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What Are the Total Costs of Surgical Treatment for Uterine Fibroids?

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Abstract

Objective: To investigate the direct and indirect costs of uterine fibroid (UF) surgery.
Methods: Data were obtained from the MarketScan Commercial Claims and Encounters databases for 1999–2004. Our sample included 22,860 women with insurance coverage who were treated surgically for UF and 14,214 women who were treated nonsurgically for UF. Medical care costs and missed workdays were divided into baseline (1 year prior to surgery) and postoperative (1 year after surgery) periods. For a subsample of women, we calculated average annual costs 3 years before and after their surgery.
Results: Of patients electing surgery, 85.9% underwent hysterectomy, 7.6% myomectomy, 4.9% endometrial ablation, and 1.6% uterine artery embolization (UAE). Women undergoing UAE incurred the highest medical care costs in the operative year ($16,430 unadjusted, $20,634 adjusted for confounders), followed by hysterectomy ($15,180 unadjusted, $17,390 adjusted), myomectomy ($14,726 unadjusted, $18,674 adjusted), and endometrial ablation ($12,096 unadjusted, $13,019 adjusted). Women treated nonsurgically incurred costs of $7,460 unadjusted and $8,257 adjusted during the year after they were diagnosed with UF. Three years after surgery, patients treated with hysterectomy had the lowest annual costs. Missed workdays in the year after surgery were high, resulting in significant losses to employers in the magnitude of $6,670–$25,229, depending on treatment, values assigned to missed workdays, and whether the analyses adjusted for confounders.
Conclusions: UF surgical treatment costs were high. Absenteeism and disability were important components of the cost burden of UF treatment for women, their employers, and the healthcare system.

Introduction

Uterine fibroids (UF), benign tumors of the uterus, are common and sometimes debilitating growths that affect women during their prime reproductive and work years. Ultrasound evidence indicates that >70% of white women and >80% of African American women may have UF by age 50.[1] Symptoms of UF include abnormal bleeding, pain, pressure, and anemia.[2–4] Most women with UF will not experience these symptoms or will seek only over-the-counter (OTC) remedies; however, in any given year, about 1% of childbearing-aged women in the United States will seek treatment for UF.[5]

Fibroid symptoms may be managed with medical therapies, such as non-steroidal anti-inflammatory drugs (NSAIDS) and hormone therapy (HT), or may be alleviated by surgical procedures.[6,7] The most common surgical procedures for UF are hysterectomy and myomectomy. UF is the most common reason for the roughly 600,000 hysterectomies provided each year in the United States.[8] Newer and less common treatments for UF include uterine artery embolization (UAE), which shrinks the fibroid by blocking blood flow, and endometrial ablation, which uses lasers and electric current to destroy part of the uterine lining.[9,10]

Few previous studies have addressed the cost of surgical treatments for UF. A recent review by Mauskopf et al.[11]

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found four studies that reported the direct cost of medical care for UF treatments. Two of these studies (Myers et al.[12] and Baker et al.[13]) were based on hospital charges from a single institution, and three used hospital charges that were converted to costs using a charge/cost ratio. Myers et al.[12] studied hysterectomy and myomectomy, but their study did not include professional fees. Baker et al.[13] reported only hospital charges for myomectomy. The third study identified by Mauskopf et al.[11] used hospital charges from the Healthcare Cost and Utilization Project's Nationwide Inpatient Sample to report on myomectomy and hysterectomy charges (Zhao et al.[14]). The fourth study, by Subramanian et al.,[15] considered only myomectomy and included inpatient and outpatient myomectomy in a population of privately insured women.

Mauskopf et al.[11] found no studies that reported the costs of endometrial ablation, nor did they find any studies that included the indirect costs of treatment resulting from missed workdays by UF patients. A recent study by Hartmann et al.[16] found that women with UF were three times as likely as women without UF to have disability claims, costing about $771 per patient per year (in 2003 dollars).

There is limited research on long-term outcomes from procedures to alleviate the symptoms of UF. Myers et al.[7] summarized results from 24 studies of myomectomy and found that 4%–12% of laparoscopic or abdominal myomectomy patients had subsequent conservative surgical procedures. Variation in reported rates of subsequent conservative surgical therapy was greatest for hysteroscopic myomectomy patients (3%–76% of patients had subsequent therapy). The incidence of hysterectomy to treat recurrence of symptoms for patients who previously had a myomectomy ranged from 0.5% to 8.0%. Other research shows that most women experience significant improvements in symptoms 1–2 years after surgery.[3,17,18]

Our study fills some important knowledge gaps concerning the cost implications of surgical treatment for UF. Previous studies have focused on perioperative costs (costs incurred around the time of the surgery). We study perioperative costs and also follow patients for 1–3 years after surgery. We also assess productivity losses by measuring missed workdays due to absenteeism and disability in the year before and the year after surgery. Finally, we examine costs for women with UF who did not receive surgery, before and after receiving a diagnosis for the disease, to provide context for expenditures associated with surgical treatments.

Materials and Methods

Data sources and sample members

The data sources for this study were the Thomson Healthcare MarketScan Commercial Claims and Encounter (CCAE) database for the years 1999–2004 and the MarketScan Health and Productivity Management (HPM) database for the years 1999–2002. The CCAE database provided information on diagnoses, time and place of service, healthcare utilization, and payments for healthcare services and prescription drugs for women who were enrolled in employer-sponsored health plans in the United States. The HPM database provided additional information on the disability and absenteeism experience for the subset of women who were employed during UF treatment and whose employers contributed those data to Thomson Healthcare.

Our sample included women aged 25–54 who had symptomatic UF (i.e., those who received healthcare services to treat UF). Sample members were continuously enrolled in their employer-sponsored health plan(s) for at least 2 years during the measurement period. To identify women with clinically significant UF, we required all patients in the sample to have (1) at least one insurance claim with a UF diagnosis code (ICD-9-CM diagnosis codes 218.0–218.9 or 654.10–654.12) for an inpatient stay or an emergency room visit or (2) at least two claims with a UF diagnosis code for outpatient visits that were at least 30 days apart. We required at least two outpatient claims with a UF diagnosis to rule out coding errors (the second outpatient claim served as a confirmatory diagnosis).

Women with UF were assigned to five mutually exclusive groups based on the type of treatment they received for their UF symptoms. Four groups included patients treated surgically with either (1) hysterectomy, (2) myomectomy, (3) UAE, or (4) endometrial ablation. The fifth group included patients who were treated without surgery (i.e., by medical management or watchful waiting). CPT-4 procedure codes for each treatment category are shown in Table 1. Patients with procedure codes from more than one surgical group (e.g., where both myomectomy and endometrial ablation CPT-4 codes were present) were excluded from the analysis (55 patients).

Cost measures

In contrast to other studies that used hospital charges data,[12,13] we used actual payments to the provider to calculate healthcare expenditures. Actual payments reflect the reality of the marketplace and account for any negotiated discounts, as well as the employer's and patient's share of costs. Thus, payments from the insurer plus payments from the patient (including deductibles and copayments) were included in the total payment measure. All payments were adjusted to 2005 dollars using the Consumer Price Index (CPI).[19]

About 20% of the women in our sample were enrolled in capitated plans. Detailed service-level payments were not available for these patients. We, therefore, imputed payments for women in capitated plans using standard methods.[20] Specifically, we matched encounters for women in capitated plans with claims for similar women who were enrolled in fee-for-service (FFS) indemnity plans. This matching was based on procedure code, the census region where the patient lived, and the year of service. We then assigned the payment on the FFS claim to the matching capitated claim.

