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Endometrial cancer in morbidly obese women: Do racial disparities affect surgical or survival outcomes?

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Abstract

Objective—Endometrial cancer mortality disproportionately affects black women and whether greater prevalence of obesity plays a role in this disparity is unknown. We examine the effect of race on post-surgical complications, length of stay, and mortality specifically in a morbidly obese population.

Methods—Black and white women with endometrial cancer diagnosed from 1996 to 2012 were identified from the University Pathology Group database in Detroit, Michigan, and records were retrospectively reviewed to obtain clinicopathological, demographic, and surgical information. Analysis was limited to those with a body mass index of 40 kg/m² or greater. Differences in the distribution of variables by race were assessed by chi-squared tests and *t*-tests. Kaplan–Meier and Cox regression analyses were performed to examine factors associated with mortality.

Results—97 white and 89 black morbidly obese women were included in this analysis. Black women were more likely to have type II tumors (33.7% versus 15.5% of white women, *p*-value = 0.003). Hypertension was more prevalent in black women (76.4% versus 58.8%, *p*-value = 0.009), and they had longer hospital stays after surgery despite similar rates of open vs minimally invasive procedures and lymph node dissection (mean days = 5.4) compared to whites (mean days = 3.5, *p*-value = 0.036). Wound infection was the most common complication (16.5% in whites and 14.4% in blacks, *p*-value = 0.888). Blacks were more likely to suffer other complications, but overall the proportions did not differ by race. In univariate analyses, black women had higher risk of endometrial cancer-related death (*p*-value = 0.090). No racial differences were noted in adjusted survival analyses.

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Conflict of interest

The authors of this manuscript report no conflicts of interest.

Conclusion—A more complete investigation, incorporating socio-demographic factors, is warranted to understand the effects of morbid obesity and race on endometrial cancer.

Keywords

Endometrial carcinoma; Morbid obesity; Race/ethnicity

Introduction

More than 8100 women will die from endometrial cancer in 2013, making it the 8th leading cause of cancer-related death among women in the United States [1]. Endometrial cancer mortality disproportionately affects black women, as they are 2.5 times more likely to die than their white counterparts [2]. Various institution and population-based studies have consistently shown that African-American women are more likely to be diagnosed with more aggressive histological subtypes and later-stage disease, yet the survival disparity exists across every stage and subtype [3]. There are likely many elements contributing to this disparity (reviewed in [4]), and identification of potentially modifiable factors is critical to reduce this survival disparity.

Obesity, a strong risk factor for development of endometrial cancer, may also play a role in survival. Obesity (defined as having a body mass index $>30 \text{ kg m}^{-2}$) is more prevalent in African-American populations than in non-Hispanic white populations, and until recently, the rates have been increasing in the United States [5]. Morbid obesity, defined as having a body mass index $\geq 40 \text{ kg m}^{-2}$, has increased by 70% between 2000 and 2010 and is more common among African-Americans, particularly women [6]. This is reflected in a hospital-based study, with 47% of African-American patients reported to be morbidly obese versus 33% of the white patients [7]. The risk of dying from endometrial cancer is 6 times greater in this population compared to those with healthy BMI (RR = 6.25, 95% CI: 3.75, 10.42), twice as high as the risk seen for those who are obese (defined as BMI = 30–39.9 kg/m²) [8].

Recent work that has focused on the morbidly obese population with respect to endometrial cancer has shown that total laparoscopic hysterectomy and robotic surgery are feasible and result in fewer perioperative complications [9–11], although these results may not be valid for extremely or “super” obese (BMI $\geq 50 \text{ kg m}^{-2}$) women [12]. Length of hospital stay has not been reported to vary by BMI for some hospitals [7] but has for others [12], with longer stays associated with increasing BMI. Similarly, the association between BMI and survival is also unclear, depending on various endpoints and BMI classifications. The confounding effect of BMI on the association between race and endometrial cancer survival is well-described [13]. In this study we examine the effect of race on comorbidities, post-surgical complications, length of stay, and endometrial cancer survival in a smaller but specific morbidly obese population.

Methods

Black and white women who received surgical treatment for endometrial cancer between 1996 and 2012 were identified from a database from the Wayne State University/Karmanos Cancer Institute, maintained by the University Pathology Group (UPG) in Detroit,

Michigan. After local Institutional Review Board approval, a retrospective record review was conducted to obtain clinical, demographic, treatment, and surgical outcome information for each case, including height and weight measurements at the time of surgery. Body mass index (BMI) was calculated from these values, and the analysis was limited to morbidly obese patients, defined by a BMI of 40 kg/m² or greater. Treatment and survival information from the medical records was supplemented by linking case information to the Metropolitan Detroit Cancer Surveillance System (MDCSS), a member of the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program.

