Disparities in Use of Gynecologic Oncologists for Women with Ovarian Cancer in the United States

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Objective. To examine disparities in utilization of gynecologic oncologists (GOs) across race and other sociodemographic factors for women with ovarian cancer.

Data Sources. Obtained SEER-Medicare linked dataset for 4,233 non-Hispanic White, non-Hispanic African American, Hispanic of any race, and Non-Hispanic Asian women aged ≥ 66 years old diagnosed with ovarian cancer during 2000–2002 from 17 SEER registries. Physician specialty was identified by linking data to the AMA master file using Unique Physician Identification Numbers.

Study Design. Retrospective claims data analysis for 1999–2006. Logistic regression models were used to analyze the association between GO utilization and race/ethnicity in the initial, continuing, and final phases of care.

Principal Findings. GO use decreased from the initial to final phase of care (51.4–28.8 percent). No racial/ethnic differences were found overall and by phase of cancer care. Women >70 years old and those with unstaged disease were less likely to receive GO care compared to their counterparts. GO use was lower in some SEER registries compared to the Atlanta registry.

Conclusions. GO use for the initial ovarian cancer treatment or for longer term care was low but not different across racial/ethnic groups. Future research should identify factors that affect GO utilization and understand why use of these specialists remains low.

Key Words. Disparities, ovarian cancer, gynecologic oncologists, utilization

One of the most lethal cancers for women in the United States is ovarian cancer. Although it accounts for only 3 percent of all cancers, it is the fifth most common cause of death among women after lung, breast, colorectal, and pancreatic cancer (American Cancer Society 2010). Treatment for ovarian cancer includes surgery, chemotherapy, and radiation therapy; in many instances, two or even all of the treatments are recommended (American Cancer Society 2009). In addition, appropriate staging is important to plan

follow-up treatment, that is, chemotherapy and radiation, and debulking to surgically remove as much of the tumor as possible. Surgery is usually followed by chemotherapy, which is important to increase the chance of killing residual tumor cells, and thus improving survival (National Cancer Institute 2010a).

Another key component of quality of care for women with ovarian cancer is the care delivered by gynecologic oncologists (GOs). At any stage of disease, patients whose surgery was performed by GOs have been shown to have optimal debulking, smaller residual tumors, and higher survival rates than patients operated on by obstetric gynecologists or general surgeons (Eisenkop et al. 1992; Mayer et al. 1992; Nguyen et al. 1993; Junor, Hole, and Gillis 1994; Kehoe et al. 1994; Woodman et al. 1997; Junor et al. 1999; Carney et al. 2002; Elit et al. 2002; Chan et al. 2007; Vernooij et al. 2009). In addition, GOs provide comprehensive management of ovarian cancer and thus provide continuity of care that is important for women with this disease (Elit et al. 2010). The 2011 Clinical Practice Guidelines for Oncology by the National Comprehensive Cancer Network (NCCN) recommend that GOs should provide the primary assessment, debulking, and follow-up care for women with ovarian cancer (NCCN Clinical Practice Guidelines in Oncology 2011).

Despite these national guidelines, not all women diagnosed with ovarian cancer receive care from GOs. Non-Hispanic African American women may be at higher risk of not receiving this care compared to non-Hispanic white women. This may contribute to non-Hispanic African Americans having higher mortality rates despite having lower incidence of ovarian cancer than non-Hispanic white women (Barnholtz-Sloan et al. 2002; Altekruse et al. 2010). Moreover, previous studies have reported that non-Hispanic African American women are diagnosed at later stages of ovarian cancer and are less likely to receive appropriate treatment (Barnholtz-Sloan et al. 2002; Chan et al. 2008). Furthermore, studies in other areas, such as pancreatic cancer, neurology, and cardiovascular disease, documented that non-Hispanic

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African Americans and other minorities are less likely than non-Hispanic whites to be treated by specialists (McGowan et al. 1985; Kogan, Kotelchuck, and Johnson 1993; Blustein and Weiss 1998; Murphy et al. 2009). In addition, disparities in health care utilization exist by age, education, income, health insurance, English language proficiency, and rural/urban residence (Agency for Healthcare Research and Quality 2010), and it may also exist in the use of GOs among ovarian cancer patients.

