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Trends in Emergency Department Utilization Among Women With Leiomyomas in the United States

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Original Research

Trends in Emergency Department Utilization Among Women With Leiomyomas in the United States

Chelsea N. Fortin, MD, Charley Jiang, MS, Martina T. Caldwell, MD, MS, Sawsan As-Sanie, MD, Vanessa Dalton, MD, and Erica E. Marsh, MD, MSCI

OBJECTIVE: To describe trends in emergency department (ED) visits in the United States with a primary diagnosis of leiomyomas, subsequent admissions, and associated charges.

METHODS: The Healthcare Cost and Utilization Project Nationwide Emergency Department Sample database was used to retrospectively identify all ED visits from 2006 to 2017 among women aged 18–55 years with a primary diagnosis of leiomyomas as indicated by International Classification of Diseases (ICD) diagnosis codes. Trends in ED visits and subsequent admissions were analyzed and stratified by patient and hospital characteristics. Secondary ICD codes, Current Procedural Terminology codes, and hospital charges were analyzed. A multivariate regression model was used to identify predictors of admission.

RESULTS: Although the number of ED visits for leiomyomas increased from 28,732 in 2006 to 65,685 in 2017, the admission rate decreased, from 23.9% in 2006 to 11.1% in 2017. Emergency department visits for leiomyomas were highest among women who were aged 36–45 years (44.5%), in the lowest income quartile (36.1%), privately insured (38.3%), and living in the South (46.2%). Admission was more likely at nonteaching hospitals (odds ratio [OR] 1.23, 95% CI 1.08–1.39) or those located in the Northeast (OR 1.39, 95% CI 1.15–1.68). Patient characteristics associated with admission included older age (26–35 years: OR 1.42, 95% CI 1.21–1.66; 36–45 years: OR 2.01, 95% CI 1.72–2.34; 46–55 years: OR 2.60, 95% CI 2.23–3.03) and bleeding-related complaints (OR 14.92, 95% CI 14.00–15.90). Admission was least likely in uninsured patients (Medicare: OR 1.37, 95% CI 1.21–1.54; Medicaid: OR 1.26, 95% CI 1.16–1.36; private: OR 1.44, 95% CI 1.32–1.56).

CONCLUSION: Although ED visits for leiomyomas are increasing, admission rates for these visits are decreasing. The substantial decline in admissions suggests many of these visits could potentially be addressed in a non–acute-care setting. However, when women with leiomyomas present with a bleeding-related complaint, the odds of admission increase 15-fold. There is an apparent disparity in likelihood of admission based on insurance type.

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Uterine leiomyomas are the most common benign gynecologic condition in the United States, with a prevalence of up to 70% by age 50 years.[1] Although the majority of leiomyomas are asymptomatic, approximately 25–50% of patients will experience symptoms, most commonly heavy menstrual bleeding and pelvic pain or pressure.[2] Because of their associated morbidity, leiomyomas continue to be the leading cause of hysterectomy in the United States[3] and a cause of protracted

symptoms for which there are limited long-term treatment options.

Although leiomyomas are often a chronic condition, many women with symptomatic leiomyomas will seek evaluation in the emergency department (ED). It has been estimated that one in five will visit the ED in the first year after their diagnosis of leiomyomas.[4] Furthermore, women with leiomyomas have more ED visits than women without leiomyomas.[4] Receiving care in the ED is costly, and has been found to be 10 times more expensive than receiving care at an urgent care center for the same diagnosis.[5] The total annual costs of leiomyomas have been estimated to be as high as $5.9–34.4 billion U.S. dollars.[6] Both ED visits and hospital admissions contribute substantially to the overall economic burden that leiomyoma disorders pose to individual patients and society.

Gaining insight into the volume of these visits and drivers of admission could help redirect appropriate patients to alternative care settings, resulting in significant cost savings. However, little is known currently about leiomyoma-related care in the ED or about the women who seek care in this setting. The objective of this study was to describe national trends in leiomyoma-related ED visits and associated hospital charges, as well as to determine factors associated with subsequent hospital admission.

