Inpatient Surgical Treatment Patterns for Patients with Uterine Fibroids in the United States, 1998–2002

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Objective: To analyze the impact of patient and organizational characteristics on surgical treatment patterns for patients with uterine fibroids.

Methods: Unadjusted means and percentages were calculated from a population-based inpatient sample (HCUP-NIS). Multiple logistic regression analysis was used to estimate the prevalence odds ratios for the association of uterine fibroid treatments and covariates of interest.

Results: More than 1.2 million patients with a primary diagnosis of uterine fibroids were treated from 1998 to 2002. Of these, 84.4% received a hysterectomy and 12.3% received a myomectomy. Total abdominal hysterectomy was the most common procedure. The number of supracervical hysterectomies increased 18.1% over the five-year period. Black women and Asians/Pacific Islanders were more likely than white women to receive a myomectomy. All types of hysterectomies were more common in Medicaid patients compared with private/HMO patients. With the exception of patients in ZIP codes with a median income of <$25,000 per year, an inverse relationship was identified between income and hysterectomy rates.

Conclusions: The management of uterine fibroids appears to differ across a variety of socioeconomic factors and institutional characteristics. This study suggests that additional research should be conducted to assess the impact of nonclinical factors on treatment decisions for patients with uterine fibroids.

Key words: uterine fibroid ■ leiomyoma ■ race/ethnicity ■ hysterectomy ■ myomectomy

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INTRODUCTION

Uterine leiomyomas (fibroids) are benign, often asymptomatic tumors derived from smooth muscles and the extracellular matrix proteins collagen and elastin. Signs and symptoms of uterine fibroids include heavy or prolonged menstrual bleeding, pain and pregnancy complications. Although patients with benign symptoms may be monitored without treatment, common surgical treatments include hysterectomy (abdominal, vaginal and laparoscopic) and myomectomy (laparotomy, laparoscopic and hysteroscopic). New approaches, such as myolysis, focused ultrasound, transvaginal cryomyolysis and uterine artery embolization (UAE), are being studied as possible alternative treatments.[1-3] Uterine fibroids have been identified as the most common diagnosis associated with hysterectomy in the United States.[4,5]

A population-based study of women age <50 found that 35% of premenopausal women had been diagnosed with fibroids, and 51% of women had evidence of fibroids on ultrasound without a prior diagnosis.[6] The same study found that the age-specific cumulative incidence of uterine fibroids by age 50 was higher at all ages for black women compared with white women. The incidence of uterine fibroids in the Nurses Health Study II was 8.9 per 1,000 in white women and 30.6 per 1,000 for black women.[7] The Black Women's Health Study found that the incidence of uterine fibroids for black women was 29.7 per 1,000, with risk decreasing with age at menarche, parity and age at first birth and increasing with years since last birth.[8]

Although uterine fibroids are a common condition, appropriate management is not clearly defined as demonstrated by regional variation in hysterectomy rates[4] and inconsistent compliance with treatment guidelines.[9] A number of studies have compared patient characteristics and clinical conditions in fibroid patients. Important covariates include age[10-14] race and ethnicity,[15-17] education and income,[12,15-17] and uterine size.[18,19] However, the impact of these factors

has not been consistent across studies. Other qualitative research suggests that surgeon and patient preferences impact treatment decisions.[20-22] This investigation evaluates five years of national hospital data to address the impact of race, payer type, income, region and hospital characteristics on treatment patterns for hospitalized patients.

MATERIALS AND METHODS

Data Source

Patients were identified from the Healthcare Utilization Project National Inpatient Sample (HCUP-NIS) for the years 1998–2002. The HCUP-NIS is a national, population-based sample representing 20% of hospital discharges annually in the United States and is prepared by the Agency for Healthcare Research and Quality. The number of states contributing data ranged from 22 states in 1998 to 35 states in 2002.[23]

HCUP-NIS is an administrative database with information from a variety of hospitals that may differ in their coding practices. Detailed clinical data, such as symptom severity and fibroid size or location, cannot be described using the HCUP-NIS. Outpatient surgical procedures are not included in this database.