We currently do not know whether disparities exist in utilization of GO care. The objective of this study was to examine the utilization of GO specialists across sociodemographic variables and, in particular, to test the hypothesis that non-Hispanic African American women were less likely to receive care from a GO compared to non-Hispanic white women. In addition, since GOs provide comprehensive care to women with ovarian cancer, we investigated the utilization of GOs in the different phases of care, that is, the study evaluated the use of GOs not only for initial ovarian cancer treatment but also for longer term care.

METHODS

The study was a retrospective analysis of the Surveillance Epidemiology and End Results (SEER)—Medicare linked dataset for women aged 66 years and older, diagnosed with ovarian cancer during the period 2000–2002 in 17 SEER registries (Atlanta, Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco, Seattle, Utah, Los Angeles, San Jose, the Arizona Indians, rural Georgia, Greater California, Kentucky, Louisiana, and New Jersey) (National Cancer Institute 2011). These registries capture about 97 percent of all incident cancer cases in the mentioned regions and represent 26 percent of the US population (Zippin, Lum, and Hankey 1995; Anderson et al. 2010; Wasif et al. 2010).

Non-Hispanic white, non-Hispanic African American, Hispanic of any race, and non-Hispanic Asian women were included in the study. We excluded women of other race/ethnicity (Native Americans, Pacific Islanders, and multiracial) diagnosed with ovarian cancer during the same period because of low numbers ($n = 26$). To include only women whose Medicare claims data were available, we included women continuously enrolled in Medicare Part A and Part B during the follow-up period and not enrolled in managed care plans.

Medical Care and Physician Specialty

Medicare claims included information on care received in hospitals, skilled nursing and outpatient facilities, physicians' offices, and home health and hospice providers for the years 1999–2006 (National Cancer Institute 2010b). The specialty of the performing physician was identified linking these data to the American Medical Association physician master file using Unique Physician Identification Numbers (UPINs). Physicians were classified as GO and other.

Analysis

Three phases of care were identified for each woman (Brown et al. 2002; Yabroff et al. 2008). The *initial phase* included the 12 months after diagnosis, including the diagnosis month; the *final phase* included the last 12 months of life, including the month of death; and the *continuing phase* included any time in between initial and final phases. If a woman lived less than 24 months, the last 12 months were assigned to the final phase and the remaining to the initial phase. Binary variables were created to indicate whether care was received from GOs over the follow-up period (overall) and in each phase of care. A woman was considered to have had GO care if she had at least one claim indicating a GO performing physician. We also examined the number of GO visits per month over the follow-up period. In addition, we examined use of GOs for women who survived through the follow-up period, for those who died during the follow-up, but lived more than 24 months, and for those who died within 24 months of diagnosis.

We examined the association between GO care and race in bivariate and multivariable analyses. Chi-square analyses were conducted to identify significant difference across minority groups. Pairwise comparisons were performed using ANOVA tests with the Tukey-Kramer method to adjust for multiple comparisons (Westfall et al. 1999; Littell, Stroup, and Freund 2002). The Behavioral Model for Health Services Utilization was used as a guide to identify factors that may confound the association (Aday and Andersen 2005). On the basis of the model, we assumed that the utilization of GO care was a function of predisposing (age at diagnosis, marital status, English-speaking ability, and education), need (stage of cancer and comorbidities), and enabling (income, rural status, and SEER registry) factors. These factors affect access to care, and thus access to GO care, and have been shown to vary across races. For example, non-Hispanic African

