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Do racial/ethnic disparities exist in the utilization of high-volume surgeons for women with ovarian cancer?

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Abstract

Objective—Determine if racial/ethnic disparities exist for access to high-volume surgeons (HVS) for patients with ovarian cancer.

Methods—Retrospective study of ovarian cancer surgeries identified by the California Cancer Registry (CCR) linked to hospital discharge data (1991–2002). Surgeon volume was defined as HVS (>10 ovarian cancer surgeries/year), middle volume (MVS; 2–9/year), and low volume (LVS; ≤1/year). Multivariate ordered logistic regression predicting surgeon volume provided estimates of relative risk (RR) of surgeon volume by patient race/ethnicity.

Results—13,186 women had ovarian cancer (mean age 57.8 years; 72% non-Hispanic White (NHW), 4% Black, 8% Hispanic). 25% of cases were treated by HVS, 31% by MVS, and 44% by LVS. Compared to NHW, Black (RR: 0.70, $p<0.05$) and Hispanic women (RR: 0.75, $p<0.05$) were less likely to have care by a HVS. Hispanic women were significant more likely to have surgery by LVS (RR: 1.1; $p<0.05$).

Conclusions—Disparities in access to HVS for cancer care exist for minority women. Selective referral to high-volume providers should be considered to improve outcomes among minority women.

Keywords

Ovarian cancer; Disparities; Quality of care; High volume

Introduction

Ovarian cancer is the most common cause of death from a gynecologic malignancy. It is estimated that in the United States, approximately 22,430 cases will be diagnosed in 2007 and 15,280 women will die from this disease [1]. Survival from ovarian cancer is very bleak

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Conflict of interest statement

The authors have no conflicts of interest to declare.

as women are often not diagnosed until the disease is advanced. Quality care for women with ovarian cancer needs to be accessible to all women in order to improve survival. The mainstay of treatment for ovarian cancer is surgical resection, which includes appropriate staging and cytoreduction. Much attention has been given to the volume– outcome relationship with regards to improving quality of surgical care because many believe that going to high-volume providers results in better outcomes [2–6]. Recent literature has suggested that high-volume surgeons tend to have better outcomes for patients with ovarian cancer and these include decreased length of hospital stay or re-operation after initial surgery [7–9]. However, not every patient has access to a highvolume provider.

Due to disparities in healthcare, minority populations generally receive lower quality healthcare compared to whites, especially those with cancer. Healthcare disparities often lead to poor outcomes for certain groups of the population, regardless of clinical factors. Reasons for why such disparities exist include structure-related (e.g. type of healthcare facility), provider-related (e.g. type and appropriateness of prescribed treatment), and patient-related (e.g. socioeconomic status, cultural/personal preferences) [10–17]. The Institute of Medicine has addressed disparities through provision of evidencebased guidelines to improve the quality of care delivered to all patients regardless of race, ethnicity, culture, or class [18].

For ovarian cancer, evidence-based guidelines recommend that experienced surgeons perform surgical resection, the mainstay of treatment. It is generally accepted that surgeons with higher case volumes are better experienced at performing ovarian cancer resection [7–9]. However, accessing specialty care is more difficult for minorities due to the aforementioned reasons, and little is known how this disparity impacts the care received by women with ovarian cancer. The objective of this study is to determine if racial/ethnic and payer disparities exist for access to high-volume surgeons for women with ovarian cancer. We hypothesized that Non-White minorities and certain payers would be less likely to undergo ovarian cancer resection by a high-volume surgeon and concomitantly more likely to undergo ovarian cancer resection by a low-volume surgeon.

Methods

The study design was a retrospective cohort study of all patients diagnosed with ovarian cancer in the state of California from 1991–2002. Three data sources were used to perform this analysis: (1) the California Cancer Registry (CCR); (2) the Patient Discharge Database (PDD) of hospitalizations in the state of California; and (3) the 2000 Census Summary File 4 (SF4). The California Cancer Registry created a confidential data file linking the CCR database to the PDD using patient social security number (SSN), gender, and birthdate prior. The SF4 is publicly available and was linked to the confidential data file by patient census tract.

