

# Using a Physician Survey to Estimate the Economic Burden of Fibromyalgia in China

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## Research article

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# Abstract

**Background:** Fibromyalgia (FM) is a chronic pain disorder with a global prevalence estimated to be between 2 and 3%. In addition to the chronic pain incurred by patients, FM is commonly associated with comorbidities and complications such as depression, anxiety, and sleep disturbances. This study estimates the economic burden of patients with FM in China using a physician survey.

**Methods:** A burden of illness model was constructed using a micro-costing approach to estimate the direct cost associated with FM patients in China. FM-related comorbidities of anxiety, depression, and sleep disturbance were included in the model. Treatment utilization and costs for FM and FM-related comorbidities were included as well as FM-related healthcare resource utilization (physician visits, hospitalizations, blood tests, and radiologic tests). FM treatments included nonsteroidal anti-inflammatory drugs, pregabalin, duloxetine, amitriptyline, tramadol, Chinese medicine, physiotherapy, and acupuncture. The model leveraged the results of a physician survey, which targeted 6 rheumatologists and pain experts each with 5-10 FM patients per month in China. All costs are presented in Renminbi (¥) using spot exchange rates as of May 1, 2020.

**Results:** From the physician survey, the prevalence rate of FM in China was estimated to be 2.8% with 75.8% as female. The economic model estimated the annual per patient direct medical cost of FM to be ¥17,377. Within these costs, FM-medication and treatment costs (¥11,216), healthcare resource utilization (¥4,297), and costs for medications treating FM-related comorbidities (¥1,863) were the highest contributors. Healthcare resource utilization costs were driven by physician visits (¥2,787) followed by radiographic tests (¥808), blood tests (¥508), and hospitalizations (¥194).

**Conclusion:** The prevalence and gender distribution of FM patients in China is similar to those of other countries. The economic model estimates patients with fibromyalgia in China to incur significant economic costs.

## Background

Fibromyalgia (FM) is a chronic pain disorder affecting muscles and soft tissue while causing significant health and economic burden to patients [1]. The American College of Rheumatology (ACR) has published guidelines to define the criteria for diagnosing fibromyalgia in adult patients. However, in clinical practice in China, the majority (> 60%) of physicians are unfamiliar with the ACR guidelines. Due to this lack of familiarity, which is not only a factor in China but globally, it is estimated that most cases take over 2 years to diagnosis [2].

The overall prevalence of fibromyalgia globally is estimated to be between 2 and 3% [2–3]. It is more than three times as common in females as males [3]. Prevalence rates also vary significantly from study to study depending on the criteria and sample, with very few national studies being conducted. Patients with FM experience a high rate of comorbid conditions compared to their non-FM counterparts. Common comorbidities include sleep disturbance/insomnia, anxiety, and depression [6]. Rates of depressive

symptoms and anxiety were positively correlated with FM severity. Sleep disturbance/insomnia was highly prevalent regardless of FM severity with a reported prevalence of 52.4% in mild patients, 71.4% in moderate patients, and 69.2% in severe patients. The average number of comorbid conditions among mild patients was 2.9 compared to 4.1 in moderate patients and 4.4 in severe patients [6].

In China, a study of 107 confirmed FM patients reported over 20% had lumbar disk herniation or suspected or misdiagnosed spondyloarthritis, and 14% had osteoarthritis. Furthermore, 12.15% had either anxiety or depression [7].

There currently is no cure for FM and the majority of Chinese rheumatologists believe the goal of treatment should be to focus on relieving symptoms [8]. In China the preferred treatments for FM patients cared for by rheumatologists include antidepressants (79.1%), nonsteroidal anti-inflammatory drugs (NSAIDs) (61.2%), physical therapy (56.0%), and exercise (52.6%). The majority of rheumatologists (95.3%) were prescribing pharmacotherapy to patients with a focus on relieving symptoms of FM, while 71.8% believed there was no effective fibromyalgia therapy [8].

