



Cardiometabolic comorbidities in Hispanic/Latino cancer survivors: prevalence and impact on health-related quality of life and supportive care needs

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Abstract

Purpose The aim of this study was to characterize the prevalence of cardiometabolic comorbidities (i.e., diabetes, peripheral vascular disease, myocardial infarction, congestive heart failure, cerebrovascular disease) among Hispanic/Latino cancer survivors and examine the impact of cardiometabolic comorbidities on health-related quality of life (HRQoL), unmet supportive care needs, patient-provider communication self-efficacy, satisfaction with cancer care, and increases in healthy behaviors.

Methods Hispanics/Latinos diagnosed with breast, prostate, or colorectal cancer ($N = 288$) were assessed within 15 months of primary treatment completion.

Results One-quarter (24.7%) of survivors were diagnosed with diabetes and one-fifth (20.8%) were diagnosed with peripheral vascular disease. Survivors with at least one cardiometabolic comorbidity were older ($t(278) = -3.622, p < .001$) and more likely to have a household income of less than \$25,000 ($X^2 = 8.369, p = .004$). When adjusting for sociodemographic and medical covariates, survivors with cardiometabolic comorbidities demonstrated worse overall HRQoL ($B = -4.792, p = .050$), emotional ($B = -1.479, p = .018$) and physical ($B = -2.228, p = .005$) wellbeing, a higher odds of unmet psychological (OR = 2.095, $p = .027$) and sexuality (OR = 2.898, $p = .004$) needs, and greater patient-provider communication self-efficacy ($B = .179, p = .045$). There were no differences in healthy behavior changes or satisfaction with cancer care.

Conclusions Cardiometabolic comorbidities may be highly prevalent among Hispanic/Latino cancer survivors and increase the risk of worse HRQoL and unmet supportive care needs. Targeted interventions are needed to optimize health among Hispanic/Latino cancer survivors with cardiometabolic comorbidities.

Keywords Hispanic/Latino · Cancer · Survivorship · Cardiometabolic · Quality of life · Supportive care needs

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Cardiometabolic-related illness is the leading cause of death among cancer survivors previously treated for early-stage breast, prostate, and colorectal cancer [1, 2]. Decrements in cardiometabolic health among cancer survivors are often related to treatment toxicity and lifestyle risk factors [3, 4]. Compared to non-Hispanics/Latino whites, Hispanic/Latinos in the U.S. demonstrate disproportionately high rates of cardiometabolic comorbidities, including obesity, hypertension, and diabetes [5–7]. As a result, Hispanic/Latino cancer survivors are also at an elevated risk for poor cardiometabolic health following the completion of cancer treatment [8]. Despite their heightened risk of poor cardiometabolic health, little is known about the prevalence of cardiometabolic comorbidities in Hispanic/Latino cancer survivors and the relationship between cardiometabolic comorbidities and outcomes such as health behaviors, health-related quality of life (HRQoL), and supportive care needs.

Health behaviors play a crucial role in the development and management of cardiometabolic health [9, 10]. Physical activity, healthy diet, stress management, and abstinence from smoking are well characterized as cardioprotective, both generally and for cancer survivors specifically [11, 12]. Hispanics/Latinos in the U.S. are generally less likely to engage in cardioprotective health behaviors like physical activity and healthy diet [13, 14]. Almost one-third of Hispanics/Latinos report engaging in no leisure-time physical activity during the past month [15]. Hispanics/Latinos also tend to consume greater amounts of sodium and fatty acids in their diets than is recommended by the U.S. Department of Health & Human Services (HHS) and U.S. Department of Agriculture (USDA) Dietary Guidelines for Americans [16]. Furthermore, Hispanics/Latinos are twice as likely to live below the federal poverty level compared to non-Hispanic/Latino whites and are more likely to live in communities located in food deserts that lack access to safe outdoor spaces and recreational facilities [17, 18]. Despite these challenges and the risk of poor cardiometabolic health following cancer treatment, no previous study has examined the impact of undergoing cancer treatment on health behaviors among Hispanic/Latino cancer survivors and how changes in health behaviors may vary between survivors with and without cardiometabolic comorbidities.

