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Factors Associated With Undergoing Bilateral Salpingo-Oophorectomy at the Time of Hysterectomy for Benign Conditions

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Abstract

Objective—To identify possible factors associated with undergoing bilateral salpingo-oophorectomy (BSO) at the time of hysterectomy among women with benign conditions.

Methods—This is a cross-sectional analysis using the 2005 Nationwide Inpatient Sample. Women 18 years or older who underwent hysterectomy with BSO or hysterectomy only for a noncancerous condition were included. We examined a broad range of factors associated with undergoing BSO in multivariable analyses.

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Results—Fifty-two percent of 461,321 hysterectomies included BSO, with a mean age of 49 years compared to 43 years in the hysterectomy only group ($p<.001$). The odds of BSO were two times higher in the Midwest and South, and 1.67 times higher in the West as compared to the Northeast ($p<.001$). Women who were uninsured or had Medicaid were more likely to undergo BSO compared to those with private insurance (OR 1.86, 95%CI 1.14–3.04 for “no charge/charity”, OR 1.21, 95% CI 1.08–1.35 for Medicaid) While BSO was more common among White women than African-American, Latina, and Asian women ($p<0.001$), lower income was associated with BSO among African-American and White women only, not among Asian and Latina women ($P=.007$ for test for interaction). BSO was 8 times as likely with a laparoscopic hysterectomy and 12 times as likely with an abdominal hysterectomy compared to a vaginal approach ($p<.001$). Women who had endometriosis, pelvic infection, or an ovarian cyst were more likely to undergo BSO ($p<.001$) compared to women who did not have these diagnoses.

Conclusion—There is significant nationwide variation in the practice of BSO. Age, route of hysterectomy, and diagnosis at surgery affect BSO rates. Nonclinical factors such as race/ethnicity, insurance status, income, and geographic location are also associated with BSO practice.

INTRODUCTION

Hysterectomy is the most common major surgery among nonpregnant women in the United States with over 600,000 cases a year.^{1, 2} Elective bilateral salpingo-oophorectomy (BSO) is routinely offered to women at the time of hysterectomy as a prophylactic procedure to prevent ovarian cancer and future surgery for benign ovarian masses, and as treatment for pelvic pain, premenstrual syndrome, or symptomatic endometriosis.^{3–7} However, the permanent loss of endogenous ovarian hormones due to BSO has been postulated to adversely affect a diverse range of health outcomes. The current literature precludes a definitive recommendation for performing elective BSO due to conflicting results for the risk of coronary heart disease^{8–14}, osteoporotic fractures^{15, 16}, sexual functioning and mental health following BSO.^{17–21}

BSO is common, with a rate of 54% for all hysterectomies from 2000–2004.² Age at the time of hysterectomy influences BSO rates; among women 50–54 years 78% underwent BSO compared to 37% of women age 15–44 years.² Route of hysterectomy is also associated with BSO as higher rates have been reported among women who undergo abdominal hysterectomy compared to vaginal hysterectomy.^{2, 22} However, besides age and surgical approach, patient and provider characteristics that determine the practice of elective BSO are largely unknown.

Given the high rate of BSO and the potential impact of this surgery on a wide range of health outcomes, understanding practice patterns is critical. Our aim is to evaluate possible demographic, clinical, and health system factors associated with undergoing elective BSO at the time of hysterectomy in a nationwide sample of women. Our results will inform surgical practice guidelines and provide a foundation for future research on the risks and benefits of this common surgical procedure.

MATERIALS AND METHODS

This is a cross-sectional analysis of the 2005 Nationwide Inpatient Sample (NIS), a national database sponsored by the Agency for Healthcare Research and Quality. The NIS is a 20% stratified random sample of discharges from all community hospitals in the United States. Hospitals considered for sampling include nonfederal, general, and specialty short-term hospitals, including public and academic facilities. The sampling scheme of the NIS represents approximately 90% of all hospitals. It is the largest all-payer database of hospital discharges with 8 million hospital stays in the 2005 NIS from 37 states.

Each record in the NIS contains a maximum of 15 procedure codes and 15 diagnostic codes classified using both the International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) and the Clinical Classification Software developed by the Agency for Healthcare Research and Quality. The Clinical Classification Software is a categorization scheme that collapses ICD-9 codes into clinically meaningful categories that are useful for descriptive analysis.

