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Racial Differences in Aging-Related Deficits Among Older Adults with Colorectal Cancer

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Abstract

BACKGROUND: Despite the known influences of both race and aging-related factors in colorectal cancer outcomes and mortality, there is very little literature about the intersection between race and aging-related impairments.

OBJECTIVE: We aimed to explore racial differences in frailty and geriatric deficit sub-domains among colorectal cancer patients.

DESIGN: Retrospective study using data from the Cancer and Aging Resilience Evaluation Registry.

SETTINGS: A comprehensive cancer center in the Deep South.

PATIENTS: Older adults (≥ 60 years old) with colorectal cancer with Black or White race.

MAIN OUTCOME MEASURES: Composite measure of frailty and geriatric assessment sub-domains of physical function, functional status, cognitive complaints, psychological function, and health-related quality of life.

RESULTS: Of the 304 patients included, 21.7% (n = 66) were Black and the mean age was 69. Black patients lived in areas with a higher social vulnerability index compared to White patients (SVI 0.69 vs 0.49; $p < 0.01$) and more often had limited social support (54.5% vs. 34.9%; $p = 0.01$). After adjustment for age, cancer stage, comorbidities and SVI, Black patients had a higher rate of frailty compared to White patients (aOR 3.77, 95% CI 1.76–8.18; $p = 0.01$). In addition, Black patients had more physical limitations (walking 1 block: aOR 1.93, 95% CI 1.02–3.69; $p = 0.04$), functional limitations (activities of daily living: aOR 3.21, 95% CI 1.42–7.24; $p = 0.01$)

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and deficits in health-related quality of life (poor global self-reported health: aOR 2.45, 95% CI 1.23–5.13; $p = 0.01$). Cognitive complaints and psychological functions did not differ by race ($p > 0.05$). Similar findings were shown after stratification by stage I-III vs IV.

LIMITATIONS: Retrospective study at a single institution.

CONCLUSIONS: Among older patients with colorectal cancer, Black patients were more likely than white patients to be frail, with deficits observed specifically in physical function, functional status, and health-related quality of life. Geriatric assessment may provide an important tool in addressing racial inequities in colorectal cancer. See Video Abstract at http://links.lww.com/DCR/Bxxx.

DIFERENCIAS RACIALES EN LOS DÉFICITS RELACIONADOS CON EL ENVEJECIMIENTO ENTRE ADULTOS MAYORES CON CÁNCER COLORRECTAL

Estudio retrospectivo utilizando datos del registro Cancer and Aging Resilience Evaluation.

Un centro oncológico integral en el Sur Profundo.

Adultos mayores (≥ 60 años) con cáncer colorrectal de raza Negra o Blanca.

Medida compuesta de fragilidad y subdominios de evaluación geriátrica de función física, estado funcional, quejas cognitivas, función psicológica y calidad de vida relacionada con la salud.

De los 304 pacientes incluidos, el 21,7 % (n = 66) eran negros y la edad media era de 69 años. Los pacientes negros vivían en áreas con un índice de vulnerabilidad social (SVI) más alto en comparación con los pacientes blancos (SVI 0,69 vs 0,49; p < 0,01) y con mayor frecuencia tenían apoyo social limitado (54,5% vs. 34,9%; p = 0,01). Después de ajustar por edad, estadio del cáncer, comorbilidades y SVI, los pacientes de raza negra tenían una mayor tasa de fragilidad en comparación con los pacientes de raza blanca (ORa 3,77, IC del 95 %: 1,76–8,18; p = 0,01). Además, los pacientes negros tenían más limitaciones físicas (caminar 1 cuadra: ORa 1,93, IC 95% 1,02–3,69; p = 0,04), limitaciones funcionales (actividades de la vida diaria: ORa 3,21, IC 95% 1,42–7,24; p = 0,01) y déficits en la calidad de vida relacionada con la salud (mala salud global autoinformada: ORa 2,45, IC 95% 1,23–5,13; p = 0,01). Las quejas cognitivas y las funciones psicológicas no difirieron según la raza (p > 0,05). Se mostraron hallazgos similares después de la estratificación por estadio I-III frente a IV.

Estudio retrospectivo en una sola institución.