California Cancer Registry

All cancers (with the exception of basal and squamous cell carcinoma) in the state of California are reported to the CCR, and the entire state of California is part of the national Surveillance, Epidemiology, and End Results database sponsored by the National Cancer

Institute. Approximately 130,000 new cancer cases and 52,000 cancer deaths are reported to the CCR annually. Medical treatment facilities and physicians collect and report data on cancer patients to 8 regional registries, which evaluate the quality and accuracy of the data and perform local analyses. Finally, the Cancer Surveillance Section in Sacramento, California, compiles the data from the 8 registries and performs additional quality checks as well as statewide analyses. The variables utilized from the CCR in this analysis include unique patient identifier (patient id by region), patient demographics, ovarian cancer characteristics (ovarian cancer stage and tumor differentiation), and whether or not the patient underwent surgical resection for treatment of ovarian cancer. The CCR also reports the surgeon's California physician license number, which allows for calculation of the surgeon's annual volume of ovarian cancer resections.

Patient discharge database

Hospitalization datawere obtained fromCalifornia's Office of Statewide Health Planning and Development (OSHPD) in Sacramento, California. OSHPD collects annual data from all inpatients discharged from acute care hospitals licensed by the state of California. Each hospital discharge abstract in the PDD contains demographic data (e.g. gender, age, race/ethnicity, type of insurance (private, Medicare, Medicaid, uninsured, and other), zip code of residence), reason for admission (e.g. Diagnosis Related Group (DRG)), primary and secondary (up to 24) diagnoses, primary and secondary (up to 20) procedures, dates of procedure, and discharge information (e.g. length of stay). All diagnoses and procedures were coded using the International Classification of Diseases, 9th Revision, Clinical Modification(ICD9-CM). For this analysis, we identified the hospitalization when the surgical resection occurred and identified the type of insurance and all diagnoses reported for that admission. A modified Charlson Comorbidity Index (excluding cancer) [19,20] was derived from the reported diagnoses.

2000 Census

Proxy data for socioeconomic status (SES) by census tract were obtained from the 2000 Census SF4 database. Proxy SES was measured as the percentage of the population living below the 200% poverty threshold in the patient's census tract.

Case identification

All women with a diagnosis of primary ovarian cancer in the CCR from 1991–2002 were identified (International Classification of Diseases — Oncology code C569). Of these women, those who were reported to have an ovarian cancer surgery were identified. Women who did not have a surgeon identifier were excluded from the study cohort. Thus, inclusion criteria for the final cohort of patients were: 1) ovarian cancer resection as reported in the PDD and 2) presence of the surgeon license number, which allowed for the calculation of each surgeon's annual volume of ovarian cancer resections.

Dependent variable: annual surgeon volume

Categorization of annual surgeon volume for ovarian cancer resection was defined based on published literature as well as the range of annual procedural volume in the linked dataset.

The surgeon volume thresholds were defined as follows: 1) Highvolume surgeon (HVS)—10 or more ovarian cancer resections per year, 2) Medium-volume surgeon (MVS)—2 to 9 resections per year, and 3) Low-volume surgeon (LVS) — 1 resection per year [7].

Independent variables

The independent variables included patient demographics, comorbid disease, and cancer stage and grade. Patient-level characteristics included: age (continuous measure in years), race/ethnicity (Non-Hispanic White [reference group], Black, Hispanic, other), payer (private insurance [reference group], Medicare, Medicaid, other government insurance, and uninsured), and census-derived income. The census-derived income was defined as the percentage of the population living below the 200% poverty threshold, and was categorized by quintile. Comorbid disease was measured by the Charlson Comorbidity Index, which was divided into three strata by score: 0, 1, and 2+. Ovarian cancer characteristics included stage (I [reference group], II, III, and IV) and tumor differentiation (well differentiated [reference group], moderate, poor, undifferentiated, and unknown).