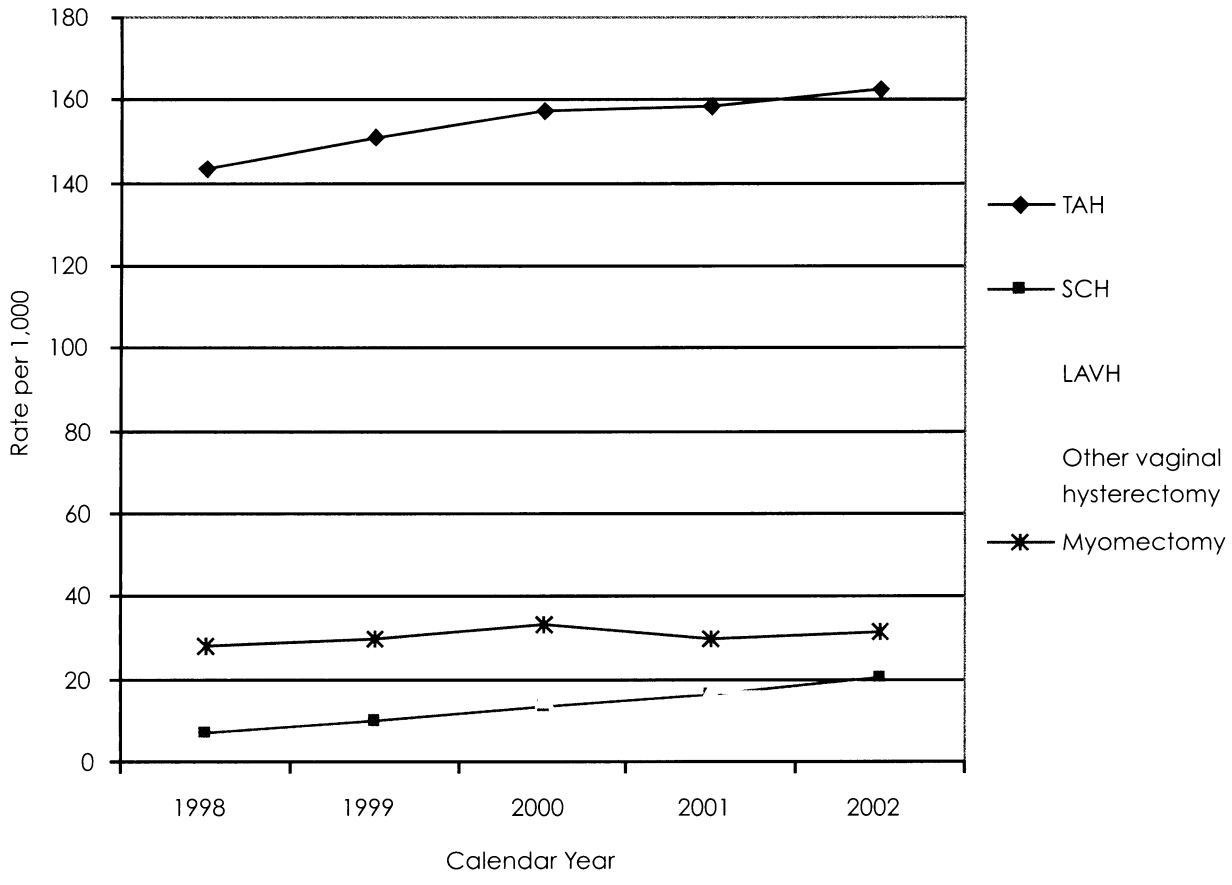
Patient Selection and Coding

International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) diagnosis codes were used to select patients with leiomyoma of the uterus.[24] Patients with a discharge diag-

Table 1. Inpatient admissions in U.S. hospitals for uterine fibroids, HCUP-NIS, 1998–2002

	1998	1999	2000	2001	2002	Total	Percent Change 1998–2002
Diagnosis of uterine fibroid	338,985	404,415	435,076	439,223	467,542	2,136,151	20.2%
Primary diagnosis of uterine fibroids	223,825	238,018	255,457	254,753	264,416	1,236,469	18.1%

Figure 1. Procedures for patients with a primary diagnosis of uterine fibroids



nosis code of 218.xx (including any numbers to the right of the decimal point) or 654.1x (including any number for the x) were included. Subclassifications of ICD-9-CM code 218 specify the location of uterine fibroids, and 654.1x identifies uterine fibroids associated with pregnancy or labor and delivery. HCUP-NIS includes up to 15 diagnoses codes, and the first ICD-9-CM diagnosis code listed is considered the primary diagnosis.