Entre los pacientes mayores con cáncer colorrectal, los pacientes negros tenían más probabilidades que los pacientes blancos de ser frágiles, observándose déficits específicamente en la función física, el estado funcional y la calidad de vida relacionada con la salud. La evaluación geriátrica puede proporcionar una herramienta importante para abordar las desigualdades raciales en el cáncer colorrectal. Consulte Video **Resumen** en http://links.lww.com/DCR/Bxxx.

Keywords

Colorectal cancer; Deficits; Frailty; Geriatric; Geriatric assessments; Race

INTRODUCTION

Racial inequities in colorectal cancer mortality are well established and persist despite advancements in care. Recent data from 2013–2017 supports that there is a 38% higher mortality for Black patients (19.0 per 100,000) compared to White patients (13.8 per 100,000).[1] Studies show that Black patients have significantly lower rates of colorectal screening compared to White patients and have more advanced stage at diagnosis compared to White patients.[2,3] Black patients are less likely to receive adjuvant chemotherapy, radiation, and undergo surgery for resectable disease.[4,5] Differences in colorectal mortality are often attributed to these causes in addition to disparities in post-treatment survivorship. However, the underlying factors that contribute to these inequities are complex and include less understood patient, provider, health-system, and political factors. Despite growing numbers of young patients with colorectal cancer, the majority of new colorectal cancer diagnoses still occur in older patients, and aging-related factors have been shown to be an important influencer of cancer outcomes.[6–8] Whether an imbalance of adverse geriatric factors can contribute to racial inequities in colorectal cancer outcomes is unknown.

Older adults with colorectal cancer represent a unique patient population that often faces its own unique challenges and treatment disparities. In fact, a recent study has demonstrated that over half of older patients receive substandard treatment based on current guidelines.[9] Age alone has been found to be a poor marker of functional status for older adults and, consequently, geriatric assessment identified deficits are now more frequently measured as they can influence cancer outcomes.[10,11] Indeed, the older adult population is heterogeneous and requires individualized approaches with incorporation of validated and systematic tools to assess frailty and aging-related impairments as opposed to using chronological age alone.[10,12] A geriatric assessment is a multidimensional tool to uncover vulnerability and/or frailty and can help predict mortality and morbidity among older adults with cancer.[6,13] Knowledge of these geriatric deficits can not only guide clinical decision making but can also predict chemotherapy-related toxicity, postsurgical outcomes, and even mortality.[7,8,14]

Despite the known influences of both race and aging-related factors in colorectal cancer outcomes and mortality, there is very little literature about the intersection between race and aging-related impairments. UAB has developed and integrated the Cancer and Aging Resilience Evaluation (CARE) registry for older adults ≥ 60 undergoing cancer care at UAB Hospital and clinics into the clinic workflow in order to assess geriatric deficits.[15] In this study, we aimed to explore racial differences in frailty and geriatric deficit sub-domains among colorectal cancer patients. We hypothesized that Black colorectal cancer patients would have more deficits in geriatric assessment domains compared to other races.

METHODS

Study Design

The Cancer and Aging Resilience Evaluation (CARE) Registry is an ongoing, prospective registry of older adults (≥ 60 years old) at the University of Alabama at Birmingham (UAB) with gastrointestinal malignancies including colorectal cancer. Since September 2017, patients at UAB have been undergoing self-reported geriatric assessments as part of routine

clinical care. These patients are approached in outpatient clinics and consented to have their results in the CARE registry as previously described.[15] In the present retrospective analysis, we included all patients with diagnosis of stage I-IV colorectal cancer who completed the geriatric assessment at UAB from September 2017 until January 2022. We excluded patients with stage 0 disease and surveys with missing variables of interest. Within the CARE dataset, patients are able to self-report as either "White, Black or African American, Native American or Alaskan Native, Asian, Native Hawaiian, or Other." Due to limited sample size of other races, we limited our analysis to patients with White and Black race. The UAB Institutional Review Board reviewed and approved this study.

