Association Between Marital Status and Racial Disparities in Esophageal Cancer Care

Alan Paniagua Cruz, BS¹; Karlie L. Haug, MD²; Lili Zhao, PhD³; and Rishindra M. Reddy, MD, FACS^{1,4}

QUESTION ASKED: What is the impact of marriage on racial disparities in receipt of esophageal cancer care?

SUMMARY ANSWER: Marital status differs significantly in Black and White patients with esophageal cancer and is associated with racial disparities in cancer care.

WHAT WE DID: We performed a secondary data analysis of patients with an esophageal cancer diagnosis between January 1, 2000, and December 31, 2013, from the Michigan cancer registry.

WHAT WE FOUND: We found that single Black patients were the group least likely to receive esophagectomy and most likely to refuse treatment. Marriage was associated with an increased likelihood of receiving surgery, with married Blacks having similar rates of esophagectomy when compared with married Whites.

BIAS, CONFOUNDING FACTORS: This study is based on a single-state, retrospective, administrative database, and our results may not be extrapolatable to other regions. Furthermore, our database did not include some important patient characteristics and outcomes, such as age, comorbidities, timing of treatment in relation to cancer diagnosis, and death.

REAL-LIFE IMPLICATIONS: Not only are single Black patients the group least likely to undergo esophagectomy and chemotherapy, they are also the most likely to refuse treatment. When taking care of these patients, oncologists should take into consideration the structural biases and socioeconomic circumstances that affect individuals from this patient group.

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abstract

PURPOSE This study was designed to examine the impact of marital status on racial disparities in esophageal cancer care.

PATIENTS AND METHODS We performed a secondary analysis of data collected from the state cancer registry maintained by the Michigan Department of Health and Human Services. We identified patients with an esophageal cancer diagnosis between January 1, 2000, and December 31, 2013. χ^2 test and logistics regression were used to analyze 6,809 patients who met our eligibility criteria. Statistical significance was defined as $P \leq .05$.

RESULTS Approximately 88.4% of our patients were White and 11.6% were Black. A significantly higher number of White patients were married when compared with Blacks (62.9% v 31.8%, respectively; $P < .0001$). There was no significant difference in cancer staging between the 2 groups ($P = .0671$). Married Blacks had similar rates of esophagectomy, chemotherapy, and radiation as married Whites. Both single groups had lower rates of esophagectomy and chemotherapy than married Whites, but single Blacks were the least likely to undergo esophagectomy. Single patients were more likely to refuse treatment.

CONCLUSION Marital status differs significantly in Black and White patients with esophageal cancer and may help explain racial disparities in cancer care. Further research is needed to explore reasons for care underutilization in single patients and whether these differences translate into clinical outcomes.

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INTRODUCTION

In 2019, there will be an estimated 17,650 new cases of esophageal cancer, making this the 18th most common malignancy in the United States. Esophageal cancer carries a high morbidity and mortality, with only 19.9% of patients surviving at 5 years.¹ More importantly, significant racial disparities exist in survival, with only 13.5% of Black patients with esophageal cancer alive at 5 years, compared with 21.5% of their White counterparts.²

Although racial disparities in survival may be partly explained by inherent differences in cancer characteristics (eg, tumor morphology, aggressiveness, location, stage at the time of diagnosis),³ the effect of sociodemographic factors, including marital status, needs further clarification. Prior studies have found associations between marital status and esophageal cancer survival.⁴⁻⁶ Using the SEER database,

2 separate studies found that married patients had higher overall and cancer-specific survival than unmarried patients.^{5,6} In contrast, a prospective population-based cohort study from Sweden found no significant differences in 5-year survival between married and unmarried patients.⁷ It is important to note that the Swedish study only compared patients who had received esophagectomy, whereas the other studies compared all patients with esophageal cancer.⁴⁻⁶ These results may imply that differences in survival between married and unmarried patients may be a result of receipt of treatment. Similarly, studies have found associations between lower use of esophagectomy in Black patients and racial disparities in esophageal cancer outcomes.⁸⁻¹¹ To date, the effect of marital status on racial disparities in esophageal cancer care has yet to be explored.

To further understand these issues, we conducted a study to see whether marital status impacted receipt of

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esophageal cancer care in Black and White patients using a large statewide tumor registry with a mixed patient population. We hypothesized that White patients would undergo esophagectomy at higher rates than Black patients and that unmarried Black patients would have the lowest rate of care.

