GYNECOLOGY

Impact of race, socioeconomic status, and the health care system on the treatment of advanced-stage ovarian cancer in California

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OBJECTIVE: We sought to investigate the impact of race, socioeconomic status (SES), and health care system characteristics on receipt of specific components of National Comprehensive Cancer Network guideline care for stage IIIC/IV ovarian cancer.

STUDY DESIGN: Patients diagnosed with stage IIIC/IV epithelial ovarian cancer between Jan. 1, 1996, through Dec. 31, 2006, were identified from the California Cancer Registry. Multivariate logistic regression analyses evaluated differences in surgery, chemotherapy, and treatment sequence according to race, increasing SES (SES-1 to SES-5), and provider annual case volume.

RESULTS: A total of 11,865 patients were identified. Median age at diagnosis was 65.0 years. The overall median cancer-specific survival was 28.2 months. African American race (odds ratio [OR], 2.04; 95% confidence interval [CI], 1.45—2.87) and care by a low-volume physician (OR, 19.72; 95% CI, 11.87—32.77) predicted an increased risk of not undergoing surgery. Patients with SES-1 (OR, 0.71; 95% CI, 0.60—0.85) and those treated at low-volume hospitals (OR, 0.88; 95% CI, 0.77—0.99) or by low-volume physicians (OR, 0.80; 95% CI, 0.70—0.92) were less likely to undergo debulking surgery. African American race (OR, 1.55; 95% CI, 1.24—1.93) and SES-1 (OR, 1.80; 95% CI, 1.35—2.39) were both significant predictors of not receiving chemotherapy. African American patients were also more likely than whites to receive no treatment (OR, 2.08; 95% CI, 1.45—2.99) or only chemotherapy (OR, 1.55; 95% CI, 1.10—2.18). Patients with low SES were more likely to receive no treatment (OR, 1.95; 95% CI, 1.44—2.64) or surgery without chemotherapy (OR, 1.67; 95% CI, 1.38—2.03).

CONCLUSION: Among patients with advanced-stage ovarian cancer, African American race, low SES, and treatment by low-volume providers are significant and independent predictors of receiving no surgery, no debulking surgery, no chemotherapy, and nonstandard treatment sequences.

Key words: disparities, ovarian cancer, race, socioeconomic status

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Ovarian cancer is the second most common gynecologic cancer in the United States, with >22,000 cases diagnosed each year.[1] Because most patients present with advanced disease, >14,000 deaths are attributed to ovarian cancer annually. Significant survival gains have followed the widespread adoption of cytoreductive surgery and combined chemotherapy regimens, but improvements have not been distributed equally among races or socioeconomic categories. While 5-year survival in white women with ovarian cancer increased from 37-45% from 1975 through 2006, 5-year survival among African American patients decreased from 43-37% over the same time period.[2] Although biologic, socioeconomic, and cultural differences have been cited as reasons for this disparity, the widening survival gap suggests that African American patients have not benefited from recent improvements in ovarian cancer care, and it highlights treatment factors as important contributors to the survival disparity. Previous studies have found that African American patients with ovarian cancer are less likely to receive primary cytoreductive surgery, appropriate chemotherapy, and National Comprehensive Cancer Network (NCCN) guideline—adherent care.[3,4] However, the specific deviations from recommended treatment programs have not been well defined. The objective of this study was to examine disparities in the quality of ovarian cancer care across a large, statewide population, as well as to identify specific treatment components that contribute to the receipt of

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nonstandard therapy in patients with advanced-stage ovarian cancer.

MATERIALS AND METHODS

This was a retrospective population-based case study of primary invasive epithelial ovarian cancers reported to the California Cancer Registry from Jan. 1, 1996, through Dec. 31, 2006. The study received exempt status from the Institutional Review Board of the University of California, Irvine (Human Subjects#2011-8317). The California Cancer Registry is a standardized, quality-controlled population-based cancer surveillance registry that has collected information about tumor characteristics, patient characteristics, diagnosis, and treatment for all cancers diagnosed in California since 1988. Case reporting in the state is estimated to be 99%, and follow-up completion rates are >95%.[2,4-7] *International Classification of Diseases for Oncology, Second Edition* was used to identify tumor location and histology. Cases were identified using the ovarian Surveillance, Epidemiology, and End Results Program (SEER) primary site code (C569).[8]

