

## GYNECOLOGY

# Patient, surgeon, and hospital disparities associated with benign hysterectomy approach and perioperative complications



Ambar Mehta, BS; Tim Xu, MPP; Susan Hutfless, PhD; Martin A. Makary, MD, MPH; Abdulrahman K. Sinno, MD; Edward J. Tanner III, MD; Rebecca L. Stone, MD; Karen Wang, MD; Amanda N. Fader, MD

## Background

Hysterectomy is among the most common major surgical procedures performed in women. Approximately 450,000 hysterectomy procedures are performed each year in the United States for benign indications. However, little is known regarding contemporary US hysterectomy trends for women with benign disease with respect to operative technique and perioperative complications, and the association between these 2 factors with patient, surgeon, and hospital characteristics.

## Objective

We sought to describe contemporary hysterectomy trends and explore associations between patient, surgeon, and hospital characteristics with surgical approach and perioperative complications.

## Study Design

Hysterectomies performed for benign indications by general gynecologists from July 2012 through September 2014 were analyzed in the all-payer Maryland Health Services Cost Review Commission database. We excluded hysterectomies

**TABLE**  
Predictors of minimally invasive procedure use by patient, surgeon, and hospital characteristics

Characteristic	Adjusted odds ratio <sup>a</sup> (95% CI)
Surgeon hysterectomy volume	
1–5	1.00 (0.87–1.17)
6–10	0.92 (0.81–1.05)
11–20	<b>0.87 (0.78–0.97)</b>
≥21	Reference
Hospital hysterectomy volume	
1–100	0.93 (0.81–1.06)
101–200	<b>0.78 (0.71–0.87)</b>
≥201	Reference
Beds	
<99	<b>0.26 (0.15–0.45)</b>
100–399	<b>0.87 (0.79–0.96)</b>
≥400	Reference
Years practicing	
<20	Reference
≥20	0.92 (0.83–1.01)
Patient age, y	
<20	—
20–44	<b>1.16 (1.05–1.28)</b>
45–64	Reference
≥65	1.08 (0.88–1.34)
Patient race	
White	Reference
Black	<b>0.70 (0.63–0.78)</b>
Hispanic ethnicity	<b>0.62 (0.48–0.80)</b>
Other	<b>0.86 (0.74–1.00)</b>

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TABLE

**Predictors of minimally invasive procedure use by patient, surgeon, and hospital characteristics** (continued)

Characteristic	Adjusted odds ratio <sup>a</sup> (95% CI)
<b>Payer, %</b>	
Medicare	0.99 (0.81–1.19)
Medicaid	0.92 (0.80–1.06)
Self-pay	0.79 (0.52–1.21)
Commercial/private	Reference
Other	1.02 (0.78–1.32)
<b>Elixhauser score</b>	
0–1	Reference
2–4	<b>0.92 (0.84–1.00)</b>
≥5	0.82 (0.62–1.10)
<b>Fibroids</b>	
Yes	<b>0.75 (0.68–0.83)</b>
No	Reference
<b>Endometriosis</b>	
Yes	1.14 (1.02–1.28) <sup>b</sup>
No	Reference
<b>Abnormal menstruation bleeding</b>	
Yes	1.15 (1.05–1.27) <sup>b</sup>
No	Reference
<b>Benign neoplasm or cyst</b>	
Yes	0.84 (0.74–0.94) <sup>b</sup>
No	Reference
<b>Pelvic organ prolapse</b>	
Yes	2.07 (1.82–2.34) <sup>b</sup>
No	Reference

CI, confidence interval.

<sup>a</sup> Multivariable regression adjusted for surgeon hysterectomy volume, hospital hysterectomy volume, hospital bed size, surgeon practicing year, patient age, patient race, payer, Elixhauser score, and all 5 selected benign indications; <sup>b</sup> Odds ratios and 95% confidence intervals represent significant values.