All women age 18 years who underwent hysterectomy by any surgical approach were identified with ICD-9-CM procedure codes 68.31 or 68.39 for subtotal hysterectomies, 68.41 or 68.49 for total hysterectomies, and 68.51 or 68.59 for vaginal hysterectomies. Women were excluded with ICD-9-CM procedure codes for cesarean section with concomitant hysterectomy or with any ICD-9-CM code or Clinical Classification Software code for cancer of the gynecologic, gastrointestinal, or genitourinary tract, lymphoma, or malignant neoplasm without specification of site.

The selected cohort of women undergoing hysterectomy for benign indications was then classified into a group labeled “BSO” that underwent concomitant bilateral salpingo-oophorectomy (ICD-9-CM codes 65.61 or 65.63) or bilateral oophorectomy (ICD-9-CM codes 65.51 or 65.53) versus a group labeled “hysterectomy only” that underwent hysterectomy alone without adnexal surgery. Women who underwent unilateral salpingo-oophorectomy or unilateral oophorectomy were excluded from the analysis.

Predictor variables were classified as demographic (age, race/ethnicity, income, region of the country, rural/urban hospital setting), clinical (hysterectomy approach, surgical diagnosis), or health system (primary payer, hospital number of beds, hospital teaching status). Data on age, race/ethnicity, income, region, and hospital setting were derived from predefined NIS categories. In the NIS, the hospital setting is based on Core Based Statistical Area (CBSA) codes defined by the Office of Management and Budget using data from the 2000 Census. Hospitals with a CBSA type Metropolitan (an urban area with at least 50,000 people) or Division were used to define “urban” and Micropolitan (urban area with 10,000–50,000 people) or Rural were used to define “rural”. Primary expected payer, hospital size and teaching status were also extrapolated from available NIS categorical variables. The 7 categories for surgical diagnosis were constructed using the following codes: 1) fibroids: ICD-9-CM codes 21.80, 21.81, 21.82, or 21.89, 2) endometriosis: clinical classification software code 169, 3) pelvic infection: ICD-9-CM codes 61.40–61.49, 61.50, 61.51, 61.59, 61.610, 61.611, or 61.62–61.65, 4) prolapse: ICD-9-CM codes 61.800–61.805, 61.809,

61.81–61.84, 61.86–61.88, 61.881–61.883, 61.889, or 61.895) abnormal bleeding: ICD-9-CM codes 62.60–62.66, 62.68–62.71, or 62.67, 6) pelvic pain: ICD-9-CM diagnosis codes 62.50, or 62.52–62.55, 7) ovarian cyst: ICD-9-CM codes 62.00–62.02 for a diagnosis of follicular cyst, corpus luteum cyst, or unspecified ovarian cyst. Each patient had a maximum of 15 diagnosis codes listed at the time of surgery, and these codes were not treated as mutually exclusive in our analysis because many patients have multiple indications for undergoing hysterectomy. Each indication was represented in the model by a separate indicator variable. The resulting odds ratio for each indication can be interpreted as the odds of undergoing BSO for women with that diagnosis compared to women without that diagnosis, holding all other indications as well as other covariates constant.

To account for the sampling design of the NIS, special survey procedures were used in SAS version 9.12 (SAS Inc, Cary NC). Thus all analyses use the inverse probability of selection weights provided in the dataset, and account for stratification of the sample by geographic region, type of control (public, not-for-profit, proprietary), location (urban or rural), teaching status, and bed size (small, medium, large). The analyses also account for clustering of patient outcomes within hospitals, the primary sampling units. The subgroup and overall totals we present reflect the inverse probability weights, and thus can be interpreted as estimates of totals in the target population.

Logistic regression was used to assess the independent associations of demographic, clinical, or health system factors with undergoing a BSO at the time of hysterectomy, compared to hysterectomy only. Predictors were selected *a priori* on substantive grounds. All were included in the multivariable model, to avoid inflation of the type I error rate potentially induced by model selection. The very large NIS sample accommodates this large number of predictors. We hypothesized that the effect of income might vary by race/ethnicity, and formal tests for interaction strongly supported this hypothesis. Thus, results for other predictors are adjusted for the main effects as well as the interaction of race/ethnicity and income. For clarity, we use bar plots to describe the adjusted effects of income on BSO among White, African-American, Latina and Asian women, as well as the adjusted effects of race/ethnicity stratified by income.