Unmet supportive care needs are concerns or needs that cancer survivors report have not been fully addressed by healthcare providers [19, 20]. These needs are assessed across multiple domains, including psychological, sexuality, physical and daily living needs. Given the medical complexity of managing cancer and comorbid conditions, it is not surprising that cancer survivors with comorbidities demonstrate greater unmet supportive care needs and worse HRQoL than those without comorbid conditions [21]. Studies also demonstrate that the diagnosis of multiple comorbidities may adversely affect healthcare experiences among

cancer survivors. Cancer survivors with comorbid conditions report worse satisfaction with care and lower self-efficacy or confidence in patient-provider communication [22, 23]. Despite these findings and well-documented disparities in HRQoL and unmet supportive care needs among Hispanic/Latino cancer survivors [24–26], little is known about the impact of cardiometabolic comorbidities on unmet supportive care needs and HRQoL specifically among Hispanic/Latino cancer survivors, including those with and without comorbid cardiometabolic conditions.

The aim of the current study was to characterize the prevalence of cardiometabolic comorbidities (i.e., diabetes, peripheral vascular disease, myocardial infarction, congestive heart failure, and cerebrovascular disease) among Hispanics/Latinos previously treated for breast, prostate, and colorectal cancer and examine the impact of cardiometabolic comorbidities on HRQoL, unmet supportive care needs, patient-provider communication self-efficacy, and satisfaction with cancer care. We also examined the rates at which Hispanic/Latino cancer survivors increased a variety of protective health behaviors, including exercise, healthy diet, weight loss, stress management, and abstinence from alcohol, and tested whether changes in health behaviors vary between survivors with and without cardiometabolic comorbidities.

Methods

Participants

The current sample ($N=288$) was derived from baseline data of a National Cancer Institute (NCI) funded project that aimed to reduce symptom burden and improve adherence to treatment recommendations in Hispanic/Latino cancer survivors (NCT02275754) [27]. Eligibility criteria included a diagnosis of breast, colorectal, or prostate cancer; completion of primary cancer treatment within the past 15 months; self-identification as Hispanic/Latino; and verbal fluency in Spanish or English. Individuals with evidence of metastatic disease, current severe mental illness (e.g., psychosis), active suicidal ideation, and/or substance dependence within the past year were excluded.

Procedures

Potential participants were identified via medical chart review and recruited from major tertiary medical centers in Chicago and San Antonio. Upon recruitment, participants provided informed consent and completed a comprehensive psychosocial baseline in-person assessment (approximately 90 min) with trained bilingual interviewers. Participants had the option of completing the baseline assessment in English

or Spanish based on their language preferences and were compensated \$25 for participation, as well as parking and other transportation reimbursements.

All procedures were approved by the Institutional Review Board (IRB) of each participating institution (Northwestern University and UT Health San Antonio) and informed consent was obtained from all individual participants included in the study. Data were collected between February 2012 and January 2015.

Measures

Electronic health records were reviewed to capture diagnosis, stage of cancer, cancer treatment, months since diagnosis, and months since treatment completion. Participants also provided sociodemographic information, including age, marital status, nativity, education, language, and household income at baseline. The Charlson Comorbidity Index [28] was used to capture the presence of medical comorbidities at baseline via chart review and extraction from the electronic health record, including the five cardiometabolic comorbidities that were of primary interest in the current study: diabetes, peripheral vascular disease, myocardial infarction, congestive heart failure, and cerebrovascular disease. Measures of HRQoL, supportive care needs, patient-provider communication self-efficacy, satisfaction with cancer care, and health behaviors were assessed within 15 months of completion of primary cancer treatment.