American women are more likely to be single than non-Hispanic white women (Current Population Survey 2008), are diagnosed at later stages of disease (Barnholtz-Sloan et al. 2002; Chan et al. 2008), have more comorbid conditions (Allard and Maxwell 2009), have lower education and per capita income (US Census Bureau 2010, 2011b), and are more likely to reside in urban areas (Kahn et al. 1994; Williams and Collins 2001). Non-Hispanic Asians are less likely to speak English very well (US Census Bureau 2003b), have higher education (US Census Bureau 2003a) and income (US Census Bureau 2011a), and are more likely to live in urban areas (US Census Bureau 2002) than whites. Similarly, Hispanics of any race had lower household incomes and education than whites (US Census Bureau 2007). In addition, previous cancer studies reported that appropriate care declined in older age groups (75–84 and ≥ 85 years); hence, we categorized age at diagnosis as 66–69, 70–74, 75–79, 80–84, and ≥ 85 years (Newschaffer et al. 1996; Du et al. 2003). Stage of cancer (I, II, III, IV, and unstaged) was defined according to the American Joint Commission on Cancer staging. Comorbidities were those included in the Charlson comorbidity index and were identified in the year before diagnosis (Klabunde et al. 2000). We then identified women with 0, 1–2, or more than 2 comorbid conditions. English-speaking ability, education, and income status were measured at the Census Tract level using data from the 2000 Census. On the basis of the 75th percentile value of these variables in our selected group of women, we defined women as being from:

1. Lower English-Speaking Census Tracts, if they lived in Census Tracts where 5.7 percent or more of the population did not speak English well or did not speak English at all;
2. Lower Education Census Tracts, if they lived in Census Tracts where more than 34.4 percent of the population aged 25 years and older had a high school degree or less; and
3. Higher Income Census Tracts, if they lived in Census Tracts where median income was \$61,486 or higher.

In addition, we included a dummy variable for each SEER registry where the case of ovarian cancer was identified to further control for the regional variation in access to care (Fairfield et al. 2010). Three of the registries (Hawaii, Arizona Indians, and Rural Georgia) had only a few women with ovarian cancer and were categorized as “other.”

RESULTS

A total of 4,233 women were included in this study, of whom 3,593 (84.9 percent) died in the follow-up period. The mean age at diagnosis was 77.3 years overall (SD 7.24), 77.4 years for non-Hispanic white and non-Hispanic African American women, 75.9 years for Hispanic women of any race, and 75.6 years for non-Hispanic Asian women. The difference between the age of non-Hispanic white and Hispanic women of any race was significant ($p = .028$). Moreover, the age at diagnosis was 80 years and older for about 37.6 percent of white, 38.0 percent of non-Hispanic African American, 30.7 percent of Hispanics of any race, and 26.6 percent of non-Hispanic Asian women (Table 1). The majority of women were diagnosed with stage III and IV disease (68.5 percent), and about 15 percent were not staged or the stage was missing. More than 63 percent women across all the racial/ethnic groups reported at least one comorbid condition, with almost a quarter reporting more than 2 for a maximum of 13 comorbid conditions. Overall, 57 percent of women were not married, but non-Hispanic African Americans were more likely to be unmarried (76.4 percent). Non-Hispanic African American women lived mainly in urban areas with lower incomes, whereas non-Hispanic Asians lived in Census tracts with higher incomes. Moreover, Hispanics of any race and Non-Hispanic Asians lived in Census tracts with higher education with a large proportion of the population who did not speak English well or did not speak English at all (Table 1).

Overall, 42.1 percent of the women across all age groups used GO services at any time and non-Hispanic African American women used them the least (38.7 percent). The overall and pairwise comparisons, however, were not statistically significant (Table 2). The mean number of GO visits was 4.5 over the follow-up and 0.32 per month (SD = 0.99). Hispanic women of any race had the highest number of visits per month (0.48, SD = 1.30), followed by non-Hispanic Asian women (0.36, SD = 0.87), non-Hispanic African Americans (0.33, SD = 0.95), and non-Hispanic white women (0.31, SD = 0.98). Only the difference between Hispanics of any race and non-Hispanic white women approached statistical significance ($p = .11$). Among women with at least one visit, the mean was 0.91 visits per month (SD = 1.52), 1.25 for Hispanic of any race, 0.96 for non-Hispanic African American, 0.89 for non-Hispanic white, and 0.87 for non-Hispanic Asian women.

