being the musculoskeletal pain categories, which were higher in the OA sample. These musculoskeletal categories consisted of conditions strongly associated with arthritic conditions. Conditions with the highest RR for the FM sample compared with the OA sample included back pain (1.7 RR), anxiety (1.6 RR), irritable bowel syndrome (1.5 RR), depressive disorders (1.5 RR), and chronic fatigue syndrome (1.5 RR).

Employees with FM had greater risk of being diagnosed with each of the selected conditions when compared with controls; they were 3.1 times more likely to have back pain, 2.8 times more likely to have neurological pain, 2.1 times more likely to exhibit a depressive disorder, anxiety, or sleep disturbances, and twice as likely to have chronic fatigue syndrome.

Medical Care Use

Employees with FM compared with the OA sample had fewer hospitalizations, on average (10.6% vs 14.0%, $P < 0.0001$), but were more likely to visit the emergency department (23.3% vs 18.1%, $P < 0.0001$), rheumatologists (6.6% vs 4.3%, $P < 0.0001$), and other non-physician specialists (58.2% vs 38.5%, $P < 0.0001$) (Table 3). Among users of services, those with FM had more visits on average to emergency departments (2.5 vs 2.2, $P < 0.0001$), primary care physicians (4.8 vs 4.3, $P < 0.0001$), and other medical specialists (8.1 vs 7.2, $P < 0.0001$). Of those who saw rheumatologists in 2005, visits by em-

TABLE 2
Demographic and Health Characteristics of Employee Samples

	FM (*N* = 8,513) (1)	Control (*N* = 7,260) (2)	OA (*N* = 8,418) (3)	FM vs Control (1)/(2) Risk Ratio	FM vs OA (1)/(3) Risk Ratio	FM vs Control (2) − (1) *P**	FM vs OA (3) − (1) *P**
Age (mean, SD)	50.1 (8.1)	48.9 (7.8)	50.6 (8.0)	—	—	<0.0001	<0.0001
Age (median)	51	50	52	—	—		
Percent female	51.6	48.9	52.6	—	—	0.0007	0.1639
Region							
Mid-Atlantic and New England	10.9	12.1	9.6	—	—	0.0035	0.0159
South Atlantic	24.4	23.8	25.6	—	—		
Central	48.5	46.4	49.0	—	—		
Mountain/Pacific	16.2	17.6	15.9	—	—		
Charlson Comorbidity Index (mean, SD)	0.47 (1.11)	0.29 (0.90)	0.46 (1.04)	—	—	<0.0001	0.5677
Percent with selected medical condition							
Back pain	34.4	11.1	20.8	3.1	1.7	<0.0001	<0.0001
Neurological pain	6.7	2.4	4.9	2.8	1.4	<0.0001	<0.0001
Bipolar disorder	1.6	0.6	1.1	2.6	1.4	<0.0001	0.0095
Headache and migraine	12.8	5.4	7.8	2.4	1.6	<0.0001	<0.0001
Musculoskeletal pain: OA	11.6	5.0	52.4	2.3	0.2	<0.0001	<0.0001
Musculoskeletal pain: other	50.2	22.8	56.1	2.2	0.9	<0.0001	<0.0001
Irritable bowel syndrome	2.4	1.1	1.6	2.2	1.5	<0.0001	0.0005
Depressive disorders	13.2	6.3	9.0	2.1	1.5	<0.0001	<0.0001
Sleep disturbances	10.6	5.0	9.1	2.1	1.2	<0.0001	0.0019
Anxiety	6.7	3.2	4.1	2.1	1.6	<0.0001	<0.0001
Chronic fatigue syndrome	15.4	7.8	10.1	2.0	1.5	<0.0001	<0.0001
Abdominal pain	14.7	7.9	12.6	1.9	1.2	<0.0001	<0.0001
Chest pain	14.9	8.4	12.7	1.8	1.2	<0.0001	<0.0001
Other mental disorders	7.4	4.2	5.7	1.7	1.3	<0.0001	0.0246

*χ^2 tests for differences in percentages, *t* tests for differences in means.