We also hypothesized that a broader range of factors might be differentially associated with BSO among younger women undergoing hysterectomy at age 40–49 years for fibroids, abnormal bleeding, pelvic pain, endometriosis, or prolapse. This is the most common age range to undergo hysterectomy and the subgroup in which the decision to undergo elective BSO is most controversial. Accordingly, the analysis was repeated within this subgroup, including the test for interaction of income and race/ethnicity.

The primary analysis was restricted to the 310,552 (67%) of women who underwent hysterectomy with BSO or hysterectomy only who had complete data on all predictors included in the model. To check for the potential influence of the many observations with missing race/ethnicity (28%), we also performed a sensitivity analysis in which the missing values for these two predictors were treated as separate categories, so that the women with missing values could be included in the analysis.

RESULTS

In the 2005 Nationwide Inpatient Sample, there were 519,211 women age 18 years who underwent hysterectomy for a benign gynecologic condition. Overall, 46% of these women had a concomitant BSO and 11% underwent unilateral oophorectomy. Table 1 demonstrates the characteristics of the 461,321 women in our primary analysis who underwent either a hysterectomy with BSO or a hysterectomy and no adnexal surgery (“hysterectomy only”) for a benign condition. Among these women, 52% of hysterectomies included BSO, with a mean age of 49 years compared to 43 years in the hysterectomy only group ($p<.001$). The majority of women were White (72%) and had private health insurance (74%). The greatest number of hysterectomies occurred in the South (40%) with the lowest number in the Northeast (16%). Abdominal hysterectomy was the most common approach to surgery in both the BSO (76%) and hysterectomy only groups (49%). Overall, abnormal bleeding and fibroids were the most common indications for surgery, with or without BSO.

Several demographic factors were significant independent predictors of undergoing a BSO at the time of hysterectomy (Table 2). Age was a strong predictor of BSO; 63% of women age 45–49 years underwent BSO compared to 30% age 35–39 years. Women in the South and Midwest were about twice as likely to undergo BSO compared to women in the Northeast. BSO rates were similar in rural and urban hospital settings.

Hysterectomy route and indication for surgery were also significant predictors of BSO (Table 2). Vaginal hysterectomy had the lowest BSO rate at 21% compared to 55% of laparoscopic hysterectomies and 63% of abdominal hysterectomies. Women with endometriosis, pelvic infection, or an ovarian cyst were significantly more likely to undergo BSO compared to women who did not have these diagnoses. The odds of BSO were lower among women with a diagnosis of fibroids, abnormal bleeding, or prolapse.

Health insurance status was associated with the likelihood of undergoing BSO (Table 2). Compared to women with private insurance, women with Medicaid and those without any insurance (“no charge/charity” or self-pay) were more likely to undergo BSO, while women with Medicare were less likely. Teaching status or number of beds in the hospital were not associated with BSO.

There was a significant interaction in the multivariable model between race/ethnicity and income ($p=.007$ for test for interaction) (Figure 1). Among White and African-American women, lower income was a strong predictor of BSO. However, for Latina and Asian women, BSO rates were similar across income levels. In all income levels, nonwhite women had significantly lower rates of BSO compared to White women.

In a subgroup analysis of women age 40–49 years who underwent hysterectomy for fibroids, endometriosis, prolapse, abnormal bleeding, or pelvic pain, predictors of BSO were nearly identical, both qualitatively and quantitatively, to those in the full cohort of women (data not shown). For each year of increasing age, the odds of BSO increased by 30% (OR 1.30, 95% CI 1.28–1.32). As in the larger cohort, women in the Northeast had statistically significant lower odds of BSO compared to all other regions (Midwest OR 2.37, 95% CI 1.87–3.00, South OR 2.47, 95% CI 1.99–3.05, West OR 2.13, 95% CI 1.77–2.66). Women

with Medicaid or those that were uninsured had significantly higher rates of BSO compared to women with private insurance (Medicaid OR 1.45, 95% CI 1.23–1.70, no charge/charity OR 2.28, 95% CI 1.27–4.11). The interaction term for race/ethnicity and income was not statistically significant in this subgroup. Women in all three income levels <\$61,000 were more likely to undergo BSO with OR 1.29–1.73 ($p<.001$). Consistent with findings in the larger cohort, African-American and Latina women were less likely to undergo BSO compared to White women (African American OR 0.6, 95%CI 0.53–0.69, Latina OR 0.49, 95%CI 0.43–0.57). Hospital teaching status, number of beds, or rural setting did not effect the likelihood of BSO.