METHODS

Information on ED visits for leiomyomas in the United States from 2006 to 2017 was obtained from the Nationwide Emergency Department Sample, which is a part of the Healthcare Cost and Utilization Project, and sponsored by the Agency for Healthcare Research and Quality. The Nationwide Emergency Department Sample is the largest all-payer publicly available database of ED visits in the United States.[7] This database contains information from 33.5 million ED visits at 984 hospitals to create a 20% stratified sample of U.S. hospital-based EDs. Weighted, the database describes more than 100 million ED visits annually. Hospital and patient characteristics, as well as information on the nature of the visits, are included in the database. The University of Michigan Institutional Review Board reviewed this study and determined that it was exempt because the data are deidentified and publicly available.

Emergency department visits were selected for inclusion if they involved female patients aged 18–55 years old with a diagnosis of leiomyomas. International Classification of Diseases (both ninth [ICD-9][8] and tenth [ICD-10][9] revisions) diagnosis codes were used to identify visits in which the primary diagnosis was leiomyomas (ICD-9 codes: 218.X, 218.0, 218.1, 218.2, and 218.9; ICD-10 codes: D25.X, D25.0, D25.1, D25.2, and D25.9).

The weighted percentage of ED visits among this cohort was calculated for each year during 2006–2017, as well as, overall, during the study period. Emergency department visits for leiomyomas were stratified by a number of covariates, including age, income, payment type, and hospital location and type. Age was grouped into four categories: 18–25; 26–35; 36–45; and 46–55 years. Income quartile by ZIP code was included in the Nationwide Emergency Department Sample database. No patient-specific income data were provided. Payment type included five categories: Medicaid, Medicare, private insurance, uninsured, and other. The uninsured category included insurance type "self-pay" and "no charge."[10] "No charge" indicated that the hospital did not charge any fee for the encounter and included, for example, charity, nonpayment, and professional courtesy. The geographic location of the hospital was categorized as Midwest, Northeast, South, or West. Hospital type was divided into teaching and nonteaching. Teaching hospitals were all metropolitan based. Nonteaching hospitals included both metropolitan nonteaching and nonmetropolitan hospitals. Nonmetropolitan teaching hospitals were not classified separately by the Nationwide Emergency Department Sample, as these hospitals were rare.

Secondary diagnoses associated with leiomyoma-related ED visits were also identified using ICD-9 and ICD-10 codes (Appendix 1, available online at http://links.lww.com/AOG/C247). Diagnosis codes that represented similar clinical entities were grouped together. For instance, code N939 (abnormal uterine and vaginal bleeding, unspecified) and code N938 (other specified abnormal uterine and vaginal bleeding), were grouped together as "bleeding-related" diagnoses. Current Procedural Terminology (CPT) codes associated with leiomyoma-related ED visits were also identified to ascertain tests and procedures ordered during these visits (Appendix 2, available online at http://links.lww.com/AOG/C247). Again, clinically similar CPT codes were grouped together, such as CPT code 76856 (nonobstetric pelvic ultrasonography, real time with image documentation; complete) and CPT code 76830 (nonobstetric transvaginal ultrasonography) both being categorized as "pelvic ultrasound." The frequencies of each group of secondary diagnoses and each group of CPT codes were calculated.

Emergency department charges were obtained from the Nationwide Emergency Department Sample database and adjusted for inflation using the

Consumer Price Index[11] related to the 2017 U.S. dollar. If ED charges were excessively low or high, the value was set to missing by the Nationwide Emergency Department Sample. Missing charge values were treated as missing at random and imputed for the calculation of total charges. Age, region, income, and the presence of a leiomyoma diagnosis were included as covariates for the imputation analysis. Average annual percentage changes of charges were estimated by fitting trend data to a log-linear model using Joinpoint 4.7.0.0.