Data analysis

Bivariate analyses were performed using chi-square and student *t*-tests where appropriate to compare the characteristics of women who underwent ovarian cancer resection by provider type — HVS, MVS, and LVS. A generalized ordered logistic regression [21] was used to estimate the impact of the primary predictors (race/ethnicity and payer) on the use of HVS or LVS accounting for other patient characteristics: age, % individuals below 200% poverty threshold, Charlson Comorbidity Index, tumor stage, and tumor differentiation. This model was selected instead of a dichotomous logistic regression or a standard ordered logistic regression because the outcome (surgeon volume category) had three ordered categories and the model failed the proportional odds assumption of a standard ordered logistic regression. Our model predicted a patient's chance of receiving care in a particular surgeon volume category (high, middle, or low) based upon the patient's characteristics. Regression analysis accounted for clustering of patients within counties. Relative risks were calculated from the regression results. Ninety-five percent confidence intervals (CI) were estimated using bootstrapping with 1000 repetitions and the bias-corrected technique [22].

Analyses were performed using STATA 8.0, S.E. (College Station, TX). *P* values <0.05 were considered statistically significant. The study protocol was reviewed and approved by the Institutional Review Board of UCLA.

Results

A total of 28,060 women with ovarian cancer were identified in the CCR from 1991–2002. Of these, 23,084 (82%) women underwent surgical resection and 14,330 cases had a valid surgeon identifier. Among these, 1,144 women were excluded due to missing or unknown ovarian cancer stage. Thus, the final sample size for analysis was 13,186. Table 1 shows the characteristics of the study patients and patients excluded due to missing physician license number. Excluded patients tend to have unknown insurance status and a greater proportion

of stage 4 cancers. Other patient characteristics (age, race, poverty level, and tumor differentiation) have statistically, but not clinically significant differences.

We compared patient demographics, Charlson Comorbidity Index, and tumor characteristics by surgeon volume category (Table 2). Overall, mean age was 57.8 years; 72.1% were Non-Hispanic White, 3.8% were Black, 7.5% were Hispanic, 16.2% were Asian, and 0.4% were of other race; 54.7% had private insurance, 21.3% had Medicare, 5.7% had Medicaid, 2.2% were uninsured, and 16.1% had other insurance. Of the 13,186 women, 25% were treated by HVS, 31% by MVS, and 44% by LVS. When stratified by surgeon volume, HVS were more likely to be older, Non-Hispanic White, have private insurance, have less comorbid disease, have more advanced stage disease (i.e. Stage III or IV), and have moderate, poor, or undifferentiated tumors.

Table 3 shows the adjusted relative risk of race/ethnicity (i.e. Blacks, Hispanics, Asians, and other races) with respect to Non-Hispanic Whites undergoing ovarian cancer resection by a HVS, MVS, and LVS. The analysis accounted for age, insurance status, % earning less than 200% of the poverty level, Charlson Comorbidity Index, ovarian cancer stage, and tumor grade. Black (RR: 0.70, 95% CI [0.58, 0.84], $p<0.05$) and Hispanic (RR: 0.75, 95% CI [0.67, 0.82], $p<0.05$) women had significantly lower adjusted relative risks of undergoing ovarian cancer resection with a HVS compared to Non-Hispanic Whites. For example, among women undergoing ovarian cancer resection, Blacks were only 70% as likely as Whites to be treated by a HVS after adjusting for the other patient-level characteristics in the model. There was no statistically significant risk for being treated by a MVS between the different races. However, Hispanic women have a statistically significant higher adjusted relative risk of undergoing ovarian cancer resection by a LVS (RR: 1.12, 95% CI [1.06, 1.17], $p<0.05$).