Study Outcomes

Our primary outcome of interest was a composite measure of frailty. Composite measures of frailty have been previously associated with mortality, chemotherapy toxicities, and hospitalizations in older adults with cancer.[10,16,17] For this study, we utilized the frailty index determined by the deficit accumulation method using 44 items from the CARE survey as previously described.[10] As some patients did not have complete responses for all 44 items, a minimum of 30 items were required to calculate a Frailty Index score. Patients with a proportion of deficits >0.35 were considered as frail in concordance with prior methods.[16]

Secondary outcomes of interest included specific geriatric assessment domain deficits related to physical activities, functional status, cognitive complaints, psychological function, and health-related quality of life (HRQOL). Physical function included the number of falls in last 6 months and ability to walk one block.[18] Functional status evaluation included assessment of Activities of Daily Living (ADL) and Instrumental Activities of Daily living (IADL) from the Older American Resources and Services (OARS) survey. Cognition complaints were assessed using the PROMIS Cognitive Function abilities and psychological domain was assessed with the Patient Reported Outcome Measurement Information System (PROMIS) anxiety and depression modules.[19,20] Fatigue and Pain were measured using single items from the PROMIS-10 physical health surveys.[21] HRQOL was measured uses PROMIS 10-item Global Health survey and was reported as standardized t-scores for physical health and mental health sub-scores as well as a single item response for self-reported global health.[22] We additionally examined a Comorbidity domain assessed using number of medications and the Vision and Hearing Assessment.[23,24] Patients self-reported the number of daily medications (categorized as <9 or ≥9).[25] In this analysis, we chose to use the available data for each subdomain which resulted in less than 5% loss for each measure.

Additional Covariates

Age, education level, gender, marital status, employment, and ZIP Code were obtained as part of the CARE survey. Comorbidities were obtained as part of the OARS survey of comorbid conditions[26] which assesses 13 common comorbidities as well as vision and hearing impairments. We subsequently dichotomized comorbidities as either greater than two or fewer. Social support was assessed with the emotional/informational support subscales in the MOS (medical outcomes survey) Social Support Survey[26,27] and was specifically reported as limited social support if the patient reported that they did not have

help most or all of the time for any component. Area level social vulnerability index (SVI), a composite measure of community susceptibility to stressors on human health based on 15 socioeconomic factors, was included by linking census tract to patient zip code and taking the median SVI for each patient ZIP Code.[28] We utilized the most recent (2018) SVI dataset and a 2018 ZIP Code to census tract crosswalk compiled by the Department of Housing and Urban Development.[29] Cancer stage, cancer type, and date of diagnosis were abstracted from the electronic medical record.

Statistical analyses

Descriptive statistics were used to characterize the study population. For bivariate analysis of patient characteristics and outcomes by race, one-way ANOVA was used for continuous variables and Pearson's Chi-squared test was used for nominal variables. For multivariable analysis of frailty and geriatric deficit subdomains, we performed three sequential models of each outcome adding pre-determined clinically relevant variables to determine if the association between race and each geriatric assessment domain changed with adjustment for specific variables. Models were developed only for aging-related deficits that had significant racial differences on bivariate analysis. A linear regression model was used for continuous variables and logistic regression models were used for dichotomous variables. For Model 1 of each outcome, we controlled for age, race, and cancer stage. In Model 2, we controlled for Model 1 factors plus the number of comorbidities. In Model 3, we controlled for Model 2 factors plus SVI. Given clinically significant differences in the management of patients with stage I-III and stage IV colorectal cancer, we performed a stratified analysis by each stage category in a similar manner to the overall analysis. Analysis was conducted using R (version 4.0.2, 2020).[30] Statistical significance was set at an alpha level of 0.05.

RESULTS

There were 403 patients with colorectal cancer who were approached from September 2017 to January 2022 to complete the CARE survey and 349 (86.6%) consented. Among these 349 patients, 304 (75.7%) had all key variables of interest including data on age, sex, race, comorbidities, education, marital status, employment, cancer type, cancer stage, SVI, social support, and frailty (Fig. 1).

Cohort Characteristics

Of the 304 patients included in our study, 238 (78.3%) were White and 66 (21.7%) were Black (Table 1). Mean age of the cohort was 69 years (range, 60–96) and 171 (56.1%) were male. There were no statistical differences in age, gender, marital status, employment, comorbidities, time from cancer diagnosis to survey, or cancer stage between races. A majority of the participants were retired (60.0%) and married (57.6%). Black patients were more likely to have a high school or less education level compared to White patients (35.4% vs 54.5%) and White patients had more college experience, college degrees, and advanced degrees compared to Black patients ($p = 0.04$). Black patients were more likely to report limited social support (54.5% vs 39.3%, $p = 0.01$) and lived in areas with a higher social vulnerability compared to White patients (SVI 0.69 vs 0.49; $p < 0.01$).