About 51 percent of women used the services of GOs in the initial phase, 42 percent in the continuing phase, and 29 percent in the final phase (Table 2).

Table 1: Characteristics of Women Aged 66 Years and Older, Diagnosed with Ovarian Cancer in Surveillance Epidemiology and End Results (SEER) Registries in 2000–2002 (SEER-Medicare Linked Dataset)

	Race/Ethnicity					
		Non-Hispanic	Non-Hispanic	Hispanic of	Non-Hispanic	
Variables	All	White	African	Any Race	Asian	p [§]
	4,233	3,639	271	199	124	
Predisposing factors						
Age at diagnosis						
66–69	16.8	16.5	14.4	21.6	25.0	.02
70–74	22.2	21.7	27.3	24.1	25.0	
75–79	23.9	24.3	20.3	23.6	23.4	
80–84	19.5	19.7	18.8	19.6	16.1	
≥ 85	17.4	17.9	19.2	11.1	10.5	
Marital status						
Married	37.1	38.0	23.6	36.7	41.9	<.0001
Unmarried	62.8	62.0	76.4	63.3	58.1	
Language*						
English speaking	74.3	77.6	79.3	37.2	25.0	<.0001
Lower English speaking	24.6	21.1	20.7	61.3	75.0	
Education [†]						
Higher education	73.8	72.5	72.3	88.4	90.3	<.0001
Lower education	25.1	26.2	27.7	10.0	9.7	
Need factors						
Stage of cancer						
I	10.1	10.2	9.2	9.2	—	.14
II	6.3	6.2	8.9	6.0	—	
III	37.3	38.1	26.9	37.2	35.5	
IV	31.2	30.7	38.0	31.2	33.1	
Unstaged	15.0	14.8	17.0	16.1	15.3	
Comorbidities						
0	34.4	34.9	28.4	36.7	29.8	.001
1–2	42.3	42.9	38.7	35.7	42.7	
>2	23.3	22.2	32.8	27.6	27.4	
Enabling factors						
Income [‡]						
Lower income	74.0	72.4	94.8	83.4	59.7	<.0001
Higher income	24.8	26.3	4.8	15.1	40.3	
Residence						
Urban	90.0	89.2	94.8	93.0	—	<.0001
Rural	10.0	10.8	5.2	7.0	—	

Note. Percentages may not add up to 100 percent due to missing values. Some values are omitted due to small numbers.

*Lower English-Speaking Census tracts are those where more than 5.7 percent (75th percentile) of the population spoke English poorly or not at all.

[†]Lower Education Census Tracts are those where the percentage of population with less than high school is 34.4 or above (75th percentile).

[‡]Higher income indicates a Census Tract where the median household income is \$61,486 or above (75th percentile).

[§]*p* values obtained from chi-square tests.

Table 2: Percentage of Older Women with Ovarian Cancer Receiving Care from Gynecologic Oncologists (GOs), SEER-Medicare Linked Data 2000–2006 (*N* = 4,233)

	<i>Percent of Women Using GOs</i>					<i>p</i> [†]
	<i>All</i>	<i>Non-Hispanic White</i>	<i>Non-Hispanic African American</i>	<i>Hispanic of Any Race</i>	<i>Non-Hispanic Asian</i>	
GOs at any time	42.1	41.9	38.7	46.7	48.4	.17
Phases of care						
Initial phase	51.4	51.6	44.7	53.1	55.4	.46
Continuing phase	41.9	41.8	38.0	45.8	43.6	.79
Final phase	28.8	28.2	28.6	36.0	35.0	.09
GO in initial phase						
Women who survived through follow-up (<i>n</i> = 614)	57.0	57.4	53.8	53.3	57.1	.96
Women who died during follow-up but were alive for >24 months (<i>n</i> = 998)	53.7	53.6	48.1	61.0	56.2	.65
Women who died within 24 months from diagnosis* (<i>n</i> = 568)	41.4	41.8	32.3	40.0	50.0	.66
GO in final phase						
Women who died during follow-up but were alive for >24 months (<i>n</i> = 1,066)	33.7	33.4	31.6	38.3	37.1	.85
Women who died within 24 months from diagnosis (<i>n</i> = 2,494)	26.7	26.0	27.7	35.0	33.8	.09