Health-Related Quality of Life (HRQoL) HRQoL was assessed using the Functional Assessment of Cancer Therapy – General (FACT-G) [29]. The FACT-G is a 27-item self-report questionnaire that assesses overall HRQoL and the domains of physical, functional, social, and emotional well-being on a 5-point Likert-type scale ranging from 0 (not at all) to 4 (very much). Sample items included the following: “I am bothered by side effects of treatment” (physical, reverse-coded), “I am able to work” (functional), “I am satisfied with family communication about my illness” (social), and “I worry about dying” (emotional, reverse-coded).

Supportive care needs The 34-item short Supportive Care Needs Survey [30] was used to assess unmet needs across five domains: psychological (PSY), health system and information (I), patient care and support (PCS), physical and daily living (PDL), and sexuality (SXN). For each item, participants indicated their level of need over the past month [(1 (not applicable), 2 (satisfied), 3 (low need), 4 (moderate need), and 5 (high need)]. Following standard scoring procedures for this measure [19, 30] each domain was dichotomized to categorize participants as having unmet needs if they endorsed at least one ‘moderate’ to ‘high’ unmet need in that domain.

Patient-provider communication self-efficacy The 10-item Perceived Efficacy in Patient-Physician Interactions (PEPPI) was used to assess self-efficacy in patient-provider communication on a 5-point Likert-type scale from 1 (not at all confident) to 5 (very confident) [31]. Sample items include: “How confident are you in your ability to get a doctor to take your chief health concern seriously?” and “How confident are you in your ability to know what questions to ask a doctor?”.

Satisfaction with cancer care The 18-item Patient Satisfaction with Cancer Care Scale [32] assessed satisfaction with cancer care on a Likert-type scale from 1 (*strongly disagree*) to 4 (*strongly agree*). Sample items include: “I felt included in decisions about my health,” “I had enough time with my doctor,” “I was treated with courtesy and respect,” “My doctors seemed to communicate well about my care,” “Making an appointment was easy,” “I knew who to contact when I had a question.”

Health behaviors Health behaviors were assessed using the American Cancer Society (ACS) Study of Cancer Survivors II Survey [33]. This measure assesses the extent to which cancer survivors have engaged in positive health behaviors “more” (1) or “the same amount” or “less” (-1) since their cancer diagnosis. For the purposes of the study, we examined six health behaviors that are central to cardiometabolic health: exercise, eating healthy food (e.g. eating fruits and vegetable), controlling stress, trying to lose weight loss, and abstinence from alcohol.

Data analysis plan

Descriptive analyses examined the percentage of participants by gender, marital status, household income, nativity, language preference, tumor type, cancer stage, and cardiometabolic comorbidity as well as mean and standard deviation for age and months since cancer diagnosis. Differences in these sociodemographic and medical characteristics by cardiometabolic comorbidity (none versus at least one cardiometabolic condition) were examined using Chi-square tests of independence for categorical variables and independent samples *t*-tests for continuous variables. Multivariate linear regressions were used to examine differences in the outcomes of HRQoL (overall and subdomains of physical, functional, social, and emotional well-being), patient-provider communication self-efficacy, and satisfaction with cancer care by cardiometabolic comorbidity (none versus at least one cardiometabolic condition), when adjusting for the sociodemographic and medical covariates. Multivariate logistic regressions were used to examine differences in the binary outcomes of supportive care needs (unmet versus met) and health behaviors (increased versus same or decreased) by

cardiometabolic comorbidity (none versus at least one cardiometabolic condition), when adjusting for the sociodemographic and medical covariates. Separate regression analyses were conducted on each outcome variable using SPSS version 28.0 (IBM).

Results

Participants were on average 56 years old, married/cohabitating (61.5%), and had a high school education or less (65.6%) with a household income less than \$50,000 (68.4%). Most participants were foreign-born (59.4%) and either monolingual Spanish-speaking (54.2%) or English–Spanish bilingual (26.0%). Survivors were on average diagnosed 17 months previously ($M=17.14$, $SD=19.33$) with breast (44.4%), colorectal (24.3%), and prostate (31.3%) cancer. The majority of survivors were diagnosed with Stage 0 (2.1%), I (20.1%), and II (35.4%) cancers and one-quarter of participants were diagnosed with Stage III (25.0%).