SAS 9.4 was used to perform the statistical analyses. Descriptive statistics were calculated as counts and percentages for categorical variables and means for continuous variables. *t* test, χ^2 test, and F-test were used to carry out significant difference tests, and $P<0.05$ was considered statistically significant.

A weighted multivariable logistic regression model was constructed to determine factors associated with hospital admission for leiomyoma-related visits. The patient and hospital characteristics were used as covariates in the model. The dependent variable was an indicator of ED visit admission status. The independent variables included in the logistic model were age group, region, payment type, income quartile by ZIP code, hospital teaching status, concomitant diagnosis of bleeding, and concomitant diagnosis of pain. The logistic model estimation incorporated different weights based on national hospital stratum. We obtained maximum likelihood estimates of regression parameters and standard errors, as well as the corresponding odds ratios and CIs for each independent predictor.

RESULTS

During the study period, there were a total of 533,963 ED visits for leiomyomas among women aged 18–55 years. There were 487,688,338 total ED visits by women in this age group for all diagnoses during the study period. The number of ED visits for leiomyomas within this population increased 129% from 2006 (28,732 visits) to 2017 (65,685 visits) (Fig. 1). The proportion of all ED visits that were for a primary diagnosis of leiomyomas also increased over the study period, from 0.079% in 2006 to 0.154% in 2017 (Table 1), suggesting that the increase was not simply from an increase in overall population volume. The overall admission rate for women aged 18–55 years presenting to the ED for leiomyomas during the 12-year study period was 16.3% and decreased by more than half, from 23.9% in 2006 to 11.1% in 2017. In comparison, the rate of admission for all other non-leiomyoma diagnoses presenting to the ED was relatively stable throughout the study period (9.2% in 2006 and 8.1% in 2017). The overall admission rate for patients presenting to the ED with all other diagnoses during the study period was only 8.5%.

Table 2 depicts the descriptive characteristics of ED visits and admissions for leiomyomas during the entire study period. Almost half (44.5%) of the women were aged 36–45 years; only 3.4% were aged 18–25 years. Women presenting to the ED were most likely to be in the lowest income quartile (36.1%) and least likely to be in the highest income quartile (16.4%). The majority of ED visits for leiomyomas during the study period were paid by private insurance (38.3%), Medicaid (27.1%), or self-pay (24.4%). Regarding geographic location, women presenting to the ED with leiomyomas during the study period were most likely to be from the South (46.2%) and least likely to be from the Midwest (12.2%).

The most common secondary diagnoses among patients with a primary diagnosis of leiomyomas were those related to blood loss–anemia or abnormal menstrual bleeding (40.9%). The next most common secondary diagnoses were those related to abdominal or pelvic pain (21.4%). Table 3 shows the most common procedures and tests ordered during ED visits for leiomyomas. The most commonly ordered tests were chemistry studies (61.9%), hematologic studies (58.0%), and pelvic or abdominal ultrasonograms (57.3%). We found that 14.2% of patients with a primary diagnosis of leiomyomas received intravenous hydration. This was significantly higher than the 8.6% of age-matched women presenting to the ED with all other diagnoses during the study period ($P<.001$). Furthermore, 1.8% of women with a primary diagnosis of leiomyomas received a blood transfusion. This was also significantly higher than the 0.1% of age-matched women with all other diagnoses who received a blood transfusion ($P<.001$).

From 2006 to 2017, the median ED visit charges for leiomyomas more than doubled, from $2,586 to $6,193. Average ED charges for leiomyomas were consistently higher than charges for non–leiomyoma-related visits ($P<.001$) (Fig. 2). Furthermore, the total ED visit charges for leiomyomas increased by 445% during the study period, totaling nearly $500 million in 2017. The annual average percentage change for leiomyoma-related ED visit charges was significantly higher than that of all other age-matched diagnoses during the overall study period (8.7% vs 7.3%; $P<.01$).