Note. Phases of care are not mutually exclusive categories.
*Initial phase is less than 12 months.
[†]*p* values reported in this table were obtained from chi-square tests on overall racial/ethnic differences. None of the pairwise comparisons (ANOVA tests) were statistically significant (data not shown).

The involvement of GO decreased from the initial to final phase of care across all racial/ethnic groups. In the initial and continuing phases, the percentages of non-Hispanic African American women using GO care were lower than those of non-Hispanic White, Hispanic of any race, and non-Hispanic Asian

women, although differences were not statistically significant (overall and pair wise comparisons) (Table 2). The highest rates of GO use were in the initial phase of cancer among women who were alive through the follow-up period (57.0 percent), while the lowest were in the final phase of care among women who lived 24 months or less (26.7 percent) (Table 2). Moreover, across the racial/ethnic groups, use of GOs in the initial phase of cancer care was highest among Hispanic women who survived more than 24 months (61 percent), and lowest among non-Hispanic African American women who died within 24 months of diagnosis (32 percent) (Table 2). The difference in use of GOs for non-Hispanic African American women who survived through the follow-up period (53.8 percent) and those who died (32.3 percent) was larger than that for women of other groups.

Results from logistic regression were consistent with bivariate analyses. After adjusting for potential confounding factors, race/ethnicity was not associated with GO use overall and in each phase of care (Table 3). Significant associations were found for age, marital status, stage, comorbid conditions, higher income and rural Census tract, and being diagnosed in some specific registry areas. In particular, women older than 70 years were less likely to use GO care overall and in the last phase of care, while women 80 and older were less likely to have GO care in the initial and continuing phase compared to their counterparts. Married women were more likely to use GO care than their counterparts overall and in the final phase of care. Compared with women with stage I cancer, women with unstaged disease were less likely to use GO care. However, women with stage III cancer were more likely to have GO care in each of the three phases of care. Furthermore, women with more than two comorbid conditions were less likely to have overall GO care compared with women with no claims for comorbid conditions. Women in Census Tracts with higher incomes were more likely to use GO services compared to their counterparts except in the final phase of care, while women in rural areas were less likely to have overall GO care. Lastly, compared with women in the Atlanta registry, women in the Detroit, Iowa, Seattle, Utah, Greater California, and Louisiana registries were less likely to use GO services, while women in New Mexico were more likely to use GO overall and in the final phase of care.

DISCUSSION

The NCCN guidelines recommend that GOs perform the primary assessment, debulking, and follow-up care for women with ovarian cancer (NCCN

Table 3: Odds of Obtaining Care from Gynecologist Oncologists Overall and by Phase of Cancer, SEER-Medicare Linked Data 2000–2006