Table 4 shows the adjusted relative risk of payer categories with respect to women with private insurance undergoing ovarian cancer by a HVS, MVS, and LVS. The analysis accounted for age, race/ethnicity, socioeconomic status as measured by the poverty variable, Charlson Comorbidity Index, ovarian cancer stage, and tumor grade. Women with Medicare (RR: 0.81, 95% CI [0.69, 0.94], $p<0.05$), and other insurance (RR: 0.67, 95% CI [0.60, 0.73], $p<0.05$) had a significantly lower adjusted relative risk of undergoing ovarian cancer resection with a HVS compared to women with private insurance. Women with Medicaid (RR: 1.18, 95% CI [1.06, 1.30], $p<0.05$) had a significantly higher adjusted relative risk of undergoing ovarian cancer resection with a MVS compared to women with private insurance while women with other insurance (RR: 0.88, 95% CI [0.82, 0.95], $p<0.05$) had a significantly lower adjusted relative risk. Women with Medicare (RR: 1.18, 95% CI [1.11, 1.24], $p<0.05$) and other insurance (RR: 1.32, 95% CI [1.26, 1.39], $p<0.05$) had a significantly higher adjusted relative risk of undergoing ovarian cancer resection with a LVS compared to women with private insurance.

Discussion

Our population-based study shows that overall use of HVS for the care of ovarian cancer is low and that this is compounded by racial/ethnic and payer disparities, with the disparities

being apparent for Black and Hispanic women and women with Medicare and Medicaid. These findings suggest the need to target minority women, of whom many do not have adequate healthcare coverage, to improve access to HVS for these women.

A thorough literature review looking at ovarian cancer disparities, specifically in the utilization of HVS was conducted and the literature is sparse in this regard, which emphasizes the importance of the current study to address this knowledge gap. In other cancers specific to women such as breast and endometrial cancers, disparities in the treatment and management are apparent [23–25]. Current breast cancer treatment requires multidisciplinary care with adjuvant therapy contributing to better prognosis and survival [26–28]. Many minority women are able to receive the appropriate surgical care but receive suboptimal adjuvant treatment. Bickell et al. found minority women with early stage breast cancer are less likely to receive necessary adjuvant treatment despite rates of oncologic consultation similar to those for Non-Hispanic White women. Specifically, one in three Black women and nearly one in four Hispanic women experienced under use of one or more adjuvant treatments [23]. As in ovarian cancer, surgery is the primary treatment for endometrial cancer. Randall and Armstrong conducted a study using SEER data from 1992–1998 and found that Black women were significantly less likely to undergo surgery and have significantly shorter survival than Non-Hispanic White women [25]. Despite the differences in the treatment and management of these three cancers of women, studies have shown disparities do exist and minority women more likely to experience suboptimal care for their disease.

It is important to discern the reason behind these disparities. Patient factors may have a role as well — patients may be unable or unwilling to travel to a HVS (e.g. because of illness, social support, or cultural reasons) or may lack insurance and receive care at a public hospital, where a HVS may not be available. From the professional side, physicians have a great degree of control over patient referrals to higher levels of care. Physicians should be aware that patients with ovarian cancer should be referred to providers who are able to perform comprehensive and adequate surgery. Establishing referral to specialty centers/surgeons that is blinded to financial means or insurance would increase use of these facilities for all patients. Certain disparities might remain despite this, especially if travel to the provider remains a barrier.

Our study findings are relevant to the care of ovarian cancer patients because recent studies have suggested that high-volume surgeons have better outcomes [2–6]. For ovarian cancer, Elit et al. conducted a population-based study in Ontario, Canada and found the volume of surgery performed by a surgeon influenced re-operation rate (i.e. patients of high-volume surgeons had a lower rate of re-operation) [7]. Another study conducted by Schrag et al. found patients operated on by HVS spent less days in the hospital after surgical resection [8]. These studies also showed similarly low rates of use of HVS for ovarian cancer care as in the current investigation. These studies suggest the need for more research to further investigate the relationship between HVS and outcomes for women with ovarian cancer in order to improve care, as well as to better understand why relatively few patients receive initial therapeutic care by trained sub-specialty physicians.