In the sensitivity analysis treating missing values of race/ethnicity as a separate category, results did not differ meaningfully from the results of the main analyses, which were conducted excluding these observations (data not shown).

DISCUSSION

In this large cross-sectional analysis of over 400,000 women who underwent hysterectomy, we identified several independent predictors of undergoing concomitant BSO. Age, route of hysterectomy, and the indication for hysterectomy were expected to influence BSO rates because they are routinely included in preoperative counseling and have been reported in previous studies.^{22–28} However, variation by race/ethnicity, income, insurance status, and geographic region indicate BSO practice variation is in part influenced by nonclinical factors.

Age at the time of hysterectomy was a strong predictor of undergoing BSO in our study. BSO is least common in women under age 40 years because of the potential adverse consequences of a significantly premature surgical menopause. Several survey studies of gynecologists have found patient age to be a primary influence in the decision of whether or not to recommend BSO.^{23–25, 29, 30} Recent guidelines from the American College of Obstetricians and Gynecologists (ACOG) confirmed this approach to BSO by stating premenopausal status should favor ovarian preservation and postmenopausal status should favor BSO.³¹ However, we found BSO is still a common procedure in premenopausal women, accompanying hysterectomy for benign conditions in 40% of women age 40–44 years and 63% of women age 45–49 years. Given that the ACOG guidelines are based on Level C evidence and the literature on adverse outcomes of BSO is inconclusive, these rates of BSO likely reflect uncertainty regarding the risk/benefit ratio of BSO for premenopausal women. The majority of postmenopausal women underwent BSO (78% in age 50–54 years, 68% in age >55 years) because the ovaries are generally not considered productive endocrine organs in this age range. However, several studies have demonstrated continued production of estrogen and testosterone in postmenopausal women and these hormones may be associated with sexual functioning in older women.^{32–34} The potential lasting benefit of continued ovarian hormone production, however small, may explain why some women and providers elect ovarian conservation in this age range.

BSO rates varied substantially by race/ethnicity, with significantly lower rates of BSO among all racial and ethnic groups compared to White women. Disparities in overall

hysterectomy rates have previously been reported with Latina women generally showing lower rates of hysterectomy and African-American women demonstrating higher rates compared to White women.^{35, 36} However, these surgical trends are not consistent with the overall low BSO rates in nonwhite groups. One factor that may influence racial/ethnic differences in BSO is that African-American women have a lower rate of hormone use and physicians are less likely to recommend hormone to African-American women compared to White women.^{37, 38} Among premenopausal women, use of estrogen following BSO is frequently used to control menopausal symptoms, so that a desire, or physician recommendation, to avoid hormone use may influence the decision to undergo BSO. We were unable to determine whether racial/ethnic differences in BSO represent distinct patient preferences or a differential influence of physicians on BSO practice by race/ethnicity. Further investigation is needed to examine the cause of this difference in surgical practice.

Lower income was associated with higher rates of BSO among White and African-American women, but not among Latinas and Asians in the primary analysis. This interaction may be due to actual differences by income in provider or patient preference for BSO among White and African-American women that are weaker or absent among Latina and Asian women. Alternatively, lack of English proficiency could blunt the effect of lower income among Latina and Asian women. For instance, English language proficiency among Latina patients has been shown to affect participation in medical care decision-making and access to health services.^{39, 40}

In our multivariable model, women with Medicaid or no health insurance were more likely to undergo BSO compared to women with private health insurance. Medicaid reimbursement rates for BSO at the time of hysterectomy vary by surgical approach. For abdominal and vaginal hysterectomy, there is no increased reimbursement for a concomitant BSO, but for laparoscopic-assisted vaginal hysterectomy or laparoscopic hysterectomy, BSO increases payment by \$30–\$77. Given that only 14% of hysterectomies occurred via laparoscopy, differences in BSO by payer type are unlikely due to financial incentives. Rather, the differences in BSO practice may reflect an increased patient desire or greater likelihood of physician recommendation to perform BSO to prevent the need for additional ovarian surgery and its associated costs among women at high risk for being uninsured in the future.