Patients with fibromyalgia have a significant economic and humanistic burden. In the United States, patients with fibromyalgia were found to have costs that were three-times higher than their non-FM counterparts [9]. This trend in higher costs has held true in global studies as well, with heightened costs for FM patients [10–11]. The economic impact has been described as similar to rheumatoid arthritis [12]. In addition to the high economic burden patients also experience a considerable humanistic burden with lower rates of employment, reduced productivity, and lower quality of life compared to non-FM patients [10, 13, 14].

The primary objective of this study was to estimate the financial burden of fibromyalgia in China through the development of an economic model. The secondary objective was to conduct a survey of physicians to understand the prevalence, severity, and treatment patterns of patients with FM in China.

## Methods

### Model Overview

A model was developed to estimate the direct costs associated with FM in China. The model utilized a micro-costing approach and considered costs related to FM medications, medications for FM-related comorbidities, physician visits, hospitalizations, blood tests, and radiologic tests. This type of model has been used in previous FM studies to estimate the burden of disease within a health system [15]. Data for the model was sourced from a physician survey, a literature review, and publically available data.

### Physician Survey

In the absence of recent literature describing the local treatment patterns of patients with fibromyalgia in China, a survey was administered to Chinese rheumatologists and pain physicians currently treating patients with FM. Their responses were based on their personal impressions based on their experience.

Since the average physician in China may not be familiar with FM, the physicians chosen had an average of 5–10 patients per month. The selected physicians regularly participated in advisory boards and patient education activities for a variety of stakeholders. The survey covered four areas including 1) epidemiology of FM; 2) FM-related treatment patterns; 3) treatment patterns for FM-related comorbidities; and 4) healthcare resource utilization and costs for FM patients. A total of six Chinese rheumatologists were targeted for the surveys, which was administered in-person/via phone. Ethics committee approval was not required because the data were based on the opinions of clinical experts without the aide of patient charts.

## Model Inputs

The model inputs were sourced from a combination of the literature and the physician survey described above. Clinical inputs included the percentage of patients on FM-related medications/therapy (Table 1) and medication for FM-related comorbidities as reported in the physician survey. The cost per day of each included medication is based on publically-available information and can be provided upon request.

Table 1  
Physician-Reported Treatment Distribution

MEDICATION	POINT ESTIMATE	MEDIAN	RANGE	
			LOW	HIGH
NSAIDs	25.4%	17.5%	0.0%	80.0%
Chinese Herbal / Patent Medicine	18.3%	15.0%	0.0%	50.0%
Pregabalin	67.1%	62.5%	50.0%	90.0%
Duloxetine	43.3%	45.0%	20.0%	60.0%
Tramadol	16.7%	20.0%	0.0%	30.0%
Amitriptyline	13.5%	7.5%	0.0%	55.0%
Physiotherapy	57.5%	50.0%	0.0%	100.0%
Acupuncture	12.5%	2.5%	0.0%	60.0%

Resource utilization included physician visits of 9.33 per year and 0.23 hospital days per year (physician survey). The cost per physician visit (¥298.72) and hospital day (¥841.90) was sourced from a recent burden of illness study for postherpetic neuralgia in China [16]. A cost per year for lab tests (¥508.33) and radiologic tests (¥808.33) was also applied to patients.

The model took a societal perspective and reported the direct cost per FM patient in China. All costs were reported in 2019 Renminbi (¥) using spot exchange rates as of May 1, 2020 (1 USD = ¥7.06).

# Results

## Physician Survey

The response rate to the survey was 100% with all physicians providing completed surveys. The physicians were rheumatologists and pain physicians located in the following hospitals: two physicians were from the Chinese PLA General Hospital and one each was from the Beijing Tsinghua Chang Gung Hospital, Shanghai Ruijin Hospital, Harbin Medical University, and Shanghai Xinhua Hospital. The prevalence rate in the Chinese population was estimated to be 2.8% (Range: 1% – 6%) with 75.8% (Range: 70% – 87%) of FM patients being female. The severity of FM within patients was fairly evenly distributed with an estimated 32.2% having mild FM, 38.1% with moderate FM, and 29.7% with severe FM. All physicians estimated that 100% of diagnosed patients across all severities were treated for FM.