PATIENTS AND METHODS

Patient Population and Study Design

We performed a secondary data analysis of data collected from the Michigan Cancer Surveillance Program (MCSP) maintained by the Michigan Department of Health and Human Services (MDHHS). The MCSP is Michigan's state cancer registry since 1985 and obtains new cancer case information from approximately 165 reporting facilities, including hospitals, physician offices, and laboratories. This study was approved by the University of Michigan Institutional Review Board.

Our study population consisted of individuals with an esophageal cancer diagnosis between January 1, 2000, and December 31, 2013. We obtained information on sex, race, marital status, insurance status, county of diagnosis, year of diagnosis, cancer morphology, cancer location, treatment type, and reason for no treatment. Marital status was categorized into married and single, which included patients who were single, separated, divorced, widowed, or in an unmarried or domestic partner relationship. We used the sixth edition of the American Joint Committee on Cancer staging manual to determine tumor stage. Counties were categorized as rural or urban based on the 2006 MDHHS classification. We excluded any patients who were missing cancer stage, sex, race, or a microscopically confirmed diagnosis, or who had a histologically confirmed lymphoma in the esophagus (Fig 1). There was a small minority of patients listed as Asian (0.13%), Native American (0.29%), or Hispanic (1.82%), and for this study, we felt that the limited number precluded a meaningful analysis; thus, we focused primarily on White and Black patients.

Statistical Analysis

Baseline patient and cancer characteristics were summarized with descriptive statistics, and differences were assessed using a χ^2 test. We used logistic regression to determine differences in receipt of esophagectomy, chemotherapy, and radiation. On multivariable analysis, we adjusted for the following potential confounding variables: sex, race, marital status, insurance status, county designation (urban v rural), year of diagnosis, cancer morphology, cancer location, and stage at diagnosis. Individuals with missing covariates were excluded from the multivariable model. All analyses were conducted using SAS, version 9.4 (SAS Institute, Cary, NC).

FIG 1. Flow diagram of exclusion criteria.

RESULTS

Patient Characteristics

In total, 6,809 patients with esophageal cancer met our eligibility criteria. The majority of these patients were White (88.4%), and a minority were Black (11.6%; Table 1). Approximately one fifth of the patients (20.9%) in this study were women. Black patients, compared with White patients, were almost half as likely to be married (31.9% v

TABLE 1. Baseline Patient and Cancer Characteristics for White and Black Patients

Characteristic	Race, No. of Patients (%)		Total No. of Patients (N = 6,809)	P
	White	Black		
Sex				< .0001
Male	4,827 (80.2)	559 (70.5)	5,386	
Female	1,189 (19.8)	234 (29.5)	1,423	
Marital status				< .0001
Married	3,786 (62.9)	252 (31.8)	4,038	
Single	1,970 (32.8)	500 (63.0)	2,470	
Unknown	260 (4.3)	41 (5.2)	301	
County				< .0001
Urban	4,277 (71.1)	772 (97.3)	5,049	
Rural	1,609 (26.7)	15 (1.9)	1,624	
Unknown	130 (2.2)	6 (0.8)	136	
Insurance				< .0001
Medicare	2,435 (40.5)	140 (17.7)	2,575	
Medicaid	170 (2.8)	32 (4.0)	202	
Private	917 (15.2)	62 (7.8)	979	
Other	522 (8.7)	36 (4.5)	558	
Uninsured	295 (4.9)	72 (9.1)	367	
Unknown	1,677 (27.9)	451 (56.9)	2,128	
Esophageal location				< .0001
Upper	356 (5.9)	113 (14.3)	469	
Middle	727 (12.1)	280 (35.3)	1,007	
Lower	4,139 (68.8)	270 (34.0)	4,409	
Unknown	794 (13.2)	130 (16.4)	924	
Morphology				< .0001
Adenocarcinoma	4,322 (71.9)	126 (15.9)	4,448	
Squamous cell	1,326 (22.0)	605 (76.3)	1,931	
Other	368 (6.1)	62 (7.8)	430	
Stage				.0671
Local	1,853 (30.8)	225 (28.4)	2,078	
Regional	2,047 (34.0)	256 (32.3)	2,303	
Distant	2,116 (35.2)	312 (39.3)	2,428	
Year of diagnosis				.0018
2000	387 (6.4)	71 (9.0)	458	
2001	384 (6.4)	71 (9.0)	455	
2002	397 (6.6)	62 (7.8)	459	
2003	393 (6.5)	51 (6.4)	444	
2004	344 (5.7)	36 (4.5)	380	
2005	382 (6.4)	35 (4.4)	417	
2006	409 (6.8)	64 (8.1)	473	
2007	428 (7.1)	58 (7.3)	486	
2008	432 (7.2)	66 (8.3)	498	
2009	512 (8.5)	61 (7.7)	573	
2010	512 (8.5)	47 (5.9)	559	
2011	514 (8.5)	55 (6.9)	569	
2012	463 (7.7)	56 (7.1)	519	
2013	459 (7.6)	60 (7.6)	519	