Like other health conditions, insurance coverage plays a role in access to and receipt of healthcare. Our research findings parallel the results of a study conducted by Liu et al. which found insurance status to have a significant impact on the utilization of high-volume hospitals for 10 complex surgical procedures after accounting for other patient characteristics [29]. In general, HVS are associated with high-volume hospitals. In contrast, payer disparities are more often associated with race/ethnicity and socioeconomic status. These patient demographics overlap and affect access to care issues. Minority women appear more likely to face access to care issues. Reasons for this include lack of adequate healthcare coverage due to lower socioeconomic status, individual cultural health behaviors, language barriers, and lack of knowledge with respect to the appropriate treatment. Patient preference, especially related to social comfort (e.g. ethnic or cultural makeup of the provider) probably also plays an important role in healthcare decision making for many minorities [30–35]. Thus, patient and system factors must be identified and addressed in order to improve care for minorities, especially minority women.

Limitations

This was a retrospective observational study using administrative data from a single (albeit large — 12% of the national population) state and may not generalize to other regions. Missing or inaccurately reported cancer characteristics, comorbid diagnoses, and physician license numbers may bias analysis results. In addition, surgeon volume may not adequately represent surgical training, experience, or proficiency. Because only a single surgeon identifier is allowed for each patient, actual surgeon volume may be understated, especially if the sub-specialty surgeon is listed as an “assistant” to the attending surgeon of record. This would tend to bias our findings to the null, thus our findings are more likely to be conservative estimates. Because these data were retrospective observational data, we were unable to account for patient preference as a factor influencing whether or not a patient saw a HVS or LVS. Despite these limitations, this analysis of the care of women with ovarian cancer makes use of a powerful combination of already existing information from cancer registries, hospital discharge data, and census information for a large ethnically diverse population.

Conclusions

Racial/ethnic and payer disparities compound the relatively low utilization of HVS for women with ovarian cancer in California. The disparities are most apparent for Black and Hispanic women in comparison to Non-Hispanic White women and women with Medicare and Medicaid in comparison to women with private insurance. These disparities have important implications, as better outcomes are associated with HVS for women with ovarian cancer. Systems of selective referral to high-volume providers need to address these identified disparities in order to realistically improve survival from ovarian cancer at the population level.

