Hospitalisation charges for fibromyalgia in the United States, 1999-2007

M.G. Haviland[1], J.E. Banta[2], P. Przekop[3]

[1]Department of Psychiatry, Loma Linda University School of Medicine, Loma Linda, CA, USA; [2]Department of Health Policy and Management, Loma Linda University School of Public Health, Loma Linda, CA, USA; [3]Betty Ford Center, Rancho Mirage, CA, USA, Departments of Pediatrics, Psychiatry, and Neurology, Loma Linda University School of Medicine, Loma Linda, CA, USA.

Mark G. Haviland, PhD
Jim E. Banta, PhD, MPH
Peter Przekop, DO, PhD

Please address correspondence to:
Mark G. Haviland, PhD,
Department of Psychiatry, BHI,
1686 Barton Road, Box D,
Redlands, CA 92373, USA.
E-mail: mhaviland@llu.edu

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ABSTRACT

Objectives. *To estimate fibromyalgia (FM) hospitalisation costs (i.e. charges) for patients in the United States from 1999 to 2007; to determine factors associated with variation in costs of FM and non-FM hospitalisations; and to investigate hospital procedures associated with FM hospitalisations.*

Method. *Data were from the Nationwide Inpatient Sample, a large database of hospitalisations in the U.S. Over the study period, an estimated 63,772 patients – two-thirds women, one-third men – had been hospitalised for FM (FM criterion was the International Classification of Diseases, 9th Revision, Clinical Modification diagnosis code 729.1, Myositis and Myalgia, unspecified). Demographics and hospital characteristics were described with frequencies and mean inflation-adjusted charges. Two multivariable linear regressions (one for FM and a second for non-FM patients), with Consumer Price Index (CPI)-adjusted charges (hospital and related services category) in thousands of dollars as the dependent variable, were performed, excluding cases with masked or missing data. Procedures were categorised with a standard classification scheme.*

Results. *Survey-adjusted total CPI-adjusted charges over the study period were estimated to be approximately $1.0 billion. Hospital procedures and Charlson-Deyo Index (co-morbidity severity) scores were the strongest predictors of charges in bivariate and multivariate analyses (for both FM and non-FM patients). The majority of procedures for FM patients were related to musculoskeletal, gastrointestinal, or cardiovascular systems. Most FM patients, however, did not have any procedure or a life-threatening co-morbid illness.*

Conclusion. *Over the nine-year period, hospital charges for FM were substantial. Studies of how to reduce or avoid these costs in the treatment of FM need to be undertaken.*

Introduction

Fibromyalgia (FM) is a chronic, functional pain disorder that confers a high degree of morbidity to patients and financial burden to society (1, 2). Typically, patients with FM have reported widespread pain in all four body quadrants persisting for at least three months and palpated pain at 11 of the 18 specified "tender points" (1990 American College of Rheumatology diagnostic criteria (3)). FM patients report multiple co-morbid disorders (4), which contribute to poor quality of life and can make the diagnosis difficult and costly (5, 6). The management of FM primarily occurs in the outpatient setting, and rarely should hospitalisation be required (7). As such, little is known about FM hospitalisations.

The burden of FM reaches well beyond what is endured by the patients. Equally evident are the high societal and health care costs, both indirect (disability/loss of productivity) and direct (health care expenditures) (5). Researchers have taken various approaches to estimate these costs, and despite methodological variation, the results remain remarkably consistent. All document substantial indirect and direct costs (*e.g.* (8-12)), be they large or small studies. Moreover, Berger *et al.* (9) note that costs are high both pre- and post-diagnosis.There is also some evidence that the overall cost of FM may be equivalent to other pain conditions such as rheumatoid or osteoarthritis (8, 12).

Despite the relatively large number of FM studies demonstrating substantial economic burden, little data exist on patients admitted to the hospital for FM symptom (*e.g.* pain exacerbation) management. Data from the late 1990s (13) showed that hospital charges accounted for the largest portion of direct medical costs for FM patients (followed by medications) and that approximately 50% of the hospitalised FM patients in the study sample had been admitted

for FM-related symptoms/conditions. We (14) conducted the largest FM hospitalisation study to date. With data from the Nationwide Inpatient Sample (NIS, Healthcare Cost and Utilisation Project; HCUP (15)), we showed that from 1999-2007, an estimated 63,772 patients – 20,004 (31.4%) men and 43,768 (68.6%) women – were hospitalised for FM (*i.e.* FM was their primary diagnosis). The most common secondary diagnoses among these FM patients were essential hypertension, disorders of lipid metabolism, and coronary atherosclerosis and other heart disease. These findings are quite similar to Wolfe *et al's* 1997 reported comorbidity data (13). The present study uses the same NIS dataset to report hospitalisation charges.

