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Trends in the Receipt of Guideline Care and Survival for Women with Ovarian Cancer: A Population-Based Study

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Abstract

Background—We assessed trends in the receipt of guideline care and 2-year cause-specific survival for women diagnosed with ovarian cancer.

Methods—This retrospective cohort analysis used National Cancer Institute's Patterns of Care studies data for women diagnosed with ovarian cancer in 2002 and 2011 (weighted n=6427). Data included patient characteristics, treatment type, and provider characteristics. We used logistic regression to evaluate the association of year of diagnosis with receipt of guideline surgery, multiagent chemotherapy, or both. Two-year cause-specific survival, 2002–2013, was assessed using SEER data.

Results—The adjusted rate of women who received stage-appropriate surgery, 48%, was unchanged from 2002 to 2011. Gynecologic oncologist (GO) consultations increased from 43% (2002) to 78% (2011). GO consultation was a significant predictor for receipt of guideline care, although only 40% of women who saw a GO received guideline surgery and chemotherapy. The percent of women who received guideline surgery and chemotherapy increased significantly from 32% in 2002 to 37% in 2011. From 2002 to 2011, 2-year cause-specific ovarian cancer survival was unchanged for Stages I-III cancers, with slight improvement for Stage IV cancers.

Conclusion—Receipt of guideline care has improved modestly from 2002–2012 for women with ovarian cancer. Current treatment is far below clinical recommendations and may explain limited improvement in 2-year cause-specific survival. Most women consulted a GO in 2011 yet did not receive guideline care. There needs to be a better understanding of the decision-making process about treatment during the consultation with GOs and other factors precluding receipt of guideline care.

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Keywords

ovarian cancer; treatment; trends; guideline care; survival

INTRODUCTION

In the United States, ovarian cancer is the most common gynecologic cancer and the leading cause of gynecologic cancer deaths, accounting for more than 22,000 newly diagnosed ovarian cancer cases and more than 14,000 ovarian cancer deaths in 2016.¹ Most women with ovarian cancer are diagnosed at an advanced stage with a poor prognosis, although the 5-year relative survival rate for women with ovarian cancer has increased from 36% in 1975–1977 to 46% in 2005–2011.²

Prior studies have demonstrated that guideline care is associated with improved survival for ovarian cancer patients.^{3,4} However, studies have also shown that many women with ovarian cancer do not receive guideline care.^{3–6} Over the past 15 years, there has been little change in the treatment guidelines for ovarian cancer. Guideline care consists of stage-appropriate surgery performed by a gynecologic oncologist for all women with ovarian cancer and multi-agent chemotherapy for patients with Stages IC–IV disease.^{7,8} Between 2002 and 2011, the only additional standard for ovarian cancer treatment was a 2006 evidence-based recommendation from the US National Cancer Institute (NCI) that intraperitoneal (IP) chemotherapy be given to women with Stage III cancer who undergo optimal debulking.⁹

In this study, we evaluate population-based trends in ovarian cancer treatment and survival, focusing on receipt of guideline care for women diagnosed with ovarian cancer in 2002 and 2011. We also assess patient and provider characteristics associated with receipt of guideline care. Finally, we estimate trends in 2-year cause-specific survival, defined as the percent of women diagnosed with ovarian cancer between 2002–2011 who have not died from ovarian cancer, 2002–2013.

METHODS

Data Used

Data for this analysis came from two population-based sources supported by the National Cancer Institute - the Surveillance, Epidemiology and End Results (SEER) cancer registries and the Patterns of Care data which include a subset of the SEER cases. The SEER registries ascertain all incident cancers occurring in defined geographic regions that include 30% of the U.S. population. The SEER registries routinely collect data on cancer site, date of diagnosis, tumor characteristics, type of surgical treatment, demographic characteristics, and date and cause of death. Information about stage at diagnosis and treatment for each patient comes primarily from hospitals records. Data from all cases reported to the SEER registries were used to calculate population-based trends in 2-year cancer-specific survival through 2013.¹⁰

The SEER registries data do not capture complete information about chemotherapy as such treatment is often provided in the outpatient setting and thus under-reported.¹¹ To obtain

information about chemotherapy, NCI annually conducts Patterns of Care (POC) studies on selected cancer sites. Ovarian cancer was selected for inclusion in 2002 and 2011. The POC studies collect information about cancer treatment from the patient's hospital record and from each cancer patient's treating physician. The identified treating physician is asked if any other health care professional provided care, if so these providers are also contacted for treatment information.