TABLE 3
Medical Care Use in 2005: Fibromyalgia, Control, and Osteoarthritis Employee Samples

	FM (*N* = 8,513)		Control (*N* = 7,260)		OA (*N* = 8,418)					
Medical Care Use	(1) % With Use	(2) Conditional Mean (SD)	(3) % With Use	(4) Conditional Mean (SD)	(5) % With Use	(6) Conditional Mean (SD)	FM vs Control (3) − (1) *P**	FM vs Control (4) − (2) *P**	FM vs OA (5) − (1) *P**	FM vs OA (6) − (2) *P**
Hospital emergency department	23.3	2.5 (3.6)	13.0	1.8 (1.9)	18.1	1.9 (2.2)	<0.0001	<0.0001	<0.0001	<0.0001
Hospital inpatient	10.6	4.3 (5.8)	6.2	4.1 (7.6)	14.0	4.6 (8.1)	<0.0001	0.0743	<0.0001	0.0503
Outpatient	62.6	4.1 (6.9)	47.5	3.0 (3.9)	68.3	4.2 (5.4)	<0.0001	<0.0001	<0.0001	0.0999
Office: primary care physician	79.4	4.8 (4.6)	65.6	3.4 (3.2)	80.5	4.3 (3.8)	<0.0001	<0.0001	0.0550	<0.0001
Office: rheumatologist	6.6	3.1 (3.7)	0.8	2.6 (2.8)	4.3	3.0 (2.7)	<0.0001	0.0145	<0.0001	0.9402
Office: other physician specialty	80.3	8.1 (10.3)	64.5	5.1 (6.8)	83.7	7.2 (8.1)	<0.0001	<0.0001	<0.0001	0.1730
Office: other non-physician	58.2	12.0 (13.1)	24.4	7.6 (11.1)	38.5	9.9 (12.1)	<0.0001	<0.0001	<0.0001	<0.0001

*χ^2 tests for differences in percent with use, Wilcoxon rank sum tests for differences in visits.

ployees with FM were comparable with those of employees with OA (3.1 vs 3.0, $P = 0.9402$). Compared with controls, employees with FM were more likely to use all types of medical services, especially specialty physicians (Table 3). Among users of services, employees with FM had more inpatient stays, emergency department visits, and office visits in 2005.

Use of Prescription Drugs in Selected Therapeutic Classes

In the FM sample, the most commonly used therapeutic classes were

narcotic analgesics (41.4%), followed by skeletal muscle relaxants (20.0%), SSRIs (19.4%), benzodiazepines (18.1%), non-benzodiazepine sleep aids (13.7%), SNRIs (8.2%), and tramadol (7.8%) (Table 4).

Among the therapeutic classes and subclasses defined for this analysis, employees with FM were more likely than employees with OA or controls to be prescribed drugs in multiple therapeutic classes. Employees in the FM sample were prescribed an average of 1.47 of 7 therapeutic classes, compared with 0.73 among controls and 1.29 in the OA sample (all $P < 0.0001$). Likewise, employees in the FM sample were prescribed an average of 1.72 of 14 therapeutic subclasses, compared with 0.79 among controls and 1.49 in the OA sample (all $P < 0.0001$).

Employees with FM were more likely than employees with OA to receive prescriptions in five of the seven selected therapeutic classes (all <0.0001): antidepressants (32.0% vs 23.5%), skeletal muscle relaxants (20.0% vs 13.5%), anticonvulsants (9.6% vs 6.2%), benzodiazepines (18.1% vs 13.7%), and non-benzodiazepine sleep aids (13.7% vs 10.0%). Employees with FM were less likely than employees with OA to be prescribed narcotic analgesics (41.4% vs 48.1%, $P < 0.0001$). No significant difference was found in the rate of antihistamine prescriptions across the two samples (8.2% vs 7.9%). Differences were also found among employees with FM and OA in the select drug classes detailed within the select therapeutic classes analyzed. In particular, employees with FM were 2 times more likely to use

TABLE 4
Use of Prescription Drugs in Selected Therapeutic Classes in 2005: Fibromyalgia, Control, and Osteoarthritis Employee Samples