The purposes of the present study were to: (a) estimate total costs for patients in the U.S. hospitalised for FM from 1999 to 2007, (b) determine factors associated with variation in these costs, (c) compare FM hospitalisation costs to all hospitalisations, (d) investigate hospital procedures associated with FM hospitalisations, and (e) provide length of stay (LOS) data.

Method

Data

We used hospital discharge data from the Nationwide Inpatient Sample, the largest all-payer inpatient care database in the U.S. (15). NIS is one of several datasets developed as part of the HCUP, a Federal-State-Industry partnership sponsored by the Agency for Healthcare Research and Quality. NIS approximates a 20-percent stratified sample of U.S. community hospitals, with the sampling frame covering roughly 90% of all hospital discharges in the U.S. Annual NIS databases contain roughly seven to eight million records, which represent discharges from approximately 1,000 hospitals. NIS is the one national hospital database that contains information on charges for all patient records, regardless of payer, and, thus, it has proved to be an excellent source to address research questions similar to ours, for example, in dental (16) and mental and addictive disorder samples (17, 18).

FM patients

Selected were those discharge records from 1999 to 2007 where the primary diagnosis code (reason for hospitalisation) was 729.1 (Myositis and Myalgia, unspecified, *International Classification of Diseases, 9th Revision, Clinical Modification* [ICD-9-CM]). There is no specific ICD-9-CM diagnostic code for FM; however, the 729.1 criterion is used to represent FM in many large health services research with managed care and claims data (*e.g.* [19, 20]). As the Centers for Disease Control and Prevention has noted, however, hospitalisation rates and, thus, the corresponding charges based on this code may be overestimates for FM (21).

Statistical analyses

Basic demographic and hospital characteristics (detailed in Table I) were obtained from NIS records. Hospital charges were adjusted for inflation to 2007 values using the medical care – hospital and related services – expenditures category of the Consumer Price Index for all Urban Consumers, with 1982–1984 as a baseline of 100 (22). As an example, 2001 dollars were converted to hospital CPI-adjusted 2007 dollars by first multiplying charges times the 2007 annual average of 498.9 and then dividing by the 2001 annual average of 338.3.

Each discharge record could have up to 15 billable procedures. The thousands of specific procedures have been organised by the Clinical Classification Software system into 231 unique categories (23). We present the most frequent of these procedure code categories in Table IV. Procedure codes can be collapsed further into four categories of diagnostic vs. therapeutic (and for both, inside/outside of an operating room) (24), as shown in Table III. Overall patient health status was measured via comorbidities (25) using the well-established Charlson-Deyo Index (26, 27), a score that represents the risk of dying in the hospital from one's comorbid conditions.

Basic demographics and hospital characteristics for the study sample were described with frequencies, mean inflation-adjusted charges, and mean length of stay (LOS). Design-adjusted 95% confidence intervals also are shown for each measure. Multivariable linear regression was performed using all NIS discharges during the study period, with hospital CPI-adjusted charges in thousands of dollars as the dependent variable, excluding cases with masked or missing data. General linear modeling, accounting for discharge-level weighting but not sampling design, was used because more than 30% of discharges had missing data. Analyses were stratified by FM as a primary diagnosis (yes/no). The procedures analysis also was not survey adjusted, because the goal was to evaluate up to 15 procedures per discharge record to find patterns among FM patients and not to estimate the nationwide number of patients having specific procedures. File manipulation and survey-adjusted statistical analyses (28) were conducted using SAS 9.3 (SAS Institute Inc., Cary, NC).

Results

Sample characteristics

As shown in Table I, over the nine-year span, an estimated 63,772 patients – 20,004 (31.4%) men and 43,768 (68.6%) women – were hospitalised for FM (*i.e.* ICD-9-CM 729.1 was the primary diagnostic code). The number of FM hospitalisations rose slightly from 1999 to 2003 and declined thereafter. The majority in the sample were in the 45 to 64 year age range and White.

