

# Economic Burden of Plantar Fasciitis Treatment in the United States

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## Abstract

Although plantar fasciitis (PF) is prevalent among adults in the United States, few studies have quantified the economic burden of this condition.

In the present study, which was based on PF treatment patterns identified by Riddle and Schappert in 2004, we quantified the costs of treatment and explored the magnitude of the burden on third-party payers. Costs for these established treatment options were obtained from 2007 fee schedules and relative value units released by the Centers for Medicare and Medicaid Services. These rates were used to determine a range of costs for treating PF. We projected that in 2007 the cost of treatment to third-party payers ranged from \$192 to \$376 million.

Future studies may provide additional insight into treatment details and cost-effectiveness.

**P**lantar fasciitis (PF), often referred to as *heel spur syndrome* or *painful heel syndrome*, is the most common cause of heel pain in adults, with an estimated lifetime risk of 10% in the US population.<sup>1</sup> The plantar fascia is a thick aponeurosis that has the dual purpose of supporting the longitudinal arch of the foot and acting as a dynamic shock absorber for the foot. Although the etiology of PF is unknown in approximately 85% of cases,<sup>2</sup> the disease is widely recognized as being triggered by repetitive microtearing of the plantar fascia. This causes an inflammatory reaction and eventually leads to a degenerative process.<sup>3</sup> When chronic injury to this connective tissue overtakes the natural healing capacity of the body, the symptoms of PF begin to manifest. The disease usually presents as pain in the inferior medial region of the heel.

## PREVALENCE

Investigators have reported that more than 2 million patients are treated for PF every year.<sup>4</sup> Furthermore,

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approximately 11% to 15% of the adult patients who seek treatment from a podiatric physician present with a chief complaint of heel pain.<sup>5</sup> PF is the most common foot condition encountered by dedicated foot and ankle surgeons.<sup>4,6</sup> PF often occurs in athletes<sup>6-8</sup> and appears to be associated with training on hard surfaces and improper or excessively worn footwear.<sup>8</sup> However, PF also occurs in sedentary people, particularly middle-aged women.<sup>6,7</sup> Certain risk factors also contribute to susceptibility to PF, including obesity, low arches, poor flexibility, and flat feet.<sup>9</sup>

## TREATMENTS

Although PF is largely a self-limited condition, there are different treatment options, including conservative therapy, medication therapy, extracorporeal shock wave therapy (ESWT), and surgical intervention. Conservative treatments have shown a wide range of acceptable outcomes with success rates ranging from 46% to 100%.<sup>5</sup> However, 20% to 30% of patients treated with traditional measures progress to a chronic condition.<sup>10</sup> Once the condition becomes chronic, response to any form of treatment becomes less predictable. Recovery from treatment for chronic PF tends to be lengthy, and recurrence is common.

The natural history of PF is gradual resolution through rest, but often over an extended period of time.<sup>11</sup> For patients with enduring symptoms, other forms of treatment, such as physical therapies and use of orthoses, are available. Many physical therapy modalities (eg, ice, heat, massage, creams, ultrasound, iontophoresis) have been proposed, but support for use of these modalities is mostly anecdotal.<sup>6</sup> A wide variety of prefabricated and custom-made orthoses, including heel pads, heel cups, and medial arch supports, are used to treat PF. Medication therapy traditionally involves use of either nonsteroidal anti-inflammatory drugs (NSAIDs) or corticosteroids. ESWT is a relatively new technology that administers high-pressure sound waves to injured tissue to provide pain relief.<sup>10,12</sup> Like physical therapies and orthoses, ESWT is a nonoperative treatment for chronic PF used to avoid surgery.

Surgical intervention with either open or endoscopic partial plantar fascia release is a final option and should be considered only when the pain persists after 3 months of other treatments.<sup>13</sup> Some investigators have reported that 83% of patients in their study stated that the percutaneous plantar fasciotomy procedure met or exceeded their expectations.<sup>14</sup> Most surgical stud-

**Table I. National Economic Burden of Plantar Fasciitis and Sensitivity Analysis**

Resource Use	Annual Economic Burden (\$ Million)		
	Base Case	Minimum	Maximum
Ambulatory care visit	41	33	50
Medication	225	149	301
Exercise counseling or education	10	6	14
Physical therapy	8	4	11
<b>Totals</b>	<b>284</b>	<b>192</b>	<b>376</b>