To assess productivity-related losses, we calculated the number of missed workdays due to absenteeism and disability for patients undergoing treatment. Absenteeism days included missed work for all reasons, including illness, caring for family members, and vacation. We included all reasons for missed work because some employers operated with a paid time off (PTO) policy that does not differentiate between reasons for missed work. We estimated the cost of a missed workday based on the average daily wage for typical workers. For absenteeism days, the cost to an employer for a missed day of work equaled that woman's daily wage.

TABLE 1. DESCRIPTION OF PROCEDURES RECEIVED BY PATIENTS IN EACH GROUP

Procedure	*CPT-4 codes*	*Number of patients*	*Perioperative cost per patient*[a]
Hysterectomy			
Total abdominal	58150, 58152, 58200	14,271	$9,881
Vaginal	58260, 58262, 58263, 58267, 58270, 58275, 58280, 58285, 58290-58294	2,611	$8,649
Laparoscopy	58550, 58552, 58553, 58554, 56308	1,958	$9,010
Subtotal hysterectomy	58180	607	$8,962
Other	More than 1 hysterectomy code	151	$7,554
Radical	58210	31[b]	$16,312
Total: Hysterectomy		19,629	$9,594
Myomectomy			
Abdominal	58140, 58146	1,588	$8,971
Vaginal	58145	92	$6,553
Laparoscopy	58545, 58546	44	$11,602
Other	More than 1 myomectomy code	19	$7,126
Total: Myomectomy		1,743	$8,890
Endometrial ablation	56356, 58353, 58561, and/or 58563	1,115	$4,110
Uterine artery embolization (UAE)[c]	36247, 37204, and/or 52250	373	$10,696

[a]Average perioperative costs are not weighted or regression adjusted.

[b]12 of the 31 radical hysterectomy patients had diagnosis codes for cervical cancer (ICD-9-CM 180.0–180.9, 233.1) during the year before surgery or at the time of the surgery (11 patients had cervical cancer codes as part of an inpatient stay). We have included these patients, as some women with UF will have cervical cancer. The average cost of a hysterectomy decreased to $9,584 when the 31 patients with radical hysterectomy were excluded. This is $10 less than the average cost for all hysterectomy.

[c]Only claims with both the uterine artery embolization CPT-4 codes and uterine fibroid diagnosis codes (ICD-9-CM diagnosis codes: 218.0–218.9 or 654.10–654.14) are included. For the other procedures, the patient must have a claim with the CPT-4 procedure code and meet the conditions for inclusion in the sample (they may or may not have a UF diagnosis on the claim with the CPT-4 procedure code). Patients with codes from multiple procedure types (i.e., myomectomy and endometrial ablation) could not be classified and are excluded from all analyses (55 patients).

For disability, the cost to the employer was set at 70% of the woman's daily wage because disability wages for employers in the database were generally paid at 70% of normal wages. We estimated a woman's average daily wage at $344 based on previous work with similar large companies like those who contributed data to the HPM database.[21] In a sensitivity analysis, we computed results of absenteeism and disability losses based on a $193.20 daily wage rate, based on national daily wage and benefits estimates from the Bureau of Labor Statistics for all U.S. companies in 2002.[21]

Observation period

Our primary analysis is based on the sample of patients with at least 2 years of enrollment in their companies' medical plans. We divided medical expenditures into baseline and operative-related expenditures for the analysis of patients with 2 years of data (Fig. 1). We constructed the time period so that there was a baseline year of observation (366 days) and a year of observation (366 days) after surgery to include the surgery and any preoperative payments. Payments for claims originating during the operative observation period were then divided into preoperative, perioperative, and postoperative payments. Perioperative medical payments were payments made for claims for services received at the time of the surgical procedure. For outpatient procedures, this included payments for all claims on the day of the surgery. For inpatient procedures, perioperative payments included all payments for claims associated with the inpatient stay for the surgical treatment. Preoperative payments included all claims for medical services received during the 14 days prior to surgery. Baseline medical payments included all payments for claims originating in the year before the start of the preoperative observation period. The postoperative observation period began the day after discharge (or day after surgery if outpatient surgery) and continued for a year after the start of the preoperative period.

For women without surgical UF treatment, their operative year began on the date of their earliest observed diagnosis for UF (defined as a diagnosis without any other UF diagnoses in the previous 365 days), and their baseline period was the year prior to diagnosis. This diagnosis date should be interpreted as the date the woman began an episode of nonsurgical treatment for UF for women who we do not observe receiving surgical treatment for UF. We were able to

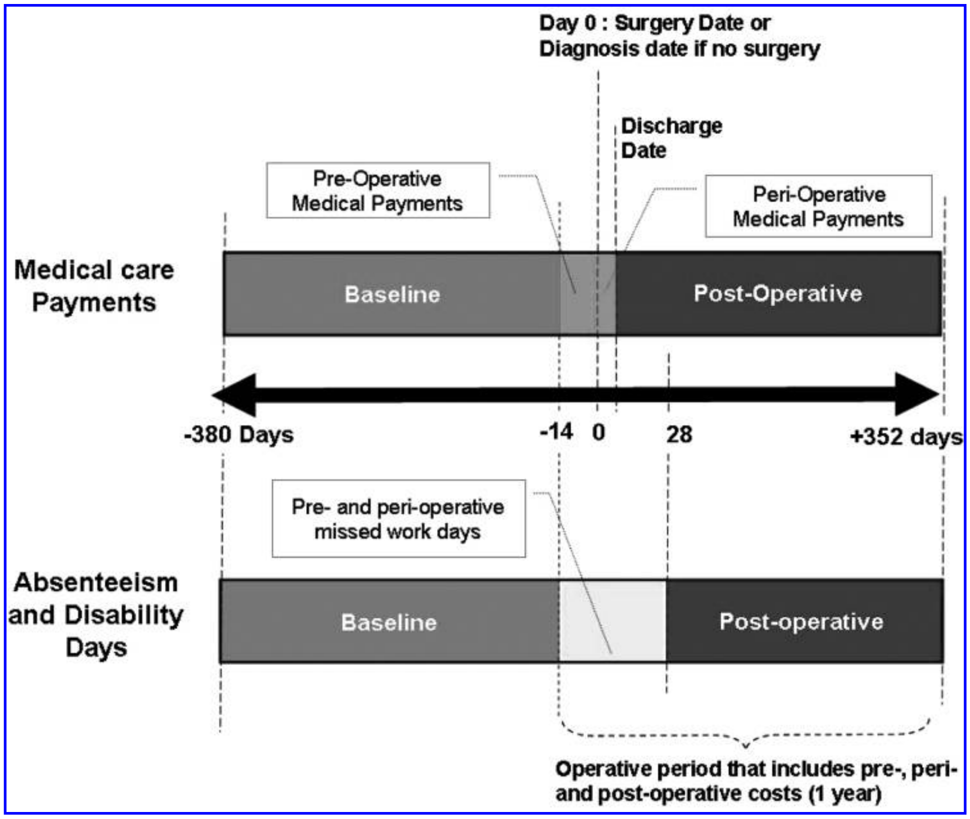


FIG. 1. Observation period used in the 2-year medical care cost and absenteeism/disability analyses.

observe all of these women for at least 1 year after the episode began and 23% of them for 3 or more years.

