
Impact of National Cancer Institute Comprehensive Cancer Centers on Ovarian Cancer Treatment and Survival



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BACKGROUND: The regional impact of care at a National Cancer Institute Comprehensive Cancer Center (NCI-CCC) on adherence to National Comprehensive Cancer Network (NCCN) ovarian cancer treatment guidelines and survival is unclear.

STUDY DESIGN: We performed a retrospective population-based study of consecutive patients diagnosed with epithelial ovarian cancer between January 1, 1996 and December 31, 2006 in southern California. Patients were stratified according to care at an NCI-CCC (n = 5), non-NCI high-volume hospital (≥ 10 cases/year, HVH, n = 29), or low-volume hospital (<10 cases/year, LVH, n = 158). Multivariable logistic regression and Cox-proportional hazards models were used to examine the effect of NCI-CCC status on treatment guideline adherence and ovarian cancer-specific survival.

RESULTS: A total of 9,933 patients were identified (stage I, 22.8%; stage II, 7.9%; stage III, 45.1%; stage IV, 24.2%), and 8.1% of patients were treated at NCI-CCCs. Overall, 35.7% of patients received NCCN guideline adherent care, and NCI-CCC status (odds ratio [OR] 1.00) was an independent predictor of adherence to treatment guidelines compared with HVHs (OR 0.83, 95% CI 0.70 to 0.99) and LVHs (OR 0.56, 95% CI 0.47 to 0.67). The median ovarian cancer-specific survivals according to hospital type were: NCI-CCC 77.9 (95% CI 61.4 to 92.9) months, HVH 51.9 (95% CI 49.2 to 55.7) months, and LVH 43.4 (95% CI 39.9 to 47.2) months (p < 0.0001). National Cancer Institute Comprehensive Cancer Center status (hazard ratio [HR] 1.00) was a statistically significant and independent predictor of improved survival compared with HVH (HR 1.18, 95% CI 1.04 to 1.33) and LVH (HR 1.30, 95% CI 1.15 to 1.47).

CONCLUSIONS: National Cancer Institute Comprehensive Cancer Center status is an independent predictor of adherence to ovarian cancer treatment guidelines and improved ovarian cancer-specific survival. These data validate NCI-CCC status as a structural health care characteristic correlated with superior ovarian cancer quality measure performance. Increased access to NCI-CCCs through regional concentration of care may be a mechanism to improve clinical outcomes. (J Am Coll Surg 2015;220:940–950. © 2015 by the American College of Surgeons)

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In the United States (US), there are 22,000 new cases of ovarian cancer diagnosed and more than 14,000 disease-related deaths annually.¹ Ovarian cancer is the fifth leading cause of cancer-related death among US women and accounts for more deaths than all other gynecologic cancers combined. Adherence to National Comprehensive Cancer Network (NCCN) treatment guidelines for ovarian cancer, a comprehensive measure of overall care, has recently been validated as correlating with improved disease-specific and overall survival, and has emerged as a relevant process measure of quality cancer care.²⁻⁴ For ovarian cancer, optimizing survival outcomes hinges on access to specialized providers that are most likely to

Abbreviations and Acronyms

HR	= hazard ratio
HVH	= high-volume hospital
LVH	= low-volume hospital
NCI-CCC	= National Cancer Institute Comprehensive Cancer Center
NCCN	= National Comprehensive Cancer Network
OR	= odds ratio
SES	= socioeconomic status

administer effective and evidence-based treatment programs.⁵⁻¹⁰ To date, one of the most reliable health care system characteristics correlated with adherence to NCCN ovarian cancer treatment guidelines has been hospital annual case volume.⁶⁻⁹ As a structural measure of quality cancer care, however, annual case volume has been criticized as being imprecise and not reflective of more subtle aspects of ovarian cancer care.¹¹⁻¹³

National Cancer Institute-designated cancer centers are characterized by scientific excellence and the capability to integrate a diversity of research approaches to focus on the problem of cancer. There are 41 NCI-designated Comprehensive Cancer Centers (NCI-CCC) in the US.¹⁴ Generally, the designation criteria are focused on research infrastructure and programs; however, the regional effect on clinical outcomes of cancer patients has not been well defined. The objective of this study was to examine this question with respect to ovarian cancer and determine the impact of care at NCI-CCC hospitals in southern California on adherence to NCCN treatment guidelines and disease-specific survival.