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**Results**

A total of 5660 hospitalizations were identified during the study period. Most patients (61.5%) had an open hysterectomy; 38.5% underwent a minimally invasive surgery procedure (25.1% robotic, 46.6% laparoscopic, 28.3% vaginal). Most surgeons (68.2%) were very low- or low-volume surgeons. Factors associated with a lower likelihood of undergoing minimally invasive surgery included older patient age (reference 45–64 years; 20–44 years: adjusted odds ratio, 1.16; 95% confidence interval, 1.05–1.28), black race (reference white; adjusted odds ratio, 0.70; 95% confidence interval, 0.63–0.78), Hispanic ethnicity (adjusted odds ratio, 0.62; 95% confidence interval, 0.48–0.80), smaller hospital (reference large; small: adjusted odds ratio, 0.26; 95% confidence interval, 0.15–0.45; medium: adjusted odds ratio, 0.87; 95% confidence interval, 0.79–0.96), medium hospital hysterectomy volume (reference ≥200 hysterectomies; 100–200: adjusted odds ratio, 0.78; 95% confidence interval, 0.71–0.87), and medium vs high surgeon volume (reference high; medium: adjusted odds ratio, 0.87; 95% confidence interval, 0.78–0.97). Complications occurred in 25.8% of open and 8.2% of minimally invasive hysterectomies ( $P < .0001$ ). Minimally invasive hysterectomy (adjusted odds ratio, 0.22; 95% confidence interval, 0.17–0.27) and large hysterectomy volume hospitals (reference ≥200 hysterectomies; 1–100: adjusted odds ratio, 2.26; 95% confidence interval, 1.60–3.20; 101–200: adjusted odds ratio, 1.63; 95% confidence interval, 1.23–2.16) were associated with fewer complications, while patient payer, including Medicare (reference private; adjusted odds ratio, 1.86; 95% confidence interval, 1.33–2.61),

performed by gynecologic oncologists, reproductive endocrinologists, and female pelvic medicine and reconstructive surgeons. We included both open hysterectomies and those performed by minimally invasive surgery, which included vaginal hysterectomies. Perioperative complications were defined using the Agency for Healthcare Research and Quality patient safety indicators.

Surgeon hysterectomy volume during the 2-year study period was analyzed (0–5 cases annually = very low, 6–10 = low, 11–20 = medium, and ≥21 = high). We utilized logistic regression and negative binomial regression to identify patient, surgeon, and hospital characteristics associated with minimally invasive surgery utilization and perioperative complications, respectively.

Medicaid (adjusted odds ratio, 1.63; 95% confidence interval, 1.30–2.04), and self-pay status (adjusted odds ratio, 2.41; 95% confidence interval, 1.40–4.12), and very-low and low surgeon hysterectomy volume (reference  $\geq 21$  cases; 1–5 cases: adjusted odds ratio, 1.73; 95% confidence interval, 1.22–2.47; 6–10 cases: adjusted odds ratio, 1.60; 95% confidence interval, 1.11–2.23) were associated with perioperative complications (Table).

### Conclusion

Use of minimally invasive hysterectomy for benign indications remains variable, with most patients undergoing open, more morbid procedures. Older and black patients and smaller hospitals are associated with open hysterectomy. Patient race and payer status, hysterectomy approach, and surgeon volume were associated with perioperative complications. Hysterectomies performed for benign indications by high-volume

surgeons or by minimally invasive techniques may represent an opportunity to reduce preventable harm. ■

### Author and article information

From the Johns Hopkins School of Medicine (Ms Mehta and Mr Xu); and Departments of Gastroenterology and Hepatology (Dr Hutfless) and Surgery (Dr Makary), and Kelly Gynecologic Oncology Service (Drs Sinno, Tanner, Stone, and Fader) and Division of Gynecologic Specialties (Dr Wang), Department of Gynecology and Obstetrics, Johns Hopkins Medicine, Baltimore, MD.

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