To ensure a consistent uterine fibroid population, all patients with an admission source from the court or law enforcement (538 cases) and patients who had an admission from an "other source" (867 cases) were excluded. To ensure a comprehensive population, inclusion was not restricted by age; however, 153 cases were described as newborns and those subjects were excluded as were any subjects identified as male.

The types of procedures performed on the selected patient population are the primary focus of this study. In HCUP-NIS, as many as 15 four-digit ICD-9-CM procedure codes can be attributed to an inpatient visit. Currently, no ICD-9CM procedure codes are available for UAE, focused ultrasound, transvaginal cryomyolysis or myolysis.

Analysis

Unadjusted means and percentages were calculated based on database counts using HCUP-NIS sample discharge weights. Multiple logistic regression analysis was used to estimate prevalence odds ratios for the association of the most common fibroid surgical treatments and patient and socioeconomic covariates of interest.[25] The number of diagnosis and procedure codes as well as length of stay (LOS) were included in the analysis to account for potential differences in the severity of the condition and comorbidities. Reference categories were identified for relevant variables. The detailed definitions of these variables are further elaborated in HCUP-NIS documentation.[26]

Statistical Package for the Social Sciences (SPSS) version 13 was used for all analyses.[27]

RESULTS

Population Characteristics

Overall, for patients hospitalized with any uterine fibroid diagnosis, there were 2,136,151 admissions over the five-year period. The number of patients

Table 2. Demographic and medical characteristics of discharges with a primary diagnosis of uterine fibroids by race in the 1998–2002 HCUP-NIS

Characteristic	White N=512,647	Black N=254,930	Hispanic N=78,185	Asian/Pacific Islander N=26,553
Mean age (years)	45.3	41.8	43.3	44.4
Mean LOS (days)	2.56	3.02	2.85	2.82
Insurance (%)				
Medicare	3.7	3.1	2.6	1.7
Medicaid	3.6	10.9	14.7	6.3
Private/HMO	87.7	77.7	71.0	85.4
Self-pay/other	1.9	3.8	5.4	3.9
No charge	3.0	4.5	6.3	2.7
Median Income of the Patient's ZIP Code (%)				
≤$25,000	2.1	12.7	11.5	1.5
$25,000–$35,000	20.6	29.1	25.7	7.8
$35,000–$45,000	28.0	27.2	26.6	19.3
>$45,000	49.3	31.0	36.2	71.4
Region (%)				
Northeast	24.1	19.7	19.4	15.7
South	18.4	10.9	1.3	1.8
Midwest	36.9	59.4	39.3	15.8
West	20.7	10.0	40.0	66.7
Total number of procedures on each inpatient record	2.25	2.07	2.19	2.17
Total number of diagnoses on each inpatient record	4.58	4.63	4.28	4.14

with any uterine fibroid diagnosis on their discharge record increased an average of 4.0% per year. For more than 50% of this subset, the primary diagnosis was uterine fibroids (Table 1). Patients with a primary diagnosis of fibroids had an average LOS of 2.73 days (SD=1.91, range 0–346), an average of 4.5 diagnoses (SD=2.3, range 1–25) and 2.2 procedures (SD=1.1, range 0–16) based on inpatient records.

The majority of patients in the sample were white followed by blacks, Hispanics, Asians/Pacific Islanders, Native Americans and other races. Based on population means, black patients were younger and experienced a longer LOS compared with other racial groups. Hispanic patients were more likely to have Medicaid listed as their primary payer when compared with other groups (Table 2).

Processes of Care

For inpatients with a primary diagnosis of uterine fibroids, 322 distinct procedures were identified. However, 95.1% of the inpatients were treated with one of five procedures: 1) total abdominal hysterectomy (TAH) (62.2%), 2) uterine myomectomy (11.2%), 3) other vaginal hysterectomy (10.0%), 4) laparoscopically assisted vaginal hysterectomy (LAVH) (6.3%), and 5) supracervical hysterectomy (SCH) (5.4%). Figure 1 shows the rate per 1,000 discharges for each of the most common procedures over the five-year study period for patients with a primary diagnosis of uterine fibroids. TAH was by far the most common procedure performed. Women with a primary diagnosis of uterine fibroids were approximately seven times more likely to be treated with a hysterectomy than a myomectomy. The rate of SCH increased 181% over the five-year study period but never reached the frequency of TAH. The rate of myomectomies increased by 13% over the study period. The procedure associated with the longest LOS was TAH followed by SCH and myomectomy (Table 3).