The participating registries included the metropolitan areas of San Francisco/Oakland, Detroit, Seattle, Atlanta, San Jose/Monterey, Los Angeles County, and the states of Connecticut, Hawaii (2011 only), Iowa, Kentucky (2011 only), Louisiana, New Jersey, New Mexico, and the remainder of California. Institutional review board approval was received as required by the registries. Abstractors responsible for the ovarian cancer POC study underwent centralized training. The focus of the analysis was on trends in initial treatment. Because the SEER registries collect the month of cancer diagnosis, but not the exact diagnosis day, we assumed that patients were diagnosed on the first day of the month. Hospital records were re-abstracted for the sampled patients to verify tumor characteristics of the ovarian cancer, demographic, and insurance information. Type of surgical procedure was obtained from SEER data routinely collected by cancer registrars who operate under nationally established standards for data collection. Hospital bed size and teaching status was obtained from the American Hospital Association data. Specialty of the treating physicians was obtained from the registries. Physician specialty was used to identify patients who had a consultation with a gynecologic oncologist (GO). Each patient's physician was asked to provide information about the types of chemotherapy agents given, if intraperitoneal chemotherapy was administered, and if the patient had participated in a clinical trial. Therapy was verified for 97% of cases in 2002 and 98% of cases in 2011. For quality control, 5% of patients had their records re-abstracted.

Study Sample

The POC study included a sample of SEER patients diagnosed with invasive ovarian cancer (ICD-O-3 Site code C56.9) not diagnosed at autopsy or on death certificate only. Patients with a previous diagnosis of any cancer other than non-melanoma skin cancer, lymphomas, or diagnosed under age 20 were ineligible for the study. Eligible patients were stratified by registry, racial/ethnic group, stage, and age (2011 only) and randomly sampled within strata. Sampling weights varied based on the race/ethnicity of the patient. Sampling fractions were used to calculate weighted percentages which reflect SEER populations from which the data were obtained. Non-whites and women with Stage I and II disease were oversampled to obtain more stable estimates. Patients with non-epithelial ovarian cancer were excluded from the analysis. To obtain a larger sample to estimate trends in 2-year cause-specific survival, we used data for all women with non-epithelial ovarian cancer included in the SEER data from 2002–2011 with follow-up through 2013.

Measures

Stage was determined using the SEER modified American Joint Commission on Cancer (AJCC) definition at the time of diagnosis, AJCC 3rd edition in 2002 and AJCC 6th edition in 2011.^{12,13} Patient comorbidities and type of health insurance were abstracted from the

medical record; comorbidity was coded centrally by a single Certified Tumor Registrar and assessed using the Charlson comorbidity index.¹⁴ Insurance was classified into mutually exclusive groups of private insurance, any Medicaid, Medicare only (no supplemental coverage), or no or unknown health insurance. Bed size was categorized as large (400+ beds), medium (200–399 beds), small (100–199 beds), and very small (1–99 beds). Type of hospital reflects a composite measure of bed size and whether the hospital had an approved residency training program, except for small/very small hospitals where teaching was not assessed. Use of intraperitoneal chemotherapy was evaluated only in women for whom it is recommended- those with Stage III cancer who had undergone debulking.

Guideline care was determined using National Comprehensive Cancer Network (NCCN) guidelines for ovarian cancer for 2002 and 2011.^{7,8} Guideline surgery was defined as oophorectomy with node dissection for Stage I disease and debulking for women with Stages II–IV cancer. Debulking is defined by the SEER program as surgical removal of as much macroscopic ovarian tumor as possible in the pelvis and abdomen with partial or complete omentectomy. It may involve removal of other involved abdominal organs including intestine, genital organs, bladder, ureters and ligamentous attachments. We did not assess hysterectomy as there were no data on prior surgeries and many women may have undergone hysterectomy prior to their cancer diagnosis. Guideline adjuvant chemotherapy was defined as the receipt of multi-agent chemotherapy, a platinum drug (cisplatin or carboplatin) and a taxane (paclitaxel or docetaxel). Receipt of chemotherapy included only patients for whom chemotherapy is recommended, those with Stages IC–IV disease.