Physician-reported rate of treatment for each class of medication is shown in Table 1. Pregabalin (67.1%), and duloxetine (43.3%) were the most frequently utilized pharmacological treatments followed by NSAIDs (25.4%), and Chinese medicine (18.3%). A significant percentage of patients were also undergoing physiotherapy (57.5%), and acupuncture (12.5%).

The distribution of specific NSAIDs were 84.7% for celecoxib (40% on 200 mg/day and 60% on 400 mg/day), 6.7% for etoricoxib (60 mg/day), 6.7% for meloxicam (15 mg/day), and 2.0% for loxoprofen (90 mg/day).

It was estimated that 36.7% of patients on pregabalin received 150 mg/day and the remaining 63.7% received 300 mg/day. The majority (89.2%) of patients on duloxetine received 60 mg/day, while 8.3%, 1.7%, and 0.8% received 30, 90, and 120 mg/day, respectively.

Patients receiving tramadol were mostly on a dose of 100 mg/day (70.0%) with 20.0% receiving 50 mg/day and 10.0% receiving 150 mg/day. Amitriptyline was most commonly utilized at either 12.5 mg/day or 25 mg/day (40.0% of patients for both dose), while 20.0% received 18.8 mg/day.

Surveyed physicians estimated one-third (range: 0% – 90%) of FM patients received medication to treat anxiety, 8.8% (range: 0.0% – 30.0%) to treat depression, and 36.7% (range: 0.0% – 90.0%) to treat a sleeping disturbance. Of patients receiving medication for anxiety, lorazepam was the most commonly used with 73.8% of patients. The remaining patients were receiving 12.5 mg/day of clonazepam (25.0%) or 1.2 mg/day of alprazolam (1.3%). Patients receiving depression medication received venlafaxine most frequently (41.7%) followed by flupentixol/melitracen (30.0%), citalopram (25.0%), and sertraline (3.3%). Sleep disturbance was most frequently treated with olanzapine (76.3%) followed by lorazepam (23.8%). The distribution of dosing for each medication is shown in Table 2.

Table 2  
Distribution of Dosing of Medications for FM-Related  
Comorbidities

MEDICATION	POINT ESTIMATE
Depression Medication	
Venlafaxine	
112.5 mg / day	80.0%
150 mg / day	20.0%
Citalopram	
10 mg / day	66.7%
15 mg / day	33.3%
Flupentixol/melitracen	
1.5 mg / day	44.4%
2 mg / day	55.6%
Sertraline	
50 mg / day	100%
Sleep Disturbance Medication	
Lorazepam	
0.75 mg / day	
Olanzapine	
2 mg / day	1.6%
2.5 mg / day	32.8%
3.5 mg / day	32.8%
5 mg / day	32.8%
Anxiety Medication	
Alprazolam	
1.2 mg / day	100%
Lorazepam	
0.75 mg / day	66.1%
1.0 mg / day	33.9%

MEDICATION	POINT ESTIMATE
Clonazepam	
12.5 mg / day	100%

FM-related healthcare resource utilization was also collect in the surveys. Two-thirds of physicians reported FM patients had physician visits once every one to three months, and the other third of physicians reported visits once per month. The average cost of a physician visit was reported to be ¥159 per visit.

## Burden of Illness

The estimated total cost per patient per year for an FM patient was ¥17,377. These costs were driven by medications for FM with ¥11,216 (64.5%) followed by healthcare resource utilization (¥4,297; 10.7%) and medication costs for treating FM-related comorbidities (¥1,863; 24.8%) (Fig. 1).