Table 2 also shows the multivariate analysis of predictors of hospital admission. The probability of hospital admission for leiomyomas increased with

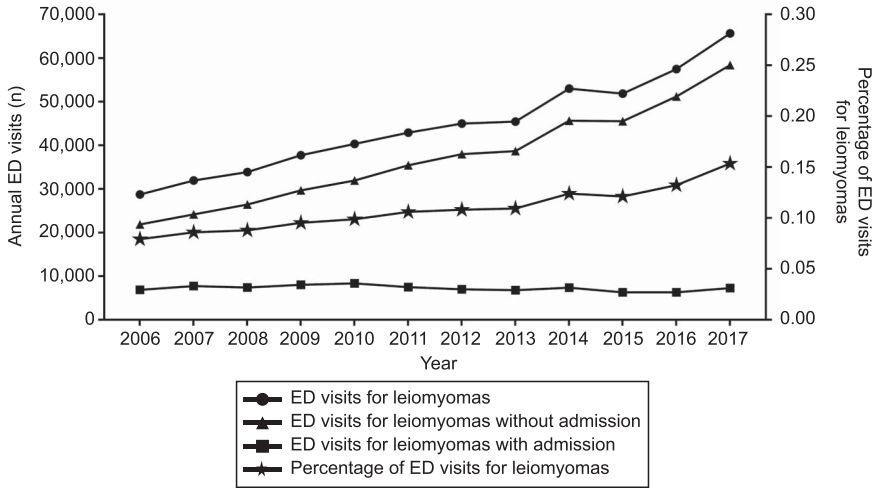

Fig. 1. Yearly emergency department (ED) visits for leiomyomas among women aged 18–55 years by admitted status, 2006–2017.

Fortin. Emergency Department Visits For Leiomyomas. Obstet Gynecol 2021.

age, with women aged 18–25 years being significantly less likely to be admitted than older women (26–35 years: odds ratio [OR] 1.42, 95% CI 1.21–1.66; 36–45 years: OR 2.01, 95% CI 1.72–2.34; 46–55 years: OR 2.60, 95% CI 2.23–3.03). Emergency department visits in the Northeast were significantly more likely to result in admission than those in other regions (OR 1.39, 95% CI 1.15–1.68). Admission was least likely to occur in the South. Admission was least likely in uninsured patients (Medicare: OR 1.37, 95% CI 1.21–1.54; Medicaid: OR 1.26, 95% CI 1.16–1.36; private: OR 1.44, 95% CI 1.32–1.56). Unadjusted χ^2 analyses demonstrated that women in the lowest income quartile were less likely to be admitted. Income quartile by ZIP code did not correlate significantly with admission in our logistic regression model. Patients seen at nonteaching hospitals were more likely to be admitted than those seen at teaching hospitals (OR 1.23, 95% CI 1.08–1.39). Finally, women with leiomyomas who presented to the ED with bleeding were significantly more likely to be admitted (OR 14.92, 95% CI 14.00–15.90). Patients who presented with pain were significantly less likely to be admitted (OR 0.29, 95% CI 0.27–0.33).

DISCUSSION

In this analysis of a large nationally representative database, ED visits with a primary diagnosis of leiomyomas progressively increased while admission rates decreased over the 12-year study period. Approximately one in 10 ED visits for leiomyomas resulted in admission in 2017. The growing disparity between the number of ED visits for leiomyomas and the number of those visits resulting in admission warrants exploration. It is possible that women are increasingly using the ED for nonurgent leiomyoma-related issues. Alternatively, this finding could potentially reflect changes in ED care patterns, such as

Table 1. Proportion of Total Emergency Department Visits for Leiomyomas Among Women Aged 18–55 Years, 2006–2017

Year	Total ED Visits (All Diagnoses)	ED Visits for Leiomyomas	Proportion of Total ED Visits for Leiomyomas (%)
2006	36,241,653	28,732	0.079
2007	37,165,635	31,933	0.086
2008	38,522,166	33,850	0.088
2009	39,542,196	37,728	0.095
2010	40,788,108	40,304	0.099
2011	40,477,498	42,918	0.106
2012	41,607,380	44,985	0.108
2013	41,574,457	45,461	0.109
2014	42,761,683	53,033	0.124
2015	42,755,919	51,843	0.121
2016	43,477,273	57,491	0.132
2017	42,774,371	65,685	0.154

ED, emergency department.