	FM (*N* = 8,513) (1)	Control (*N* = 7,260) (2)	OA (*N* = 8,418) (3)	FM vs Control (2) − (1) *P**	FM vs OA (3) − (1) *P**
Number of therapeutic classes per person, in 2005 (mean, SD)†	1.47 (1.56)	0.73 (1.05)	1.29 (1.31)	<0.0001	<0.0001
Number of therapeutic subclasses per person, in 2005 (mean, SD)‡	1.72 (1.95)	0.79 (1.18)	1.49 (1.62)	<0.0001	<0.0001
Percent with use of selected therapeutic classes in 2005					
Antidepressants	32.0	15.0	23.5	<0.0001	<0.0001
TCAs	6.0	1.6	3.1	<0.0001	<0.0001
Tetracyclic antidepressants	4.6	1.6	2.8	<0.0001	<0.0001
SNRIs	8.2	2.4	4.6	<0.0001	<0.0001
SSRIs	19.4	9.3	14.7	<0.0001	<0.0001
Other antidepressants	7.1	3.4	5.3	<0.0001	<0.0001
Skeletal muscle relaxants	20.0	6.8	13.5	<0.0001	<0.0001
Anti-convulsants	9.6	2.6	6.2	<0.0001	<0.0001
Alpha 2 delta ligands	6.0	1.2	3.6	<0.0001	<0.0001
Other anticonvulsants	4.4	1.5	3.1	<0.0001	<0.0001
Non-benzodiazepine sleep aids	13.7	5.8	10.0	<0.0001	<0.0001
Benzodiazepines	18.1	8.2	13.7	<0.0001	<0.0001
Analgesics	45.7	29.4	54.0	<0.0001	<0.0001
Narcotic analgesics	41.4	27.9	48.1	<0.0001	<0.0001
Salicylates and Cox 2 inhibitors	6.7	2.5	11.4	<0.0001	<0.0001
Other (tramadol)	7.8	2.0	7.4	<0.0001	0.2990
Antihistamines	8.2	5.2	7.9	<0.0001	0.4734
Percent with use of selected medications in 2005					
Duloxetine	4.0	0.5	1.6	<0.0001	<0.0001
Pregabalin	1.1	0.2	0.4	<0.0001	<0.0001
Gabapentin	5.4	1.0	3.3	<0.0001	<0.0001
Amitriptyline	4.4	0.9	2.3	<0.0001	<0.0001
Tramadol	7.8	2.0	7.4	<0.0001	0.2990
Venlafaxine	4.7	2.0	3.2	<0.0001	<0.0001
Fluoxetine	3.9	1.9	2.9	<0.0001	0.0005

*χ^2 tests for differences in percentages, *t* test for differences in means.

†Number of therapeutic classes ranged from 0 to 7. Classes were antidepressants, skeletal muscle relaxants, anticonvulsants, non-benzodiazepine sleep aids, benzodiazepines, analgesics, and antihistamines.

‡Number of therapeutic classes ranged from 0 to 14. Classes were TCAs, tetracyclic antidepressants, SNRIs, SSRIs, other antidepressants, skeletal muscle relaxants, alpha 2 delta ligands, other anticonvulsants, non-benzodiazepine sleep aids, benzodiazepines, narcotic analgesics, salicylates and cox 2 inhibitors, tramadol, and antihistamines.

tricyclic antidepressants (6.0% vs 3.1%), duloxetine (4.0% vs 1.6%), and pregabalin (1.1% vs 0.4%) (all $P < 0.0001$).

Employees with FM had higher rates of use for all therapeutic classes, drug classes, and individual agents selected for this study (all $P < 0.0001$). Rates of use were at least 2 times higher in the FM sample versus the controls for all comparisons with the exception of the use of analgesics, narcotic analgesics, and antihistamines, all of which were at least 1.5 times higher than the rate of use in controls.

Costs

Total costs included medical costs, drug costs, and indirect costs incurred through time lost from work due to medical care and disability. Total costs among employees with FM were not significantly different from those of the OA sample ($10,199 vs $10,861, $P = 0.3758$), and were nearly twice those of the control sample ($10,199 vs $5274, $P < 0.0001$).