<i>Variable (Reference)</i>	<i>Phase of Cancer Care</i>		
	<i>Overall OR (95% CI) N = 4,181</i>	<i>Initial OR (95% CI) N = 2,159</i>	<i>Continuing OR (95% CI) N = 1,616</i>
			<i>Final OR (95% CI) N = 3,511</i>
Race/ethnicity (non-Hispanic white)			
Non-Hispanic African American	1.09 (0.82, 1.46)	0.94 (0.61–1.45)	1.00 (0.59, 1.69)
Hispanic of any race	1.02 (0.73, 1.43)	0.97 (0.61–1.54)	1.07 (0.62–1.82)
Non-Hispanic Asian	0.95 (0.62, 1.45)	0.70 (0.39–1.26)	0.55 (0.28, 1.11)
Predisposing factors			
Age at diagnosis (66–69)			
70–74	1.00 (0.81, 1.23)	0.94 (0.73, 1.21)	1.05 (0.79, 1.39)
75–79	0.69 (0.56, 0.85)*	0.79 (0.60, 1.03)	0.77 (0.57, 1.04)
80–84	0.42 (0.33, 0.52)*	0.64 (0.47, 0.87)*	0.59 (0.41, 0.86)*
≥ 85	0.22 (0.17, 0.29)*	0.46 (0.31, 0.69)*	0.43 (0.26, 0.74)*
Marital status (unmarried)			
Married	1.34 (1.16, 1.55)*	1.09 (0.90, 1.31)	1.15 (0.92, 1.43)
English-speaking status (English speaking)			
Lower English-speaking census tract	0.94 (0.79, 1.12)	0.90 (0.71, 1.14)	1.01 (0.77, 1.33)
Education (higher education)			
Lower education census tract	0.86 (0.71, 1.04)	1.03 (0.80, 1.32)	1.05 (0.78, 1.41)
Need factors			
Stage of cancer (I)			
II	0.99 (0.71, 1.38)	1.04 (0.71, 1.53)	1.31 (0.85, 2.01)
III	1.23 (0.98, 1.56)	1.43 (1.10, 1.87)*	1.39 (1.03, 1.88)*
IV	0.57 (0.45, 0.72)*	0.75 (0.56, 1.01)	0.87 (0.61, 1.23)

continued

Table 3. Continued

Variable (Reference)	Phase of Cancer Care			
	Overall OR (95% CI) N = 4,181	Initial OR (95% CI) N = 2,159	Continuing OR (95% CI) N = 1,616	Final OR (95% CI) N = 3,511
Unstaged	0.35 (0.26, 0.46)*	0.46 (0.31, 0.69)*	0.67 (0.42, 1.07)	0.61 (0.40, 0.92)*
Comorbidities (0)				
1-2	1.12 (0.96, 1.31)	1.21 (0.99, 1.48)	1.03 (0.82, 1.29)	1.05 (0.88, 1.26)
>2	0.82 (0.68, 0.995)*	1.02 (0.78, 1.35)	0.82 (0.59, 1.14)	0.87 (0.70, 1.09)
Enabling factors				
Income (lower income)				
Higher income census tract	1.19 (1.01, 1.42)*	1.44 (1.15, 1.80)*	1.44 (1.11, 1.87)*	1.21 (0.99, 1.47)
Region (urban)				
Rural	0.74 (0.56, 0.97)*	0.75 (0.52, 1.07)	0.75 (0.48, 1.18)	0.78 (0.57, 1.07)
SEER registry (Atlanta)				
San Francisco	1.02 (0.58, 1.78)	0.83 (0.38, 1.80)	0.40 (0.18, 0.90)*	0.93 (0.50, 1.75)
Connecticut	1.09 (0.67, 1.79)	0.85 (0.44, 1.64)	1.28 (0.63, 2.59)	1.27 (0.73, 2.20)
Detroit	0.36 (0.23, 0.59)*	0.14 (0.07, 0.28)*	0.35 (0.17, 0.70)*	0.66 (0.39, 1.14)
Iowa	0.53 (0.32, 0.89)*	0.36 (0.18, 0.70)*	0.43 (0.20, 0.91)*	0.60 (0.33, 1.08)
New Mexico	2.55 (1.30, 4.99)*	1.65 (0.63, 4.32)	2.78 (0.88, 8.74)	2.02 (1.01, 4.02)*
Seattle	0.59 (0.36, 0.96)*	0.39 (0.20, 0.74)*	0.24 (0.11, 0.49)*	0.63 (0.36, 1.10)
Utah	0.19 (0.10, 0.35)*	0.14 (0.07, 0.31)*	0.11 (0.04, 0.32)*	0.24 (0.11, 0.51)*
San Jose	0.95 (0.51, 1.79)	0.82 (0.36, 1.88)	0.35 (0.15, 0.83)*	0.45 (0.21, 0.98)*
Los Angeles	0.77 (0.47, 1.25)	0.55 (0.29, 1.04)	0.71 (0.35, 1.41)	0.86 (0.50, 1.49)
Greater California	0.42 (0.27, 0.65)*	0.34 (0.19, 0.60)*	0.38 (0.20, 0.70)*	0.41 (0.25, 0.67)*
Kentucky	0.97 (0.59, 1.57)	0.87 (0.45, 1.68)	1.06 (0.52, 2.16)	1.18 (0.68, 2.06)
Louisiana	0.43 (0.27, 0.70)*	0.29 (0.15, 0.54)*	0.37 (0.18, 0.76)*	0.56 (0.33, 0.97)*
New Jersey	0.94 (0.61, 1.45)	0.57 (0.32, 1.02)	0.62 (0.35, 1.21)	1.01 (0.62, 1.65)
Other	1.14 (0.64, 2.02)	1.23 (0.54, 2.83)	2.42 (0.94, 6.24)	1.18 (0.63, 2.23)
Observation not used	52	21	15	49