Hospitalisation charges

Survey-adjusted total CPI-adjusted charges over the nine-year study period for FM were estimated to be 950 million dollars. To put this number in perspective, the total charges for all hospitalisations for rheumatoid arthritis (RA, n = 122,462) over this same time period were approximately $3.4 billion (average mean charges per hospitalisation = $28,265 compared to $15,692 for FM).

Charges by patient and hospital characteristics

Also shown in Table I, the mean charges per hospitalisation were slightly higher for women than for men, and women had a slightly longer average LOS. Among those with reported

race/ethnicity data, mean charges were lowest for Whites ($15,575) and highest for Blacks ($19,251) and Hispanics ($18,413). Race/ethnicity is masked for approximately 25% of these hospitalisations (mostly due to selected states not releasing race/ethnicity data), and these cases had the lowest mean charges ($13,157). Patient economic status is approximated by examining the median income of the patient's zip code, stratified by NIS into lowest through highest quartile of median household income. Relatively fewer FM hospitalisations originated from the lowest income zip codes, whereas relatively more came from the highest quartile (18.8 *vs*. 28.2%, respectively). Charges also were higher for patients living in higher-income zip code areas.

Two-thirds of the hospitalisations originated in the emergency department (ED), and those cases had slightly higher charges and shorter LOS compared to routine admission sources (excluding the roughly 3% coming from another hospital or facility). Most hospitalisations (85.2%) were "routine" (*i.e*. to home or self-care), and those had lower charges and LOS compared to other dispositions (except for patients leaving against medical advice). Most (70.2%) hospitalisations involved no procedures. Charges and LOS increased steadily with each additional procedure performed during the hospitalisation. More than half (55.8%) of the patients had no comorbidities per the Charlson-Deyo Index (*i.e*. low risk of mortality from their co-morbid illnesses). Charges and LOS increased steadily as the Charlson-Deyo Index score increased. The West and Midwest had the shortest LOS (3.2 days) and the Northeast the longest (3.6 days); the West had the highest charges ($22,213) and the Midwest the lowest charges ($12,402). Most (62.2%) hospitalisations occurred in large hospitals. These were longer and more costly than those from small and medium-sized hospitals. Most (83.4%) hospitalisations were from urban hospitals, and they were much more expensive than those in rural areas.

FM and non-FM patient regressions

FM. Approximately 30% of the FM records were excluded from the regression analysis due to masked or missing data (many states do not release race information). The variables in the regression model accounted for just under six percent of the variation in charges (R^2=.058). Regression results for FM hospitalisations, generally,

Table I. Patient characteristics, primary diagnosis FM, 1999-2007.