**Table II. Cost Components: Base-Case Values, Ranges, and Sources of Information**

Cost Component—Major Resource Use (\$ <sup>a</sup> )	Estimated Event (95% CI) (1000s)	CPT Codes	Unit Cost (\$)	References
Ambulatory care visits	818 (642-994)	99212, 99213		Riddle & Schappert, <sup>19</sup> CMS <sup>22,25</sup>
Office-based physicians (94%)			48	
Hospital outpatient departments (6%)			93	
Medication	381 (252-510)	N/A	591 <sup>b</sup>	Drug package insert, Riddle & Schappert, <sup>19</sup> <i>Drug Topics Red Book</i> <sup>26</sup>
Exercise counseling or education	210 (120-300)	99402	47	Riddle & Schappert, <sup>19</sup> CMS <sup>25</sup>
Physical therapy	154 (83-225)	97001, 97002, 97035	50	Riddle & Schappert, <sup>19</sup> CMS <sup>27</sup>

Abbreviations: CI, confidence interval; CPT, Current Procedural Terminology; N/A, not applicable; CMS, Centers for Medicare and Medicaid Services.

<sup>a</sup>Events of medication, exercise counseling or education, and physical therapy accounted for 46.6%, 26.2%, and 18.8% of total physician visits, respectively.

<sup>b</sup>\$591 was based on mean cost of nonsteroidal anti-inflammatory drug (naproxen, ibuprofen) use for 6 months.

ies, however, were uncontrolled and nonrandomized and used a variety of outcome criteria.<sup>15-17</sup> For these reasons, it is difficult to accurately assess the results of surgical intervention. It is important to note that surgical treatment of PF is not without substantial risk. Open or endoscopic plantar fascia release may be associated with swelling, complete plantar fascia rupture, prolonged healing, extensive rehabilitation, and resultant midtarsal pain.<sup>18</sup> In addition, recovery from surgery is usually slow. Maximal medical improvement from open or endoscopic plantar fascia release usually requires 1 year. Therefore, patients must be counseled regarding the potential benefits and limitations of surgery. Surgical intervention is considered a last resort in the treatment of PF and may not be recommended in some chronic patients.

### NEW CONTRIBUTION

Despite the high incidence of PF, the number of studies on treatment patterns and costs associated with PF has been limited. In the present study, we generated national estimates of the volume of ambulatory care visits and characterized the treatments provided to patients diagnosed with PF by analyzing the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Medical Care Survey (NHAMCS) national physician survey datasets for 6 consecutive years. Riddle and Schappert<sup>19</sup> in 2004 estimated that approximately 1 million PF-related ambulatory care visits were made to office-based physicians or hospital outpatient depart-

ments annually, which suggests that medication therapy, exercise counseling, and physical therapy in various combinations were the most frequently prescribed treatments for patients with PF. However, Riddle and Schappert did not report on various other treatments such as injected corticosteroid, night splints, orthoses, ESWT, and surgery, either because of the small number of observations considered unreliable by National Center for Health Statistics (NCHS) standards, or because of unavailability of data in the surveys. Furthermore, costs for the identified treatments were not assessed, highlighting a gap in the economic literature for this highly prevalent disorder.

Our aim in the present study was to expand on the results reported by Riddle and Schappert<sup>19</sup> by focusing on medical resource use to estimate total PF costs to third-party payers.

### METHODS

The present economic analysis was based on the retrospective study of national physician survey datasets by Riddle and Schappert<sup>19</sup> and utilizes NAMCS and NHAMCS data. NAMCS and NHAMCS data provided multistage probability sample surveys of visits to office-based physicians and nonfederal, short-stay, and general hospitals to consult doctors of medicine and doctors of osteopathy. The combined datasets provide national provider surveys designed to capture objective, reliable information about provision and use of ambulatory medical services in the United States.<sup>20</sup> These data are often analyzed and broadly published across various physician specialties

and disease spectrums. A list of NCHS publications and journal articles and books using NAMCS and NHAMCS data can be found on the Centers for Disease Control and Prevention Web site.<sup>21</sup>

A brief study design of the Riddle and Schappert study<sup>19</sup> is provided below. The authors combined 6 years of data to derive the incidence of ambulatory visits for PF in the United States. During these visits, the types of treatments patients received, which included both medication therapy and nonmedication therapy (eg, exercise counseling, physical therapy), were characterized. During the 6-year study period, 6,029,000 visits for PF (identified by both first and second diagnoses listed in the survey instrument) with or without other musculoskeletal conditions were identified—equivalent to a mean of 1,005,000 patient-visits per year. Riddle and Schappert<sup>19</sup> further reported a mean of 818,000 annual visits related to patients with PF and no other musculoskeletal conditions. Pain medication, including NSAIDs, was prescribed at 46.6% of visits, and counseling on exercise and physical therapy was recorded at 26.2% and 18.8% of visits, respectively. For the remaining 19.6% of visits, neither medication nor nonmedication therapy was reported. The detailed survey data collection methods and resulting study population have been described elsewhere.<sup>19</sup>