Variables abstracted from the medical record include age at surgery, FIGO grade, FIGO stage, histologic type (defined as either type I or type II) [14], cervical involvement, depth of myometrial invasion, lymphovascular space invasion, open versus minimally invasive surgery, lymph node involvement, and the number of lymph nodes dissected. The type I endometrial cancers commonly referred to as the endometrioid type, included histologically, those tumors which can be adenocarcinoma with or without squamous differentiation and often are well differentiated. Type II endometrial cancer, or nonendometrioid tumors, encompassed the remaining of cases. The common histology of this subtype was uterine serous carcinoma (USC). All Hematoxylin and Eosin slides were reviewed by gynecologic pathologists at the Wayne State University to confirm the histology and grade of tumor. A clinical history of other comorbid conditions, hypertension and diabetes, post-surgical complications, and days admitted to the hospital (calculated as date of surgery to date of discharge) were also recorded. The postsurgical complications were defined as any complication occurring in the immediate post-operative period from the date of surgery to the date of discharge from the hospital. Post-surgical complications evaluated included wound infection, vaginal or pelvic infection, sepsis or other wide-spread infection, anemia or hemorrhage, thromboembolism, congestive heart failure or myocardial infarction, acute renal failure or insufficiency, and other pulmonary or gastrointestinal complications. These complications were assessed individually and as a summary count (none, 1, or 2 or more).

Differences in the distribution of clinical and demographic variables by race were assessed by chi-squared tests for categorical variables and *t*-tests for continuous variables. For categorical variables with less than 5 women in a category, Fisher's exact test was reported. Racial differences in overall survival, endometrial cancer-related survival, and other causes of death (death due to all causes minus the endometrial cancer-related deaths) were evaluated using Kaplan–Meier curves and log rank tests. Cox proportional hazard models evaluated the effect of race on survival, using 3 models. The first model adjusted for clinical variables: age, histology type, FIGO stage, and FIGO grade. The second model included the previous variables and included surgery type, chemotherapy, and radiation. The full model included the clinical and treatment variables listed above along with comorbidities (BMI, hypertension, diabetes) and the occurrence of any surgical complication. Adjusted hazard ratios and 95% confidence intervals were estimated using proportional hazard models to evaluate risk of death. All analyses were completed using SAS statistical software, version 9.2 (SAS Institute Inc., Cary, NC).

Results

A total of 186 morbidly obese women (97 white women and 89 black women) with endometrial cancer were identified for this analysis. Eighty-two white women were identified with endometrioid carcinoma, 2 with mucinous carcinoma, 5 with mixed carcinoma (serous and endometrioid), 8 with serous carcinoma and 1 with undifferentiated carcinoma. However in the African-American population, 57 women had endometrioid carcinoma, 6 had mixed carcinoma (serous and endometrioid), 1 had mucinous carcinoma, 16 had serous carcinoma, 2 had clear cell carcinoma and 2 were identified with endometrial intraepithelial carcinoma (Table 1). Black women were more likely to be diagnosed with type II tumors (33.7% of black women versus 15.5% of white women, p -value = 0.003) and had higher grade tumors (FIGO grade 3; 46.1% of black women versus 20.6% of white women, p -value < .001). Other clinical variables, including age at surgery, FIGO stage, cervical involvement, depth of myometrial invasion, lymphovascular space invasion (LVI), and lymph node involvement, were similar between the groups. Similarly, the percent of open vs minimally invasive procedures, percent undergoing lymph node dissection, mean number of pelvic and aortic lymph nodes collected when done, and post surgical treatment with radiation and chemotherapy were similar by race.

The mean BMI in this morbidly obese population was slightly higher for black women (49.2 kg/m²) than for white women (47.0 kg/m², p -value = 0.09). Black women were more likely to be hypertensive than white women (76.4% versus 58.8%, respectively, p -value = 0.009), but rates of diabetes were similar (p -value = 0.636). On average, black women had longer hospital stays after surgery (mean days = 5.4) compared to white women (mean days = 3.5, p -value = 0.036). Wound infection was the most common complication in both white and black women (16.5% and 14.4%, respectively, p -value = 0.888). Black women were more likely to suffer other complications, but overall the number and type of post-surgical complications did not differ between the groups (Table 2).