There are several limitations to our analysis. The Nationwide Inpatient Sample is a large database that receives input from 32 state databases. Therefore, errors in coding and classification of all predictor variables are possible. The dataset does not provide some patient characteristics that may influence the decision to undergo BSO such as family history of breast or ovarian cancer, or a history of cardiovascular disease or osteoporosis. However, we do not believe that the addition of these factors in our multivariable model would alter our findings because these are rare conditions in women age 40–54 years, the majority of our study population. Finally, race/ethnicity was missing for 28% of our study population, which may have introduced bias in our complete-case analysis. However, our regression models that included women with missing data for race/ethnicity did not differ substantially from the primary models.

In this large, nationwide analysis of women who underwent hysterectomy for benign conditions, we identified several unique factors associated with undergoing a concomitant BSO. While previous studies have reported overall BSO rates and temporal trends in the rate of BSO^{2, 41, 42}, the diverse range of factors that influence national BSO practice have not been examined. It is unclear whether patients or providers are the primary influence in the BSO practice variations we identified. In the NIS, we were unable to assess physician characteristics such as age, years in practice, or subspecialty training that may influence patient counseling on whether or not to undergo BSO. Survey studies of gynecologists have found that patient age, surgical route, specialty area, and physician gender influence BSO recommendations.^{23–28, 30} Few studies have assessed patient preference for BSO; one study reported that women consider the risk of ovarian cancer, use of hormone therapy, and the therapeutic effects of BSO on pain in making the BSO decision⁴³, while another found that personality traits, sexual functioning, and preoperative symptoms all affect BSO decisions.⁴⁴ However, none of these studies examined nonclinical factors such as race/ethnicity, income, and insurance status that we identified as significant predictors of BSO. Further research is needed to elucidate the etiology of these differences in BSO practice and determine the overall health impact of these practice variations.

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Figure 1.

Percentage of women with bilateral salpingo-oophorectomy (BSO) at the time of hysterectomy by race/ethnicity (A) and income (B). * $P < .001$. *† $P < .05$ for comparison to income of \$61,000 or more or white race, controlled for age, insurance, hysterectomy approach, indication for surgery, region, urban/rural hospital, hospital teaching status, and number of beds.

Table 1

Characteristics of Study Population

Characteristic	Total N (%)	Hysterectomy and BSO N (%)	Hysterectomy only N (%)
AGE			
Mean (SE)	46.32 (0.04)	48.97 (0.05)	43.42 (0.05)
RACE/ETHNICITY			
White	238,918 (72)	131,759 (76)	107,159 (67)
African American	42,989 (13)	19,110 (11)	23,879 (15)
Latina	33,385 (10)	13,846 (8)	19,539 (12)
Asian/Pacific Islander	6,784 (2)	3,668 (2)	3,115 (2)
Native American	839 (0)	433 (0)	405 (0)
Other	10,216 (3)	5,350 (3)	4,867 (3)
INCOME			
<\$37,000	109,910 (24)	58,635 (25)	51,275 (24)
\$37,000–45,999	115,773 (26)	60,963 (26)	54,809 (25)
\$46,000–60,999	118,683 (26)	61,087 (26)	57,597 (27)
\$61,000	107,630 (24)	55,471 (23)	52,159 (24)
INSURANCE			
Medicare	44,447 (10)	26,695 (11)	17,752 (8)
Medicaid	44,093 (10)	19,990 (8)	24,103 (11)
Private insurance	341,675 (74)	177,303 (74)	164,373 (75)
Self-pay	13,755 (3)	7,861 (3)	5,894 (3)
No charge (charity)	2,245 (0)	1,352 (1)	893 (0)
Other	14,676 (3)	7,709 (3)	6,967 (3)
REGION			
Northeast	72,289 (16)	34,372 (14)	37,918 (17)
Midwest	112,307 (24)	61,184 (25)	51,123 (23)
South	183,623 (40)	98,413 (41)	85,209 (39)
West	93,102 (20)	47,176 (20)	45,927 (21)
HOSPITAL SETTING			
Urban	393,056 (85)	204,529 (85)	188,527 (86)
Rural	68,266 (15)	36,615 (15)	31,650 (14)
HYSTERECTOMY APPROACH			
Vaginal	105,347 (23)	22,337 (9)	83,010 (38)
Laparoscopic	63,814 (14)	34,980 (15)	28,835 (13)
Abdominal	291,770 (63)	183,614 (76)	108,156 (49)
SURGICAL DIAGNOSIS			
Fibroids	252,635 (55)	134,144 (56)	118,492 (54)
Endometriosis	138,139 (30)	83,609 (35)	54,531 (25)
Pelvic infection	121,530 (26)	73,038 (30)	48,492 (22)