sample n = 12,994 estimated n = 63,772	Frequencies %	 95% CI	Length of stay mean	 95% CI	Hospital charges mean	 95% CI
Gender						
Male	31.4	(31.1-31.6)	3.2	(3.1-3.4)	15.307	(14.485-16.129)
Female	68.6	(68.5-68.7)	3.4	(3.3-3.5)	16.479	(15.144-17.815)
Age group						
1 to 19 years of age	8.2	(7.5-8.7)	3.0	(2.7-3.2)	12.966	(11.879-14.053)
20 to 44 years	26.6	(26.2-27.0)	3.2	(3.1-3.3)	15.281	(14.141-16.420)
45 to 64 years	36.4	(36.1-36.7)	3.3	(3.2-3.5)	16.398	(15.007-17.789)
65 and older	28.6	(28.4-28.8)	3.7	(3.5-3.8)	15.945	(15.175-16.715)
Unknown	0.2	(0.1-0.3)	4.7	(2.9-6.6)	33.300	(100-71.987)
Race / ethnicity						
White	49.3	(48.5-50.0)	3.3	(3.2-3.4)	15.575	(14.794-16.356)
Black	13.4	(12.5-14.2)	3.7	(3.4-4.0)	19.251	(15.613-22.889)
Hispanic	8.3	(7.4-9.1)	3.2	(3.0-3.4)	18.413	(16.343-20.482)
Other	3.9	(3.5-4.3)	3.7	(3.1-4.4)	16.495	(14.722-18.268)
Masked	25.1	(23.9-26.2)	3.3	(3.2-3.5)	13.157	(12.461-13.853)
Primary payor						
Medicare	36.7	(36.5-36.9)	3.7	(3.6-3.8)	16.421	(15.505-17.337)
Medicaid	14.0	(13.4-14.5)	3.7	(3.5-4.0)	16.606	(15.335-17.876)
Private insurance	39.3	(38.9-39.6)	3.0	(2.9-3.1)	14.801	(13.524-16.078)
Self-pay	5.7	(5.1-6.3)	2.9	(2.6-3.2)	14.475	(12.753-16.197)
Other	4.3	(4.0-4.6)	3.4	(3.1-3.7)	14.947	(13.297-16.597)
Median income of patient's zip code						
Lowest quartile	18.8	(17.8-19.6)	3.2	(3.1-3.3)	14.097	(13.277-14.918)
Second quartile	25.8	(25.4-26.2)	3.3	(3.2-3.5)	14.260	(13.189-15.330)
Third quartile	25.0	(24.7-25.3)	3.4	(3.3-3.5)	17.108	(14.684-19.531)
Highest quartile	28.2	(27.3-28.9)	3.5	(3.3-3.6)	17.090	(16.221-17.959)
Unknown	2.3	(2.0-2.5)	3.2	(2.8-3.5)	13.700	(12.223-15.177)
Number of procedures						
0	70.2	(70.1-70.3)	2.7	(2.7-2.8)	12.161	(10.995-13.327)
1	15.8	(15.3-16.2)	4.0	(3.8-4.1)	19.229	(18.113-20.346)
2	7.4	(7.0-7.7)	4.6	(4.3-4.9)	23.651	(21.941-25.361)
3 or more	6.6	(6.1-7.1)	7.3	(6.6-8.0)	36.644	(33.332-39.955)
Charlson-Deyo Index						
0	55.8	(55.2-56.4)	2.3	(2.3-2.4)	13.390	(12.923-13.857)
1	25.1	(24.6-25.6)	3.5	(3.4-3.6)	16.998	(15.073-18.924)
2	10.7	(10.4-11.0)	3.9	(3.7-4.1)	19.295	(16.869-21.722)
3 or more	8.4	(8.0-8.8)	5.1	(4.6-5.5)	22.127	(20.072-24.181)
Admission source						
Emergency room	66.2	(65.6-66.8)	3.2	(3.1-3.3)	15.828	(15.205-16.451)
Another hospital	1.9	(1.6-2.2)	4.4	(3.7-5.0)	24.371	(12.251-36.491)
Another facility	0.8	(0.6-1.0)	3.7	(3.0-4.5)	15.758	(11.233-20.283)
Court/law enforcement	0.0	(0.0-0.1)	4.6	(3.5-5.7)	22.428	(17.559-27.297)
Routine / other	31.0	(30.6-31.3)	3.7	(3.5-3.8)	14.828	(13.347-16.310)
Disposition						
Routine	85.2	(85.0-85.4)	2.9	(2.8-3.0)	14.124	(13.349-14.899)
Transfer to short-term hospital	1.1	(0.9-1.2)	4.4	(3.5-5.4)	17.944	(14.728-21.161)
Transfer to another facility	7.2	(7.0-7.4)	6.5	(6.0-7.0)	27.803	(23.949-31.657)
Home health care	5.1	(4.9-5.4)	5.7	(5.4-6.1)	22.462	(20.781-24.144)
Against medical advice	1.1	(0.9-1.2)	2.3	(1.8-2.7)	13.382	(10.855-15.909)
Died in hospital	0.2	(0.1-0.3)	10.1	(6.0-14.2)	55.426	(31.098-79.754)
Discharged alive, destination unknown	0.1	(0.0-0.1)	4.6	(2.6-6.5)	14.528	(6.158-22.898)

continues

Table I - *continued*.