62.9%, respectively) and more likely to live in urban counties (97.4% v 71.1%, respectively). Black patients, compared with White patients, had higher rates of uninsurance (9.1% v 4.9%, respectively) and lower rates of private insurance (7.8% v 15.2%, respectively) or Medicare insurance (17.7% v 40.5%, respectively; [Table 1](#)).

Cancer Characteristics

We found that Black patients had a higher proportion of squamous cell carcinoma (76.3%), whereas White patients had more adenocarcinoma (71.8%). White patients had more cancer located in the lower esophagus (68.8%), and Black patients had similar distributions in the middle and lower esophagus (35.3% v 34.1%, respectively). There were no significant racial differences in cancer staging between the 2 groups ($P = .0671$; [Table 1](#)).

Factors Associated With Receipt of Esophagectomy, Chemotherapy, and Radiation

On univariable analysis, we found that Black patients were significantly less likely than White patients to undergo esophagectomy (odds ratio [OR], 0.31; 95% CI, 0.25 to 0.38), but not chemotherapy or radiation ([Table 2](#)). Moreover, single patients were less likely to receive an esophagectomy (OR, 0.48; 95% CI, 0.43 to 0.54), chemotherapy (OR, 0.58; 95% CI, 0.50 to 0.68), or radiation (OR, 0.85; 95% CI, 0.76 to 0.95) than married patients. When compared with men, women were less likely to receive an esophagectomy (OR, 0.73; 95% CI, 0.64 to 0.84) or chemotherapy (OR, 0.70; 95% CI, 0.58 to 0.83), but not radiation (OR, 0.92; 95% CI, 0.81 to 1.05). Rural residency was associated with higher odds of esophagectomy (OR, 1.38; 95% CI, 1.22 to 1.56) and lower odds of

TABLE 2. Univariable ORs for Treatment by Patient Demographics and Cancer Characteristics

Predictor	Esophagectomy OR (95% CI)	Chemotherapy OR (95% CI)	Radiation OR (95% CI)
Race			
White	Reference	Reference	Reference
Black	0.31 (0.25 to 0.38)	0.87 (0.69 to 1.10)	1.09 (0.92 to 1.30)
Sex			
Male	Reference	Reference	Reference
Female	0.73 (0.64 to 0.84)	0.70 (0.58 to 0.83)	0.92 (0.81 to 1.05)
Marital status			
Married	Reference	Reference	Reference
Single	0.48 (0.43 to 0.54)	0.58 (0.50 to 0.68)	0.85 (0.76 to 0.95)
County			
Urban	Reference	Reference	Reference
Rural	1.38 (1.22 to 1.56)	0.75 (0.63 to 0.89)	1.20 (1.06 to 1.36)
Insurance			
Medicare	Reference	Reference	Reference
Medicaid	0.79 (0.58 to 1.09)	2.25 (1.25 to 4.02)	1.51 (1.10 to 2.05)
Private	1.68 (1.45 to 1.96)	2.51 (1.86 to 3.40)	1.21 (1.03 to 1.41)
Other	1.14 (0.94 to 1.38)	2.21 (1.53 to 3.20)	1.23 (1.01 to 1.49)
Uninsured	0.64 (0.55 to 0.83)	1.54 (1.02 to 2.31)	0.98 (0.78 to 1.22)
Esophageal location			
Lower	Reference	Reference	Reference
Middle	0.44 (0.38 to 0.52)	0.85 (0.68 to 1.07)	1.22 (1.04 to 1.42)
Upper	0.23 (0.18 to 0.31)	0.78 (0.57 to 1.05)	1.56 (1.23 to 1.97)
Morphology			
Adenocarcinoma	Reference	Reference	Reference
Squamous cell	0.34 (0.30 to 0.39)	0.81 (0.68 to 0.96)	1.45 (1.28 to 1.65)
Stage			
Local	Reference	Reference	Reference
Regional	0.93 (0.82 to 1.05)	3.34 (2.72 to 4.12)	5.88 (5.07 to 6.81)
Distant	0.08 (0.06 to 0.09)	1.66 (1.37 to 2.00)	1.41 (1.24 to 1.61)

Abbreviation: OR, odds ratio.

chemotherapy (OR, 0.75; 95% CI, 0.63 to 0.89). With regard to insurance status, privately insured individuals had a higher chance of receiving all 3 forms of therapy when compared with patients with Medicare. Furthermore, uninsured patients were significantly less likely to receive esophagectomy than Medicare patients (OR, 0.64; 95% CI, 0.55 to 0.83).