Characteristic	Total N (%)	Hysterectomy and BSO N (%)	Hysterectomy only N (%)
Prolapse	98,261 (21)	36,531 (15)	61,730 (28)
Abnormal bleeding	214,426 (46)	100,282 (42)	114,145 (52)
Pelvic Pain	77,172 (17)	33,688 (14)	43,484 (20)
Ovarian cyst	78,485 (17)	62,825 (26)	15,661 (7)
HOSPITAL TEACHING STATUS			
Nonteaching	290,738 (63)	150,108 (62)	140,630 (64)
Teaching	170,583 (37)	91,037 (38)	79,546 (36)
HOSPITAL BEDSIZE			
Small	59,733 (13)	30,956 (13)	28,777 (13)
Medium	114,239 (25)	56,555 (23)	57,684 (26)
Large	287,349 (62)	153,633 (64)	133,716 (61)

Table 2

Factors Associated with Undergoing Bilateral Salpingo-Oophorectomy at the time of Hysterectomy for Benign Conditions

			Multivariable*	
Factors	Total	Hysterectomy and BSO N (row%)	OR(95% CI)	P Value
Demographic Factors				
AGE in years				
18–34	49,525	14,418 (29)	Reference	
35–39	63,420	19,119 (30)	1.09 (0.99–1.20)	.07
40–44	106,675	42,844 (40)	1.87 (1.70–2.06)	<.001
45–49	110,285	69,975 (63)	6.03 (5.40–6.74)	<.001
50–54	54,960	43,044 (78)	16.98 (15.02–19.20)	<.001
55	76,456	51,744 (68)	19.05 (16.66–21.79)	<.001
REGION				
Northeast	72,289	34,372 (48)	Reference	
Midwest	112,307	61,184 (54)	1.97 (1.66–2.34)	<.001
South	183,623	98,413 (54)	2.03 (1.71–2.41)	<.001
West	93,102	47,176 (51)	1.67 (1.40–2.00)	<.001
HOSPITAL SETTING				
Urban	393,056	204,529 (52)	Reference	
Rural	68,266	36,615 (54)	1.03 (0.84–1.25)	.81
Clinical Factors				
HYSTERECTOMY APPROACH				
Vaginal	105,347	22,337 (21)	Reference	
Laparoscopic	63,814	34,980 (55)	7.85 (6.65–9.26)	<.001
Abdominal	291,770	183,614 (63)	11.52 (9.97–13.32)	<.001
DIAGNOSIS				
Fibroids	84,111	43,414 (52)	Reference	
Endometriosis	53,774	30,742 (57)	1.81 (1.67–1.96)	<.001
Pelvic infection	70,023	40,779 (58)	1.67 (1.54–1.82)	<.001
Prolapse	57,286	20,403 (36)	0.93 (0.84–1.02)	.14
Abnormal bleeding	95,606	42,174 (44)	1.00 (0.94–1.07)	.92
Pelvic Pain	36,944	15,027 (41)	1.40 (1.27–1.53)	<.001
Ovarian cyst	42,028	33,189 (79)	5.23 (4.66–5.87)	<.001
Health System Factors				
PRIMARY PAYER				
Private insurance	341,675	177,303 (52)	Reference	
Medicare	44,447	26,695 (60)	0.83 (0.77–0.91)	<.001
Medicaid	44,093	19,990 (45)	1.21 (1.08–1.35)	<.001

			Multivariable*	
Factors	Total	Hysterectomy and BSO N (row%)	OR(95% CI)	P Value
Self-pay	13,755	7,861 (57)	1.57 (1.24–1.98)	<.001
No charge/charity	2,245	1,352 (60)	1.86 (1.14–3.04)	.013
Other	14,676	7,709 (53)	1.11 (0.90–1.37)	.34
HOSPITAL TEACHING STATUS				
Nonteaching	290,738	150,108 (52)	Reference	
Teaching	170,583	91,037 (53)	0.98 (0.83–1.15)	.77
NUMBER OF BEDS IN HOSPITAL				
Small	59,733	30,956 (52)	Reference	
Medium	114,239	56,555 (50)	0.91 (0.75–1.12)	.37
Large	287,349	153,633 (53)	0.95 (0.80–1.14)	.59

* Adjusted for all predictors listed in the table and race/ethnicity, income, race/ethnicity-by-income interaction term