We divided missed workdays before and after surgery in a similar fashion to our analysis of medical costs by constructing a baseline year prior to the preoperative period and an operative year that began with the preoperative period. We used a different definition for preoperative and perioperative payments because the absenteeism and disability data provided limited information on the reason for missed work and because disability episodes typically lasted for a month. We defined a preoperative and perioperative period that encompassed the time 14 days prior to surgery through 28 days after surgery. We counted all absenteeism days during this period and all disability episodes that began during this time window as part of the preoperative and perioperative costs. Postoperative missed days included all days missed after the first 28 days after surgery for a year after the start of the operative observation period.

To provide context for our cost analysis, we also observed a subsample of patients with medical plan enrollment for 3 years before and 3 years after surgery. The purpose of the 6-year analysis was to provide a broader picture of how the cost history differs between surgically and nonsurgically treated UF patients. In particular, we were interested in observing how costs in the first year after diagnosis for nonsurgical patients compared with their costs in subsequent years. If peak medical expenditures occurred during the year after diagnosis for women who were not treated surgically, this would suggest that the year after diagnosis is the relevant year to observe for nonsurgical patients when measuring the costs of nonsurgical treatment. For the 6-year analysis, we calculated the average annual medical expenditures each year. Year 0 was defined as the year beginning on the preoperative date (i.e., 14 days prior to surgery) and is the same as the operative year in the 2-year analysis (Fig. 2).

Potentially confounding factors

We applied statistical techniques to control for potential confounders that may impact observed costs. In everyday clinical practice, outside the confines of a randomized clinical trial, patients and their doctors will not choose a surgical procedure for UF (or any other type of treatment) randomly.[22] Factors involved in making such decisions include the desire to preserve the woman's childbearing ability; the size, rate of growth, and location in the uterus of the fibroid; the amount of bleeding or pain; the importance of avoiding lengthy hospital stays; and other clinical or personal preferences that influence treatment choices. Factors that affect treatment choices, but are not fundamentally part of the clinical pathway, may potentially confound the care of patients and cost estimates for each treatment.

Confounding variables can affect treatment in several ways. For example, patients undergoing a hysterectomy may be older and thus have higher expenditures than younger women, regardless of the presentation of UF for those patients. Thus, to estimate costs for hysterectomy treatment compared with myomectomy, one would statistically adjust for the fact that older women are more likely to be treated with a hysterectomy. This adjustment would, in turn, lower overall hysterectomy costs relative to other treatments.

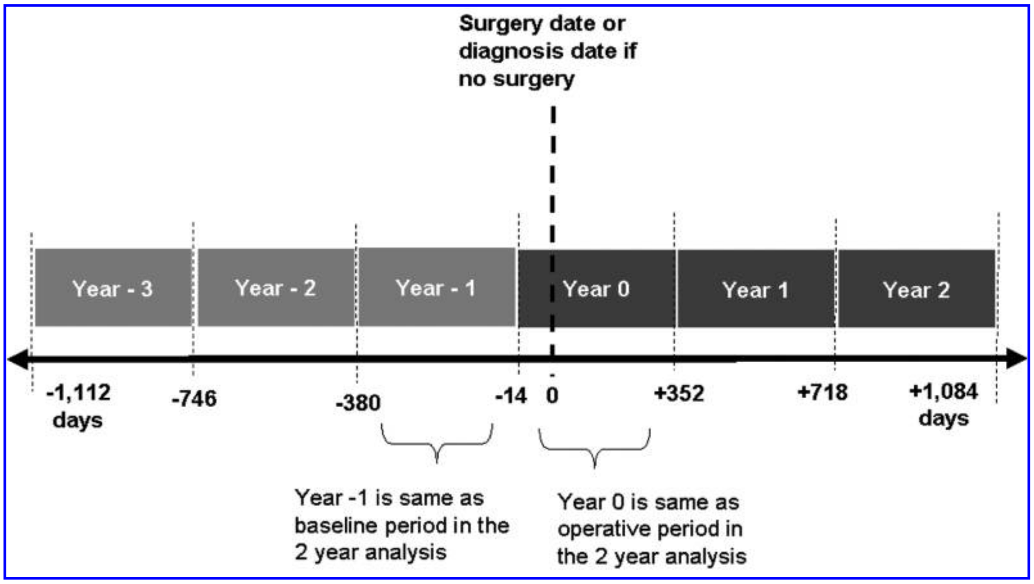


FIG. 2. Observation period used in the 6-year medical cost analysis.

Because we relied on medical claims data for our analyses, we could not directly observe clinical or motivational variables that could potentially confound our analyses. We did, however, have access to demographic information and medical utilization patterns of patients during the baseline period, which may be related to treatment choices. We, therefore, constructed measures of general health status, conditions associated with UF, and the use of medical care services and outpatient pharmaceuticals in the baseline year, which could be used as control variables. We report these patient characteristics for each study group and use them in statistical analyses that attempt to balance the characteristics of patients across groups. The next sections describe the patient characteristics we collected and the statistical methods used to adjust for potential confounding.

Patient characteristics

We recorded the age of the patient on the day of the surgery (or at diagnosis for women without surgical treatment). Hysterectomy rates are known to vary by age, with the highest rates among women aged 40–44.[8] We measured the location of the patient's residence, using the four regions identified by the U.S. Census Bureau. There are large regional variations in hysterectomy rates; women in the South have significantly higher hysterectomy rates than those in the Northeast or West.[8] Reasons for this regional variation in procedure rates are not well understood but may be related to variation in the underlying prevalence of disease, uncertainties about the indications for hysterectomy, the availability of medical services and physicians, and patient preferences.[23] In addition to region, we categorized the type of health plan providing coverage for women in the study as health maintenance organization (HMO), FFS indemnity plan, preferred provider organization (PPO), or point of service (POS) plan. Plans with more managed care features, such as HMOs, may have more administrative barriers to the use of less common procedures, such as UAE and endometrial ablation, so we expected to find lower rates of these procedures for patients enrolled in plans with managed care features.

We measured the patient's general overall health and prognosis using the Charlson Comorbidity Index (CCI). The CCI summarizes a patient's risk of death or serious disability in the coming year, based on whether diagnosis codes for 18 conditions were observed in the baseline period.[24] CCI values >6 indicate a high risk of death or major disability, whereas values ranging from 2 to 6 indicated moderate risk and values <2 indicate low risk. The CCI does not, however, address mental illnesses in a complete manner, so we also included a count of the number of psychiatric diagnosis groups (PDGs) observed for each woman during the pretreatment period to measure complicating psychiatric illnesses.[25] There were 11 possible PDGs, which were aggregated from ICD-9-CM diagnosis codes for mental health problems. Examples included alcohol use disorders, other substance use disorders, depression, bipolar disorder, posttraumatic stress disorders (PTSD), and schizophrenia.

We also examined conditions that may be associated with uterine fibroids. The list of conditions included pregnancy, anemia, inflammatory diseases, endometriosis, noninflammatory disorders, pelvic pain, menstrual disorders, constipation or gas, urinary problems, intestinal obstructions, and others (i.e., disorders of the uterus not elsewhere classified, genital prolapse, benign neoplasm of the uterus, and sepsis).[2,3,17,26,27] Although these conditions may be taken into account by the surgeon, their presence may indicate potentially higher future expenditures regardless of the treatment type selected by the patient and surgeon.