Primary and Secondary Outcomes

Table 2 shows analysis of frailty and aging-related deficits by race. Black patients had a higher prevalence of frailty compared to White patients (33.3% vs. 14.7%; $p < 0.01$). For aging-related deficits, Black patients had significantly more limitations in walking one block (56.1% vs 39.2%, $p = 0.02$), IADL dependence (57.6% vs 41.8%, $p = 0.02$), and ADL dependence (24.6% vs 9.7%, $p = 0.01$) compared to White patients. Black patients more frequently self-reported poor global health (78.5% vs 60.3%, $p = 0.01$), and showed worse standardized t-scores for HRQOL physical and mental health ($p = 0.01$ and $p = 0.03$, respectively). White patients had a higher prevalence of hearing impairment compared to Black patients (30.3% vs 15.4%, $p = 0.02$). There were no significant differences in falls, moderate/severe cognitive complaints, moderate/severe anxiety or depression, moderate/severe fatigue or pain, use of 9 or more medications daily, or vision impairment. See Supplemental Tables 1 and 2 at https://links.lww.com/DCR/CXX.

Results from each sequential multivariable model of frailty and aging-related deficits are shown in Table 3. Using model 1, which included adjustment for age and cancer stage, Black race was associated with higher levels of frailty (aOR 2.98, 95% CI 1.57–5.61; $p = 0.01$). Additionally, Black race was associated with each aging-related deficit that was significant on bivariate testing (limitations in walking, IADL and ADL dependence, poor global self-reported health, HRQOL physical and mental domains, and lower hearing impairments). After additionally controlling for comorbidities in model 2, similar findings were observed. Lastly, after additional adjusting for SVI in model 3, Black race remained associated with both overall frailty (aOR 3.77, 95% CI 1.76–8.18; $p = 0.01$) and each aging-related deficit except for IADL.

Stratified Analysis

Multivariable models from the stage-stratified analysis are shown in Table 4. In each model for stage I-III patients, Black race was associated with higher rates of frailty, ADL dependence, poor global self-reported health, and lower HRQOL physical t-score values. For stage IV patients, Black race was associated with higher rates of overall frailty and ADL dependence in each model.

DISCUSSION

Despite the known influence of aging-related deficits on cancer outcomes and established racial inequities in colorectal cancer mortality, there is limited existing literature regarding racial differences in aging-related deficits. In this study, we assessed racial differences in aging-related deficits among older adults with colorectal cancer and found that Black patients were more likely to be frail compared to White patients. Specifically, Black patients were more likely to have deficits in physical activities and functional status including higher deficits in falls, walking, IADL, and ADL in addition to more deficits in HRQOL including subdomains of both physical and mental health. There were no significant racial differences in cognitive complaints or psychological domains. These findings remained significant when adjusting for comorbidities and social vulnerability. Similar findings were observed when stratified by stage. Together these results support that geriatric assessment may be an

important tool to understand racial inequities in colorectal cancer care and offer targetable domains to improve outcomes.

Previously, cancer related care for the older populations was often defined by age as opposed to aging-related deficits. A study by Reisinger et al. looked at patients who underwent colorectal surgery for cancer and frailty levels were assessed using the Groningen Frailty Index. They found that frailty in colorectal cancer surgery is associated with adverse postoperative outcomes.[14] Recently, the American Society of Colon and Rectal Surgery released guidelines on management of frailty among older adults in colorectal surgery.[31] The guidelines recognize the importance of caring for this unique population and recommend geriatric assessments to identify vulnerable and frail older adults. Conduction of routine assessment utilizing the CARE tool in colorectal cancer patients, as conduced in this study, is consistent with the recommendation made by these national guidelines. Our study adds additional important information to these guidelines regarding that Black patients may be at higher risk of aging-related deficits and may require different supporting levels of care. Recognizing and establishing aging-related deficits and frailty in minority patients undergoing cancer treatment is vital to promote equitable care.