Inpatient discharges for women age <30 were more likely to be associated with myomectomy. Compared with women under 30, women in their 30s were 3.2 times less likely to have a myomectomy, while women in their 40s were 29.9 times less likely. Women in their 40s were 29.5 times more likely to have a procedure code for hysterectomy than women <30 years old. A comparison of the major types of hysterectomies suggests that older women are more likely to be treated with a TAH. Compared to women age <30, women who are in their 50s were 12 times more likely to be treated with TAH.

The results of the logistic regression odds ratios suggest that after controlling for patient and hospital characteristics, a wide variation exists in uterine fibroid treatment patterns across race. Compared with white women, all other races were significantly less likely to be treated with any type of hysterectomy. Asians/Pacific Islanders and black women were the least likely, respectively. In contrast, when compared with white women, all other races were more likely to be treated with myomectomy. The likelihood ranged from Hispanic women, who were 5% more likely than white women to be treated with a myomectomy, to Asian/Pacific-Island women, who were 91% more likely to be treated with a myomectomy. Black women were 62% more likely to have a myomectomy than white women.

Black women had significantly higher rates of SCH than white women. Hispanic women had a SCH rate 3.1% below white women, while the rate for Asians/Pacific Islanders was 6.4% lower. White women had the highest rate for LAVH and the third highest rate for TAH. Overall, both Hispanic women and Asians/Pacific Islanders experienced a TAH rate higher (9% and 1% respectively) than white women, although Asians/Pacific Islanders had TAH rates which were not significantly different from white women. For laparoscopically assisted procedures, all

Table 3. Mean LOS by selected surgical procedure for patients with a primary diagnosis of uterine fibroids

Procedure	Mean LOS (Days)	Range (Days)
TAH	2.97	0–67
SCH	2.92	0–180
LAVH	1.83	0–30
Myomectomy	2.74	0–346
Other hysterectomy	1.91	0–23

Table 4. Logistic regression odds ratios and confidence intervals for patients with a primary diagnosis of uterine fibroids by race

	SCH		TAH		LAVH		Other Hysterectomy		Myomectomy	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
White	1.00	ref	1.00	ref	1.00	ref	1.00	ref	1.00	ref
Black	1.34*	1.32–1.37	0.88*	0.87–0.89	0.59*	0.58–0.61	0.64*	0.63–0.65	1.62*	1.60–1.65
Hispanic	0.97	0.94–1.01	1.09*	1.07–1.11	0.75*	0.72–0.78	0.93*	0.90–0.95	1.05**	1.02–1.07
Asian/Pacific Islander	0.93***	0.89–0.99	1.01	0.98–1.04	0.68*	0.64–0.73	0.59*	0.56–0.62	1.91*	1.84–1.99

OR: odds ratio; ref: reference; * p value<0.001; ** p value <0.01; *** p value <0.05

races had rates that were significantly below white women, with black women being 69.5% less likely to have LAVH than white women (Table 4).

When discharges are controlled by patient age, all types of procedures were more common in private/HMO patients compared with Medicare patients. Medicaid patients were significantly more likely to be treated with a hysterectomy and less likely to be treated with a myomectomy when compared with private/HMO patients (Table 5).

The variable "median household income for the ZIP code from which the patient originates" approximates the health resources available in the area and the socioeconomic status of the community. With the exception of the lowest income level (<$25,000 per year), an inverse relationship was identified between income and rates for hysterectomy. Hospital discharge data indicate that patients with an income level of >$45,000 per year were more likely to be treated with myomectomy (Table 5).

Myomectomies were more common in the northeast compared with the midwest, south and western regions of the country. Hysterectomies (with the exception of SCH) were less common in the northeast region. Patients discharged from larger hospitals were less likely to have been treated with a hysterectomy than patients from either small or medium-sized hospitals. Patients discharged from teaching hospitals were more likely to have been treated with a myomectomy than those discharged from nonteaching hospitals (Table 6).