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References

1. Jemal A, Siegel R, Ward E, et al. Cancer statistics, 2006. CA Cancer J Clin. 2006; 56(2):106–130. [PubMed: 16514137]
2. Birkmeyer JD, Siewers AE, Finlayson EV, et al. Hospital volume and surgical mortality in the United States. N Engl J Med. 2002; 346(15):1128–1137. [PubMed: 11948273]
3. Birkmeyer JD, Stukel TA, Siewers AE, Goodney PP, Wennberg DE, Lucas FL. Surgeon volume and operative mortality in the United States. N Engl J Med. 2003; 349(22):2117–2127. [PubMed: 14645640]
4. Bentrem DJ, Brennan MF. Outcomes in oncologic surgery: does volume make a difference? World J Surg. 2005; 29(10):1210–1216. [PubMed: 16136281]
5. Dardik A, Bowman HM, Gordon TA, Hsieh G, Perler BA. Impact of race on the outcome of carotid endarterectomy: a population-based analysis of 9,842 recent elective procedures. Ann Surg. 2000; 232(5):704–709. [PubMed: 11066143]
6. Hillner BE, Smith TJ, Desch CE. Hospital and physician volume or specialization and outcomes in cancer treatment: importance in quality of cancer care. J Clin Oncol. 2000; 18(11):2327–2340. [PubMed: 10829054]
7. Elit L, Bondy SJ, Paszat L, Przybysz R, Levine M. Outcomes in surgery for ovarian cancer. Gynecol Oncol. 2002; 87(3):260–267. [PubMed: 12468323]
8. Schrag D, Earle C, Xu F, et al. Associations between hospital and surgeon procedure volumes and patient outcomes after ovarian cancer resection. J Natl Cancer Inst. 2006; 98(3):163–171. [PubMed: 16449676]
9. Earle CC, Schrag D, Neville BA, et al. Effect of surgeon specialty on processes of care and outcomes for ovarian cancer patients. J Natl Cancer Inst. 2006; 98(3):172–180. [PubMed: 16449677]
10. Shavers VL, Brown ML. Racial and ethnic disparities in the receipt of cancer treatment. J Natl Cancer Inst. 2002; 94(5):334–357. [PubMed: 11880473]
11. Mandelblatt JS, Yabroff KR, Kerner JF. Equitable access to cancer services: a review of barriers to quality care. Cancer. 1999; 86(11):2378–2390. [PubMed: 10590381]
12. Gornick ME. Disparities in Medicare services: potential causes, plausible explanations, and recommendations. Health Care Financ Rev. 2000; 21(4):23–43. [PubMed: 11481743]
13. Tammemagi CM. Racial/ethnic disparities in breast and gynecologic cancer treatment and outcomes. Curr Opin Obstet Gynecol. 2007; 19(1):31–36. [PubMed: 17218849]
14. Rothenberg BM, Pearson T, Zwanziger J, Mukamel D. Explaining disparities in access to high-quality cardiac surgeons. Ann Thorac Surg. 2004; 78(1):18–24. discussion 24 – 15. [PubMed: 15223394]
15. Farley J, Risinger JI, Rose GS, Maxwell GL. Racial disparities in blacks with gynecologic cancers. Cancer. 2007; 110(2):234–243. [PubMed: 17559136]
16. Polacek GN, Ramos MC, Ferrer RL. Breast cancer disparities and decision-making among U.S. women. Patient Educ Couns. 2007; 65(2):158–165. [PubMed: 16870385]
17. Saha S, Arbelaez JJ, Cooper LA. Patient–physician relationships and racial disparities in the quality of health care. Am J Public Health. 2003; 93(10):1713–1719. [PubMed: 14534227]
18. Betancourt JR, Maina AW. The Institute of Medicine report “unequal treatment”: implications for academic health centers. Mt Sinai J Med. 2004; 71(5):314–321. [PubMed: 15543432]
19. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987; 40(5):373–383. [PubMed: 3558716]
20. Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol. 1992; 45(6):613–619. [PubMed: 1607900]
21. Long, JS. Regression models for categorical and limited dependent variables. Thousand Oaks, CA: SAGE Publications, Inc.; 1997. Chapter 5: ordinal outcomes—ordered logit and ordered probit analysis.