We also observed the use of medical services in the pretreatment year. These variables included measures of inpatient admissions, emergency room visits, and the use of certain outpatient pharmaceuticals that may be prescribed to control symptoms of UF. To measure pharmaceutical use, we constructed an indicator to denote if any of the following HTs were used during the pretreatment year: progestins or oral contraceptives (OCs), gonadotropin-releasing hormone agonists (GnRH-a), danazol, mifepristone, add-back therapy (GnRH-a with a progestin or progestin and low-dose estrogen, or the addition of a bisphosphonate), estrogen-progestin combinations that were not OCs, and single ingredient estrogens.[6] We also included an indicator for whether any prescriptions were filled for NSAIDs. The National Drug Code (NDC) codes for each of these outpatient pharmaceuticals were obtained using searches of the Drug RedBook™ Database. All the pharmaceutical measures were based on outpatient drug claims, as inpatient pharmaceutical use data were not available.

Statistical methods applied to adjust for potentially confounding factors

We used regression analysis and propensity score weighting to statistically adjust for differences among patient groups for the sample with 2 years of enrollment. The regression analysis adjusted for patient characteristics at baseline (e.g., age, comorbidities present) that may be associated with future costs. The analysis estimated the contribution of each patient characteristic to costs, and this information was used to predict adjusted costs for each treatment, holding patient characteristics constant for each category of treatment. The cost regressions were estimated using exponential models to account for the nonnormal distribution of medical expenditure data.[28] The dependent variable was annual medical expenditures (or annual cost of missed workdays) in the baseline or operative year. Independent variables included indicators for each treatment group and whether the data were from baseline or operative periods and patient characteristics described in the previous section. We then estimated annual costs by using the exponential models to compute mean predicted values from the sample.

The second analytical method used propensity score weights to adjust for treatment choice effects. This is accomplished by first estimating the probability of receiving each treatment, which is known in the health services and epidemiology literatures as the patients' "propensity score". The propensity score was estimated using a multinomial logistic regression model to estimate the probability that each woman received a given treatment based on her age, type of health plan, location, health status, and medical service utilization in the pretreatment period. These predicted probabilities were then used to create a weighting factor, described by Rubin[29] and by Imbens.[30] We implemented weighted regressions by multiplying the dependent variable (direct or indirect cost) and independent variables (plan type, location, demographic, utilization, and health status) by the weighting variable (defined as the inverse of the predicted probability of selecting the treatment that was actually used). The weighting variable helped to equalize these characteristics across women in the surgical and nonsurgical groups before costs were compared.

Once the propensity score weights were created, we evaluated the effectiveness of the weights by comparing the weighted and unweighted means for all the variables that were expected to influence procedure choice. If the weights worked well, one would expect weighted means for patient characteristics measures to be very similar (i.e., not significantly different) for women in each surgical and nonsurgical treatment group.[31] Similar mean values would increase the confidence in subsequent direct and indirect cost comparisons because differences in the demographic, plan type, location, health status, and utilization factors would have already been accounted for by the weighting prior to cost estimation. We then implemented weighted regression factors by multiplying the dependent variable (direct or indirect cost) and independent variables (plan type, location, demographic, utilization, and health status) by the weighting variable (defined as the inverse of the predicted probability of selecting the treatment that was actually used).

We present both unadjusted and regression adjusted means in the tables. For the unadjusted means, we tested for statistically significant differences between the medical care costs and missed workdays for each group at 95% confidence levels (CI) using the TTEST procedure in SAS (Cary, NC). This procedure tests for the equality of the variances of each pair of treatments using an F-test. Depending on the results of the variance test, a p value was calculated using a t test based on pooled variances (if variances were equal) or the Satterthwaite method (if variances were not equal). For the regression-adjusted results, the p values for the statistical tests were obtained directly from the regression results. Because propensity score weighting did not substantively alter our findings, we do not present weighted results in the tables and only briefly discuss the impact of weighting in the Results section.

Results: Two-Year Sample

Characteristics of patients enrolled in health plans

We found 22,860 women with surgical treatments for UF who were enrolled for at least 1 year prior to the preoperative period and at least 1 year after the start of the preoperative period. Most surgical patients received a hysterectomy (85.9%), followed by myomectomy (7.6%), endometrial ablation (4.9%), and UAE (1.6%). 14,214 women with a diagnosis of UF did not receive any surgical treatments. Table 1 shows the techniques used for each procedure based on CPT-4 procedure codes. For myomectomy, the most common procedure was abdominal surgery, which included 91% of myomectomy patients (1,588 patients with abdominal myomectomy). For hysterectomy, total abdominal procedures were most common (73% of hysterectomy patients), followed by vaginal (13% of hysterectomy patients) and laparoscopic (10% of hysterectomy patients) approaches. Table 1 also shows the unadjusted mean perioperative costs for each procedure. Laparoscopic myomectomy cost on average $2,500 more than abdominal myomectomy and was undergone by a small fraction of the sample (44 patients). Laparoscopic hysterectomy patients had similar perioperative costs to total abdominal hysterectomy patients.

Table 2 shows the characteristics of patients included in the study. Women who received a myomectomy tended to be younger, and about one third were <age 35. Hysterectomy and UAE patients were older; only 3.9% of the hysterectomy patients and 5.6% of the UAE patients were <35. Sample members were primarily enrolled in PPO and POS plans. The largest portion of the sample resided in the South, ranging from about 40% to almost 60% of the patients in each group. This reflected the distribution of contributors to the MarketScan database, not necessarily the location-related preferences for treatment. Similarly, more sample members were found to have a first treatment in

TABLE 2. SAMPLE OF WOMEN AGED 25–54 WITH UTERINE FIBROIDS WITH 2 YEARS OF MEDICAL ENROLLMENT (PERCENT OF PATIENTS WITH EACH CHARACTERISTIC)[a]