sample n = 12,994 estimated n = 63,772	Frequencies %	 95% CI	Length of stay mean	 95% CI	Hospital charges mean	 95% CI
Year						
1999	9.8	(9.2-10.4)	3.6	(3.3-4.0)	13.087	(11.742-14.432)
2000	10.8	(10.1-11.6)	3.5	(3.2-3.7)	17.855	(10.951-24.758)
2001	11.5	(10.8-12.2)	3.4	(3.2-3.5)	14.030	(13.034-15.025)
2002	12.3	(11.5-13.1)	3.4	(3.2-3.5)	14.453	(13.497-15.409)
2003	12.5	(11.6-13.2)	3.3	(3.2-3.5)	15.585	(14.255-16.914)
2004	11.6	(10.7-12.5)	3.2	(2.9-3.4)	14.777	(13.710-15.845)
2005	10.6	(9.8-11.3)	3.4	(3.2-3.6)	16.062	(15.027-17.098)
2006	10.3	(9.5-11.1)	3.4	(3.2-3.6)	16.420	(15.374-17.466)
2007	10.5	(9.7-11.3)	3.3	(3.1-3.4)	16.887	(15.724-18.050)
Census Region						
Northeast	20.6	(18.8-22.2)	3.6	(3.4-3.9)	17.484	(15.964-19.004)
Midwest	26.3	(25.2-27.3)	3.2	(3.1-3.3)	12.402	(11.855-12.949)
South	35.4	(34.3-36.4)	3.4	(3.3-3.5)	14.160	(13.610-14.710)
West	17.7	(16.6-18.7)	3.2	(3.0-3.4)	22.213	(17.160-27.267)
Hospital bedsize						
Small	12.2	(11.7-12.7)	3.3	(3.1-3.5)	12.618	(11.645-13.591)
Medium	25.6	(24.8-26.3)	3.3	(3.1-3.4)	14.113	(13.368-14.859)
Large	62.2	(60.8-63.4)	3.4	(3.3-3.5)	16.931	(15.510-18.352)
Hospital location						
Rural	16.6	(15.9-17.3)	3.0	(2.8-3.1)	8.818	(8.408-9.929)
Urban	83.4	(82.8-83.9)	3.4	(3.3-3.5)	17.074	(15.978-18.171)
Hospital teaching status						
Non-teaching	54.8	(54.4-55.2)	3.2	(3.1-3.3)	15.235	(13.715-16.755)
Teaching	45.2	(43.5-46.7)	3.5	(3.4-3.6)	16.256	(15.417-17.094)

were consistent with the descriptive results. (Disposition, an outcome variable, was not included in the regression). Both descriptive and regression results showed no significant effect by gender, age group, primary payor, or admission source. The biggest contributor to charges was number of procedures, with three or more procedures having a coefficient of 23.134. Thus, after adjusting for all other measures, such hospitalisations had charges approximately $23,000 higher than those showing no procedures. Charges also increased with comorbidity (*i.e.* with a greater risk of mortality) – having a Charlson-Deyo Index of three or more were approximately $7,000 more expensive than those having a score of zero. Patients coming from the lowest income areas had charges significantly lower compared to those from the highest income. Charges were significantly higher for Blacks compared to Whites (the relatively wide confidence intervals for the descriptive results did not portend this significant difference). Charges generally increased over time, with inflation-adjusted charges in 2005 to 2007 being significantly higher compared to 1999.

Regarding hospital characteristics, both descriptive and regression results revealed that charges in the Midwest were less than the South, whereas those in the West were significantly higher. Rural hospitals charged much less than did urban hospitals, and small and medium hospitals charged less than large hospitals. Regression revealed that teaching hospitals had higher charges, whereas descriptive results did not suggest a statistically significant difference in charges.

Non-FM. The model for non-FM patients hospitalised during the study period explained nearly 18% of the variability in charges (R^2=.177), with approximately 31% of cases excluded due to masked or missing data. All predictor variables were statistically significant, which is due, partly, to a very large sample size (over 48 million). Coefficients in the non-FM regression model generally were larger compared to the FM model, possibly a function of overall charges being higher (mean charges for non-FM = $24,216 compared to $15,692 for FM). When evaluating the contributions of individual variables to the prediction of the charges criterion, procedures also had the greatest influence, with hospitalisations showing three or more procedures having charges nearly $42,000 greater than those having none. Comorbidity also played a large role; for those with the highest Charlson-Deyo Index score, for example, charges were $13,600 higher than those with the lowest score. In contrast to the FM regression, the non-FM model showed significant differences by gender, age, race/ethnicity, primary payor, and admission source. The non-FM model revealed only a small effect (plus or minus a few hundred dollars) based on quartile of median household income per patient zip code. In general, hospital-level effects were remarkably similar between the two models. The most notable difference was a more pronounced increase in charges from the West compared to the South.

Procedures

Procedure categories are shown in Table III. Of the 12,994 FM hospitalisations in our sample, 3,867 (29.8%) had at least one procedure. Among those hospitalisations, there were 7,319 billable procedures. More than half (55.3%) were diagnostic in nature and occurring outside of the operating room. Only 12.8% of those procedures occurred in an operating room, with the majority of these being diagnostic.

Table IV presents more detailed information regarding those 7,319 procedures. The majority were related to the musculoskeletal, gastrointestinal, or cardiovascular systems.