Average total direct costs, which consist of medical and drug costs, for employees with FM exceeded costs of controls by 86% ($7286 vs $3915, $P < 0.0001$), and were 12% lower than average costs among employees with OA ($7286 vs $8325, $P = 0.0287$). Average medical costs among employees with FM were significantly higher than among controls ($5656 vs $3160, $P < 0.0001$), but less than medical costs of employees with OA ($5656 vs $6984, $P = 0.0242$) (Table 5). Prescription drug costs were significantly higher for employees with FM when compared with controls ($1630 vs $755, $P < 0.0001$), and comparable with those of the OA sample ($1630 vs $1341, $P = 0.3541$).

FM imposes substantial burden in terms of work loss and indirect costs to employers. Total indirect costs among employees with FM were $2913, compared with $1359 among controls ($P < 0.0001$), and $2537 ($P < 0.0001$) among employees with OA (Table 5). Disproportionately more indirect costs among employees with FM or OA were due to disability rather than medically related absence.

Work Loss Days

Employees in the FM sample missed an average of 29.8 days (18.1 disability days; 11.6 medically related days) in 2005, or approximately 15% of all working days in a calendar year (Table 6). This amount of lost work time was approximately 3 times the average work loss among controls (29.8 vs 10.4 days, $P < 0.0001$), and significantly higher than OA patients (29.8 vs 25.7 days, $P < 0.0001$).

Sensitivity Analysis: Comparison to All Enrollees

The results of this paper focus on employees in the 16 companies because this sample allows for assessment of indirect costs (disability and work loss days). Additional analyses, excluding indirect costs, were undertaken on two further samples: patients (including employees and their dependents) in 31 companies, and all patients (ie, employees plus spouses and dependents) in 16 companies. Demographic characteristics and costs were compared across the employee, the 31 company-, and the 16 company-enrollee samples to determine whether similar trends were found for all enrollees.

The employee samples were younger and healthier, on average, than the matched samples of all enrollees; nevertheless, between-group differences in morbidity as measured by the CCI were similar for all enrollees in the 16 and 31 companies, and were consistent with the results presented in this study (Appendix). The enrollee samples were predominantly female (67% in each matched sample). The employee subsets had fewer females than the matched enrollee samples, and there were small but statistically significant between-group differences in gender. The samples of employees did not differ markedly from one another on age; nevertheless, between-group differences were statistically significant. The average age of the FM employee sample was slightly lower than the OA sample (50.1 vs 50.6, $P < 0.0001$) and slightly higher than the control sample (50.1 vs 48.8, $P < 0.0001$).

Average costs were slightly higher among all enrollees, as expected, but between-group differences in costs (FM vs control, FM vs OA) were, for the most part, similar for enrollees (both from the 31 and 16 samples) and the employee subsets. The cost distributions of the FM, control, and OA samples varied somewhat between all enrollees and the employee subset. Among all three samples—enrollees in 31 companies, enrollees in 16 companies, and employees in 16 companies—average direct costs were significantly higher among the FM sample when compared with controls. Across both enrollee samples and the employee subset, prescription costs for the FM groups were higher than control and OA prescription costs. Differences in average direct costs (FM vs OA) were slightly larger for the employee subset in the analyses reported in this paper.

Discussion

The research presented here builds on previous literature, which demonstrated that employee disability and medical comorbidity associated with FM greatly increase the economic burden of the disease.[8,25] We found that employees with FM have total costs of $10,199, which is approximately two times the cost of matched controls. Using data from one large US Fortune 100 manufacturer, Robinson et al estimated total annual costs of employees with FM to be $7776 per employee, also nearly twice the cost of a typical employee ($4045) (in 1998 dollars).[8] Adjusted to 2005 dollars, FM sample costs come to $10,380 (adjusted using the Medical Care Current Price Index for 2005 and 1998: 323.2/242.1 =

TABLE 5
Average Annual Direct and Indirect Costs (2005 USD): Fibromyalgia, Control, and Osteoarthritis Employee Samples