	Hysterectoy (n = 19,629)	*Myomectomy* (n = 1,743)	*UAE* (n = 373)	*Endometrial ablation* (n = 1,115)	*No surgical treatment* (n = 14,214)
Number of women with 6 years of enrollment	7,562	549	132	416	3,225
Number of women contributing HPM data	497	93	25	25	372
Demographics					
Average age*	46.4	38.7	45.6	44.5	44.9
Age categories*					
25–34	3.9%	33.8%	5.6%	10.0%	12.8%
35–44	41.7%	55.4%	38.6%	45.8%	38.9%
45–-54	54.4%	10.8%	55.8%	44.2%	48.4%
Census region*					
Northeast	8.3%	15.2%	26.3%	17.8%	16.5%
North Central	24.4%	16.2%	23.6%	26.7%	21.8%
South	58.9%	56.9%	39.9%	44.2%	40.2%
West	8.3%	11.5%	10.2%	11.3%	21.5%
Missing/unknown	0.1%	0.2%	0.0%	0.0%	0.1%
Type of health plan*					
FFS/Indemnity	15.4%	11.5%	18.5%	16.1%	14.4%
PPO	42.4%	35.0%	31.9%	40.9%	34.2%
POS/EPO	29.9%	35.0%	27.3%	27.4%	24.1%
HMO	8.4%	12.4%	15.5%	11.8%	21.7%
Capitated POS	3.9%	6.1%	6.7%	3.8%	5.6%
Missing/unknown	0.1%	0.0%	0.0%	0.1%	0.0%
Year of surgery (year of diagnosis if no surgery)*					
2000	18.1%	20.7%	14.5%	13.3%	21.4%
2001	19.9%	18.6%	19.6%	18.7%	17.3%
2002	29.1%	25.8%	34.6%	30.3%	32.2%
2003	32.9%	34.9%	31.4%	37.8%	29.0%
Use of prescription drugs in baseline period					
Hormone therapy*	33.0%	31.3%	31.6%	43.9%	25.9%
NSAID use*	29.9%	26.4%	27.3%	32.6%	25.3%
Health status in baseline period					
Charlson Comorbidity Index (CCI) (mean)*	0.29	0.17	0.22	0.27	0.25
Psychiatric diagnostic group (PDG) (mean)	0.16	0.13	0.14	0.18	0.16
Other conditions in baseline period					
Menstruation disorders*	53.4%	40.0%	51.7%	72.1%	24.9%
Pain*	31.4%	29.7%	22.3%	21.3%	12.9%
Other comorbidities*[,b]	21.3%	12.9%	11.0%	16.2%	6.1%
Anemias*	18.1%	14.8%	22.3%	22.1%	9.8%
Inflammatory diseases*	12.3%	17.7%	13.7%	12.5%	11.0%
Noninflammatory disorders*	17.1%	14.5%	9.4%	14.3%	8.7%
Endometriosis*	4.5%	5.9%	1.3%	3.7%	1.7%
Pregnancy*	1.8%	12.9%	2.7%	3.7%	9.1%
Urinary problems*	2.8%	2.0%	4.0%	1.6%	1.6%
Constipation or gas	1.1%	0.8%	0.3%	1.3%	1.0%

[a]We also evaluated the percent of women with intestinal obstructions and peritonitis. Rates were trivially low, so these conditions are not reported here.
[b]Other comorbidities include disorders of the uterus not elsewhere classified, genital prolapse, benign neoplasm of the ovary, and sepsis.
* Denotes variables with statistically significant differences between groups at 95% confidence levels.

2002 or 2003 because more employers contributed data to MarketScan in those years.

Myomectomy patients were in the best overall health, as measured by low CCI and PDG scores prior to surgery. Hysterectomy and endometrial ablation recipients had the highest CCI and PDG scores prior to treatment. Differences in CCI scores were statistically significant among groups, whereas differences in PDG scores were not. The most common other condition in all groups was menstruation disorders, followed by pain diagnoses. Endometrial ablation patients were more likely than the other groups to have menstruation disorder diagnoses (72%) during the baseline observation period. Hysterectomy patients were more likely to have been diagnosed with pain prior to surgery than patients who received other surgical interventions. Pregnancy during the baseline period was more likely for myomectomy (12.9%) and nonsurgical patients (9.1%) than for other groups.

Medical care costs

Table 3 shows the unadjusted medical costs from baseline through the end of the operative period for women with at least 2 years of medical enrollment. Baseline annual costs were similar for patients who received a surgical treatment ($4,418–$4,911). The only statistically significant differences were between hysterectomy (more costly) and myomectomy ($p = 0.0436$), and between hysterectomy (more costly) and UAE ($p = 0.0423$). Baseline costs were significantly lower for women without surgical treatment ($3,870) compared with those who underwent any surgery.

Regression adjustment had a small impact on medical costs in the baseline year (Table 3). Regression adjusted estimates of medical care costs in the baseline year were 5% lower (hysterectomy) to 10% higher (UAE) than the unadjusted mean estimates. After regression adjustment, baseline cost differences between nonsurgical patients and patients receiving each of the surgical treatments were statistically significant. However, baseline cost differences between each of the surgical treatments were not statistically significant.

Total unadjusted costs in the year of surgery (total operative costs) were highest for UAE at $16,430, followed by hysterectomy ($15,180), myomectomy ($14,726), and endometrial ablation ($12,096). Operative costs were significantly lower for endometrial ablation compared with the other three surgical treatments. Other operative cost differences between surgical treatments were not statistically significant. The cost increase from baseline was highest for UAE

TABLE 3. MEDICAL CARE COSTS DURING 2-YEAR STUDY PERIOD (AVERAGE PAYMENTS FOR MEDICAL CARE PER PATIENT)

	Baseline costs (1 year)	*Pre operative costs*	*Peri operative costs*	*Post operative costs*	*Total operative costs (1 year)*[a]	*Cost increase*[b]
Not regression adjusted						
Hysterectomy[c] (*n* = 19,629)	$4,911^{M,U,N}$	$625	$9,594^{M,E}$	$4,961^{E}$	$15,180^{E,N}$	$10,269
Myomectomy (*n* = 1,743)	$4,603^{H,N}$	$579	$8,890^{H,U,E}$	$5,257^{E}$	$14,726^{E,N}$	$10,123
Uterine artery embolization (UAE) (*n* = 373)	$4,418^{H,N}$	$685	$10,696^{E,M}$	$5,049^{E}$	$16,430^{E,N}$	$12,012
Endometrial ablation (*n* = 1,115)	$4,793^{N}$	$641	$4,110^{H,M,U}$	$7,345^{H,M,U}$	$12,096^{H,U,N}$	$7,303
No surgical treatment (*n* = 14,214)	$3,870^{H,M,E,U}$	n.a.[d]	n.a.	n.a.	$7,460^{H,M,U,E}$	$3,590
Regression adjusted						
Hysterectomy (*n* = 19,629)	$4,665^{N}$	$624	$9,562^{M,U,E}$	$7,204^{M,U,E}$	$17,390^{M,U,E,N}$	$12,725
Myomectomy (*n* = 1,743)	$4,610^{N}$	$619	$8,969^{H,U,E}$	$9,086^{H,U,E}$	$18,674^{H,E,N}$	$14,064
Uterine artery embolization (UAE) (*n* = 373)	$4,873^{N}$	$670	$11,114^{H,M,E}$	$8,850^{H,M,E}$	$20,634^{H,E,N}$	$15,761
Endometrial ablation (*n* = 1,115)	$4,589^{N}$	$629	$4,222^{H,M,U}$	$8,168^{H,M,U}$	$13,019^{H,M,U,N}$	$8,430
No surgical treatment (*n* = 14,214)	$3,812^{H,M,U,E}$	n.a.	n.a.	$8,257	$8,257^{H,M,U,E}$	$4,445

[a]Total operative costs for patients without surgical treatment includes medical payments made during the year after first diagnosis for UF.
[b]Cost increase is total costs in the operative year minus costs in the baseline year.
[c]The hysterectomy cost estimates included the 31 patients with radical hysterectomy. The average cost for patients with radical hysterectomy was $5,581 at baseline, $1,940 preoperative, $16,312 perioperative, and $16,653 postoperative. Excluding these patients did not significantly impact results. The average cost for hysterectomy patients, excluding patients with a radical hysterectomy, was $4,910 at baseline, $623 preoperative, $9,583 perioperative, $4,943 postoperative. The total for the operative year was $15,149, which was an increase of $10,239 from baseline.
[d]n.a., Not applicable; patients without surgical treatment do not have preoperative, perioperative, and postoperative costs.
H, Cost was significantly different from the cost incurred by hysterectomy patients.
M, Cost was significantly different from the cost incurred by myomectomy patients.
U, Cost was significantly different from the cost incurred by UAE patients.
E, Cost was significantly different from the cost incurred by endometrial ablation patients.
N, Cost was significantly different from the cost incurred by patients treated nonsurgically. Statistical significance was evaluated at 95% confidence levels.