Discussion

FM is a functional pain disorder that ideally should be adequately managed in the outpatient setting (7). Despite this, from 1999-2007, an estimated 63,772 individuals in the U.S. were hospitalised for FM symptoms. Approximately two thirds were White women in the 45 to 64 year age range. In a previous study (13), patients with FM reported a substantial number of hospitalisations. Although these data do not directly compare with ours, both studies suggest that hospitalisation remains a critical problem among FM patients.

Table II. Regression, inflation-adjusted charges in $1,000s.

Regression Sample	FM primary n = 9,042 n = 12,994		All other (non-FM) discharges n = 48,393,883 n = 70,039,223	
	Coefficient	*p*-value	Coefficient	*p*-value
Intercept	7.387	***	4.995	***
Gender				
Male	0.766		3.364	***
Female (reference)	---		---	
Age group				
1 – 19 years of age	-1.133		-5.028	***
20 – 44 years	0.203		-7.639	***
45 – 64 years	0.676		-0.270	***
65 and older (reference)	---		---	
Race / ethnicity				
White (reference)	---		---	
Black	4.310	***	1.312	***
Hispanic	1.892		0.331	***
Other	-0.305		0.477	***
Primary payor				
Medicare	0.847		2.410	***
Medicaid	0.963		0.503	***
Private insurance (reference)	---		---	
Self-Pay	0.007		1.190	***
Other	-1.329		3.018	***
Median income of patient's zip code				
Lowest quartile	-2.945	*	0.278	***
Second quartile	-1.610		-0.336	***
Third quartile	0.085		-0.307	***
Highest quartile (reference)	---		---	
Number of procedures				
0 (reference)	---		---	
1	5.373	***	7.377	***
2	10.588	***	13.282	***
3 or more	23.134	***	41.554	***
Charlson-Deyo Index				
0 (reference)	---		---	
1	3.223	***	6.152	***
2	4.653	***	9.991	***
3 or more	6.913	***	13.610	***
Admission source				
Emergency Department	-1.353		3.801	***
All other (reference)	---		---	
Year				
1999 (reference)	---		---	
2000	7.203	***	1.502	***
2001	1.187		1.096	***
2002	2.249		3.473	***
2003	3.907	*	4.697	***
2004	2.870		3.413	***
2005	3.883	*	4.538	***
2006	4.579	**	3.635	***
2007	3.734	*	3.743	***
Census Region				
Northeast	1.374		1.292	***
Midwest	-2.529	*	-2.300	***
South (reference)	---		---	
West	7.562	***	11.261	***
Hospital bedsize				
Small	-3.376	**	-4.508	***
Medium	-2.616	**	-3.096	***
Large (reference)	---		---	
Hospital location				
Rural	-6.120	***	-7.665	***
Urban (reference)	---		---	
Hospital teaching status				
Non-teaching	2.472	**	-2.104	***
Teaching (reference)	---		---	
R-square	0.058		0.177	

*p<0.05, **p<0.01, ***p<0.001

Financial burden

In our study, total inflation-adjusted hospitalisation charges for FM from 1999-2007 were estimated to be just over 950 million dollars or approximately $106 million a year. (Note: Actual charges over the study period – not adjusted for hospital inflation – were $760 million). When compared to patients with RA, the RA patients (twice the number of FM patients and twice the average cost) incurred total inflation-adjusted charges of approximately $3.4 billion. One may conjecture that much of this cost was accounted for by orthopedic interventions or the disease's effect on other organ systems. Interestingly, in a study of direct health care costs that compared FM patients to those with RA overall health care cost were similar (12).

Half of the FM hospitalisations were billed to government programmes, Medicare and Medicaid, and just over a third to private insurance carriers. In other words, private insurers were billed less than were government insurers.

The regression model for non-FM NIS discharges accounted for more of the variability in charges than did the FM model. Furthermore, more variables in the non-FM model were significantly associated with charges (than in the FM model), and the magnitude of the significant associations generally were greater, particularly for patient characteristics. Exceptions to this were a much greater effect on charges of Black *vs*. White race and of low *vs*. high income among FM hospitalisations compared to non-FM hospitalisations. Clearly, more factors than we could evaluate contribute to variability in charges and, particularly for FM hospitalisations. Equally clear, though, is that in both models, charges appear to be driven by number of procedures and co-morbidities (defined in the present study as greater risk of death). There was a striking similarity in both the direction and magnitude of hospital-level effects on charges between the FM non-FM regression models.