22. Efron B, Tibshirani R. Bootstrap methods for standard errors, confidence intervals, and other measures of statistical accuracy. Stat Sci. 1986; 1(1):54–75.
23. Bickell NA, Wang JJ, Oluwole S, et al. Missed opportunities: racial disparities in adjuvant breast cancer treatment. J Clin Oncol. 2006; 24(9):1357–1362. [PubMed: 16549830]
24. Naeim A, Hurria A, Leake B, Maly RC. Do age and ethnicity predict breast cancer treatment received? A cross-sectional urban population based study. Breast cancer treatment: age and ethnicity. Crit Rev Oncol Hematol. 2006; 59(3):234–242. [PubMed: 16829122]
25. Randall TC, Armstrong K. Differences in treatment and outcome between African-American and white women with endometrial cancer. J Clin Oncol. 2003; 21(22):4200–4206. [PubMed: 14615448]
26. Effects of chemotherapy and hormonal therapy for early breast cancer on recurrence and 15-year survival: an overview of the randomised trials. Lancet. 2005; 365(9472):1687–1717. [PubMed: 15894097]
27. National Comprehensive Cancer Network. Breast cancer treatment guidelines for patients—version VII. 2005 <http://www.nccn.org/patients/patient_gls/_english/_breast/contents.asp#>.
28. National Institutes of Health Consensus Development Program. Adjuvant therapy for breast cancer. NIH Consensus Statement. 2000; 17(4):1–23. <http://consensus.nih.gov/2000/2000AdjuvantTherapyBreastCancer114html.htm.> Published Last Modified Date. [Accessed Dated Accessed.].
29. Liu JH, Zingmond DS, McGory ML, et al. Disparities in the utilization of high-volume hospitals for complex surgery. JAMA. 2006; 296(16):1973–1980. [PubMed: 17062860]
30. Betancourt JR, Green AR, Carrillo JE, Ananeh-Firempong O 2nd. Defining cultural competence: a practical framework for addressing racial/ethnic disparities in health and health care. Public Health Rep. 2003; 118(4):293–302. [PubMed: 12815076]
31. Cooper-Patrick L, Gallo JJ, Gonzales JJ, et al. Race, gender, and partnership in the patient–physician relationship. JAMA. 1999; 282(6):583–589. [PubMed: 10450723]
32. Saha S, Taggart SH, Komaromy M, Bindman AB. Do patients choose physicians of their own race? Health Aff (Millwood). 2000; 19(4):76–83. [PubMed: 10916962]
33. Saha S, Komaromy M, Koepsell TD, Bindman AB. Patient–physician racial concordance and the perceived quality and use of health care. Arch Intern Med. 1999; 159(9):997–1004. [PubMed: 10326942]
34. Haas JS, Phillips KA, Sonneborn D, et al. Variation in access to health care for different racial/ethnic groups by the racial/ethnic composition of an individual's county of residence. Med Care. 2004; 42(7):707–714. [PubMed: 15213496]
35. Siminoff LA, Graham GC, Gordon NH. Cancer communication patterns and the influence of patient characteristics: disparities in information-giving and affective behaviors. Patient Educ Couns. 2006; 62(3):355–360. [PubMed: 16860520]

Table 1

Descriptive statistics by presence of surgeon identifier based on a cohort of California women who underwent ovarian cancer resection from 1991–2002

Variable	No surgeon identifier (*N*=6610)	Surgeon identifier (*N*=13,186)	*P* value
Patient demographics			
Age (years)			
Mean ± standard deviation	57.0±15.5	57.8±15.5	<**0.001**
Race/ethnicity (%)			**0.041**
Non-Hispanic White	70.8	72.1	
Black	4.4	3.8	
Hispanic	16.2	16.2	
Asian	8.0	7.5	
Other	0.6	0.4	
Payer (%)			<**0.001**
Private	35.4	54.7	
Medicare	11.4	21.3	
Medicaid	5.8	5.7	
Uninsured	2.1	2.2	
Other	45.3	16.1	
% <200% poverty level			
Mean±standard deviation	28.0±17.3	29.0±18.0	<**0.001**
Medical comorbid disease			
Revised Charlson			0.057
Comorbidity Index (%)			
Charlson 0	81.8	80.4	
Charlson 1	12.7	13.8	
Charlson 2+	5.5	5.8	
Ovarian cancer characteristics			
Ovarian cancer stage (%)			<**0.001**
Stage I	35.1	38.0	
Stage II	9.1	8.8	
Stage III	38.0	40.2	
Stage IV	17.8	12.0	
Tumor differentiation (%)			**0.009**
Well differentiated	8.6	8.8	
Moderately differentiated	17.3	17.8	
Poorly differentiated	32.5	33.2	
Undifferentiated	6.7	7.6	
Other differentiation	34.9	32.6	

Data in bold meant to denote findings that were statistically significant.

Table 2

Descriptive statistics by annual surgeon volume based on a cohort of California women who underwent ovarian cancer resection from 1991–2002