Within FM medication costs the largest contributors to costs were pregabalin (¥7,054; 62.9%), and duloxetine (¥2,525; 22.5%) followed by NSAIDs (¥711; 6.3%), Chinese medicine (¥685; 6.1%), tramadol (¥237; 2.1%), and amitriptyline (¥6; 0.1%). Costs for medications treating FM-related comorbidities were highest for sleep disturbance (¥1,528; 82.0%) followed by depression (¥264; 14.2%), and anxiety (¥71; 3.8%). Healthcare resource utilization (¥4,297) included physician visits (¥2,787; 64.9%), radiological tests (¥808; 18.8%), lab tests (¥508; 11.8%), and hospitalizations (¥194; 4.5%).

## Discussion

Patients with FM in China incur significant direct costs as a result of their condition. Per patient direct costs of ¥17,377 were driven by FM medication and healthcare resource utilization. To the authors' knowledge, this is the first estimation of the economic burden of FM patients in China.

Globally the economic impact of fibromyalgia has been extensively reported. While the difference in health systems and costs makes a direct comparison between the results from this analysis to analyses in other health settings difficult, the drivers of costs can be compared. The exact prevalence and incidence of FM in China are largely unknown. There have been few studies attempting to estimate the prevalence in different regions and cities, and no studies estimating nationally [4–5]. A 2015 study evaluating the prevalence of FM in a small sample of 4,056 residents of Shantou estimated a prevalence rate of 0.12% [4]. A similar study conducted in Hong Kong reported a prevalence of 0.82% [5].

In Taiwan, the direct cost per year for patients with FM was estimated to be ¥14,000. FM-related medications were responsible for 56.6% (¥7585) of costs, resource utilization was 14.1% (¥1885), and comorbid medication was due to 29.2% of costs [15] A study of Japanese patients with FM determined

the per-patient direct costs were ¥126,500, which were significantly higher than a matched cohort of non-FM patients [13].

The average annual direct cost per FM patient in the United States with a diagnosis of FM diagnosis during the period of 2001–2004 was ¥77,000. Direct costs were driven by outpatient pharmaceuticals (28.8%), inpatient stays (14.8%), and physician visits (7.6%) [12]. A study in the United States compared the costs and healthcare resource utilization of patients with FM based on severity. Of all the direct costs to the payer, 76.2% were for prescription medications in mild patients compared to 62.1% and 62.2% in moderate and severe patients, respectively [6].

Other economic burden studies have been conducted in China for other chronic disease areas. A 2019 publication estimated the economic burden of postherpetic neuralgia in China using a similar method. The study found total direct medical costs of ¥10,600. The costs were driven by higher hospitalization costs of ¥9300 compared to our study, which was driven mostly by higher drug costs [16]. The societal costs of patients with rheumatoid arthritis across 21 tertiary care hospitals between July 2009 and December 2010 were studied [17]. The total societal cost per patient-year was estimated to be ¥27,000, of which 90% (¥24,300) were direct costs. The primary driver (> 50%) of costs were drug costs, which was similar to our analysis [17]. Patients with diabetes were reported to have total annual medical costs of ¥19,600 and diabetes-related costs of ¥13,100, which was closely correlated with our estimated annual direct cost of ¥17,377 for FM patients [18].

The results of this analysis can be used by stakeholders in China to better understand the different sources of costs for FM patients in the healthcare system. While FM-related medications were the largest contributor to direct medical costs, the cost of treating comorbid conditions represented a significant 10.7% of direct medical costs. The optimal treatment selection to effectively treat FM and control comorbid conditions such as depression, anxiety, and sleep disturbance, could result in a reduction in treatment costs and healthcare resource utilization. Lastly, physician education is an important component of the effectiveness of treating FM. Physicians understanding the nature of the disease are able to more effectively treat it through the selection of the correct medication(s) for each individual patient and thus improve patient outcomes and perhaps lower the indirect costs associated with FM. Furthermore, treatments could include exercise and other healthy habits with minimal cost on the payer system.