We wanted to estimate trends in stage-specific survival. Given the limited number of cases and years in the POC data, we calculated two-year cause-specific survival for the POC data and using the SEER data, although we only show results of the SEER data. Deaths due to ovarian cancer were identified based on the SEER cause of death site recode variables.¹⁵

Statistical Analyses

The number of cases was weighted using sample weights to obtain estimates that are representative of all eligible patients from which the sample was drawn. Weights were calculated as the inverse of the sampling proportion for each sampling stratum. We used SUDAAN software (RTI International, Research Triangle Park, NC, USA) to perform the weighted analysis. Bivariate comparison between 2002 and 2011 patients were analyzed using chi-square tests and were considered significant at $p < 0.05$.

Cases from 2002 and 2011 were combined and three multivariable logistic regression models were used to assess the association of year of diagnosis with the receipt of guideline treatment: binary dependent variables (yes v no) for receipt of appropriate 1) surgery, 2) multiagent chemotherapy and 3) both surgery and multiagent chemotherapy. Other independent variables in the models included age, race, stage, Charlson comorbidity score, insurance, GO consultation, treatment in a large teaching hospital, and SEER registry. Patients with Stage IA and IB cancers were included only in the model assessing appropriate surgery. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were used to assess the association between the independent variables and receipt of guideline treatment. We also report the standardized percentages (predictive margins), representing the average

percent of patients (marginal probability) receiving guideline treatment based on patient groups.¹⁶

Two-year cause-specific survival, 2002–2013 was produced from the SEER registry data for cases diagnosed 2002 through 2011. We used SEER*STAT software.¹⁰ Two-year survival estimates for the POC data were calculated using Proc PHREG in SAS 9.3 (SAS Institute, Cary NC).

RESULTS

The total weighted number of cases were 3409 in 2002 and 3018 in 2011. As shown in Table 1, women aged 75 and older composed 24.8% of the sample in 2002 and 20.1% in 2011. Compared with 2002, women diagnosed in 2011 had significantly higher comorbidity scores. Between 2002 to 2011, there was an increase in the percent of women treated in large teaching hospitals, 31.9% and 45.1% respectively. The percent of women who had a consultation with a gynecologic oncologist rose from 43.0% in 2002 to 77.8% in 2011. In 2011, 82% of women under age 75 saw a GO compared with less than 60% of women aged 75 and older (data not shown). Enrollment in a clinical trial doubled from 5.2% to 9.9%. There was no change in the percent of women who received any type of surgery (not specifically guideline), about 84% in both years. The percent of patients receiving any chemotherapy rose from 74.0% in 2002 to 81.5% in 2011. Among women who were candidates for intraperitoneal chemotherapy, only 1.5% received it in 2002. In 2011, the percent rose to 16.6%. Forty-five percent of women who received IP chemotherapy were on a clinical trial.

Table 2 shows the changes between 2002 and 2011 in the percent of women who received guideline therapy. For women with Stage I cancer, about 60% received guideline surgery in both years. For women with Stages II and III ovarian cancer, the percent who received guideline surgery in 2002 and 2011 increased significantly from 18.3% to 31.7% and 48.9% to 56.7%, respectively. For Stage IV cases, there was no change between 2002 and 2011, 34% of women had guideline surgery. For women who did not receive guideline surgery, often their procedure was less extensive than was recommended for their stage at diagnosis (Table 3). We found that in 2011, 27.3% of Stage I cases received oophorectomy without node dissection, 41.5% of Stage II cases received oophorectomy with node dissection and 22.9% were treated with oophorectomy only. For women diagnosed with Stage III cancer in 2011, 30.5% had oophorectomy and 11.0% had no surgery. Among Stage IV cancers in 2011, 21.6% were treated with oophorectomy and 43.3% received no surgery.

Unlike surgery, the percent of women getting multiagent chemotherapy significantly increased for all stages where chemotherapy is recommended. For all stages, at least 70% of women received multiagent chemotherapy in 2011, 19.2% of which was neoadjuvant. Between 2002 and 2011, there was a significant increase in the percent of women who received both appropriate surgery and multiagent chemotherapy for women with Stages IC–III cancers. For women with Stages IC–II, the percent who received guideline surgery and chemotherapy rose from 23.9% in 2002 to 40.6% in 2011. For Stage III cases, the increase was from 36.3% in 2002 to 48.0% in 2011. For patients with Stage IV cancer, there was a

small, non-significant increase in receipt of appropriate surgery and multiagent chemotherapy to 28.8% in 2011.