While there is little literature on racial differences in aging-related deficits among patients with cancer, racial differences in aging-related deficits among non-cancer patients have been described. In a study by Washington et al. the association between race and frailty in a non-oncologic urology practice was examined using a Timed Up and GO Test as a marker for frailty. The authors found that non-white race was associated with increased odds of frailty similar to what we found in our study.[32] Hirsch et al. looked at frailty in over 500 patients in the Cardiovascular Health Study. They found that Black patients have a fourfold greater odds of frailty compared with White patients, which is higher than our findings.[33] In contrast, Anand et al. looked at racial and ethnic disparities in frail geriatric trauma patients and found that White race was associated with higher odds of mortality, in-hospital complications, and likelihood to be discharged to a skilled nursing facility (SNF).[34] While different from our findings, this study could highlight that racial differences in aging-related deficits may vary by pathologic processes and that cancer is a unique disease as compared to other diseases and disorders. We also found a lack of racial difference in cognitive complaints or psychological domains which is similar to a study by Williams et al. looking at racial differences in GI cancer patients.[35] The reason for this is not well understood, probably multifactorial and is something that warrants further exploration. We hypothesize this since this is a self-reported survey, this lack of difference may be due to stigma of mental health and may not truly reflect the cognitive and psychological differences among these patients.

The addition of measures of social determinants of health, like the surrogate measure of SVI, in geriatric assessments is a novel way to provide unique information. Black patients in our study had a significantly higher SVI compared to White patients. There are multiple studies that correlate high SVI with poor outcomes in cancer. Hyer et al. looked at “textbook outcomes” (absence of complications, extended length of stay, readmission, and mortality) relative to SVI in older adults undergoing cancer surgery. They found that social vulnerability was associated with lower attainment of textbook outcomes and

increased risk of adverse postoperative surgical outcomes. Notably, this difference was most pronounced among minority patients.[36] A study by Diaz et al. looked at patients undergoing colon resections for either diverticulitis or colon cancer and found that patients residing in vulnerable communities (high SVI) were more likely to undergo non-elective colon resections as well as had a higher risk of postoperative complications.[37] While differences in SVI may be correlated with poor outcomes, our findings importantly illustrate that racial difference in aging-related deficits still exists when controlled for SVI, meaning that aging-related deficits are not necessarily tied to SVI but are an independent risk factor.

The data from our study have practical implications and present new opportunities for study. The findings support that Black patients are more likely to have frailty, physical dependence, and decreased HRQOL and that these differences exist on top of limited social support, lower education, and residence in areas of higher socially vulnerability. For oncology and surgical teams, this highlights the role of geriatric assessment to guide care decision and goals of care in minority populations. A study by Diaz et al looked at over 27,000 patients who underwent surgery and found that among patients with increased social vulnerability, outcomes were considerable better at high-quality hospitals, highlighting the potential benefits of referral to high value care centers for these patients.[38] Another important intervention would be the consideration of prehabilitation for patients with frailty. A study by Chia et al. showed that by undergoing a transdisciplinary prehabilitation program, frail patients undergoing colorectal surgery were able to significantly decrease their length of stay as well as achieve full functional recovery.[39]

Our study has several limitations. First, due to the small sample size, we are limited in our ability to evaluate whether racial differences in geriatric deficits mediate racial differences in cancer outcomes. However, this study remains as one of the first studies illustrating racial differences in geriatric deficits in colorectal cancer patients. It will be important for future large-scale studies to understand the link between racial differences in geriatric deficits and cancer outcomes. Second, patients were administered the CARE survey throughout the continuum of their cancer care as they presented to our comprehensive cancer center and, as such, administration in different phases of care may impact the measurement of aging-related deficits. However, we have no reason to believe that this should vary by race and importantly we found similar findings for patients when stratified by stage of disease. Third, due to limited sample size of other races, we were unable to include other races in our analysis but would like to as the dataset expands. We also recognize that race is a social construct and there are many complex variables for which race is serving as a surrogate. We chose to use race in this analysis in order to determine if any differences exist prior to seeking the underlying variables that contribute to these differences.[40] Fourth, we recognize that SVI is not a comprehensive composite measure of a patient's social determinants of health, but nonetheless does give some insight into how living conditions can affect patient factors.