Variable	High-volume surgeon (HVS) (*N*=3249)	Middle-volume surgeon (MVS) (*N*=4104)	Low-volume surgeon (LVS) (*N*=5833)	*P* value
Patient demographics				
Age (years)				
Mean±standard deviation	58.4±14.7	59.0±14.6	56.6±16.3	<0.001[a]
Race/ethnicity (%)				<0.001
Non-Hispanic White	77.5	71.5	69.7	
Black	2.8	4.1	4.0	
Hispanic	12.5	16.4	18.1	
Asian	6.9	7.6	7.8	
Other	0.3	0.4	0.4	<0.001
Payer (%)				
Private	60.6	54.3	51.5	
Medicare	20.4	22.8	21.0	
Medicaid	4.7	6.6	5.6	
Uninsured	2.5	2.0	2.1	
Other	11.8	14.3	19.8	
% <200% poverty level				
Mean±standard deviation	28.8±17.7	29.3±18.2	28.8±18.1	0.500 [a]
Medical comorbid disease				
Revised Charlson				<0.001
Comorbidity Index (%)				
Charlson 0	80.3	78.4	81.9	
Charlson 1	14.4	15.1	12.5	
Charlson 2+	5.3	6.5	5.6	
Ovarian cancer characteristics				
Ovarian cancer stage (%)				<0.001
Stage I	28.7	31.7	47.7	
Stage II	8.9	8.1	9.1	
Stage III	48.2	46.5	31.5	
Stage IV	14.2	13.7	11.7	
Tumor differentiation (%)				<0.001
Well differentiated	8.7	8.0	9.5	
Moderately differentiated	19.5	17.5	17.0	
Poorly differentiated	35.8	38.0	28.3	
Undifferentiated	9.9	8.0	5.9	
Other differentiation	26.1	28.5	39.3	

[a]Comparison of continuous variable means between women undergoing ovarian cancer resection by a HVS and LVS.

Table 3

Relative risk of race/ethnicity (Black, Asian, Hispanic, and other) [a] for undergoing ovarian cancer resection by high-, middle-, and low-volume surgeons [b]

Race/ ethnicity	RR and [95% CI] for HVS[a]	RR and [95% CI] for MVS[a]	RR and [95% CI] for LVS[a]
Non-Hispanic White	1.00	1.00	1.00
Black	***0.70* [*0.58, 0.84*]**	1.11 [0.98, 1.27]	1.10 [0.99, 1.20]
Hispanic	***0.75* [*0.67, 0.82*]**	1.05 [0.99, 1.14]	***1.12* [*1.06, 1.17*]**
Asian	0.90 [0.80, 1.03]	1.07 [0.97, 1.18]	1.01 [0.93, 1.08]
Other	0.85 [0.48, 1.32]	1.08 [0.64, 1.46]	1.03 [0.73, 1.33]

Data in bold-italic meant to denote findings that were statistically significant.

[a] Relative risk with respect to Non-Hispanic White race, controlling for age, insurance status, socioeconomic status (measured by percentage <200% poverty level), Charlson Comorbidity Index, ovarian cancer stage, and tumor differentiation.

[b] Relative risks in bold italics are significant at $p < 0.05$.

Table 4

Relative risk (RR) of payer status (Medicare, Medicaid, uninsured, and other insurance) [a] for undergoing ovarian cancer resection by high-, middle-, and low-volume surgeons [b]

Payer status	RR and [95% CI] for HVS[a]	RR and [95% CI] for MVS[a]	RR and [95% CI] for LVS[a]
Private	1.00	1.00	1.00
	–	–	–
Medicare	***0.80 [0.73, 0.87]***	0.95 [0.88, 1.03]	***1.18 [1.11, 1.24]***
Medicaid	***0.81 [0.69, 0.94]***	***1.18 [1.06, 1.30]***	0.99 [0.89, 1.08]
Uninsured	1.18 [0.98, 1.41]	0.91 [0.73, 1.08]	0.95 [0.80, 1.10]
Other	***0.67 [0.60, 0.73]***	***0.88 [0.82, 0.95]***	***1.32 [1.26, 1.39]***

Data in bold-italic meant to denote findings that were statistically significant.

[a] Relative risk with respect to Private insurance, controlling for age, race/ethnicity, socioeconomic status (measured by percentage <200% poverty level), Charlson Comorbidity Index, ovarian cancer stage, and tumor differentiation.

[b] Relative risks in bold italics are significant at $p<0.05$.