*Significant at $p \leq .05$.

Clinical Practice Guidelines in Oncology 2011) as these physicians specialize in the treatment of cancers related to the female reproductive organs. However, we found that the use of these specialists was modest with just over 40 percent of women 66 years and older having evidence of receiving care from them regardless of the time since diagnosis, and about 50 percent receiving this care in the period closer to diagnosis. GO's use was low for women of all races and ethnicities considered here, and decreased from the initial to the final phase of care.

The low rate of use of GOs is concerning. Gynecologic oncology care has been associated with accurate staging, an essential component for the appropriate management and treatment of ovarian cancer. In a retrospective analysis of medical records of 291 women with primary ovarian cancer, McGowan et al. found that 97 percent of the women operated by GO had complete staging evaluation intraoperatively. Only 52 percent and 35 percent of women operated by obstetric gynecologists or general surgeons, respectively, were adequately staged (McGowan et al. 1985). We also found that women who received care from GOs had a lower likelihood of being unstaged. Furthermore, in a retrospective study of 263 patients with stage IIIC and IVA ovarian cancer, treatment by GOs resulted in optimal debulking and overall better survival (Eisenkop et al. 1992). Our study was not designed to evaluate a causal relationship between survival and use of GOs; however, we found that women who survived through the follow-up period were more likely to have GO care in the initial phase of care. Furthermore, the difference in use of GOs among women who survived and who died within 24 months of diagnosis was especially noteworthy for non-Hispanic African American women. This finding warrants further investigation to assess if indeed the use of GOs may make a difference for the survival of non-Hispanic African American ovarian cancer patients.

Previous studies that used data from earlier periods reported lower rates of use of GOs (Nguyen et al. 1993; Earle et al. 2006). An analysis of Medicare claims data of women who underwent surgery for pathologically confirmed invasive ovarian cancer from 11 SEER registries between January 1, 1992 and December 31, 1999 found that only 33 percent received surgical care from GOs (Earle et al. 2006). Similarly, an analysis of the National Survey of Ovarian Carcinoma for the years 1983 and 1988 found that only 20.8 percent of women were cared for by GOs (Nguyen et al. 1993). The higher rates we found in our study may indicate a trend to higher use of GOs over time as more have been trained and awareness of the subspecialty has grown. Furthermore, we did not limit our analysis to episodes of surgery but considered

whether care was received in the months and years after diagnosis. Use of GOs was lower in the years after the first and in the final phase of care (i.e., the year before death) even among women who survived less than 24 months after the cancer diagnosis. However, this may not be surprising as women may be referred back to their physicians for follow-up care or for end-of-life care, especially if distance from the treatment center is a concern.