Compared to patients with adenocarcinoma, patients with squamous cell carcinoma were significantly less likely to undergo esophagectomy (OR, 0.34; 95% CI, 0.30 to 0.39) or chemotherapy (OR, 0.81; 95% CI, 0.68 to 0.96) but were more likely to receive radiation (OR, 1.45; 95% CI, 1.28 to 1.65). These treatment differences remained significant after adjusting for race in patients with adenocarcinoma and squamous cell carcinoma. Cancers in the middle or upper third of the esophagus were less likely to be treated with esophagectomy and more likely to be treated with radiation. Patients with distant and regional disease received more chemotherapy and radiation.

On multivariable analysis, we found that Black patients continued to have lower odds of esophagectomy (OR, 0.64; 95% CI, 0.44 to 0.94) than White patients, but similar odds of chemotherapy and surgery (Table 3). Furthermore, being single was no longer associated with lower odds of radiation but remained associated with esophagectomy (OR, 0.65; 95% CI, 0.55 to 0.78) and chemotherapy (OR, 0.56; 95% CI, 0.43 to 0.73).

Race by Marital Status and Treatment

We found that married Black patients were significantly less likely to receive esophagectomy (OR, 0.51; 95% CI, 0.38 to 0.69) than married White patients on univariable analysis but not on multivariable analysis (OR, 0.91; 95% CI, 0.55 to 1.50; Fig 2). Both single White and single Black patients received less esophagectomy and chemotherapy on univariable and multivariable analysis. The effects of race and marital status were less significant in the receipt of radiation, as only single White patients had lower odds of treatment on univariable analysis (OR, 0.86; 95% CI, 0.77 to 0.97).

Reasons for No Treatment

When assessing reasons for no treatment, we found that single Black patients had the highest rates of treatment

refusal for esophagectomy ($P = .0083$), chemotherapy ($P = .0001$), and radiation ($P = .0003$; Table 3 and 4). Contraindication rates for surgery were similar across all 4 groups ($P = .0624$) but were higher among single Blacks for chemotherapy ($P = .0002$) and radiation ($P = .0159$).

DISCUSSION

In this retrospective single-state study, we found that Black patients received esophagectomy less frequently than White patients, but not chemotherapy or radiation. When separating racial groups by marital status, we found that married Black patients received all 3 treatment modalities at similar rates as married White patients and that single patients of both racial groups received esophagectomy and chemotherapy at significantly lower rates. Single Black patients had higher treatment refusal rates than single White, married Black, and married White patients. Collectively, these findings suggest that unmarried patients of both racial groups are significantly less likely to receive treatment for esophageal cancer and that some of the racial disparities between Black and White patients may be mitigated after adjusting for marital status.

Previous research has shown that Black patients undergo esophagectomy, but not radiation, at lower rates than White patients.⁸⁻¹² The current study confirms and expands on these findings by showing that Blacks and Whites also undergo chemotherapy at similar rates. It appears that racial differences in esophageal cancer care primarily revolve around receipt of surgery, which can result in survival disparities. A study by Revels et al⁸ showed that even when attending the same high-volume centers, Black patients underwent surgery at lower rates than White patients. Furthermore, Blacks tend to live closer to high-quality hospitals but still receive care at lower quality centers.¹³⁻¹⁶ This is of particular importance because racial differences in esophageal cancer survival tend to disappear after receipt of esophagectomy⁸⁻¹¹ and because higher volume centers are associated with better outcomes.¹⁷ Understanding patient, provider, and systemic barriers to surgery is critical in this population.

To our knowledge, this is the first study to show that Black and White patients undergo similar rates of treatment after adjusting for marital status, suggesting a protective effect

TABLE 3. Multivariable ORs for Treatment by Patient Demographics

Predictor	Esophagectomy OR (95% CI)	Chemotherapy OR (95% CI)	Radiation OR (95% CI)
Race			
White	Reference	Reference	Reference
Black	0.64 (0.44 to 0.94)	0.83 (0.53 to 1.29)	1.04 (0.76 to 1.42)
Marital status			
Married	Reference	Reference	Reference
Single	0.65 (0.55 to 0.78)	0.56 (0.432 to 0.73)	0.88 (0.75 to 1.03)

Abbreviation: OR, odds ratio.