Table 5. Logistic regression odds ratios and confidence intervals for patients with a primary diagnosis of uterine fibroids for patient characteristics

Variable	Any Type of Hysterectomy		Myomectomy	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Payer Type				
Private/HMO	1.00	reference	1.00	reference
Medicare	0.80*	0.76–0.83	0.78*	0.73–0.82
Medicaid	1.21*	1.18–1.23	0.37*	0.36–0.39
Self-pay	0.76*	0.74–0.78	0.64*	0.62–0.66
No Charge	1.60*	1.44–1.78	0.42*	0.37–0.48
Other Insurance	1.23*	1.19–1.28	0.67*	0.64–0.70
Region				
Northeast	1.00	reference	1.00	reference
Midwest	1.90*	1.87–1.94	0.52*	0.51–0.53
South	1.55*	1.53–1.57	0.75*	0.73–0.76
West	1.17*	1.15–1.19	0.82*	0.80–0.84
Median Income				
<$25,000	1.00	reference	1.00	reference
$25,000–$35,000	1.31*	1.28–1.34	0.81*	0.79–0.83
$35,000–$45,000	1.11*	1.08–1.13	1.02	0.99–1.04
>$45,000	0.80*	0.79–0.82	1.51*	1.47–1.55

* p value <0.001

Table 6. Logistic regression odds ratios and confidence intervals for patients with a primary diagnosis of uterine fibroids for hospital characteristics

Variable	Any Type of Hysterectomy		Myomectomy	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Hospital Bed Size				
Large	1.00	reference	1.00	reference
Medium	1.21*	1.19–1.23	0.80*	0.79–0.81
Small	1.54*	1.50–1.57	0.68*	0.66–0.69
Teaching hospital	0.54*	0.54–0.55	1.88*	1.85–1.91
For-profit hospital	0.88*	0.86–0.90	1.09*	1.06–1.12

* p value<0.001

DISCUSSION

Our research demonstrates that the number of inpatient surgical procedures for the treatment of patients with a primary diagnosis of uterine fibroids increased 18% over the five-year period from 1998–2002. These findings are consistent with the results of the Centers for Disease Control and Prevention's hysterectomy surveillance from 1994–1999 for patients with a uterine fibroid diagnosis.[28] It is important to note that the same study found that the rate of all hysterectomies increased from 1994–1998 at a slower rate than hysterectomies for uterine fibroids. The cause of the increase in the number of procedures for this condition cannot be determined by a database, but the change could be due to an increase in the incidence of the uterine fibroids, an increase in the number of patients diagnosed, and/or an increase in the number of patients treated in an inpatient setting with a surgical procedure. In the hysterectomy surveillance report from the Centers for Disease Control and Prevention, the authors suggest that the increase in surgical procedures for patients with uterine fibroids could be a result of changes in screening practices due to the increased availability of outpatient ultrasound and a more aggressive view toward addressing family history of uterine fibroids.[28]

Other studies confirm that uterine fibroids are more common in black women than in white women, and they tend to develop or present at a younger age.[6,7] As a result, the diagnosis and treatment of uterine fibroids is of interest to the African-American community. This study found that race played an important role in the procedures that were performed on women nationwide. For women hospitalized with a primary diagnosis of fibroids, women of all races, including blacks, were significantly less likely to be treated with a hysterectomy when compared with white women. Additionally, white women were more likely to have laparoscopically assisted procedures than other ethnic groups. Black women had the highest rate of all races to receive a SCH. Additionally, only Asians/Pacific Islanders were more likely to be treated with myomectomy compared with blacks.

Black women who are diagnosed at a younger age may be more likely to receive a myomectomy to preserve their fertility than white women. Qualitative research, including interviews and focus groups, indicates that some black women may have cultural beliefs about hysterectomies that could lead them to be more reluctant to undergo the procedure. One study reports that black women expressed a mistrust of physicians' motives for recommending surgery.[29] Another study found that black women reported that having a hysterectomy would be likely to impact their self-esteem and that black men view women unfavorably after a hysterectomy.[30] The consensus is that black women may delay surgery until symptoms are severe.[30,31] For these reasons described above, black women may prefer procedures, such as myomectomies, that do not render the patient sterile or, when hysterectomy is required, procedures that maintain the cervix, such as SCH.