	FM (*N* = 8,513) (1)			Control (*N* = 7,260) (2)			OA (*N* = 8,418) (3)			FM vs Control (2) − (1)	FM vs OA (3) − (1)
	Mean	(SD)	% of Total	Mean	(SD)	% of Total	Mean	(SD)	% of Total	*P**	*P**
Direct costs											
Medical services											
Emergency department	$205	($767)	2.8	$116	($521)	3.0	$180	($744)	2.2	<0.0001	<0.0001
Hospital inpatient	$1,243	($7,370)	17.1	$834	($7,075)	21.3	$2,472	($18,746)	29.7	<0.0001	<0.0001
Outpatient	$1,945	($5,066)	26.7	$1,132	($5,205)	28.9	$2,387	($7,145)	28.7	<0.0001	<0.0001
Office: primary care physician	$330	($670)	4.5	$206	($1,906)	5.3	$304	($1,369)	3.7	<0.0001	0.0946
Office: rheumatologist	$34	($528)	0.5	$3	($100)	0.1	$36	($652)	0.4	<0.0001	<0.0001
Office: other physician specialty	$1,065	($3,303)	14.6	$566	($3,320)	14.5	$952	($2,327)	11.4	<0.0001	0.0055
Office: other non-physician	$461	($1,066)	6.3	$132	($936)	3.4	$292	($1,094)	3.5	<0.0001	<0.0001
Other medical service	$373	($2,245)	5.1	$171	($1,752)	4.4	$360	($1,843)	4.3	<0.0001	0.0121
Total medical services costs	$5,656	($12,413)	77.6	$3,160	($12,013)	80.7	$6,984	($22,170)	83.9	<0.0001	0.0242
Total prescription drug cost	$1,630	($3,828)	22.4	$755	($1,890)	19.3	$1,341	($2,487)	16.1	<0.0001	0.3541
Total direct costs	$7,286	($13,683)	100.0	$3,915	($12,463)	100.0	$8,325	($22,666)	100.0	<0.0001	0.0287
Indirect costs											
Disability	$1,347	($6,802)	46.2	$377	($3,088)	27.7	$1,167	($4,960)	46.0	<0.0001	0.0016
Medically related absenteeism	$1,566	($2,409)	53.8	$982	($1,814)	72.3	$1,369	($2,299)	54.0	<0.0001	<0.0001
Total indirect costs	$2,913	($7,083)	100.0	$1,359	($3,598)	100.0	$2,537	($5,388)	100.0	<0.0001	<0.0001
Total costs											
Direct	$7,286	($13,683)	71.4	$3,915	($12,463)	74.2	$8,325	($22,666)	76.6	<0.0001	0.0287
Indirect	$2,913	($7,083)	28.6	$1,359	($3,598)	25.8	$2,537	($5,388)	23.4	<0.0001	<0.0001
Total costs	$10,199	($17,411)	100.0	$5,274	($14,206)	100.0	$10,861	($24,549)	100.0	<0.0001	0.3758

*Wilcoxon rank sum test for differences in costs.

TABLE 6
Average Annual Work Loss Days in 2005: Fibromyalgia, Control, and Osteoarthritis Employee Samples

	FM (*N* = 8,513) (1)		Control (*N* = 7,260) (2)		OA (*N* = 8,418) (3)		FM vs Control (2) − (1)	FM vs OA (3) − (1)
	Mean	(SD)	Mean	(SD)	Mean	(SD)	*P**	*P**
Employee work loss days								
Disability days	18.1	(71.4)	4.4	(32.5)	15.4	(62.3)	<0.0001	<0.0001
Medically related days	11.6	(12.9)	5.9	(8.9)	10.3	(12.8)	<0.0001	0.0191
Total days	29.8	(70.6)	10.4	(33.6)	25.7	(62.4)	<0.0001	<0.0001

*Wilcoxon rank sum test for differences in work loss days.

1.3349). The total cost estimate found by Robinson et al is virtually identical to the estimate obtained in the current study.[8] As in the previous study, approximately one third of the current study cost was due to employee absenteeism and disability. In addition, a recent estimate by Berger et al found health care costs to be approximately 3 times the cost of patients without FM. Although Berger's cost estimate differentials are somewhat higher than our estimate for FM patients, much of this difference is likely due to the lower average age and active employment status of our sample.[25]

This study advances current knowledge of the payer burden of the disease by updating and estimating costs from a more recent sample of employees from a geographically disperse set of companies and from a range of industries and occupations. In addition, this study has compared the payer burden of FM with OA, another painful condition that can cause work disability.