($12,012), followed by hysterectomy ($10,269), myomectomy ($10,123), and endometrial ablation ($7,303).

Regression adjustment increased costs by 8% for endometrial ablation patients, 11% for nonsurgical patients, 15% for hysterectomy patients, 26% for UAE patients, and 27% for myomectomy patients. Without regression adjustment, the most costly procedure was UAE, followed by hysterectomy, myomectomy, and endometrial ablation. Regression adjustment increased myomectomy costs above hysterectomy costs; however, the cost difference between hysterectomy and myomectomy patients was not statistically significant.

Average perioperative payments accounted for 60%–65% of total operative costs for hysterectomy, myomectomy, and UAE and only 48%–55% of total operative costs once regression adjustment was applied. For endometrial ablation, perioperative costs accounted for only 32%–34% of total operative costs (with and without regression adjustment). Patients managing UF without surgical intervention incurred medical costs of $7,460–$8,257 during the year after diagnosis, an increase of $3,590–$4,445 from baseline (range is based on unadjusted means and regression-adjusted estimates). Patients treated surgically sustained significantly higher medical costs than those treated without surgery.

We estimated a propensity score for the sample of women with 2 years of medical claims data. These weights appeared to help balance the groups of patients across treatments because the characteristics of patients in each group became more similar when the weights were applied. However, the weights had little impact on the cost estimates. Weighted estimates were within 10% of the unadjusted results reported here and did not change the ordering of treatments in terms of their medical care costs.

Characteristics of patients with absenteeism and disability information

We found 640 women with absenteeism and disability data in the HPM database who were surgically treated for UF and could be included in the analysis of missed workdays. Of these, 77.7% received a hysterectomy, followed by 14.5% who received a myomectomy. UAE and endometrial ablation each represented 3.9% of the surgically treated sample of patients. We also found 272 women who received nonsurgical treatment for UF and had data on absenteeism and disability. The productivity data tended to include more women in the younger age groups than the larger sample with medical enrollment. An exception to this is the myomectomy group, which had a higher proportion of older women. Women receiving endometrial ablation who had productivity data appeared to be in poorer general health, as measured by their CCI scores prior to treatment, compared with women in the general sample. Women with productivity data were more likely to be diagnosed with pain than were women in the general sample. Menstruation disorders were equally as likely to be diagnosed in women with and without productivity data for the hysterectomy and myomectomy groups. Menstruation disorders were relatively less likely to be diagnosed for women with productivity data who were in the UAE, endometrial ablation, and nonsurgical treatment groups.

Missed workdays

Table 4 presents unadjusted average missed workdays and associated costs due to absenteeism and short-term disability for the baseline and operative years. Baseline missed workdays were very similar for myomectomy (35.5 days) and nonsurgical patients (34.8 days) ($p = 0.8672$). Patients in the hysterectomy and UAE groups had somewhat higher baseline missed workdays (44.0 days and 43.0 days, respectively). The difference in missed days between hysterectomy and UAE was not statistically significant ($p = 0.9003$).

Differences in missed days were statistically significant for comparisons between the hysterectomy group and other groups. Missed workdays grew most for hysterectomy patients (increase of 46.9 days) and myomectomy patients (increase of 38.8 days), followed by endometrial ablation patients (increase of 19.5 days). Growth in missed days was relatively small for UAE patients, at 7.4 days on average (17% of baseline). Patients without surgical treatment had only 3.1 additional missed workdays in the year after diagnosis compared with baseline. Missed days during the preoperative and perioperative periods accounted for about half of missed days during the operative observation period for hysterectomy and myomectomy patients, whereas for UAE patients, preoperative and perioperative costs accounted for 20% of costs during the operative period.

Missed workdays in the year after surgery cost employers $14,045–$25,008 on average for hysterectomy patients, followed by $11,572–$20,924 for myomectomy patients, $8,796–$15,662 for UAE patients, and $8,119–$14,456 for endometrial ablation patients. In terms of missed workdays due to absenteeism and short-term disability, surgical patients cost employers from about $5,000 (UAE) to $15,000 (hysterectomy) more than nonsurgical patients.

Regression adjustment had a small effect on estimates of missed workdays. Regression adjustment increased or decreased missed workdays by 1–2 days (Table 4). We did not estimate weights for the subsample of women who had absenteeism and short-term disability data because there were too few patients in that subsample to reliably estimate a probability model. We explored whether to use the weights derived from the sample of women with medical claims data for our productivity studies and decided against it. The weights exacerbated differences among groups because women with productivity data were a nonrandom segment of the total sample of women and the productivity data only included employees, not dependents.

Results: Six-Year Sample

Patient characteristics

We found 8,659 women with surgical treatments for UF in the CCAE database who were continuously enrolled for 3 years prior to the preoperative period and 3 years after. Of these, 87.3% received a hysterectomy, followed by myomectomy (6.3%), endometrial ablation (4.8%), and UAE (1.5%). We also found 3,225 women with UF diagnoses who did not receive surgical treatments and were enrolled 3 years before and after their diagnosis.

Medical care costs

Figure 3 depicts how annual medical expenditures changed over time for the sample of women with 6 years of

TABLE 4. AVERAGE ABSENTEEISM AND DISABILITY DAYS PER PERSON AND ESTIMATED COSTS DURING 2-YEAR STUDY PERIOD

	Baseline (1 year)	*Preoperative and perioperative*	*Postoperative*	*Total operative (1 year)*	*Cost increase*[a]
Not regression adjusted					
Hysterectomy	44.0 days[M,E,N]	41.5 days[U,E]	49.4 days[M]	90.9 days[M,U,E,N]	46.9 days
(*n* = 497)	($7,891–$14,051)[b]	($5,907–$10,518)	($8,138–$14,490)	($14,045–$25,008)	($6,154–$10,957)
Myomectomy	35.5[H]	38.1[U,E]	36.2	74.3[H,U,E,N]	38.8
(*n* = 93)	($6,505–$11,583)	($5,409–$9,775)	($6,262–$11,149)	($11,752–$20,924)	($5,247–$9,341)
UAE	43.0	10.8[H,M]	39.5	50.4[H,M]	7.4
(*n* = 25)	($7,631–$13,587)	($1,838–$3,273)	($6,958–$12,389)	($8,796–$15,662)	($1,165- $2,075)
Endometrial ablation	28.4[H]	9.1[H,M]	38.8	47.9[H,M]	19.5
(*n* = 25)	($5,445–$9,695)	($1,570–$2,795)	($6,549–$11,661)	($8,119–$14,456)	($2,674–$4,761)
No surgical treatment	34.8[H]	n.a.[c]	n.a.	37.9[H,M]	3.1
(*n* = 372)	($6,322–$11,239)			($6,670–$11,876)	($248–$637)
Regression Adjusted					
Hysterectomy	43.0[M,E,N]	39.8[U,E]	52.2[M]	92.0[M,U,E,N]	49.0
(*n* = 497)	($7,722-$13,750)	($5,672–$10,100)	($8,497–$15,129)	($14,169–$25,229)	($6,447–$11,479)
Myomectomy	34.8[H]	38.8[U,E]	34.0[H]	72.8[H,E,N]	38.0
(*n* = 93)	($6,387–$11,373)	($5,566–$9,911)	($5,966–$10,622)	($11,532–$20,533)	($5,145–$9,160)
UAE	42.6[H]	11.5[H,M]	37.4	48.9[H,M]	6.3
(*n* = 25)	($7,657–$13,633)	($2,025–$3,605)	($5,646–$11,834)	($8,671–$15, 439)	($1,014–$1,806)
Endometrial ablation	28.0[H,M]	9.6[H,M]	35.7	45.3[H,M]	17.3
(*n* = 25)	($5,375–$9,570)	($1,640–$2,921)	($6,062–$10,795)	($7,702 -$13,716)	($2,327–$4,146)
No surgical treatment	35.2[H,M]	n.a.	n.a.	38.1[H,M]	2.9
(*n* = 372)	($6,419–$11,427)			($6,735–$11,992)	($316–$565)