Other nonclinical factors evaluated in this study that may impact treatment patterns include payer type and median income. Our study found that Medicaid patients were more likely to be treated with a hysterectomy when compared with patients with private insurance/HMO. This is consistent with a previous study, which reported that Medicaid patients had fewer vaginal procedures and more abdominal hysterectomies.[32] This study also found that Medicaid patients are more likely to be treated emergently and may not have easy access to appropriate outpatient services before reaching a stage where surgery is necessary.[32] Additionally, our study found that patients with a median household income (as evaluated by ZIP code) of >$45,000 per year were more likely than lower-income patients to be treated with myomectomy and less likely to receive a hysterectomy. These results appear to be consistent with socioeconomic explanations suggesting that higher hysterectomy rates are associated with lower socioeconomic and educational status women.[12,33,34]

The results of this study regarding regional variation are supported in other published papers as well.[4,17] The northeast has consistently experienced a lower rate of hysterectomies and a higher rate of myomectomies compared with the midwest, south and western regions of the country.[4]

HCUP-NIS provides an opportunity to describe inpatient practice patterns on a national level. While our research population and regression covariates exceed regression requirements and parameters, other factors, such as severity of illness or secondary illnesses that are not taken into account in a database evaluation, are clearly relevant. In particular, clinical data related to the size and locations of the fibroid, menopausal status of the patient, symptom severity scores and patient preference for maintaining fertility are needed to better understand the decision-making process for physicians and patients. Finally, as noted earlier, UAE, focused ultrasound, transvaginal cryomyolysis and myolysis are being evaluated as potential treatments for uterine fibroids. However, without ICD-9 procedure codes that are specific to those procedures, they cannot be tracked in this type of study.

This study has shown that the rate of inpatient surgical treatments for uterine fibroids has been increasing and that the use of certain procedures, such as LAVH and SCH, is increasing at a faster rate. Additionally, the use of these surgical interven-

tions seems to vary widely with nonmedical variables, including race, payer, income and region. When considering the prevalence of uterine fibroids and the invasiveness of surgical treatment, additional research is needed to understand more about appropriate treatment for uterine fibroids.

REFERENCES

1. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin. Surgical alternatives to hysterectomy in the management of leiomyomas. *Int J Gynecol Obstet.* 2001;73:285-294.

2. Exacoustos C, Zupi E, Marconi D, et al. Ultrasound-assisted laparoscopic cryomyolysis: two- and three-dimensional findings before, during and after treatment. *Ultrasound Obstet Gynecol.* 2005;25:393-400.

3. Stewart EA, Gedroyc WM, Tempany CMC, et al., Focused ultrasound treatment of uterine fibroid tumors: safety and feasibility of a noninvasive thermoablative technique. *Am J Obstet Gynecol.* 2003;189:48-54.

4. Lepine LA, Hillis DS, Marchbanks PA, et al. Hysterectomy Surveillance—United States, 1980–1993. *MMWR Morb Mortal Wkly Rep.* 1997;46:1-15.

5. Carlson KJ, Miller BA, Fowler FJ. The Maine Women's Health Study: I. Outcomes of hysterectomy. *Obstet Gynecol.* 1994;83:566-572.

6. Baird DD, Dunson DB, Hill MC, et al. High cumulative incidence of uterine leiomyoma in black and white women: ultrasound evidence. *Am J Obstet Gynecol.* 2003;188:100-107.

7. Marshall LM, Spiegelman D, Barbieri RL, et al. Variation in the incidence of uterine leiomyoma among premenopausal women by age and race. *Obstet Gynecol.* 1997;90:967-973.

8. Wise LA, Palmer JR, Harlow BL. Reproductive factors, hormonal contraception and risk of uterine leiomyomata in African-American women: a prospective study. *Am J Epidemiol.* 2004;159:124-126.

9. Broder MS, Kanouse DE, Mittman BS. The appropriateness of recommendations for hysterectomy. *Obstet Gynecol.* 2000;95:199-205.

10. Vessey MP, Villard-Mackintosh L, McPherson K, et al. The epidemiology of hysterectomy: findings in a large cohort study. *Brit J Obstet Gynaecol.* 1992;99:402-407.