METHODS

The study design is a retrospective population-based study of invasive epithelial ovarian cancer reported to the California Cancer Registry (CCR); it received exempt status by the Institutional Review Board of the University of California, Irvine (HS#2011-8317). Standardized data collection and quality control procedures have been in place since 1988.¹⁵⁻¹⁸ Case reporting is estimated to be 99% for the entire state, with follow-up completion rates exceeding 95%.¹⁹ International Classification of Disease Codes for Oncology based on the World Health Organization's criteria was used for tumor location and histology.¹⁹ Cases were identified using ovarian Surveillance, Epidemiology, and End Results (SEER) primary site code (C569).

This study represents a subset analysis of previously reported statewide data.^{3,7} Case selection criteria included all women age 18 years or older at the time of diagnosis

of a first or only invasive epithelial ovarian cancer in Los Angeles, Orange, Riverside, San Bernardino and San Diego counties between January 1, 1996 and December 31, 2006. Follow-up extended through January 2008. For the purposes of this study, hospitals in southern California were characterized according to whether or not they maintained NCI-CCC status during the study time period and then were sorted by average annual ovarian cancer case volume comparable to NCI-CCC hospitals (≥ 10 cases/year or < 10 cases/year). Using these criteria, hospital type was divided into 3 categories: NCI-CCC, non-NCI-CCC high-volume hospital (≥ 10 cases/year, HVH), and non-NCI-CCC low-volume hospital (< 10 cases/year, LVH). Age at diagnosis was treated either as a continuous variable or a categorical variable (< 45 years, 45 to 54 years, 55 to 69 years, and ≥ 70 years). Tumor characteristics included International Federation of Gynecology and Obstetrics (FIGO) and American Joint Commission on Cancer (AJCC) stage, tumor grade, and histology. Patient demographic characteristics included race/ethnicity and insurance type. Socioeconomic status (SES) was measured as quintiles of the Yost score: lowest (SES-1), lower-middle (SES-2), middle (SES-3), higher-middle (SES-4), and highest (SES-5). The Yost score is an index of SES level based on a principal components analysis of variables at the census block level and includes education, income, and employment.²⁰ The California Cancer Registry does not capture data on medical comorbidities.

The main outcomes of this study were adherence to NCCN ovarian cancer treatment guidelines and ovarian cancer-specific survival. Adherence to treatment guidelines was based on NCCN recommendations for surgery and chemotherapy according to the time period of diagnosis (1997 to 2005).²¹⁻²⁵ For stages I to IIIB, surgical treatment was considered adherent to NCCN guidelines if it included a minimum of oophorectomy (\pm hysterectomy), pelvic and/or para-aortic lymph node biopsy, and omentectomy. A minimum of oophorectomy (\pm hysterectomy) and omentectomy was considered adherent surgical care for stages IIIC to IV disease. For cases of stages IA to IB, grade 1 to 2 disease, no adjuvant treatment was considered guideline adherent. Administration of multiagent chemotherapy was considered appropriate for cases of stages IC to IV or grade 3 disease. Surgery must have preceded chemotherapy for stages I to IIIB to be considered adherent to NCCN guidelines; for stages IIIC to IV, either initial surgery or chemotherapy was characterized as appropriate care. Dichotomous variables (adherence/nonadherence) were created for adherence to surgical guidelines, adherence to chemotherapy guidelines, and adherence to overall treatment plan including

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