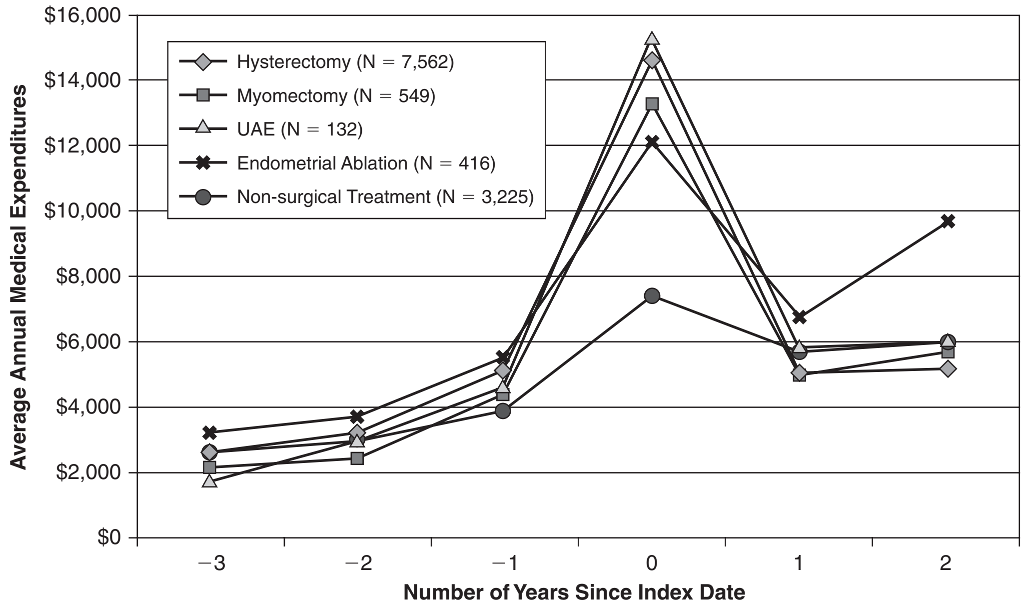
[a]Cost increase is total operative costs minus baseline costs.
[b]The lower bound of the range of costs is based on a value of $193.20/per day for absenteeism days and $135.24 for disability days. The value of a disability day is 70% of the value of an absent day because disability programs typically pay 70% of wages. The upper bound is calculated in a similar way, based on a value of $344 per day.
[c]n.a., Not applicable. Patients without surgical treatment do not have pre-, peri-, and post-operative costs.
H, Cost was significantly different from the cost incurred by hysterectomy patients.
M, Cost was significantly different from the cost incurred by myomectomy patients.
U, Cost was significantly different from the cost incurred by UAE patients.
E, Cost was significantly different from the cost incurred by endometrial ablation patients.
N, Cost was significantly different from the cost incurred by patients treated nonsurgically. Statistical significance was evaluated at 95% confidence levels.

enrollment in the data. Three years before surgery, average annual expenditures for patients who eventually received surgery ranged from $1,732 (UAE) to $3,211 (endometrial ablation). Cost differences between surgical treatments were statistically significant, except for myomectomy and UAE costs ($p = 0.1558$). Patients without surgical treatment had similar medical care costs as hysterectomy patients ($2,595 for hysterectomy and $2,642 for no surgery patients) ($p = 0.6840$) 3 years prior to the operative year. During the years prior to surgery, patients who were eventually treated with hysterectomy, myomectomy, or endometrial ablation and those treated nonsurgically experienced similar medical care cost growth. Patients who eventually received UAE had a much higher medical care cost growth prior to surgery (i.e., they had a steeper cost line slope). Patients who were not treated surgically had the lowest growth in costs in the years prior to diagnosis (i.e., their cost line slope was flatter than the slopes of the other groups).

In the year of surgery or diagnosis (year 0), medical expenditures by each group were significantly different, except for UAE and hysterectomy patients ($p = 0.5559$), UAE and myomectomy patients ($p = 0.1097$), and myomectomy and endometrial ablation patients ($p = 0.1005$). All groups experienced a large decrease in medical care costs in the period following surgery or diagnosis. Hysterectomy, myomectomy, and UAE patients experienced similar cost decreases (62%–66%). Endometrial ablation patients experienced a more moderate cost decrease of 44%. On average, nonsurgical patients experienced a cost decrease of 23% between 1 and 2 years after diagnosis. Two years after the operative year (i.e., 3 years after surgery), medical care costs between groups were not significantly different, except in the case of hysterectomy and nonsurgical patients ($p = 0.0066$).

Discussion

The objective of this study was to estimate the direct and indirect costs of surgical treatments for UF. The total unadjusted cost for hysterectomy patients during the operative period was $29,225–$40,188 (obtained by adding unadjusted average medical care costs equaling $15,180 to the range of unadjusted indirect costs, $14,045–$25,008). For these patients, there was an increase in their costs totaling $16,423–$21,226 from baseline. Total unadjusted costs were slightly lower for myomectomy patients ($26,478–$35,650) during the operative period. Myomectomy patients experienced a cost increase of $15,370–$19,464 from baseline. Despite the high perioperative medical cost of UAE, total unadjusted costs for UAE patients in the operative year were similar to costs for myomectomy, ranging from



Is the difference between each pair of treatments statistically significant?

Treatments: Hysterectomy	Myomectomy	UAE	Endometrial Ablation	Non-surgical Treatment	−3	−2	−1	0	1	2
■	■				✓	✓	✓	✓		
■		■			✓					
■			■		✓			✓	✓	
■				■			✓	✓	✓	✓
	■	■								
	■		■		✓	✓	✓		✓	
	■			■	✓	✓		✓	✓	
		■	■					✓		
		■		■				✓		
			■	■			✓	✓		

✓ = Difference between each pair of treatments (shaded in table above) is statistically significant at 95% confidence levels. Columns correspond to the time period in graph in top panel where 0 is the year beginning with the index date (surgery or date of diagnosis)

FIG. 3. Trends in medical care costs 3 years before and after index date includes only patients with 6 years of data.

$25,226–$32,092. Total costs of UAE patients increased by $13,177–$14,087 from baseline. Patients who received endometrial ablation experienced the lowest unadjusted medical and absenteeism costs ($20,215–$26,552) in the operative year. Patients who received endometrial ablation experienced a total increase in costs of $9,977–$12,064. Finally, patients treated without surgery experienced a total cost increase of $3,948–$4,227 from the baseline year.