Table 2. Characteristics of Emergency Department Visits and Admissions for Leiomyomas Among Women Aged 18–55 Years, 2006–2017, and Associated Logistic Regression*

Variable	Total ED Visits†	Admitted†	Not Admitted†	*P*	Admission	
					OR (95% CI)	Adjusted OR (95% CI)
Total	533,963 (100)	87,025 (16.3)	446,938 (83.7)			
Age (y)						
18–25‡	18,182 (3.4)	1,252 (1.4)	16,930 (3.8)	.001	1.0	
26–35	108,986 (20.4)	11,214 (12.9)	97,772 (21.9)		1.551 (1.35–1.79)	1.418 (1.21–1.66)
36–45	237,801 (44.5)	38,604 (44.4)	199,197 (44.6)		2.62 (2.28–3.01)	2.005 (1.72–2.34)
46–55	168,994 (31.6)	35,956 (41.3)	133,038 (29.8)		3.654 (3.18–4.2)	2.602 (2.23–3.03)
Region						
Northeast	120,721 (22.6)	21,516 (24.7)	99,205 (22.2)	.001	1.299 (1.12–1.51)	1.389 (1.15–1.68)
Midwest	65,290 (12.2)	10,487 (12.1)	54,802 (12.3)		1.146 (0.95–1.39)	1.126 (0.96–1.32)
South‡	246,436 (46.2)	35,254 (40.5)	211,182 (47.3)		1.0	
West	101,517 (19)	19,768 (22.7)	81,749 (18.3)		1.449 (1.3–1.62)	1.114 (0.99–1.26)
Insurance						
Medicare	21,089 (3.9)	3,575 (4.1)	17,514 (3.9)	.001	1.323 (1.18–1.48)	1.366 (1.21–1.54)
Medicaid	144,884 (27.1)	24,589 (28.3)	120,295 (26.9)		1.324 (1.2–1.46)	1.258 (1.16–1.36)
Private	204,299 (38.3)	35,886 (41.2)	168,414 (37.7)		1.38 (1.27–1.5)	1.435 (1.32–1.56)
Uninsured‡	143,111 (26.8)	19,134 (22.0)	123,978 (27.8)		1.0	
Other	19,603 (3.7)	3,741 (4.3)	15,863 (3.5)		1.528 (1.29–1.81)	1.535 (1.31–1.79)
Income quartile						
Lowest	192,734 (36.1)	29,415 (33.8)	163,319 (36.5)	.001	0.931 (0.87–1)	1.019 (0.94–1.1)
2nd	129,503 (24.3)	20,461 (23.5)	109,041 (24.4)		0.97 (0.91–1.04)	1.019 (0.95–1.1)
3rd‡	112,878 (21.1)	18,303 (21)	94,574 (21.2)		1.0	
Highest	87,679 (16.4)	15,231 (17.5)	72,448 (16.2)		1.086 (1.01–1.17)	1.01 (0.93–1.09)
Teaching status						
Teaching‡	313,247 (58.7)	50,221 (57.7)	263,025 (58.9)	.001	1.0	
Nonteaching§	220,716 (41.3)	36,804 (42.3)	183,913 (41.1)		1.048 (0.94–1.17)	1.225 (1.08–1.39)
Metropolitan status (population)						
Metro (more than 1 million)	375,185 (70.3)	63,565 (73)	311,620 (69.7)	.003	1.316 (1.18–1.47)	1.287 (1.13–1.47)
Metro (50,000 to less than 1 million)	120,149 (22.5)	18,081 (20.8)	102,068 (22.8)		1.143 (0.97–1.35)	1.19 (0.98–1.44)
Nonmetro‡	36,403 (6.8)	4,886 (5.6)	31,517 (7.1)		1.0	
Concomitant diagnoses						
Pain-related						
No‡	377,952 (70.8)	18,346 (21.1)	359,606 (80.5)	.001	1.0	
Yes	156,011 (29.2)	68,679 (78.9)	87,332 (19.5)		0.22 (0.2–0.25)	0.294 (0.27–0.33)
Bleeding-related						
No‡	427,162 (80)	81,749 (93.9)	345,413 (77.3)	.001	1.0	
Yes	106,801 (20)	5,276 (6.1)	101,525 (22.7)		15.415 (14.48–16.41)	14.919 (14–15.9)