The multivariate models show that after controlling for age, stage, comorbidities, insurance, type of hospital, registry and GO consultation, there was no significant change in the percent of women undergoing stage- appropriate surgery between 2002 and 2011, about 48% for both years (Table 4). The adjusted percent of women with Stage I cancer who received guideline surgery was 59.7%, 25.3% for Stage II, 50.3% for Stage III and 38.2% for Stage IV cases. There was a significant increase in receipt of multiagent chemotherapy between 2002 and 2011 for women with Stages IC–IV cancer, with 75.2% receiving multiagent chemotherapy in 2011. There was also a significant increase in the percent of women who received both stage-appropriate surgery and multiagent chemotherapy, increasing from 32.3% in 2002 to 37.3% in 2011. Consultation with a GO was a significant factor for receipt of guideline treatment across all models. The difference was especially noted for surgery where 55.1% of women who had a GO consultation received guideline surgery contrasted with 35.5% of women who did not see a GO. Although GO was a significant factor for receipt of guideline care, a sizeable number of women who saw a gynecologic oncologist did not receive the recommended treatment. Only 40.1% of women who saw a GO received both guideline surgery and multiagent chemotherapy. There were other factors that were also associated with receipt of guideline care. Non-Hispanic black patients were significantly less likely to receive guideline surgery and had lower rates of chemotherapy use as were women aged 75 and older.

For women in the entire SEER database who were diagnosed with ovarian cancer between 2002 and 2011, 2-year cause-specific survival remained stable for women with Stages I, II and Stage III disease, approximately 95%, 85%, and 74%, respectively (Figure). Among women with Stage IV cancer, there was an increase in cause-specific survival. Two-year cause-specific survival in 2002 was 46%, rising to 50% in 2011.

DISCUSSION

This study used population-based data to assess trends in receipt of guideline care among women diagnosed with ovarian cancer in 2002 and 2011. The findings show that during the 10 year period, only women with Stages II and III cancers had a significant increase in surgery in accordance with NCCN guidelines. For all stages of ovarian cancer, the percent of patients receiving guideline surgery in 2011 remained low. This was especially noted for Stages II and IV cancers, where only one-third of all women received guideline surgery. For Stage I and III cases, approximately 60% received guideline surgery in 2011. The lack of appropriate surgery for Stage I cases is of concern as 27% of these patients did not undergo node dissection, suggesting that the stage of their disease was not adequately evaluated. If incorrectly staged, these women may not have been given needed chemotherapy.

Unlike surgery, receipt of guideline chemotherapy rose significantly from 2002 to 2011 for Stages IC–IV cancers. Although chemotherapy use has increased, in 2011 an estimated one-quarter of women who should have received multiagent chemotherapy were not given the recommended treatment. In addition, we found that only 17% of women for whom IP

chemotherapy was recommended were given IP chemotherapy in 2011, similar to the 13% reported from a study using 2003–2008 HMO data.¹⁷ The 17% that we observed is far below what has been reported for patients treated in National Comprehensive Cancer Network centers, where starting in 2007, almost 50% of women with Stage III cancer received IP chemotherapy after their debulking surgery.¹⁸ The higher percent in the NCCN centers, although still suboptimal, likely reflects the practice patterns in NCCN settings. Presumptively most women at NCCN centers are treated by gynecologic oncologists, unlike what happens in many community hospitals.

After adjusting for other factors, less than 40% of women with Stages IC–IV ovarian cancer received both guideline surgery and multiagent chemotherapy in 2011, although this was significantly higher than the percent of woman with Stage IC–IV cancer who received guideline surgery and chemotherapy in 2002. Among women with Stage IV cancer, there was little change between 2002 and 2011 in the percent of women who received guideline surgery and chemotherapy; less than 30% received both treatments in 2011. Our findings are consistent with prior findings, although our study offers more updated data. A study based on 1999–2006 data from the California Cancer Registry reported that 54.1% of women with ovarian cancer received NCCN guideline surgery, 60.7% received guideline chemotherapy and 37.2% received both surgery and chemotherapy.³ A study from SEER-Medicare data reported that for 1995–2008 Stage III and IV cancers, diagnosed from 1995–2008, 41.8% received debulking and chemotherapy in the recommended timeframe,⁴ while a study using 1998–2007 data from the National Cancer Database found that 43.3% of women with ovarian received guideline therapy.⁶ A 1996 SEER Patterns of Care study reported that 62% of women with Stages III and IV ovarian cancer received guideline therapy although the definitions of guideline surgery used in the 1996 analysis differ from what was used in our study.⁵