Racial disparities were previously documented in clinical staging and surgical treatment of gynecological cancers (Merrill, Merrill, and Mayer 2000; Shavers and Brown 2002; Merrill, Anderson, and Merrill 2010). However, contrary to our expectations, we did not find differences in use of GOs across racial/ethnic groups of older women. A reason may be that Non-Hispanic African Americans and other minorities are more likely to live in urban neighborhoods with proximity to urban teaching hospitals (Kahn et al. 1994; Williams and Collins 2001; Armstrong et al. 2005). These hospitals were found to be more likely to have practicing GOs with high surgery volumes (Schrage et al. 2006) as well as more likely to have better outcomes such as a lower risk adjusted mortality rate and shorter length of stay compared to non-teaching hospitals (Rosenthal et al. 1997). In our sample, the majority resided in urban areas; hence, minority women might have had access to the services of GOs similar to that of white women. Another reason for not observing differences in GO use across groups may be due to insurance status. In studies that found racial disparities in access to care, women were younger and their insurance status may have varied (Merrill, Merrill, and Mayer 2000; Merrill, Anderson, and Merrill 2010). In our sample, all women had Medicare coverage for their care, although there may still be differences in supplemental insurance.

We observed some regional variation in the use of GOs. Women in Detroit, Iowa, Greater California, and Louisiana were less likely to see a GO in all phases of care than women in Atlanta. Furthermore, rural and urban differences were observed, with women residing in rural areas less likely to use GO care overall compared to those residing in urban areas. This could be related to the availability of these specialists. A recent study reported that about 99 percent of GOs in the United States practice in metropolitan areas, a very small percentage in nonmetropolitan areas and there were no GOs available in rural counties. In addition, the eastern US regions had a higher percentage of practicing GOs than the West, and nearly half the incident ovarian cancer cases in the last 5 years occurred in counties where there were no practicing GOs (Stewart, Rim, and Richards 2011). In this study, we did not control for GO availability as this information was not available to us for the

2000–2002 period when women in our sample were diagnosed with ovarian cancer. However, using recent data from the Women's Cancer Network (Women's Cancer Network's 2011) on GOs in the SEER registry areas to derive the county-level number of GOs per 100,000 female population, we found that today, on average, women in our sample who were diagnosed in the Atlanta registry would have 1.13 GOs per 100,000, while women from Iowa, Detroit, Greater California, and Louisiana would have fewer than 0.35 GOs per 100,000 female population. Interestingly, women from New Mexico who would have on average 0.33 GOs per 100,000 were more likely to use GOs than women in Atlanta in the final phase of life, while women from Seattle who would have 1.04 GOs available were less likely to have GO care overall. Thus, if the distribution of GOs remained the same in the past decade, the availability of GOs may have explained in part the geographic variation in the use of these doctors. Further research is required to understand the factors underlying the regional availability, accessibility, and utilization of GOs.

Our results indicated that there were age differences in the use of GOs. Age-based differences in cancer care have been previously documented especially for diagnosis and treatment of breast cancer (Silliman et al. 1989; Newschaffer et al. 1996; Kearney et al. 2000; Siebel and Muss 2005). Moreover, a sample of oncology professionals (medical, nursing, and radiography staff) surveyed to assess their attitudes toward older patients had persistently negative attitudes toward these patients regardless of profession, gender, and work experience (Kearney et al. 2000). Together these studies indicate that age-based differences in cancer care exist and need attention from health care providers.

Our results should be considered in the light of some limitations. First, the population in the 17 SEER registries does not represent the entire US population. Moreover, since more than 89 percent of women in this study were urban dwellers, our sample may not represent women living in rural areas. The generalizability of our study is also limited to women enrolled in fee for service Medicare plans and not to women enrolled in managed care plans. Second, information on variables such as English-speaking ability, education, and income status were not available at the individual level: thus, we may not have adequately controlled for these factors. Furthermore, other factors such as women's health beliefs, emotional support, and having regular care or supplemental insurance that might affect the association between race and utilization of GO services were not included in the analyses.

In conclusion, we found that about 60 percent of minority and nonminority older women diagnosed with ovarian cancer do not receive care from

GOs. The low use of this specialist among women 75 years or older is of concern. Women across all ages and races need to be aware that services of GOs are beneficial in the care of ovarian cancer. Future studies should seek to understand why use of GOs is low, and what may be done to assure that all women diagnosed with ovarian cancer have access to the care most beneficial to them.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.