FIG 2. Forest plots of odds ratios (ORs) and 95% CIs for esophagectomy, chemotherapy, and radiation by race and marital group. (A-C) Univariable and (D-F) multivariable analysis of (A, D) esophagectomy, (B, E) chemotherapy, and (C, F) radiation by married Black, single White, single Black, and married White patients (reference). Multivariable analysis adjusted for sex, race, marital status, insurance status, county designation (urban v rural), year of diagnosis, cancer morphology, cancer location, and stage at diagnosis. On univariable analysis, married Whites had more treatment than all other groups. On multivariable analysis, this difference was no longer significant when compared with married Blacks but remained significant for single patients with regard to surgery and chemotherapy.

by marriage to mitigate the causes of worse outcomes in Black patients. Interestingly, we found that Black patients were married at approximately half the rate as White patients. Taken together, these findings suggest that racial disparities in care may be partly explained by differences in social support. It is well known that the time surrounding cancer diagnosis and treatment is one of significant physical, psychological, and financial stress. Not

surprisingly, patients with cancer are prone to the development of depression, and research has shown that married patients not only develop less depression than their unmarried counterparts, but are also better able to cope with psychological distress.^{4,18} Research has also shown that patients who are married seek treatment at higher quality hospitals,¹⁹ have better adherence to physician recommendations,²⁰ show improved functionality after

TABLE 4. Reasons for No Treatment by Marriage and Race Groups

Reason for No Treatment	No. of Patients (%)				χ^2 <i>P</i>
	Married White	Married Black	Single White	Single Black	
Esophagectomy					
Not first course of treatment	1625 (72.2)	139 (72.8)	996 (70.0)	334 (73.7)	< .0001
Contraindicated as a result of risk factors	181 (8.0)	10 (5.2)	125 (8.8)	28 (6.2)	.0624
Patient or family refused	40 (1.8)	1 (1.1)	36 (2.5)	13 (2.9)	.0083
Unknown/other	406 (18.0)	40 (20.9)	266 (18.7)	78 (17.2)	.0002
Chemotherapy					
Not first course of treatment	1078 (77.4)	69 (80.2)	632 (73.7)	142 (67.6)	.0285
Contraindicated as a result of risk factors	34 (2.4)	4 (4.7)	36 (4.2)	15 (7.1)	.0002
Patient or family refused	42 (3.0)	3 (3.5)	49 (5.7)	15 (7.1)	.0001
Unknown/other	238 (17.1)	10 (11.6)	141 (16.4)	38 (18.1)	.1542
Radiation					
Not first course of treatment	1190 (61.5)	55 (42.0)	624 (57.3)	126 (41.7)	.0004
Contraindicated as a result of risk factors	39 (2.0)	2 (1.5)	31 (2.8)	13 (4.3)	.0159
Patient or family refused	44 (2.3)	4 (3.1)	47 (4.3)	16 (5.3)	.0003
Unknown/other	662 (34.2)	70 (53.4)	388 (35.6)	147 (48.7)	< .0001

surgery,²¹ and have better overall and disease-specific survival. Moreover, there are unique phenotypic features to esophageal cancer that require a high-level social support for optimal care. For example, spouses can help improve nutritional intake and encourage patients with esophageal cancer to seek care when they develop alarming symptoms or complications. It is also possible that physicians may be less inclined to offer esophagectomy, a procedure with high morbidity, to single patients, or that these patients may forgo treatment. The latter is supported by our findings showing that single Blacks and single Whites were the demographic groups with highest treatment refusal rates.

Our study should be considered in the context of several limitations. First, this is a single-state study, and findings may not be generalizable to other regions. Second, marital status is captured at the time of cancer diagnosis and may change throughout the course of treatment. Furthermore, marriage does not always predict the strength of a patient's

social support system. Some single patients may have more social support than married patients. Although possible, this phenomenon would bias our results toward the null and underestimate the degree of association. Third, our data did not include some important patient characteristics and outcomes, such as age, comorbidities, timing of treatment in relation to cancer diagnosis, and death. Nonetheless, we did have information on reason for no treatment and consider receipt of care to be a significant outcome in and of itself.

Our collective findings highlight the significance of marital status in racial disparities and receipt of esophageal cancer care. Moving forward, research in this area should focus on exploring system-, physician-, and patient-level factors for lower rates of treatment utilization in single patients. In addition, it will be important to study whether the similar treatment rates between married Black and married White patients result in equivalent oncologic and survival outcomes.

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Administrative support: Rishindra M. Reddy

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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