In univariate analyses, black women had a non-significant higher risk of death, both from any cause (log rank p -value = 0.092) and from endometrial cancer-related (log rank p -value = 0.090) (Figs. 1a and b). There was no association between race and other causes of death (log rank p -value = 0.53) (Fig. 1c). In multivariable adjusted models, race was not associated with death from any cause after adjusting for clinical variables (HR = 1.19, 95% CI: 0.55, 2.54), clinical and treatment variables (HR = 1.35, 95% CI: 0.62, 2.95) or all potential predictive variables (HR = 0.85, 95% CI: 0.36, 2.03) (Table 3). Findings were similar for death from endometrial cancer.

Discussion

We report clinical outcomes for morbidly obese black and white women with endometrial cancer, with a focus on gaining insight to reasons for the racial disparity consistently reported in population-based analyses of disease mortality. In our population from a large, urban medical center, race is not a significant predictor of survival after adjustment for other clinical factors. We note that the excess of type II cancers persists in morbidly obese black women, with over one third of the cancers diagnosed as type II in black women, double the

number in white women. Higher grade, which is strongly associated with type, was also more common in black women. Other clinical factors, such as lymph node involvement, cervical involvement, myometrial invasion, or surgery type, did not differ by race. A recent pooled analysis comparing type I and type II cancers reported that morbid obesity increased risk of type I cancers 7-fold (OR = 7.14, 95% CI: 6.33, 8.06) compared to a 3-fold increase for type II tumors (OR = 3.11, 95% CI: 2.19, 4.44) [15]. Thus, while obesity is more strongly associated with estrogen-driven type I tumors, the prevalence of the aggressive, non-estrogen dependent type II tumors is still high in the morbidly obese population, particularly for black women. This suggests that biological or environmental factors other than the preponderance of obesity in black women are responsible for the differences in histologic types between white and black women.

Another potential explanation for the mortality difference seen nationally between black and white women is differential rates of perioperative complications. We report here the first estimates of post-surgical complication rates for morbidly obese black women. While black women were somewhat more likely to have at least one post-surgical complication compared to white women, we did not find a statistically significant difference in complications between the racial groups, either by number or specific type. Giugale et al. report complications in 275 morbidly obese women and had similar rates of wound infection (17.5%) compared to our population [12]. Myocardial infarction rates post-surgery were low and similar to reports from Santoso et al., whose population was not restricted to morbidly obese women [7]. Their overall population was only 29% black, and slightly older, except for their morbidly obese patients (mean age = 57.9), who were similar in age to our population. This report also focused on only major complications and did not stratify based on BMI, so it is difficult to compare our findings in detail. Given that rates of comorbidities are higher among black women, additional work should be done to determine whether post-surgical complications differ between black and white women in a population-based sample.

In our study, mortality rates were similar for both groups, but black women were more likely to be hospitalized post-surgery for a significantly longer period of time, despite similar surgical and staging procedures. Studies examining the effect of BMI on days of hospitalization have not reported significantly longer stays for morbidly obese women [7,16–18], but this is the first time a difference in days hospitalized after endometrial cancer surgery has been examined by race in a morbidly obese population. Using administrative databases (i.e. statewide hospital discharge data, SEER-Medicare), others have reported black patients having greater days of post-surgery hospitalization after colorectal, brain and ovarian cancer surgeries compared to their white counterparts [19–21], yet none of these studies considered BMI. Thus, it is reasonable to believe our findings would be valid for a wider population and may not be restricted to the morbidly obese. Elucidating the underlying reasons for this disparity, and whether it influences disease survival, will require the integration of detailed health histories, measures of social support, medical records, and active follow-up.

There are limitations to our study which should be considered. First, our focus for data abstraction was on post-surgical complications, and we did not collect details on operating time or comorbidities prior to surgery with the exception of hypertension and diabetes. Thus,

our ability to compare findings to other studies that did gather this information was limited, although the majority of these studies were not specific to morbidly obese patients. Second, our ability to examine survival was somewhat limited by the low number of deaths in this population despite adequate follow-up time. Lastly, we did not have the power to examine “super obese” women separately (BMI ≥ 50), who have been shown to be at greatest risk for surgical complications and mortality, despite younger ages at diagnosis [12]. Fifty seven women in our population were super obese, and the proportion did not vary by race (p -value = 0.24). Over the past 25 years, the rates of super obesity in the United States population have increased 10-fold and represent an understudied clinical population [6].