Even though regression adjustment increased medical costs for myomectomy patients more so than for hysterectomy patients, total costs (indirect plus direct costs) for hysterectomy were still higher for hysterectomy patients largely due to their higher indirect costs. Regression adjusted direct and indirect operative costs for myomectomy patients were $30,206–$39,207 compared with $31,559–$42,619 for hysterectomy patients.

We found that whereas healthcare costs accounted for a portion of total costs (in most cases, the largest portion), indirect costs due to missed workdays were also significant. Direct costs for medical care accounted for 38% (hysterectomy) to 70% (UAE) of total costs in the operative year, depending on the treatment, value assigned to a missed workday, and use of regression adjustment.

Our 6-year analysis suggests that 3 years prior to surgery or diagnosis, patients in the two largest groups, hysterectomy and nonsurgical treatment, had almost identical total costs and thus likely had a similar disease burden. Over the next 3 years, costs diverged as costs increased more for patients who were eventually treated with hysterectomy. Six years later, average costs for nonsurgical patients were about $1,000 more than for hysterectomy patients. We cannot conclude, however, that subsequent lower costs for hysterectomy patients are due to lower symptom relief for nonsurgical patients; nonsurgical patients were also more likely to have a pregnancy after the UF diagnosis, which would have increased their costs.

The spike in costs in the year following diagnosis of UF for the nonsurgical group (observed in the 6-year analysis) suggests that that year represents the peak period for medical treatment of the condition. Thus, we conclude that the year following diagnosis is a relevant time period for measuring the treatment costs for patients treated nonsurgically for UF.

UAE patients had the lowest costs at the start of the 6-year period, although at 3 years after surgery, they had similar cost outcomes as myomectomy patients, suggesting that UAE was similarly effective at least 3 years after surgery. Three years prior to surgery, endometrial ablation patients had the highest costs, suggesting that endometrial ablation patients tend to have more complicated (or at least more costly) clinical presentations at the outset. Costs in the year beginning with surgery were lower for endometrial ablation patients than for the other surgical treatments, but those costs increase again after 2 years postsurgery, suggesting that symptoms may have recurred for some endometrial ablation patients. There was insufficient evidence to draw this conclusion, however, because the costs incurred by UAE patients were not significantly different from those of the other groups because of the large variance in medical expenditures by the UAE sample. A larger sample of patients and additional information, such as patient histories, are needed to understand long-term cost implications of UAE treatment.

Most of our cost estimates (i.e., those for hysterectomy and UAE) were greater than observed in previously published studies, but some were consistent with those findings (i.e., our estimate for myomectomy was within the same range as reported in previous studies). The review by Mauskopf et al.[11] found short-term treatment cost estimates of $5,012–$7,645 for hysterectomy, $5,425–$11,839 for myomectomy, and $5,425–$7,645 for UAE (in 2004 dollars). When we deflated our peri-operative medical cost estimates using the CPI so that our estimates and those in previous studies related to the same base year, our cost estimates were $9,280 for hysterectomy, $8,599 for myomectomy, and $10,345 for UAE.

There are several possible reasons why our estimates may vary from previous estimates. Most of the previous studies used an estimated cost/charge ratio to estimate treatment cost. In contrast, we used actual paid claims to calculate expenditures. All of the sample members in our study had employer-sponsored insurance; this was not the case in previous studies. Next, the site of care differed across studies. We included inpatient and outpatient procedures from a variety of settings, whereas other studies focused on patients from a single hospital.[12,13] In addition, all the previous studies used data from the 1990s; our data were for the period 1999–2004. Technical advances in particular procedures can alter costs over time. For example, an increased use of less invasive myomectomy procedures could explain the lower costs for myomectomy found in this study.

It is important to recognize that our results apply to the particular mix of patients who received each treatment and the mix of procedures used during our study. We described characteristics of patients in each group to better understand how those patients may be alike or different from one another, but we lacked important clinical information, such as the size, location, and rate of growth of the fibroid. In the future, costs for traditional therapies (hysterectomy and myomectomy) may decrease as less invasive techniques for these therapies become more widespread. Average costs could increase for hysterectomy, however, if patients with milder cases shift into the alternative treatments, leaving mostly severe cases being treated with hysterectomy.

We may have underestimated the cost of surgical treatment, especially for open procedures, which may include some hysterectomy and myomectomy patients. For example, patients with anemia who plan to undergo open procedures must undergo more aggressive treatment for anemia prior to surgery than patients who do not have open surgery. These patients may take a drug, such as Lupron (Tap Pharmaceuticals, Deerfield, IL), for 3–6 months prior to surgery to more aggressively treat the anemia. These costs were included in our baseline cost estimates, although they can be thought of as part of the treatment costs.

In addition, we were not able to measure certain outcomes using administrative data. For example, our analysis did not account for presenteeism or the reduced productivity at work that may be caused by pain and other symptoms of UF and its treatment. We were also unable to include losses resulting from the diminished capacity to perform nonwork activities of daily living, such as household chores or leisure activities. We also did not have access to other potentially relevant information, such as education and type of job, which could be related to treatment choice and use of absence and disability programs.

We were unable to account for the impact of UF or its treatment on turnover (movement from employer to employer or from employment to unemployment status). Moreover, the sample of women with absenteeism and disability data was small, particularly for those who received endometrial ablation or UAE, so these estimates could have been influenced by unusual cases. Also, we did not measure satisfaction with care or other nonfinancial metrics that affect the utility of each treatment choice. Thus, we conducted a cost-burden analysis not a cost-effectiveness analysis.

Conclusions

Our study advances the literature by reporting on cost outcomes related to the treatment of UF for 1–3 years after surgical treatments. It should be noted, however, that some of the follow-up costs associated with surgical choice may not be realized until several years after treatment. Our results for the sample with 6 years of data should be interpreted with caution because some of the groups were small (especially the UAE group).

Future work may focus on estimating costs separately for each type of procedure. For example, there are various procedures for myomectomy (abdominal, vaginal, hysteroscopic, laparoscopic), and differences in costs among these procedures can be investigated. Medical claims data can differentiate among some of these procedures (laparoscopic) but not others (hysteroscopic).

We found that the total costs of surgical treatment for UF were high. Total costs for hysterectomy and myomectomy patients were similar, followed by UAE and endometrial ablation. Costs were primarily linked to medical care, but productivity-related costs were not trivial and differed among treatment options. Indirect costs varied between surgical treatments by a few hundred dollars (UAE and endometrial ablation) to several thousand dollars (between hysterectomy and UAE or endometrial ablation). Given the high costs of care for UF patients, new cost-effective treatments that better address the symptoms of the disease would be highly valued.

Disclosure Statement

D.W.L. is an employee of GE Healthcare. T.G., S.W., and G.S.C. are employees of Thomson Healthcare. R.J.O. is a former employee of Thomson Healthcae. E.S. is a Professor at the Mayo Clinic and Mayo Medical School and is a clinical trial investigator for Insightec and a consultant for AMS, Bayer, Cytc, Fallon Medical, Gynesonics, Innovus, Insightec, Lilly, Medstat/Thomson/GE, Quality Metrics, Schering AG, Smith & Nephew, Society for Interventional Radiology, and United HealthCare. All of E.S.'s consulting relationships have been approved either by Partners Health Care within Harvard Medical School guidelines or by Mayo Clinic and Mayo School of Medicine. E.S. is an officer in the Fibroid Foundation, has stock options with Gynesonics, and is a trustee for the Berlex Foundation.

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