Procedures and co-morbidities

Although the majority of FM patients did not undergo a procedure, those who did incurred substantial cost increases.

Table III. Procedure categories for FM patients, n (raw) = 7,319.

Location and Type	n	%
Non-operating room diagnostic procedures, minor	4.050	55.3
Non-operating room therapeutic procedures, minor	2.340	32.0
Operating room diagnostic procedures, major	579	7.9
Operating room therapeutic procedures, major	350	4.8

Table IV. Most frequent procedure categories, n (raw) = 7,319.

Procedure Code Category	n	%
Other therapeutic procedures	689	9.41
Diagnostic cardiac catheterisation; coronary arteriography	622	8.50
Other diagnostic procedures on musculoskeletal system	509	6.95
Magnetic resonance imaging	423	5.78
Upper gastrointestinal endoscopy; biopsy	334	4.56
Diagnostic spinal tap	312	4.26
Other vascular catheterisation; not heart	244	3.33
Diagnostic ultrasound of heart (echocardiogram)	223	3.05
Cardiac stress tests	202	2.76
Insertion of catheter or spinal stimulator and injection into spinal canal	173	2.36
CT scan abdomen	166	2.27
Haemodialysis	159	2.17
Colonoscopy and biopsy	154	2.10
Computerised axial tomography (CT) scan	138	1.89
Blood transfusion	127	1.74
Other diagnostic ultrasound	116	1.58
Radioisotope scan and function studies	108	1.48
Physical therapy exercises; manipulation; and other procedures	107	1.46
Injections and aspirations of muscles; tendons; bursa; joints and soft tissue	96	1.31
Other therapeutic procedures on muscles	95	1.30
CT scan chest	89	1.22
Other diagnostic radiology and related techniques	89	1.22
Other CT scan	85	1.16
Electrographic cardiac monitoring	85	1.16
Electrocardiogram	84	1.15
Other diagnostic procedures (interview; evaluation; consultation)	84	1.15
Other non-OR or closed therapeutic nervous system procedures)	77	1.05
Arterio- or venogram (not heart and head)	77	1.05
Respiratory intubation and mechanical ventilation	77	1.05

It is uncertain whether the majority of these procedures were associated with exacerbations of FM pain. At least one study in which healthcare data were analysed, procedures were a major contributing factor to overall expense in healthcare for FM patients (11).

The majority of listed procedures for FM patients were diagnostic and largely minor (87.3%). The remaining procedures were therapeutic. The majority of individual procedures were related to musculoskeletal, gastrointestinal, and cardiovascular issues. Similarly, the more co-morbid diseases hospitalised FM patients had, the more expensive their stay. This is similar to the findings reported in the Wolfe *et al*. study (13).

From data shown in Table I, a picture of the 'typical' hospitalised FM patient emerges: a White woman in the 45-64 year age range, coming to the hospital through the ED for a problem that is not life threatening, 'defined' as an FM patient (*i.e*. FM, a functional pain disorder, is the primary reason for hospitalisation), likely not to undergo a hospital procedure, and be discharged 'routinely'. Some patients, however, have more co-morbid illness and demand inpatient procedures that are much more expensive to treat in the hospital.

Study strengths and limits

Among the study strengths is that it is large and population-based, and a substantial number of men and racial/ethnic minority patients were represented. Moreover, we were able to use well-established classification schemes to simplify and understand both procedures and potentially life-threatening co-morbidity data.

Among the limits, is that ours is a unique FM sample, individuals who have been hospitalised, and they may not adequately represent 'typical' FM patients. In fact, they may better represent a subset of patients whose symptoms are poorly managed (*e.g*. pain is poorly controlled) in outpatient settings. Moreover, cases are hospitalisations, not unique individuals. Also, the ICD-9-CM diagnosis code 729.1 is not specific to FM and, thus, we likely have overestimated both the number of patients with FM and total charges. Hospital charges do not represent collections nor do they include physician services or medication costs. Finally, although many patients were excluded from the regressions, there appears to be no substantial or unusual discrepancies between the numbers in Table I and the regression results in Table II.

Conclusion

FM is a difficult-to-treat functional pain disorder, which ideally should not require a hospitalisation. We have shown, however, that many FM patients still are hospitalised for non life-threatening FM symptoms. Perhaps, more effective outpatient treatment will decrease the need for hospitalization, and, thus, lower the overall and substantial cost of treatment.

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