ED, emergency department; OR, odds ratio.
Data are n (%) unless otherwise specified.
* Variables in the final logistic regression model included age group, region, insurance, teaching status, metropolitan status, and concomitant diagnoses.
† Count (n) estimates are unweighted; percentage estimates are weighted using Healthcare Cost and Utilization Project discharge weights, which are representative of the reported total of ED visits in the United States. The percentages within each covariate are column percentages. Some counts do not sum to totals because of missing data for factor; percentages calculated from all nonmissing data. Fewer than 0.5% of the data were missing.
‡ Reference group.
§ Nonteaching hospitals included both metropolitan nonteaching and nonmetropolitan hospitals.

Table 3. Most Common Current Procedural Terminology Codes Associated With Emergency Department Visits for Leiomyomas Among Women Aged 18–55 Years, 2006–2017

Procedure or Test	Frequency (%)
Chemistry studies	61.9
Hematologic studies	58.0
Pelvic or abdominal ultrasonography	57.3
Urinalysis or urine culture	47.9
STI or vaginitis screen	39.6
Injections and infusions*	38.5
Pregnancy test	36.1
CT of abdomen or pelvis	18.9
Blood typing	16.7

STI, sexually transmitted infection; CT, computed tomography.
* Defined as "Therapeutic, Prophylactic, & Diagnostic Injections & Infusions," per the Centers for Medicare & Medicaid Services.[34]

managing pain control and administering blood transfusions in the ED as opposed to admitting. Increasing use of effective medical therapies in the ED, such as tranexamic acid, to manage heavy bleeding, could also contribute to the decreasing admission rate. Because admission rates varied significantly by region and payer, this pattern may also result from local policy or health care professional biases. The increasing number of leiomyoma-related ED visits is particularly interesting given the recent finding of a decreasing trend of new leiomyoma diagnoses among women aged 18–65 years between 2005 and 2015.[12] Future research exploring patients' motivations for seeking care in the ED may provide clarification.

The overall economic burden of symptomatic leiomyomas on society has been estimated to be $5.9–34.4 billion U.S. dollars annually in both direct costs and indirect costs.[6] We found an average ED charge of more than $6,000 per visit and $500 million in total charges in 2017. Furthermore, average ED charges for leiomyoma-related visits were consistently twice as high as ED charges for other diagnoses. The high proportion of patients who received costly ED-based imaging studies likely contributed significantly to these costs. It is likely that many of these patients were appropriate candidates for outpatient imaging, which potentially could have saved significant money and resources. Prior studies have similarly found that women with leiomyomas incur total health care costs of more than twice that of their counterparts without leiomyomas.[13] This cohort of women should be targeted for intervention to improve access to outpatient care, thereby mitigating unnecessary, costly ED utilization.