One-quarter of survivors (24.7%) were diagnosed with comorbid diabetes and one-fifth of survivors (20.8%) were diagnosed with comorbid peripheral vascular disease. Two to three percent of survivors were diagnosed with comorbid myocardial infarction, congestive heart failure, or stroke. The total number of cardiometabolic comorbidities diagnosed among survivors varied, however, most survivors had either one or no cardiometabolic comorbidity: 56.6% none, 34.7% one condition, 7.3% two conditions, and 1.4% three conditions. Survivors reported increasing consumption of healthy foods like fruits and vegetables (61.8%) and stress management (54.1%). However, increases in weight loss (45.1%), exercise (40.6%), and abstinence from alcohol (26.0%) were less common.

Survivors with at least one cardiometabolic condition were older ($M=58.46$, $SD=9.565$) than those without a cardiometabolic condition ($M=54.11$, $SD=10.304$; $t(278)=-0.3.622$, $p<0.001$). Furthermore, survivors who had an income of less than \$25,000 were more likely to have at least one cardiometabolic condition (68.9%) than those with an income greater than \$25,000 (31.1%; $X^2=(1, N=241)=8.369$, $p=0.004$). There were no other statistically significant differences in sociodemographic and medical characteristics by cardiometabolic comorbidity.

Health-related quality of life

Table 1 displays the association of cardiometabolic comorbidity with overall HRQoL and the domains of physical, social, emotional, and functional wellbeing. When adjusting for sociodemographic and medical covariates, survivors with cardiometabolic comorbidity demonstrated lower overall HRQoL ($B=-4.792$, $t(184)=-1.969$,

$p=0.050$; 4.792 score decrease) as well as emotional wellbeing ($B=-1.479$, $t(184)=-2.387$, $p=0.018$; 1.479 score decrease) and physical wellbeing ($B=-2.228$, $t(184)=-2.829$, $p=0.005$; 2.228 score decrease), than those with no cardiometabolic comorbidity. There were no differences in social and functional wellbeing among survivors with and without cardiometabolic comorbidity. In addition, survivors who were married demonstrated greater overall HRQoL ($B=4.770$, $t(184)=1.987$, $p=0.048$), emotional wellbeing ($B=1.369$, $t(184)=2.240$, $p=0.026$), and social wellbeing ($B=2.199$, $t(185)=2.619$, $p=0.010$) than those who were unmarried. Survivors who have a household income greater than \$25,000 demonstrated greater overall HRQoL ($B=6.453$, $t(184)=2.655$, $p=0.009$), social wellbeing ($B=1.871$, $t(185)=2.261$, $p=0.025$), and functional wellbeing ($B=2.614$, $t(185)=3.519$, $p=0.002$) than those who have a household income less than \$25,000. Survivors who were older demonstrated greater emotional wellbeing than those who were younger ($B=0.108$, $t(184)=3.404$, $p<0.001$).

Unmet supportive care needs

Table 2 displays the association of cardiometabolic comorbidity with unmet supportive care needs (health systems, psychological, patient care, physical, and sexuality needs). When adjusting for sociodemographic and medical covariates, survivors with cardiometabolic comorbidity demonstrated a greater odds of having unmet psychological needs ($OR=2.095$, $p=0.027$) and unmet sexuality needs ($OR=2.898$, $p=0.004$) than those with no cardiometabolic comorbidity. There were no differences in unmet health systems, patient care, and physical needs among survivors with and without cardiometabolic comorbidity.

Patient-provider communication self-efficacy & satisfaction with cancer care

Table 3 displays the association of cardiometabolic comorbidity with patient-provider communication self-efficacy and satisfaction with cancer care. When adjusting for sociodemographic and medical covariates, survivors with cardiometabolic comorbidity demonstrated greater patient-provider communication self-efficacy than those with no cardiometabolic comorbidity ($B=0.179$, $t(186)=2.018$, $p=0.045$). In addition, survivors who were married demonstrated greater patient-provider communication self-efficacy than those who were unmarried ($B=0.243$, $t(186)=2.771$, $p=0.006$). There were no differences in satisfaction with cancer care among survivors with and without cardiometabolic comorbidity.