Average direct health care costs in the FM sample were significantly higher than control group costs and approached those of employees with OA who had similar demographic profiles. Indirect costs among employees with FM were more than twice those of controls and exceeded costs of employee with OA. All FM cost components were significantly larger than those of the control group, but the relative amount of the FM cost components varied in relation to OA costs. Although average total costs for OA were not significantly different ($10,199 vs $10,861, $P = 0.3758$), average prescription drug costs and indirect costs were significantly higher among the FM sample ($1630 and $2913 vs $1341 and $2537, respectively, $P < 0.0001$) and average medical costs were significantly lower ($7286 vs $8325, $P < 0.0001$).

These cost comparisons between the FM and OA groups may reflect underlying differences in the disease-specific samples and typical treatment for the diseases. For example, inpatient costs comprised a relatively larger proportion of total costs for employees with OA than for employees with FM. This is understandable in light of more intensive inpatient use (eg, for joint replacements) among persons with OA. In contrast, prescription drug utilization and use of non-physician medical providers contributed to a larger portion of total direct costs among the FM group. High prescription drug costs among the FM group may be partly due to polypharmacy, which is common among persons with FM. Although this was not a study of drug treatment patterns, the descriptive comparisons of drug utilization indicated that employees with FM typically use prescription drugs from multiple classes. In 2005, employees with FM used prescription drugs across more of the studied therapeutic classes when compared with employees with OA (Mean of seven therapeutic classes: 1.47 FM vs 1.29 OA, $P < 0.0001$).

No FDA approved indication for FM existed until the recent approval of the alpha-2-delta ligand, pregabalin, in mid-2007. Pharmacotherapy has traditionally focused on control of symptoms, including pain; sleep disturbances; and mental symptoms such as anxiety. Consequently, patients with FM often use analgesics, antidepressants, and sleep aids. The research presented in this paper indicates that such is the case, but there is widespread use of prescribed opioid analgesics and benzodiazepines among persons with FM, despite little evidence to support the use of opioid analgesics and benzodiazepines in the specific treatment of FM.[9,15,16] The American Pain Society treatment guidelines have increased the focus on drug classes such as SSRIs, SNRIs, and selected drugs, including amitriptyline and tramadol as well as pregabalin.[14,15] Although the use of some drugs newer to the market (eg, duloxetine, pregabalin) was not prevalent in the FM sample, FM patients were more likely than controls to be prescribed such drugs.

Employees with FM also typically suffer from a number of symptoms or other related conditions, falling generally into three categories of pain, sleep disturbance, fatigue, and mental comorbidity. Treatment of comorbidity in FM patients, as well as the clustering of comorbidities, may contribute disproportionately to the total direct cost burden. Sleep disturbance, and mental conditions typically associated with FM, such as

depression, anxiety, and other mental disorders, as well as chronic fatigue syndrome and sleep disturbances, were significantly more prevalent among FM employees than in either other group. Pain conditions, in particular, were much more prevalent in employees with FM, even when compared with the OA sample.

Indirect costs among employees with FM are quite high, even higher than average per-employee costs in a sample of OA patients. Although the higher prevalence of OA in the general population creates a total employer burden that is probably larger, it is important for employers to know that the economic burden associated with FM can be just as large at an individual level.

Limitations

The research presented here is subject to limitations associated with any retrospective claims analysis. Insurance claims data do not contain detailed clinical data on diagnosis and treatment, and as a result, the longevity and history of the disease is unknown. This retrospective analysis was complicated by the challenge of defining FM with diagnostic information in claims. Diagnosis of "myalgia and myositis, not otherwise specified" may be used by providers as a catch-all category for symptoms associated with muscle pain. Not only does the ICD-9 code for "myalgia and myositis" represent pain originating from causes not otherwise specified in the ICD-9 diagnostic criteria, this code may also be used on claims for health care services leading up to a more definitive diagnosis. This makes it difficult to differentiate FM syndrome, which corresponds to a defined set of diagnostic criteria, from other conditions such as trauma-induced myalgia. Such ambiguity in the coding may reduce the external validity of study findings from claims-based analyses of FM syndrome.