11. Wilcox LS, Koonin LM, Pokras R, et al. Hysterectomy in the United States, 1988–1990. *Obstet Gynecol.* 1994; 83:549-555.

12. Harlow BL, Barbieri RL. Influence of education on risk of hysterectomy before age 45 years. *Am J Epidemiol.* 1999;150:843-847.

13. Shao JB, Wong F. Factors influencing the choice of hysterectomy. *Aust N Z J Obstet Gynaecol.* 2001;41:304-306.

14. Goldhaber MK, Armstrong MA, Golditch IM, et al. Long-term risk of hysterectomy among 80,007 sterilized and comparison women at Kaiser Permanente, 1971–1987. *Am J Epidemiol.* 1993;138:508-521.

15. Kjerulff KH. Hysterectomy and race. *Obstet Gynecol.* 1993;82:757-764.

16. Kjerulff KH, Erickson BA, Langenberg PW. Chronic gynecologic conditions reported by U.S. women: findings for the National Health Interview Survey. 1984–1992. *Am J Public Health.* 1996;86:195-199.

17. Palmer JR, Rao RS, Adams-Campbell LL, et al. Correlates of hysterectomy among African-American women. *Am J Epidemiol.* 1999;150:1309-1315.

18. Steege JF. Indications for hysterectomy: have they changed? *Clin Obstet Gynecol.* 1997;40:878-885.

19. Dorsey JH, Steinberg KP, Holtz PM. Clinical indications for hysterectomy route: patient characteristics or physician preferences? *Am J Obstet Gynecol.* 1995;173:2452-1460.

20. Richter DL, Kenzig MJ, Greaney ML, et al. Physician-patient interaction and hysterectomy decision making: the ENDOW Study. *Am J Health Behav.* 2002;26:431-441.

21. Bickell NA, Earp JA, Garrett JM, et al. Gynecologists' sex, clinical beliefs and hysterectomy rates. *Am J Pub Health.* 1994;84:1649-1652.

22. Varma R, Tahseen S, Lokugamage AU, et al. Vaginal route as the norm when planning hysterectomy for benign conditions: change in practice. *Obstet Gynecol.* 2001;97:613-616.

23. Agency for Healthcare Quality and Research, "Introduction to the HCUP Nationwide Inpatient Sample (NIS)," June 2004, p. 5–9. www.ahrq.gov/data/hcup.

24. Practice Management Information Corporation. ICD-9-CM: International Classification of Diseases: 9th ed., Clinical Modifications: 5th ed. Los Angeles, CA: Practice Management Information Corp.; 2001.

25. Hosmer DW, Lemeshow S. Applied Logistic Regression—2nd ed. New York: John Wiley and Sons Inc., 2000.

26. Agency for Healthcare Quality and Research, "Introduction to the HCUP Nationwide Inpatient Sample (NIS)," June 2004, p. 10–23. www.ahrq.gov/data/hcup.

27. SPSS Inc., Chicago, IL, 2004.

28. Keshavarz H, Hillis SD, Keike BA, et al. Hysterectomy surveillance—United States, 1994–1999. *MMWR Morb Mortal Wkly Rep.* 2002;51:1-8.

29. Galavotti C, Richter DL. Talking about hysterectomy: the experiences of women from four cultural groups. *J Womens Health Gend Based Med.* 2000;9:S63-S67.

30. Augustus CE. Beliefs and perceptions of African American women who have had hysterectomy. *J Transcultural Nursing.* 2002;13:296-302.

31. Shelton AJ, Lees E, Groff JY. Hysterectomy: beliefs and attitudes expressed by African-American women. *Ethn Dis.* 2001;11:732-740.

32. Hakim RB, Benedict MB, Merrick NJ. Quality of care for women undergoing a hysterectomy: effects of insurance and race/ethnicity. *Am J Public Health.* 2004;94;1399-1405.

33. Kjerulff KH, Langenberg PW, Guzinski GM. The socioeconomic correlates of hysterectomies in the United States. *Am J Public Health.* 1993;83:106-108.

34. Brett KM, Marsh JV, Madans JH. Epidemiology of hysterectomy in the United States: demographic and reproductive factors in a nationally representative sample. *J Women's Health.* 1997;6:309-316. ■