The study population consisted of women at least 18 years of age who were diagnosed with primary advanced-stage epithelial ovarian cancer from Jan. 1, 1996, through Dec. 31, 2006. There were 21,044 incident ovarian cancer cases identified during the time period with follow-up continuing through January 2008. After sequentially excluding borderline tumors; germ-cell tumors; sex cord tumors; cases with missing *International Classification of Diseases for Oncology, Second Edition* morphology codes; cases prepared solely from autopsy or death certificates; and cases with unknown or incomplete surgery, chemotherapy, or hospital information, 18,327 cases of all stages remained. As this study included only patients with stage IIIC or IV ovarian cancer, a total of 11,865 cases were finally analyzed.

Explanatory variables included patient, tumor, and health care provider characteristics. Race/ethnicity was categorized into 4 groups: white, African American, Hispanic, and Asian/Pacific Island. Patient insurance type was grouped into 4 categories: private insurance (managed care, health maintenance organization, preferred provider organization, or other private insurance), Medicaid, Medicare, or other insurance type. Socioeconomic status (SES) was classified into 5 categories: lowest, lower-middle, middle, higher-middle, and highest SES based on quintiles of Yost's index of socioeconomic status (YOSTSCL) score.[9] Age at diagnosis was used as either a continuous variable or categorical variable with groups including those age <45, 45-54, 55-69, and ≥70 years.

Hospital volume was derived based on the average number of ovarian cancer cases treated at each hospital annually. Hospitals with ≥20 cases per year were classified as high-volume hospitals; hospitals with <20 cases per year were low volume. Physician volume was derived from the average number of cases treated annually by each physician (surgeon, medical oncologist, or attending physician). Physicians involved in ≥10 cases per year were considered high volume.

Outcome variables included the concordance of surgery type, chemotherapy type, and treatment sequence with NCCN treatment guidelines.[10-14] Surgery type was classified as follows: no surgery, oophorectomy with or without hysterectomy, oophorectomy with omentectomy, and/or debulking surgery. Chemotherapy type was categorized into 4 groups including multiple-agent chemotherapy, single-agent chemotherapy, no chemotherapy despite recommendation, and no chemotherapy for other reason. Treatment sequence had 6 categories: surgery and adjuvant chemotherapy, neoadjuvant chemotherapy and surgery, surgery and chemotherapy in unknown sequence, surgery only, chemotherapy only, and no surgery or chemotherapy.

Differences among treatment groups (surgery, chemotherapy, and treatment sequence) were analyzed with χ^2 or Fisher exact test. A multinomial logistic regression model was used to perform multivariate analysis for outcomes with >2 categories. The guideline-adherent treatment category was used as the referent for each outcome variable, and binary logistic regression was performed for this outcome. Race and SES were interpreted as independent variables, as interaction terms for these variables were not significant.

RESULTS

Population characteristics

Patient, tumor, and provider characteristics are shown in Table 1. Overall, 11,865 patients were included. A total of 7272 patients (61.3%) had stage IIIC disease, while 4593 (38.7%) had stage IV disease. White patients accounted for 71.7% of cases, followed in frequency by Hispanics (15.3%), Asian/Pacific Islanders (8.3%), and African American (4.7%). Despite a small percentage of minority patients, sample sizes were sufficient for analysis. Median age at diagnosis was 65.0 years (18-104 years). Private insurance was the most common payer category (47.7%), while 32.5% of patients had Medicare. Patient distribution across socioeconomic quintiles was relatively even. SES-1 was slightly underrepresented, accounting for only 13.0% of the study population. Most patients were treated at low-volume hospitals (82.1%) and by low-volume providers (61.9%). The median cancer-specific survival for all patients was 28.2 months.

Surgery

Table 2 presents patient, tumor, and provider characteristics stratified by surgery type. Overall, 25% of patients received no surgery for advanced-stage ovarian cancer, although African American race was associated with an increased likelihood of not undergoing surgery. Among African American patients, 37.3% did not undergo surgery compared to 23.8% for whites, 25.4% for Hispanics, and 26.0% for Asian/Pacific Islanders. Multinomial logistic regression analysis revealed that African American patients experienced a 2-fold increase in the risk of no surgery (odds ratio [OR], 2.04; 95% confidence interval [CI], 1.45—2.87) and were 50% more likely than whites to undergo only resection of the primary tumor with or without hysterectomy (OR, 1.49; 95%