CONCLUSION

Older Black patients with colorectal cancer were more likely to have limited social support and reside in areas of high social vulnerability. Frailty was more prevalent in Black

compared to White older adults with colorectal cancer. Black patients specifically had more physical and functional status limitations and decreased HRQOL. These aging-related deficits differences were independent of comorbidities and social vulnerability. Our findings highlight the importance of geriatric assessment in the care of minority patients with colorectal cancer and provide a potential avenue to target racial inequities in colorectal cancer outcomes. These findings were originally presented at the annual meeting of the American Society of Colon and Rectal Surgeons.[41]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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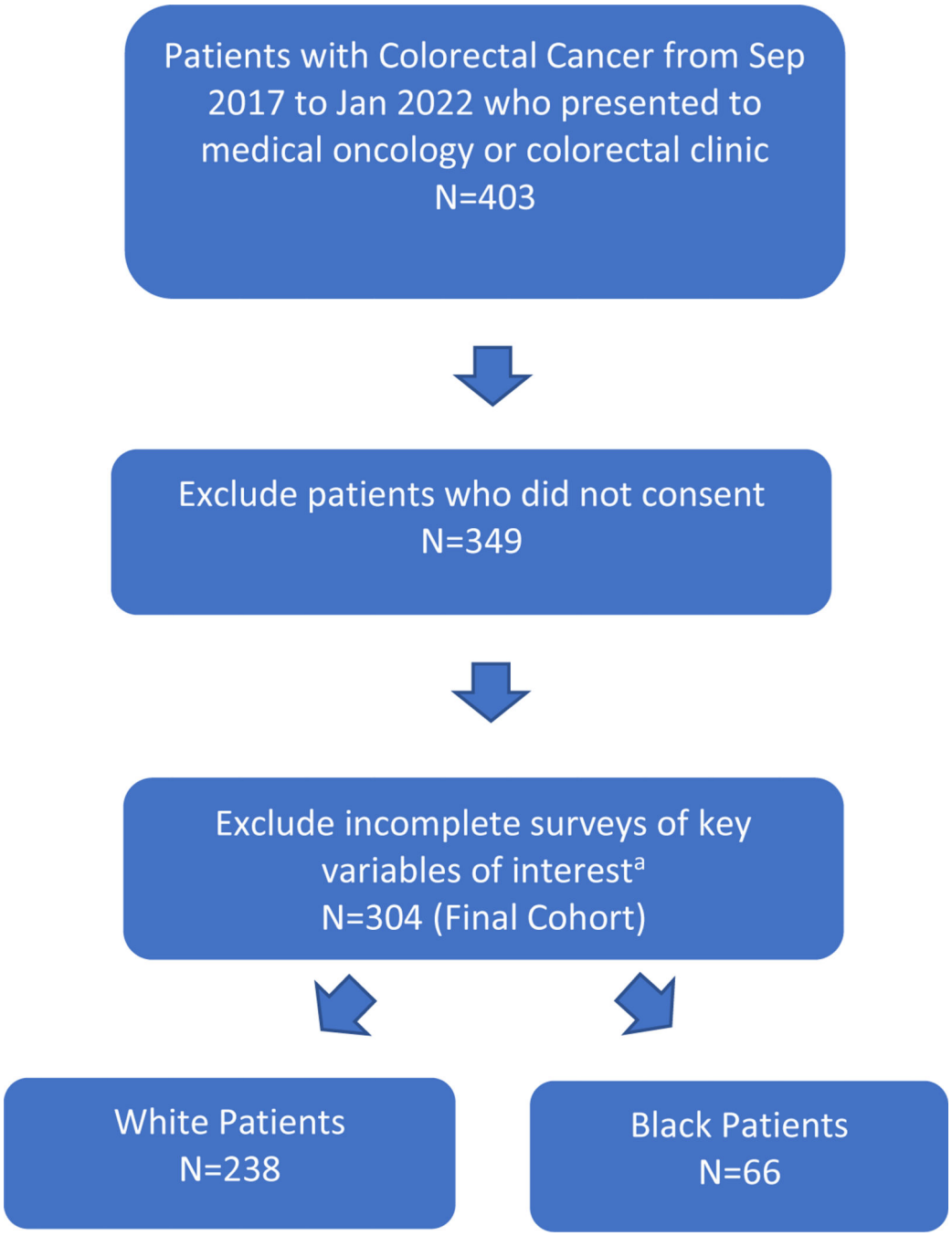

Figure 1.
Flow chart for cohort deviation.
[a]Patients missing key variables of interest including race, frailty score, age, gender, comorbidity number, cancer type, cancer stage, education, employment, marital status, social support, and social vulnerability index were excluded from the analysis.

Table 1.