In conclusion, we report no significant association between race and survival after endometrial cancer in a hospital-based cohort of morbidly obese women. It should be noted that the excess of type II cancers reported nationally for all black women persists, representing over one third of the cancers diagnosed in morbidly obese black women in this cohort. Even with the high prevalence of hypertension in our black patients, overall there were no racial differences in post-surgical complications. Despite the similar complication rates and similar rate of open versus minimally invasive procedures, there was a significant difference in the number of days of hospitalization after surgery, with black women staying an average of 2 days longer than white women. Reasons for this should be elucidated in a larger, population-based study that can incorporate socioeconomic and social support factors along with clinical and surgical outcomes in this growing population of morbidly obese women.

References

1. American Cancer Society. Cancer Facts and Figures 2013. Atlanta: American Cancer Society; 2013.
2. Jemal A, Siegel R, Xu J, Ward E. Cancer statistics, 2010. *CA Cancer J Clin.* 2010; 60(5):277–300. [Epub 2010/07/09]. [PubMed: 20610543]
3. Wright JD, Fiorelli J, Schiff PB, Burke WM, Kansler AL, Cohen CJ, et al. Racial disparities for uterine corpus tumors: changes in clinical characteristics and treatment over time. *Cancer.* 2009; 115(6):1276–1285. [Epub 2009/02/11]. [PubMed: 19204905]
4. Long B, Liu FW, Bristow RE. Disparities in uterine cancer epidemiology, treatment, and survival among African Americans in the United States. *Gynecol Oncol.* 2013; 130(3):652–659. [Epub 2013/05/28]. [PubMed: 23707671]
5. Finucane MM, Stevens GA, Cowan MJ, Danaei G, Lin JK, Paciorek CJ, et al. National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *Lancet.* 2011; 377(9765):557–567. [PubMed: 21295846]
6. Sturm R, Hattori A. Morbid obesity rates continue to rise rapidly in the United States. *Int J Obes (Lond).* 2013; 37(6):889–891. [Epub 2012/09/19]. [PubMed: 22986681]
7. Santoso JT, Barton G, Riedley-Malone S, Wan JY. Obesity and perioperative outcomes in endometrial cancer surgery. *Arch Gynecol Obstet.* 2012; 285(4):1139–1144. [Epub 2011/10/25]. [PubMed: 22020677]
8. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med.* 2003; 348(17):1625–1638. [PubMed: 12711737]
9. Fader AN, Michener CM, Frasure HE, Giannios N, Belinson JL, Zanutti KM. Total laparoscopic hysterectomy versus laparoscopic-assisted vaginal hysterectomy in endometrial cancer: surgical and survival outcomes. *J Minim Invasive Gynecol.* 2009; 16(3):333–339. [Epub 2009/05/09]. [PubMed: 19423064]