### Costing Methods

Unit costs for physician office visits, surgery, exercise counseling or education, and physical therapy were obtained from the 2007 Centers for Medicare and Medicaid Services physician fee schedule based on the *Current Procedural Terminology, Fourth Edition (CPT-4)* codes associated with each resource use. Different CPT-4 codes for specific treatments were used to capture the cost variation per treatment. For instance, physical therapy included physical therapy evaluation and reevaluation

by ultrasound. The base-case value was calculated as the mean of the minimum and the maximum costs.

Hospital reimbursement rates were obtained from calculations based on formulas and relative value units given for 2007 diagnosis-related group codes associated with traditional and endoscopic plantar fasciotomy procedures. These calculations were based on the fiscal year 2007 Medicare hospital inpatient prospective payment fee schedule. Wage index and geographic adjustment factors were set at 1.00 in these calculations.<sup>22</sup> Physician charges were obtained from physician charges published by the Practice Management Information Corporation.<sup>23</sup> The pain relief medications reported by Riddle and Schappert<sup>19</sup> included general analgesics, narcotic analgesics, antiarthritics, and NSAIDs as classified in the National Drug Code directory.<sup>24</sup> However, the specific distribution of these medications, dosages, and durations of use were not reported. To fill this information gap, we identified the most common medications associated with the aforementioned medication classes. The recommended dosages and durations of use for these medications were obtained from their product package inserts or from [www.rxlist.com](http://www.rxlist.com). This information was subsequently validated by an expert orthopedic surgeon (Dr. Furia). Unit costs of these medications were calculated using average wholesale prices in the 2007 *Red Book: Pharmacy's Fundamental Reference* drug catalogue.

### Projection of National Burden and Sensitivity Analysis

Our projection of the annual economic burden attributable to PF treatments is based on the volume of ambulatory care visits and patterns of care provided, as well as the estimated cost of each visit and prescribed treatment. It is worth noting that some earlier studies had suggested

**Table III. Estimation of Medication Costs**

Drug Class	Drug Name	Dosage (mg)	Duration	2007 AWP (\$)	2007 Cost/y (\$)
General analgesics	Ultram	50	Q6	52.91	2574.95
	Tramadol hydrochloride	50	Q6	82.90	1210.34
Narcotic analgesics	Tylenol 3 (acetaminophen & codeine phosphate)	300-30	Q4	20.23	1476.79
	Darvocet <sup>a</sup>	650-100	Q4	39.29	2868.17
	Propoxyphene napsylate & acetaminophen <sup>a</sup>	650-100	Q4	37.50	2737.50
Nonnarcotic analgesics	Tylenol 8-hour <sup>b</sup>	650	Q8	9.58	131.13
	Acetaminophen	650	Q8	4.69	427.96
NSAIDs	Ibuprofen	600	Q8	30.16	330.25
	Feldene	20	Q24	64.30	1173.48
	Celebrex	200	Q24	106.50	1295.75
	Celecoxib	200	Q24	351.01	1281.19
	Piroxicam	20	Q24	401.48	1465.40
	Motrin	600	Q8	40.20	440.19

Abbreviations: NSAIDs, nonsteroidal anti-inflammatory drugs; AWP, average wholesale price; Q, quarter.

<sup>a</sup>Dosages should be lowered for patients with renal or hepatic impairment.

<sup>b</sup>Taking Tylenol for more than 10 days is not recommended.

that approximately 2 million US people receive treatment for PF each year.<sup>4</sup> However, we did not estimate the national costs based on this number of patients because of lack of information about the specific treatments these patients received and how often these treatments were given. A projection of the national economic burden of PF is likely to be sensitive to variation in several key parameters, including the annual number of office visits, distribution of treatments, and mean total cost of treatment. Therefore, a 1-way sensitivity analysis was conducted to assess the impact of uncertainty in the key parameters used in the base-case scenarios (ie, min-max of study results) for assessing economic cost (Table I). In the base-case scenario, we calculated the national economic cost of PF based on the midpoints of the annual number of visits as well as the treatment distribution percentages for these visits. In the sensitivity analysis, calculations were based on the minimum and maximum reported values of this parameter.