Patient Characteristics by Race

Demographics	Overall (N=304)	Black (N=66)	White (N=238)	p-value
Age, mean (stdev)	69.3 (7.5)	69.3 (7.3)	69.3 (7.6)	0.96
Male Sex, n (%)	171 (56.2%)	33 (50.0%)	138 (58.0%)	0.25
Education, n (%)				0.04
High school or less	120 (39.5%)	36 (54.5%)	84 (35.3%)	
Some college	69 (22.7%)	11 (16.7%)	58 (24.4%)	
College degree	75 (24.7%)	14 (21.2%)	61 (25.6%)	
Advanced degree	40 (13.2%)	5 (7.6%)	35 (14.7%)	
Marital, n (%)				0.09
Single, never married	22 (7.2%)	7 (10.6%)	15 (6.3%)	
Married	175 (57.6%)	32 (48.5%)	143 (60.1%)	
Separated	7 (2.3%)	4 (6.1%)	3 (1.3%)	
Divorced	48 (15.8%)	12 (18.2%)	36 (15.1%)	
Widowed	52 (17.1%)	11 (16.7%)	41 (17.2%)	
Employment, n (%)				0.10
Disabled	36 (11.8%)	13 (19.7%)	23 (9.7%)	
Full time	46 (15.1%)	5 (7.6%)	41 (17.2%)	
Other	29 (9.5%)	6 (9.1%)	23 (9.7%)	
Part time	11 (3.6%)	3 (4.5%)	8 (3.4%)	
Retired	182 (59.9%)	39 (59.1%)	143 (60.1%)	
Comorbidity, n (%)				0.34
0–2	178 (58.6%)	42 (63.6%)	136 (57.1%)	
≥3	126 (41.4%)	24 (36.4%)	102 (42.9%)	
Limited Social Support[a], n (%)	119 (39.1%)	36 (54.5%)	83 (34.9%)	0.01
SVI, mean (stdev)	0.53 (0.22)	0.69 (0.17)	0.49 (0.21)	< 0.01
Days from diagnosis to survey (Median, Q1, Q3)	41 (16,11)	48 (20,242.5)	38 (15,135.25)	0.35
Cancer Type, n (%)				0.02
Colon Cancer	203 (66.8%)	52 (78.8%)	151 (63.4%)	
Rectal Cancer	101 (33.2%)	14 (21.2%)	87 (36.6%)	
Cancer Stage, n (%)				0.8
Stage 1–3	188 (61.8%)	40 (60.6%)	148 (62.2%)	
Stage 4	116 (38.2%)	26 (39.4%)	90 (37.8%)	

stdev= standard deviation; SVI= Social Vulnerability Index

[a]Limited social support defined as reporting not having help most or all of the time for any component of the Medical Outcomes Study (MOS) Social Support Survey.

Table 2.

Frailty and Aging-Related Deficits by Race

Aging-Related Deficits	Total (N=304)	Black (N=66)	White (N=238)	p-value
Frail, n (%)	57 (18.8%)	22 (33.3%)	35 (14.7%)	< 0.01
Physical Function				
One or more falls, n (%)	43 (14.6%)	9 (14.5%)	34 (14.7%)	0.98
Limitations in walking 1 block, n (%)	130 (42.9%)	37 (56.1%)	93 (39.2%)	0.02
Functional Status				
Any IADL dependence, n (%)	137 (45.2%)	38 (57.6%)	99 (41.8%)	0.02
Any ADL dependence, n (%)	39 (12.9%)	16 (24.6%)	23 (9.7%)	0.01
Cognitive/Psychological Function				
Moderate/Severe Cognitive Complaints, n (%)	17 (5.6%)	2 (3.1%)	15 (6.3%)	0.32
Moderate/Severe Anxiety, n (%)	42 (14.2%)	10 (16.1%)	32 (13.7%)	0.63
Moderate/Severe Depression, n (%)	27 (9.0%)	8 (12.5%)	19 (8.1%)	0.28
Moderate/Severe Fatigue, n (%)	155 (51.5%)	40 (61.5%)	115 (48.7%)	0.07
Moderate/Severe Pain, n (%)	107 (36.0%)	29 (46.0%)	78 (33.3%)	0.06
Health-Related Quality of Life (HRQOL)				
Poor Global Self-Reported Health [a]	194 (64.2%)	51 (78.5%)	142 (60.3%)	0.01
HRQOL - Physical Health T-score, mean (stdev)	45.6 (10.2)	42.0 (9.9)	46.6 (10.1)	0.01
HRQOL - Mental Health T-score, mean (stdev)	48.5 (8.3)	46.4 (7.5)	49.0 (8.5)	0.03
Comorbidities				
≥9 medications daily, n (5)	64 (21.3%)	16 (24.6%)	48 (20.3%)	0.46
Vision Impairment, n (%)	71 (23.5%)	20 (30.3%)	51 (21.6%)	0.14
Hearing Impairment, n (5)	82 (27.1%)	10 (15.4%)	72 (30.3%)	0.02