Based on the results of our logistic regression, we further characterized patients who are more likely to be admitted after presenting to the ED for leiomyomas. Women who presented with a bleeding-related complaint were 15-times more likely to be admitted than those who did not present with a bleeding-related complaint. On the contrary, if the primary complaint was pain-related, the odds of admission were significantly lower. These associations are logical, because bleeding-related issues can quickly

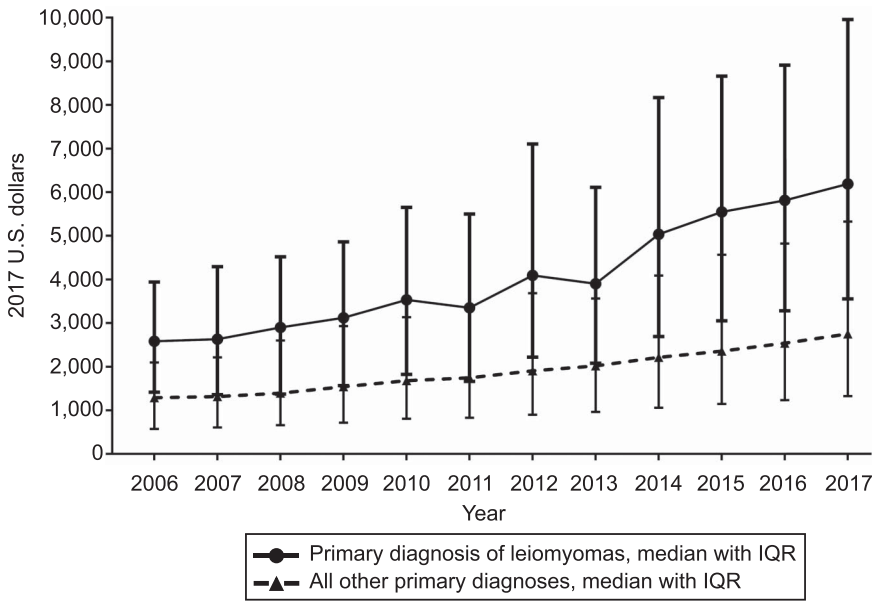

Fig. 2. National estimates of average emergency department charges in 2017 U.S. dollars for women aged 18–55 years, 2006–2017. IQR, interquartile range.

Fortin. Emergency Department Visits For Leiomyomas. Obstet Gynecol 2021.

lead to hemodynamic instability, a scenario that almost exclusively warrants admission. Pain-related leiomyoma symptoms are poorly understood, are often multifactorial, and may not be directly related to leiomyomas when present. Pain is also less likely to be emergent in nature and can often be managed as an outpatient.

The probability of admission was significantly lower among women aged 18–25 years, and nearly nine out of every 10 women admitted for leiomyomas were aged 36–55 years old. This finding is consistent with results from prior studies. Cox et al[14] analyzed reproductive health-related ED visits by women in Maryland from 1999 to 2005 and reported an increased odds of admission with increasing age. Several other studies have looked specifically at women with leiomyomas, and have all concluded that the hospitalization rate for leiomyomas increases with age, peaking among women aged 40–54 years.[15–17] Admission rates are lowest among younger women, possibly because of different perceptions of what constitutes a medical emergency leading to higher care-seeking behavior. Indeed, prior research has demonstrated that young adults receive a greater proportion of their care in the ED compared with older adults.[18] Furthermore, younger adults are least likely to report the seriousness of their medical problem as the reason for seeking care in the ED compared with older age groups.[19] Additionally, older women may have more comorbidities contributing to their leiomyoma-related ED visits, increasing their rates of admission. Finally, it is also likely that younger women have less leiomyoma burden.

Women in the South had the lowest probability of hospital admission, though the number of leiomyoma-related ED visits in this region was highest. Although the high volume of ED visits in the South may be in part because it is the most populous region in the country as defined by the Nationwide Emergency Department Sample,[20] it is also known to be the region with the highest prevalence of leiomyomas.[21] Regional differences in leiomyoma prevalence could largely be explained by differences in racial makeup. Black women, who are disproportionately affected by leiomyomas, comprise a greater proportion of the total population in the South.[22] Prior Nationwide Emergency Department Sample studies have also demonstrated significant variation in hospital admission rates across U.S. regions for other medical conditions.[23–26] Potential factors contributing to this variation include regional differences in health care access, systemic racism, disease severity, physician density, and environmental factors.