Table 1 Multivariate linear regression models for health-related quality of life domains

	Overall HRQoL		Physical Wellbeing		Social Wellbeing		Emotional Wellbeing		Functional Wellbeing	
	B(SE)	p	B(SE)	p	B(SE)	p	B(SE)	p	B(SE)	p
Demographic variables										
Age (years)	.178(.125)	.155	.058(.040)	.156	.010(.044)	.827	.108(.032)	<.001***	.003(.043)	.946
Gender										
Female vs male(ref)	1.973(3.033)	.516	-.642(.981)	.514	1.684(1.064)	.115	.938(.772)	.226	-.008(1.047)	.994
Marital status										
Married vs unmarried(ref)	4.770(2.401)	.048*	.906(.777)	.245	2.198(.842)	.010*	1.369(.611)	.026*	.297(.829)	.721
Nativity										
U.S. vs foreign born(ref)	2.43(3.029)	.423	.435(.980)	.658	1.431(1.062)	.180	.214(.771)	.781	.350(1.046)	.739
Income										
\$25,000 + vs. <\$25,000(ref)	6.453(2.431)	.009*	1.073(.787)	.174	1.891(.853)	.028*	.874(.619)	.160	2.614(.839)	.002**
Language										
English vs Spanish(ref)	-.113(5.557)	.984	-2.930(1.797)	.105	1.333(1.669)	.717	-.586(1.453)	.688	-.683(2.096)	.745
English vs Bilingual(ref)	-1.021(4.265)	.811	.272(1.430)	.850	-.820(1.011)	.933	1.320(1.096)	.232	-.357(1.656)	.830
Bilingual vs Spanish(ref)	-1.620(1.699)	.342	-1.041(.531)	.945	-.296(1.068)	.594	.031(.417)	.941	-.480(1.457)	.742
Medical variables										
Time since diagnosis (months)	.008(.068)	.910	.015(.022)	.493	-.002(.024)	.917	-.018(.017)	.302	.013(.024)	.582
Cancer type										
Prostate vs breast(ref)	-1.680(3.306)	.612	-2.069(1.021)	.170	1.587(.893)	.180	.110(.873)	.190	.153(.640)	.812
Colorectal vs breast(ref)	-4.909(4.366)	.263	1.901(1.432)	.187	-.809(1.381)	.589	1.470(1.102)	.184	1.166(1.733)	.503
Prostate vs colorectal(ref)	.731(3.929)	.853	.207(1.306)	.874	1.184(1.163)	.405	.189(.954)	.843	1.098(1.572)	.487
Cancer stage (0-IV)	.543(1.602)	.735	-.404(.518)	.437	-.071(.562)	.917	.763(.408)	.063	.255(.553)	.646
Cardiometabolic comorbidity, 1+ vs none(ref)	-4.792(2.434)	.050*	-2.228(.787)	.005**	.088(.854)	.918	-1.479(.620)	.018*	-1.172(.840)	.165
Overall R ²	.116	.010*	.140	.002**	.086	.076	.149	.001***	.086	.075