10. Lau S, Buzaglo K, Vaknin Z, Brin S, Kaufer R, Drummond N, et al. Relationship between body mass index and robotic surgery outcomes of women diagnosed with endometrial cancer. *Int J Gynecol Cancer*. 2011; 21(4):722–729. [Epub 2011/05/07]. [PubMed: 21546874]
11. Farthing A, Chatterjee J, Joglekar-Pai P, Dorney E, Ghaem-Maghami S. Total laparoscopic hysterectomy for early stage endometrial cancer in obese and morbidly obese women. *J Obstet Gynaecol*. 2012; 32(6):580–584. [Epub 2012/07/12]. [PubMed: 22779967]
12. Giugale LE, Di Santo N, Smolkin ME, Havrilesky LJ, Modesitt SC. Beyond mere obesity: effect of increasing obesity classifications on hysterectomy outcomes for uterine cancer/hyperplasia. *Gynecol Oncol*. 2012; 127(2):326–331. [Epub 2012/08/23]. [PubMed: 22910692]
13. von Gruenigen VE, Tian C, Frasure H, Waggoner S, Keys H, Barakat RR. Treatment effects, disease recurrence, and survival in obese women with early endometrial carcinoma: a Gynecologic Oncology Group study. *Cancer*. 2006; 107(12):2786–2791. [Epub 2006/11/11]. [PubMed: 17096437]
14. Tavassoli, FA. DPE. World Health Organization Classification of Tumours. Pathology and Genetics of Tumours of the Breast and Female Genital Organs. Lyon: IARC Press; 2003.
15. Setiawan VW, Yang HP, Pike MC, McCann SE, Yu H, Xiang YB, et al. Type I and II endometrial cancers: have they different risk factors? *J Clin Oncol*. 2013; 31(20):2607–2618. [Epub 2013/06/05]. [PubMed: 23733771]
16. Erkanli S, Kayaselcuk F, Bagis T, Kuscü E. Impact of morbid obesity in surgical management of endometrial cancer: surgical morbidity, clinical and pathological aspects. *Eur J Gynaecol Oncol*. 2006; 27(4):401–404. [Epub 2006/10/03]. [PubMed: 17009636]
17. Everett E, Tamimi H, Greer B, Swisher E, Paley P, Mandel L, et al. The effect of body mass index on clinical/pathologic features, surgical morbidity, and outcome in patients with endometrial cancer. *Gynecol Oncol*. 2003; 90(1):150–157. [Epub 2003/06/25]. [PubMed: 12821356]
18. Pavelka JC, Ben-Shachar I, Fowler JM, Ramirez NC, Copeland LJ, Eaton LA, et al. Morbid obesity and endometrial cancer: surgical, clinical, and pathologic outcomes in surgically managed patients. *Gynecol Oncol*. 2004; 95(3):588–592. [Epub 2004/12/08]. [PubMed: 15581968]
19. Schneider EB, Haider AH, Hyder O, Efron JE, Lidor AO, Pawlik TM. Assessing short and long-term outcomes among black vs white Medicare patients undergoing resection of colorectal cancer. *Am J Surg*. 2013; 205(4):402–408. [Epub 2013/02/05]. [PubMed: 23375764]
20. Mukherjee D, Patil CG, Todnem N, Ugiliweneza B, Nuno M, Kinsman M, et al. Racial disparities in Medicaid patients after brain tumor surgery. *J Clin Neurosci*. 2013; 20(1):57–61. [Epub 2012/10/23]. [PubMed: 23084348]
21. Brooks SE, Ahn J, Mullins CD, Baquet CR. Resources and use of the intensive care unit in patients who undergo surgery for ovarian carcinoma. *Cancer*. 2002; 95(7):1457–1462. [Epub 2002/09/19]. [PubMed: 12237914]

HIGHLIGHTS

- The excess of type II endometrial cancers among black women is present in a morbidly obese population.
- Race is not a significant predictor of survival after adjustment for clinical and treatment variables.
- Despite similar comorbidities, rates of open vs. minimally invasive procedures and lymph node dissection, black women have longer hospital stays following surgery for endometrial cancer compared to white women.

Fig. 1. Survival in months from endometrial cancer surgery, by race. 1a. All-cause mortality. 1b. Endometrial cancer-related mortality. 1c. Other cause mortality.

Table 1

Select clinical and demographic characteristics for morbidly obese women with endometrial cancer, by race.

	White (N = 97)		Black (N = 89)		p value*
	N	%	N	%	
Age at surgery					0.218
20-49	19	19.6%	20	22.5%	
50-59	39	40.2%	25	28.1%	
60+	39	40.2%	44	49.4%	
Mean (std)	56.8 (10.0)		56.9 (12.5)		0.970
FIGO grade					<.001
I	27	27.8%	23	25.8%	
II	47	48.5%	22	24.7%	
III	20	20.6%	41	46.1%	
Unknown	3	3.1%	3	3.4%	
FIGO stage					0.169
I	66	68.0%	59	66.3%	
II	12	12.4%	4	4.5%	
III / IV	12	12.4%	14	15.7%	
Unknown	7	7.2%	12	13.5%	
Histologic type					0.003
Type I	82	84.5%	58	65.2%	
Type II	15	15.5%	30	33.7%	
Unknown	0	0.0%	1	1.1%	
Cervical involvement					0.349
No	77	79.4%	75	84.3%	
Yes	18	18.6%	12	13.5%	
Unknown	2	2.1%	2	2.2%	
Depth of invasion					0.564
None to superficial	25	25.8%	30	33.7%	
Inner 1/2	44	45.4%	40	44.9%	
Outer 1/2	17	17.5%	11	12.4%	