This study has several limitations. First, the model included an average patient and the treatment patterns were heavily influenced by the physician survey. Within China, access to certain medications and the prices of medications can vary significantly, which would influence the cost of care. Second, this study may underestimate the economic burden of FM as it did not consider medications outside of FM medications and the three included comorbidities. There may be additional medications utilized by FM patients that were not covered. Additionally, the study only considered the costs of healthcare resource utilization for physician visits, lab tests, radiologic tests, and hospitalizations. FM patients likely utilize other healthcare services FM-related events. Third, the model did not consider the humanistic burden

associated with FM, which is significant. Fourth, we did not include indirect costs in the study due to lack of data and reliable sources. Lastly, the model relied on data reported in the physician survey, which was made up of physicians with a relatively high caseload of FM patients. These results were based on physician impressions and not chart reviews, so one cannot determine whether the patients fulfilled any specific criteria for FM. Patients under the care of physicians without as much knowledge of FM may experience a different level of care. Moreover, there are limitations to generalizing the results of a survey based on 6 physicians to an entire country, such as China. The physicians do not represent the wide-ranging geographic regions of the country.

## Conclusion

The survey results suggest the prevalence and gender distribution of FM patients in China to be similar to those of other countries. Patients with fibromyalgia have a significant economic burden on the Chinese health care system. Medications and lifestyle changes to better control FM could potentially reduce costs.

## Abbreviations

ACR - American College of Rheumatology

FM - Fibromyalgia

NSAIDs - Nonsteroidal anti-inflammatory drugs

PLA - People's Liberation Army

## Declarations

### **Ethics approval and consent to participate:**

Ethics committee approval was not required because the data were based on the opinions of clinical experts without the aide of patient charts. No individual, patient-level data was referenced for the work. Please see the following link to support this statement:

<https://www.bu.edu/researchsupport/compliance/human-subjects/determining-if-irb-approval-is-needed/>

### **Consent for Publication:**

Not Applicable

### **Availability of data and materials:**

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

### **Competing interests:**

Bruce CM Wang, Wesley E Furnback, and Dongfeng Liang are paid consultants of Pfizer Upjohn Medical Trading Co., Ltd. Feifei Chen is an employee of Pfizer Upjohn Medical Trading Co., Ltd and Jim Z Li is an employee of Upjohn Division, Pfizer Inc.

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### **Author's Contributions:**

BW and WF provided data analysis, interpretation of data, and drafting of the work. FC and JL contributed to the study conception, design of work, and drafting of the work. DL contributed to the design of the work, data acquisition, and substantial revision of the draft.

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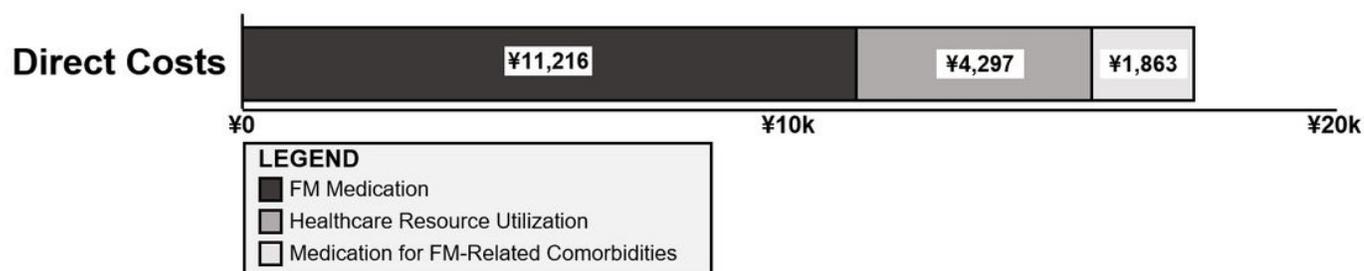
None

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## Figures



**Figure 1**

Direct Costs Per FM Patient

## Supplementary Files

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