Additionally, although estimates are based on a large sample, the prevalence of comorbidities, and estimates of use and costs depend, in part, on how the research samples were defined. Matching methods were employed to make comparisons between the FM and comparison samples. As a result of matching on age, the OA sample may not be fully representative of the disease. Unlike FM, OA commonly begins later in life, with incidence peaking between age 70 and 79 for both males and females.[26] Due to the lack of available female matches in the OA and control samples, the FM sample contains only 52% women, whereas the original, unmatched sample consisted of approximately 70% women, more accurately reflecting the disease's demographic profile.

Implications

The results of this analysis show that disability burden is substantial among persons with FM. Comparisons of employees underestimate the true economic burden of this disease. Societal costs have not been fully assessed for those outside of the workforce, but prior research suggests that an estimated 9% to 26% of patients with FM are not working due to temporary or permanent disability.[12] Further, the contribution of different cost components to overall burden underscores the importance of understanding utilization and components of costs during different stages of diagnosis and treatment of FM. Substantial costs may be incurred prior to a confirmed diagnosis of FM. Additional analyses of medical and drug treatment patterns and costs across stages of diagnosis of FM would add to current knowledge surrounding the real-world treatment experience of patients with FM. Although guidelines for diagnosis and treatment exist, to date there are no FDA-approved pharmaceutical interventions with indication for treatment of FM. Effective treatment, through improvements in diagnosis, management, and pharmaceutical intervention, could result in reduced direct and indirect costs.

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APPENDIX TABLE 1

Selected Characteristics of Fibromyalgia, Control, and Osteoarthritis Samples: All Enrollees and Employees Only

	FM (1)		Control (2)		OA (3)		FM vs Control (2) − (1)	FM vs OA (3) − (1)
	Mean	SD	Mean	SD	Mean	SD	*P**	*P**
31 Companies-all enrollees								
Number of enrollees	38,170		38,170		38,170			
Age	52.1	(8.3)	52.0	(8.3)	52.5	(8.1)	0.9993	<.0001
Percent female	67.4		67.4		67.4		1.0000	1.0000
Charlson Comorbidity Index	0.6	(1.2)	0.4	(1.0)	0.6	(1.2)	<.0001	0.8133
Total medical costs	$6,530	($17,195)	$3,397	($14,123)	$6,974	($20,334)	<.0001	0.0040
Total cost of prescription drugs	$2,092	($3,949)	$949	($2,192)	$1,645	($3,498)	<.0001	<.0001
Total direct costs	$8,622	($18,382)	$4,346	($14,669)	$8,619	($21,086)	<.0001	<.0001
16 Companies-all enrollees								
Number of enrollees	17,206		16,828		16,917			
Age	51.7	(8.4)	51.8	(8.5)	52.3	(8.3)	0.3919	<.0001
Percent female	66.5		66.4		66.9		0.8190	0.3970
Charlson Comorbidity Index	0.5	(1.2)	0.4	(1.0)	0.5	(1.1)	<.0001	0.1747
Total medical costs	$6,346	($14,643)	$3,449	($12,387)	$6,996	($19,853)	<.0001	0.1279
Total cost of prescription drugs	$2,091	($4,185)	$942	($2,009)	$1,602	($2,860)	<.0001	<.0001
Total direct costs	$8,437	($16,065)	$4,391	($12,894)	$8,598	($20,475)	<.0001	0.0018
16 Companies-employees only								
Number of employees	8,513		7,260		8,418			
Age	50.1	(8.1)	48.9	(7.8)	50.6	(8.0)	<.0001	<.0001
Percent female	51.6		48.9		52.6		0.0007	0.1639
Charlson Comorbidity Index	0.5	(1.1)	0.3	(0.9)	0.5	(1.0)	<.0001	0.5677
Total medical costs	$5,656	($12,413)	$3,160	($12,013)	$6,984	($22,170)	<.0001	0.0242
Total cost of prescription drugs	$1,630	($3,828)	$755	($1,890)	$1,341	($2,487)	<.0001	0.3541
Total direct costs	$7,286	($13,683)	$3,915	($12,463)	$8,325	($22,666)	<.0001	0.0287

*χ^2 tests for differences in percentages, *t* tests for differences in mean age, and Charlson Comorbidity Index, Wilcoxon rank sum test for differences in costs.