The trends in the percent of women who received multiagent chemotherapy may offer insight into factors that have influenced trends in 2-year cause specific survival. For Stage IV cancers, there has been an 8% increase in survival between 2002 and 2011. During the same period, there was a 15% increase in the percent of Stage IV cancer cases receiving multiagent chemotherapy. Two-year survival for Stage I ovarian cases has remained unchanged for cases diagnosed between 2002–2011 as has the percent of Stage I women who received guideline surgery. For women with Stages II and III ovarian cancer, the increased use of guideline treatment from 2002 and 2011 is not consistent with the slight increase in 2-year cause-specific survival.

Prior studies have found that patients treated in large hospitals and higher socio-economic status (SES) were more likely to receive guideline care and have better survival.^{6,19} In our study, hospital size and SES were significantly associated with receipt of guideline treatment in univariate analysis. However in the multivariate analyses, we found that hospital size and SES were no longer significantly associated with guideline treatment, explained by the significant correlation in our data of type of hospital and SES with receipt of a GO consultation. This is consistent with other studies using population-based data that have reported that for women with ovarian cancer, hospital volume was not significantly associated with survival after adjusting for other factors, including surgeon volume.^{20,21}

Other prior studies that have reported that hospital volume and SES were significantly associated with guideline care did not have available information about consultation with a GO, which we had available for our analysis.

We found in the multivariate models that consultation with a GO was a significant predictor of receiving guideline treatment, consistent with prior studies.^{22,23} However, the adjusted percentages from the regression models show that among women who consulted with a GO, a large number did not receive guideline care. This raises perplexing questions as to why so many women who have consulted a GO are not receiving guideline treatment, especially for surgery which is under the direct purview of the GO. The fact that a sizeable percent of women who saw a GO did not get guideline care may be partially explained in cases of women who were elderly, where the GO determined that given the patient's life expectancy, guideline care might not be advisable. However, in our study, women aged 75 and older were much less likely to see a GO than were younger women, suggesting that other factors were associated with patients who saw a GO not receiving guideline care. Are GOs not recommending guideline treatment and if so, why? Are women not accepting the treatment offered? What factors are influencing patient decision making? There have been suggestions that ovarian cancer care should be regionalized in an effort to ensure more women are receiving guideline care.^{24–26} However, our findings of the low levels of guideline treatment among patients consulting with gynecologic oncologists suggests that there needs to be a more complete understanding of what factors are influencing patient and physician treatment decisions before there can be an informed determination of the best approach to obtaining optimal levels of guideline care.

Our study had limitations that need to be considered in interpreting the data. We used data obtained from medical records and physician reports. Treatment information was abstracted from the medical record by trained abstractors and reports from the treating physician. It is possible that documentation of treatment may be incomplete, either because it was not recorded in the medical record or reported by the physician. We did not have information about the quality of the debulking, nor were we able to determine the specialty of physician administering chemotherapy. Although we collected information about the level of residual disease following debulking, we did not include it in the analysis as it was missing for 24% of cases in 2002 and 18% of cases in 2011. Prior studies have reported that residual disease following debulking is not reported in 25%–40% of cases.^{27,28} Given that we had data only for 2002 and 2011, we assessed the SEER treatment data to determine if there had been changes in the percent of ovarian cancer patients receiving surgery during the 10 year period. We found that the percent of patients undergoing debulking remained stable from 2002–2011. Given the relatively small sample size of the POC data, we used the SEER data to assess survival, allowing for more years of data and a larger sample size. We compared the survival rates for the POC sample with those observed for the entire SEER data and found the 2002 rates to be lower, although not significantly so, while the 2011 POC and SEER rates were similar. Finally, we had no information about what factors may have influenced physician or patient decisions related to treatment.

We conclude that from 2002–2011, there was some improvement in the receipt of guideline care for women with ovarian cancer. However, the current rate of treatment falls far short of

clinical recommendations. This shortfall in guideline care may explain the lack of improvement in cause-specific survival. Clearly having contact with a gynecologic oncologist is associated with more guideline treatment but is not alone a sufficient factor to ensure that a large percent of women receive guideline care. Further research is needed to provide a better understanding of what factors contribute to treatment decisions in order to improve the current practice patterns.