Income was not found to be a significant predictor of hospital admission. There were, however, notable differences in ED use across income quartiles. Emergency department visits for leiomyomas were highest among women in the lowest income bracket. Overall health care utilization has previously been shown to be influenced by socioeconomic status.[27] In a large national cross-sectional study, Nicholson et al[28] found a significant inverse relationship between ED usage for gynecologic conditions and median household income. There are likely numerous reasons to explain this finding. For instance, many low-income women do not have a primary care physician and report limited access to primary care services.[29] Additionally, studies have found that patients of lower socioeconomic status prefer to receive medical care in the ED over ambulatory care centers owing to affordability and trust in the technical quality of care.[30] As a result, many of these women use the ED for their regular source of medical care.[29]

Given the observed association between number of ED visits and lower socioeconomic status, we had anticipated that the most frequently billed payer would be Medicaid. Indeed, Nicholson et al[28] found that ED visits for gynecologic conditions were three times more common among women with Medicaid compared with private insurance. The results of our analysis unexpectedly showed that the most frequently billed payer for leiomyoma-related ED visits was private insurance. Potential explanations could include higher primary care physician referrals to the ED among the privately insured or the expansion of private coverage under the Affordable Care Act. Akosa Antwi et al looked at the effect of the Affordable Care Act on patterns of ED use among adults aged 19–29 years. From 2007 to 2011, the fraction of privately insured patients increased and the fraction of those insured through Medicaid decreased.[31] Our results also showed that women who were uninsured were least likely to be admitted for their leiomyomas. Prior studies have demonstrated that admission rates for several other conditions are higher in privately insured women and lower in the uninsured.[32,33]

Because the Nationwide Emergency Department Sample database does not provide detailed clinical data or associated outcomes data, we were unable to elucidate whether this apparent disparity is being driven by unnecessary admissions of the privately insured or inappropriate discharges of the uninsured. The former would suggest current practices are contributing to unnecessary health care expenditures, and the latter means that a vulnerable cohort of patients is being placed at risk for suboptimal care.

Other possible explanations to explain this disparity include differences in disease severity or patient choice regarding admission. Reasons for the observed variation in admission rates based on insurance coverage warrants further investigation.

Our study has some limitations. First, patients with several ED visits during the study period were potentially represented more than once, because analyses were visit-based not patient-based. Second, there are limitations associated with the use of ICD codes, which are intended for billing purposes, not disease surveillance, and do not perfectly capture the clinical picture of the visit. It is also possible that the transition from ICD-9 to ICD-10 that occurred during the study period resulted in coding errors and disruptions in observed rates. We did not, however, notice any sharp or unexplained trend changes during this period. Finally, the Nationwide Emergency Department Sample database does not contain information on race or ethnicity or patient-specific income levels or other socioeconomic variables, which limited our ability to assess the effect of social determinants of health.

Despite these limitations, this work has many strengths. It is based on the largest, publicly available all-payer ED database in the United States, with information on 33.5 million ED visits derived from 984 hospitals. The large number of ED records in the Nationwide Emergency Department Sample database decreases the risk of sampling error. Furthermore, estimates from the Nationwide Emergency Department Sample database are nationally representative, increasing the external validity of our findings. Finally, our data were stratified by several key variables, providing a comprehensive understanding of ED visits for leiomyomas in the United States.

This nationally representative analysis provides a foundation for understanding ED visits and hospitalizations where uterine leiomyomas are the primary diagnosis. These encounters impart a significant and increasing economic burden on patients, our health care system, and society, and highlight an opportunity to change the trajectory of ED utilization for this often chronic and typically nonemergent condition. Improving our understanding of patients with leiomyomas who present to the ED, but are not admitted, will help target interventions to better care for these patients in the outpatient setting and ultimately reduce the burden of leiomyomas for both patients and society. Finally, there is an apparent disparity in the likelihood of admission based on insurance type. This finding warrants further study to ensure that all women presenting with leiomyomas receive equitable care.

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