## RESULTS

### Treatment Patterns

Pain medication, including NSAIDs, was prescribed at 381,000 (46.6%) of the 818,000 annual physician office visits and hospital outpatient department visits made by patients with PF and no other musculoskeletal diseases. Exercise counseling and physical therapy were provided at 210,000 visits (26.2%) and 154,000 visits (18.8%), respectively. For the remaining visits (19.6%), neither medication nor nonmedication therapies were reported. Treatment procedures and estimated annual frequencies described in the study by Riddle and Schappert<sup>19</sup> are presented in Table II.

### Treatment Costs

Mean unit cost of treatment was \$48 per physician office visit and \$93 per hospital outpatient department visit. Mean cost of an ambulatory care visit was estimated at \$51. The rate was based on national unadjusted Medicare payment rates for the physician office and hospital outpatient department and weighted according to the distribution of these visits.<sup>19</sup> Ninety-four percent were made to office-based physicians and 6% to hospital outpatient departments. Mean medication cost for NSAIDs was \$591 per patient per year. Minimum and maximum medication costs were \$131.13 and \$2,868.17, respectively, depending on type of medication prescribed (Table III). The unit costs of exercise counseling or education and physical therapy were \$47 and \$50, respectively. Surgical interventions were the most costly form of treatment for PF. The physician reimbursement rate from Medicare for traditional fasciotomy procedures was \$295.22 in 2007. In 2008, the median cost charged by physicians was \$897. Inpatient hospital reimbursement rates for this procedure ranged from \$4,568 to \$8,662. The physician reimbursement rate

from Medicare for endoscopic fasciotomy procedures was \$389 in 2007. In 2008, the median cost charged by physicians was \$1,347. Inpatient hospital reimbursement rates ranged from \$4,352 to \$9,500. When nerve decompression<sup>28</sup> was involved in the procedure, the inpatient hospital reimbursement rates ranged from \$4,568 to \$8,662. These rates represent the significant cost to treat chronic PF by surgical intervention.

### Projection of National Burden

In the base-case scenario, the national economic burden was projected to be \$284 million. Medication costs accounted for almost 80% of the total costs, followed by ambulatory care visits, which accounted for 14% of costs. Through the sensitivity analysis, we determined the minimum and maximum values of the annual economic cost of PF to be \$192 million and \$376 million, respectively. In addition, a simple arithmetic calculation of applying changes of  $\pm 20\%$  in the cost of each treatment to the values assessed in the study suggests that increasing (decreasing) the cost of these treatments by 20% produced a corresponding increase (decrease) in total costs of 20%.

## DISCUSSION

The present study represents one of the first attempts to go beyond quantifying the incidence of PF to estimating the costs attributable to this disease. By using allowable rates set by Medicare, we attempted to quantify treatment costs. We recognize that payments for services vary widely among regions and payers, so we used only nationally unadjusted Medicare payment rates in our calculations in an attempt to offset some of the regional variations in payment. Considering the cost of medication, counseling, and physician office visits alone, it is clear that the cost of PF to third-party payers is significant.

### Limitations

Our estimates do not account for all diagnostic tests and treatments common for PF. As a result, it is likely that this study understates the true costs of care for the disease. More accurate accounting would require more robust data on patient care, which is outside the scope of this study.

In addition, our study was limited to direct costs associated with PF, but the disease has several indirect costs borne by patients. There are also quality-of-life factors that were not assessed in this study. However, though both areas are important in providing a complete picture of the burden of illness, the objective of this study was to provide a starting point to attribute economic costs to PF. A more complete assessment of the indirect costs and quality-of-life considerations is left for future studies.

We also recognize that there are inherent limitations in using multiple data sources to estimate costs. For example, the Medicare standard analytic file used to estimate the number of physician office visits per patient is specific to the Medicare population. These ratios were

applied in a study that used a national survey of all outpatient visits. However, the purpose of the present study was not to provide an exact figure on the annual costs associated with PF but to produce an estimate that will assist in qualifying the magnitude of the costs associated with the disease. To conduct a more rigorous analysis, we would need data detailing the distribution of patient care and costs.

## CONCLUSIONS

Two main conclusions can be drawn from the present study. First, there is a discrepancy between the number of patients diagnosed with PF and the number of patients who seek treatment for the disease. Future studies may help address whether this gap is due to a lack of effective treatment options or underestimation of the number of patients who seek treatment. Second, PF poses a significant financial burden to third-party payers. Chronic PF requires treatment regimens that can be particularly costly, as symptoms are recurring, and recovery is lengthy. Additional studies may help provide more specific information on the costs of the disease as well as potential cost-effective methods for managing the disease.

## AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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