[a]Patients reporting self-report health as good/fair/poor as opposed to excellent/very good on a single item question concerning global health.

Table 3.

Multivariable Models Evaluating the Association between Race and Frailty

	Model 1[a]		Model 2[b]		Model 3[c]	
Aging-Related Deficits	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**
Frailty	2.98 (1.57–5.61)	0.01	3.85 (1.93–7.78)	<0.01	3.77 (1.76–8.18)	0.01
Significant Aging-Related Deficits						
Limitations in walking 1 block	2.01 (1.15–3.54)	0.02	2.39 (1.32–4.37)	0.01	1.93 (1.02–3.69)	0.04
IADL Dependence	1.90 (1.09–3.34)	0.02	2.06 (1.17–3.67)	0.01	1.80 (0.98–3.34)	0.06
ADL Dependence	3.12 (1.50–6.40)	0.01	3.22 (1.54–6.64)	0.01	3.21 (1.42–7.24)	0.01
Poor Global Self-Reported Health	2.41 (1.29–4.76)	0.01	2.83 (1.48–5.73)	0.01	2.45 (1.23–5.13)	0.01
HRQOL-Physical Health T-score	−4.50 (−7.30- −1.69)[†]	0.01	−5.12 (−7.75- −2.49)[†]	<0.01	−4.44 (−7.26- −1.61)[†]	0.01
HRQOL-Mental Health T-score	−2.60 (−4.89- −0.31)[†]	0.03	−2.93 (−5.13- −0.74)[†]	0.01	−2.47 (−4.84- −0.11)[†]	0.04
Hearing Impairment	0.40 (0.18–0.81)	0.02	0.41 (0.19–0.84)	0.02	0.39 (0.17–0.83)	0.02

[a] age, race, cancer stage

[b] age, race, cancer stage, comorbidities

[c] age, race, cancer stage, comorbidities, SVI

[†] Beta-coefficient (95%) from multivariable linear regression model

Table 4.

Stage-Stratified Multivariable Models Evaluating the Association between Race and Frailty

	Model 1[a]		Model 2[b]		Model 3[c]	
Stage 1–3	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**
Frailty	2.92 (1.27–6.58)	0.01	4.18 (1.66–10.82)	0.01	3.99 (1.43–11.50)	0.01
ADL Dependence	3.08 (1.17–7.88)	0.02	3.22 (1.21–8.33)	0.02	2.91 (0.97–8.64)	0.05
Poor Global Self-Reported Health	2.73 (1.25–6.45)	0.02	3.28 (1.45–8.07)	0.01	2.46 (1.01–6.41)	0.05
HRQOL-Physical Health T-score	−4.68 (−8.20 - −1.16)[†]	0.01	−5.40 (−8.61 - −2.19)[†]	0.01	−4.36 (−7.85 - −0.87)[†]	0.02
Hearing Impairment	0.45 (0.17–1.05)	0.08	0.46 (0.17–1.08)	0.1	0.45 (0.16–1.14)	0.11
Stage 4	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**	**Adjusted Odds Ratio (95% CI) Black vs White**	**p-value**
Frailty	3.12 (1.11–8.68)	0.03	3.54 (1.22–10.42)	0.02	3.62 (1.15–11.60)	0.03
Limitations in walking 1 block	2.87 (1.16–7.68)	0.03	3.25 (1.2–8.96)	0.02	2.53 (0.93–7.30)	0.07
ADL Independent	3.34 (1.05–10.54)	0.04	3.36 (1.05–10.61)	0.04	3.76 (1.08–13.31)	0.04

[a] age, race, cancer stage

[b] age, race, cancer stage, comorbidities

[c] age, race, cancer stage, comorbidities, SVI

[†] Beta-coefficient (95%) from multivariable linear regression model