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HIGHLIGHTS

- Guideline care improves ovarian cancer survival, yet guideline care is underused.
- Less than half of women received guideline surgery with no increase, 2002–2011.
- Multiagent chemotherapy use has increased, but rates remain low.
- Gyn/oncs use rose, 2002–11, but rates of guideline care from gyn/oncs were not optimal
- Low rates of guideline care may explain lack of improvement in 2-year survival.

Figure 1.

Trends in 2-year survival by stage, 2002–2011 diagnosed cases with follow-up through 2013

Characteristics of Ovarian Cancer Patients Included in the SEER Patterns of Care Studies, 2002 and 2011

Table 1

Age Group	2002			2011			p value
	Wt	N	Wt Col %	Wt	N	Wt Col %	
<50	725		21.3	613		20.3	ns
50-64	1197		35.1	1156		38.3	
65-74	641		18.8	642		21.3	
75+	846		24.8	607		20.1	
Race							
NH White	2634		77.2	1983		65.7	<0.05
NH Black	207		6.1	250		8.3	
Hispanic	360		10.6	469		15.5	
Asian/PI	209		6.1	315		10.4	
Stage*							
I	696		20.4	762		25.2	<0.05
II	318		9.3	257		8.5	
III	1580		46.3	1159		38.4	
IV	815		23.9	839		27.8	
Charlson Comorbidity Score							
0	2835		83.2	2171		71.9	<0.05
1	497		14.6	686		22.8	
2+	77		2.3	160		5.3	
Type of Insurance							
Any Medicaid	367		10.8	510		16.9	<0.05
Private	371		10.9	230		7.6	
Medicare Only	2520		73.9	2164		71.7	
None	152		4.5	113		3.7	
Type of Hospital							
Large Teaching	1087		31.9	1362		45.1	<0.05
Large Community	283		8.3	281		9.3	
Medium Teaching	600		17.6	469		15.6	

Age Group	2002		2011		p value
	Wt N	Wt Col %	Wt N	Wt Col %	
Medium Community	650	19.1	593	19.7	
Small/Very Small	788	23.1	311	10.3	
Consulted gynecologic oncologist	1467	43.0	2348	77.8	<0.05
Use of Select Treatments					
Participated In a clinical trial	176	5.2	298	9.9	<0.05
Any type of surgery	2880	84.5	2499	82.8	ns
Any chemotherapy administered [^]	2206	74.0	2068	81.5	<0.05
Intraperitoneal chemotherapy ^{**}	12	1.5	109	16.6	<0.05
SEER Area Reporting Case					
San Francisco	215	6.3	230.0	7.6	na [*]
Connecticut	174	5.1	177.0	5.9	
Detroit	199	5.8	232.0	7.7	
Hawaii			37.0	1.2	
Iowa	145	4.2	149.0	4.9	
New Mexico	87	2.6	87.0	2.9	
Seattle	238	7.0	243.0	8.1	
Utah	84	2.5	105.0	3.5	
Atlanta	124	3.7	136.0	4.5	
San Jose	123	3.6	101.0	3.3	
Los Angeles	437	12.8	433.0	14.4	
Greater California	897	26.3	273.0	9.1	
Kentucky			190.0	6.3	
Louisiana	204	6.0	154.0	5.1	
New Jersey	482	14.2	469.0	15.5	

^{*} Stage-American Joint Committee on Cancer (AJCC) 3rd edition used in 2002; 6th edition used in 2011 wt=weighted, all numbers and percents are unadjusted

ns=not significant; nh=non-hispanic; PI=Pacific Islander, na=not assessed as 2 registries were not included in 2002

[^] Includes only patients with Stage IC–IV cancer

^{**} Includes only Stage III cancer patients who underwent debulking

Table 2
Receipt of Guideline Care among Ovarian Cancer Patients in the SEER Patterns of Care Studies, 2002 and 2011

	2002			2011		
	Wt N	Wt Col %	Wt N	Wt Col %	p value	
Appropriate Surgery						
Stage I	415	59.5	487	63.9	ns	
Stage II	58	18.3	81	31.7	<0.05	
Stage III	772	48.9	658	56.7	ns	
Stage IV	283	34.7	282	33.7	ns	
Multiagent Chemotherapy						
Stage IC and Stage II	397	67.5	415	77.1	<0.05	
Stage III	1111	70.3	939	81.0	<0.05	
Stage IV	451	55.3	590	70.4	<0.05	
Appropriate Surgery & Multiagent Chemotherapy						
Stage IC and Stage II	141	23.9	219	40.6	<0.05	
Stage III	574	36.3	557	48.0	<0.05	
Stage IV	182	22.4	242	28.8	ns	