HRQoL health related quality of life

* p < .05

** p < .01

*** p < .001

Table 2 Multivariate logistic regression models for unmet supportive care needs

	Health Systems Needs		Psychological Needs		Patient Care Needs		Physical Needs		Sexuality Needs	
	B(SE)	OR	B(SE)	OR	B(SE)	OR	B(SE)	OR	B(SE)	OR
Demographic variables										
Age (years)	-.016(.017)	.984	-.012(.018)	.988	-.001(.020)	.999	.000(.020)	1.00	-.031(.021)	.969
Gender										
Female vs male(ref)	-.740(.654)	.477	.112(.613)	1.118	-.053(.812)	.949	-.046(.812)	.955	-.076(.753)	.927
Marital status										
Married vs unmarried(ref)	-.005(.321)	1.005	-.603(.330)	.547	.235(.383)	1.264	.259(.382)	1.295	.462(.380)	1.578
Nativity										
U.S. vs foreign born(ref)	.102(.460)	1.107	-.252(.467)	.777	-.371(.544)	.465	-.400(.545)	.671	-.079(.527)	.924
Income										
\$25,000+ vs. <\$25,000(ref)	-.149(.327)	.861	.052(.333)	1.054	-.097(.382)	.690	-.075(.381)	.928	-.478(.384)	.620
Language										
English vs Spanish(ref)	.248(.597)	1.282	-.114(.606)	.892	-.626(.694)	1.871	.649(.695)	1.914	1.213(.680)	3.363
English vs Bilingual(ref)	.231(.448)	.794	.119(.455)	.887	-.382(.521)	1.465	.370(.523)	1.448	.760(.512)	2.138
Bilingual vs Spanish(ref)	.479(.505)	.900	-.234(.509)	.792	.245(.577)	1.277	.207(.550)	.141	.453(.546)	1.573
Medical variables										
Time since diagnosis (months)	.002(.009)	1.002	-.008(.009)	.992	.000(.012)	.997	.000(.012)	1.000	.017(.010)	1.017
Cancer type										
Prostate vs breast(ref)	-1.342(.779)	.261	-.670(.745)	.512	-1.294(.975)	.274	-1.295(.976)	.389	1.041(.899)	1.342
Colorectal vs breast(ref)	-1.066(.599)	.344	-.839(.562)	2.313	-.960(.710)	.383	-.951(.710)	.278	-.072(.677)	1.075
Prostate vs colorectal(ref)	-.276(.510)	.293	.168(.505)	1.184	-.334(.675)	.245	.543(.745)	.530	1.113(.582)	3.044
Cancer stage (0-IV)	.003(.212)	1.003	-.012(.218)	.988	.024(.244)	1.025	.038(.244)	1.038	.068(.240)	1.070
Cardiometabolic comorbidity, 1+ vs none(ref)	.591(.323)	1.805	.740(.333)	2.095*	.097(.377)	1.102	.112(.377)	1.118	1.064(.370)	2.898**
Cox and Snell R^2		.058		.102*		.056		.055		.140**
Nagelkerke R^2		.078		.136*		.085		.084		.198**

* $p < .05$ ** $p < .01$ *** $p < .001$

Changes in healthy behaviors

Table 4 displays the association of cardiometabolic comorbidity with increases in cardioprotective health behaviors (eating healthy food, trying to lose weight, controlling stress, exercise, and alcohol avoidance) following a cancer diagnosis. There were no differences in increases in health behaviors among survivors with and without cardiometabolic comorbidity when adjusting for sociodemographic and medical covariates. Prostate cancer survivors had greater odds of increasing attempts to lose weight than colorectal survivors (OR = 4.333, $p < 0.01$). U.S. born survivors had a greater odds of increasing attempts to control stress than foreign born survivors (OR = 2.734, $p < 0.05$). Female survivors had a lower odds of increasing exercise (OR = 0.142, $p < 0.01$) and alcohol avoidance (OR = 0.083, $p < 0.05$) than male survivors. Monlingual English speakers had a lower odds of increasing eating healthy foods than

bilingual English–Spanish speakers (OR = 0.314, $p = 0.027$). Both prostate and colorectal cancer survivors had a lower odds of increasing exercise than breast cancer survivors (OR = 0.146, $p < 0.05$; OR = 0.236, $p < 0.05$, respectively).