	White (N = 97)		Black (N = 89)		p value*
	N	%	N	%	
Serosa	2	2.1%	3	3.4%	
Unknown	9	9.3%	5	5.6%	
LVI					0.855
No	66	68.0%	60	67.4%	
Yes	28	28.9%	27	30.3%	
Unknown	3	3.1%	2	2.2%	
Myometrium involvement					0.420
No	21	21.6%	24	27.0%	
Yes	75	77.3%	65	73.0%	
Unknown	1	1.0%	0	0.0%	
Lymph node involvement					0.945
No	49	50.5%	42	47.2%	
Yes	9	9.3%	8	9.0%	
Unknown	39	40.2%	39	43.8%	
Number of lymph nodes examined, mean (std)					
Pelvic	13.4 (11.3)		13.2 (10.4)		0.958
Aortic	2.5 (4.5)		2.5 (3.5)		0.954
Surgery type					0.506
Open	78	80.4%	68	76.4%	
Minimally invasive	19	19.6%	21	23.6%	
Chemotherapy					0.844
No	71	73.2%	64	71.9%	
Yes	26	26.8%	25	28.1%	
Radiation therapy					0.354
No	73	75.3%	72	80.9%	
Yes	24	24.7%	17	19.1%	
Vital status					0.181
Alive	83	85.6%	67	75.3%	
Deceased—endometrial cancer	7	7.2%	13	14.6%	

	White (N = 97)		Black (N = 89)		p value*
	N	%	N	%	
Deceased—other cause	7	7.2%	9	10.1%	
Mean survival months (std)		103.9 (4.3)		88.0 (.8)	

* p value calculations do not include unknown values.

Table 2

Comorbid conditions and post-surgical complications in morbidly obese endometrial cancer patients, by race.

	White		Black		p value*
	N	%	N	%	
Body mass index mean (std)	47.0 (6.5)		49.2 (10.4)		0.093
Hypertension					0.009
No	39	40.2%	20	22.5%	
Yes	57	58.8%	68	76.4%	
Unknown	1	1.0%	1	1.1%	
Diabetes					0.636
No	60	61.9%	52	58.4%	
Yes	36	37.1%	36	40.4%	
Unknown	1	1.0%	1	1.1%	
Days in hospital mean (std)	3.5 (2.3)		5.4 (7.1)		0.036
Complications					0.220
None	71	73.2%	55	56.7%	
1	20	20.6%	28	28.9%	
2+	6	6.2%	6	6.2%	
Wound infection					0.888
No	81	83.5%	75	77.3%	
Yes	16	16.5%	14	14.4%	
Vaginal or pelvic infection					0.428
No	95	97.9%	85	87.6%	
Yes	2	2.1%	4	4.1%	
Sepsis or other infection					0.999
No	95	97.9%	88	90.7%	
Yes	2	2.1%	1	1.0%	
Anemia or hemorrhage					0.428
No	95	97.9%	85	87.6%	
Yes	2	2.1%	4	4.1%	
Thromboembolism					0.272

	White		Black		p value*
	N	%	N	%	
No	96	99.0%	86	88.7%	0.108
Yes	1	1.0%	3	3.1%	
Heart failure or MI					0.711
No	97	100.0%	86	88.7%	
Yes	0	0.0%	3	3.1%	0.483
Pulmonary					
No	94	96.9%	85	87.6%	0.711
Yes	3	3.1%	4	4.1%	
Gastrointestinal					0.711
No	94	96.9%	84	86.6%	
Yes	3	3.1%	5	5.2%	0.711
Acute renal failure or insufficiency					
No	94	96.9%	85	87.6%	0.711
Yes	3	3.1%	4	4.1%	

* p value calculations do not include unknown values. For small cell size ($n < 5$) Fisher's exact test is reported.

Table 3

Proportional hazard estimates for black race associated with survival after surgery for endometrial cancer.

	Unadjusted		Adjusted for clinical variables			Adjusted for clinical and treatment variables			Full model		
	HR (95% CI)	p value	HR (95% CI)	p value		HR (95% CI)	p value		HR (95% CI)	p value	
Death from any cause	1.77 (0.90–3.46)	0.096	1.19 (0.55–2.54)	0.661		1.35 (0.62–2.95)	0.451		0.85 (0.36–2.03)	0.720	
Death from endometrial cancer	2.17 (0.87–5.44)	0.098	1.44 (0.50–4.17)	0.505		1.49 (0.49–4.51)	0.483		0.95 (0.26–3.52)	0.939	
Death from other causes	1.38 (0.51–3.71)	0.528	0.95 (0.31–2.92)	0.922		1.06 (0.33–3.40)	0.927		0.51 (0.14–1.82)	0.299	

Clinical variables include age, histology type, FIGO stage, and FIGO grade. Treatment variables include surgery type, chemotherapy, and radiation therapy. The full model includes all clinical and treatment variables along with BMI, hypertension, diabetes, and the occurrence of any surgical complication.