Table 3

Type of Surgery for Ovarian Cancer Reported in SEER Patterns of Care Studies by Stage and Year

	2002		2011	
	Wt N	Wt Col %	Wt N	Wt Col %
Stage I				
Oophorectomy with node dissection	415	59.5	487	63.9
Oophorectomy without node dissection	204	29.2	181	23.8
Debulking	47	6.8	84	11.1
Other	2	0.3	0	0
No Surgery	29	4.2	9	1.2
Stage II				
Oophorectomy with node dissection	118	37	109	42.4
Oophorectomy without node dissection	86	27.1	58	22.4
Debulking	58	18.3	81	31.7
Other	11	3.4	0	0
No Surgery	45	14.2	9	3.5
Stage III				
Oophorectomy with node dissection	265	16.8	170	14.6
Oophorectomy without node dissection	315	20	180	15.5
Debulking	772	48.9	658	56.7
Other	68	4.3	22	1.9
No Surgery	159	10.1	131	11.3
Stage IV				
Oophorectomy with node dissection	58	7.2	58	7
Oophorectomy without node dissection	106	13.1	118	14.1
Debulking	283	34.7	282	33.7
Other	72	8.8	12	1.4
No Surgery	295	36.2	368	43.9

Table 4
Determinants of Use of Stage Appropriate Therapy for Ovarian Cancer Patients in the SEER Patterns of Care Studies

Year of diagnosis	Had Stage Appropriate Surgery				Had Multiagent Chemotherapy				Had Stage Appropriate Surgery & Multiagent Chemotherapy			
	Percent**	Adjusted OR	Lower	Upper	Percent**	Adjusted OR	Lower	Upper	Percent**	Adjusted OR	Lower	Upper
2002	48.1	1.00			67.2	1.00			32.3	1.00		
2011	46.3	0.92	0.73	1.15	75.2	1.55	1.17	2.05	37.3	1.28	0.98	1.67
Age Group												
<50	49.4	1.00			78.1	1.00			37.3	1.00		
50–64	49.1	0.98	0.75	1.30	78.6	1.03	0.69	1.54	39.2	1.09	0.80	1.49
65–74	51.9	1.12	0.81	1.56	74.3	0.80	0.52	1.24	41.1	1.20	0.83	1.73
75+	37.6	0.58	0.40	0.83	51.2	0.27	0.17	0.41	18.9	0.36	0.22	0.58
Race												
NH white	47.6	1.00			70.7	1.00	1.00	1.00	34.6	1.00	1.00	1.00
NH black	39.5	0.68	0.51	0.91	64.4	0.72	0.53	1.00	30.1	0.79	0.57	1.10
Hispanic	50.6	1.15	0.83	1.58	72.0	1.08	0.70	1.66	35.8	1.06	0.72	1.56
Asian/PI	45.7	0.92	0.67	1.26	75.6	1.33	0.83	2.13	37.5	1.15	0.80	1.67
Stage												
I*	59.7	1.00										
II*	25.3	0.20	0.14	0.29	69.6	1.00			30.1	1.00		
III	50.3	0.66	0.51	0.85	73.8	1.27	0.91	1.76	39.9	1.62	1.23	2.14
IV	38.2	0.38	0.29	0.51	66.6	0.86	0.61	1.21	28.5	0.92	0.67	1.25
Charlson Comorbidity Score												
0	48.3	1.00			71.8	1.00			35.2	1.00		
1	46.2	0.91	0.68	1.21	66.7	0.76	0.54	1.08	34.9	0.98	0.70	1.38
2+	27.8	0.36	0.22	0.62	68.3	0.83	0.43	1.60	19.4	0.41	0.21	0.78
Gynecologic oncologist consultation												
Yes	55.1	1.00			74.8	1.00			40.1	1.00		
No	35.5	0.41	0.31	0.54	65.5	0.61	0.44	0.85	26.1	0.50	0.35	0.70

* Stage IA and IB cases are excluded from the models of chemotherapy use. Stage IC cases are included with Stage II in the chemotherapy models.

Standardized percents are adjusted for variables shown in the model plus registry, type of insurance, and teaching hospital. PI=Pacific Islander

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