Discussion

Findings from the current study suggest that cardiometabolic comorbidities may be disproportionately prevalent among Hispanic/Latino cancer survivors. In our sample, approximately 25% of Hispanic/Latino cancer survivors were diagnosed with comorbid diabetes and 20% were diagnosed with comorbid peripheral vascular disease, compared to prevalence rates in the general U.S. population of 10% for diabetes [34] and 4% to 10% for peripheral vascular disease (through age 79) [35]. Older survivors and those who have a lower socioeconomic status were also more likely to have at

Table 3 Multivariate logistic regression models for patient-provider communication self-efficacy and satisfaction with cancer care

	Patient-Provider Communication Self-Efficacy		Satisfaction with Care	
	B(SE)	<i>p</i>	B(SE)	<i>p</i>
Demographic variables				
Age (years)	.001(.005)	.845	.068(.074)	.359
Gender				
Female vs male(ref)	-.045(.111)	.687	2.482(1.784)	.166
Marital status				
Unmarried vs married	-.243(.088)	.006**	.013(1.415)	.993
Nativity				
U.S. vs foreign born	.118(.111)	.360	1.429(1.782)	.424
Income				
\$25,000+ vs. < \$25,000	-.055(.088)	.535	1.352(1.432)	.346
Language				
English vs Spanish(ref)	-.071(.213)	.739	-.550(3.144)	.861
English vs Bilingual(ref)	-.152(.140)	.283	-1.158(2.470)	.641
Bilingual vs Spanish(ref)	-.057(.127)	.653	-.021(2.055)	.992
Medical variables				
Time since diagnosis (months)	.000(.002)	.878	-.054(.040)	.180
Cancer type				
Prostate vs breast(ref)	-.229(.126)	.073	2.933(2.012)	.147
Colorectal vs breast(ref)	-.286(.162)	.080	.668(2.355)	.777
Prostate vs colorectal(ref)	.141(.128)	.275	1.157(2.463)	.640
Cancer stage (0-IV)	-.049(.059)	.403	.770(.943)	.415
Cardiometabolic comorbidity (1+ vs none)	.179(.089)	.045*	2.458(1.433)	.088
Overall <i>R</i> ²		.108*		.049

Note: P-P Communication, patient-provider communication self-efficacy

**p* < .05

***p* < .01

****p* < .001

least one cardiometabolic comorbidity. Importantly, Hispanic/Latino cancer survivors with cardiometabolic comorbidities demonstrated worse overall HRQoL, including emotional and physical wellbeing, as well as a greater likelihood of having unmet psychological and sexuality needs. Hispanic/Latino cancer survivors who were younger, single, and have a lower socioeconomic status also demonstrated worse HRQoL.

Hispanic/Latino cancer survivors may require focused attention to screen for and manage cardiometabolic comorbidities in order to optimize health and HRQoL following the treatment and diagnosis of cancer. In addition to addressing psychological needs, sexual functioning and satisfaction are needs that have been historically under-addressed in cancer survivorship and should be screened among Hispanic/Latino cancer survivors with cardiometabolic comorbidities like diabetes and peripheral vascular disease [36, 37]. The growing field of cardio-oncology, including specialized, multidisciplinary clinics comprised of oncologists and cardiologists who provide care to improve cardiovascular health among cancer patients and survivors, may be particularly well-positioned to prevent, mitigate,

and treat cardiometabolic comorbidities among Hispanic/Latino cancer survivors [38]. Our findings show that survivors with cardiometabolic comorbidities endorsed greater self-efficacy in patient-provider communication than those without comorbidity. Although managing cardiometabolic comorbidities alongside cancer survivorship and follow-up care may add medical complexity, frequent or intensive contact with providers and healthcare systems may ultimately result in patients feeling more empowered or comfortable in communicating with providers. Self-efficacy in patient-provider communication is likely helpful as Hispanic/Latino cancer survivors work together with the care team to address their individual health needs. Nevertheless, Hispanic/Latino cancer survivors who are born abroad, less acculturated, and monolingual Spanish-speaking often report lower self-efficacy in patient-provider communication [39–41]. Our previous research also demonstrates that lower self-efficacy in patient-provider communication is associated with unmet supportive care needs and lower satisfaction with cancer care [24, 39]. Therefore, it is critical to consider acculturation, primary language, and nativity when providing care for

Table 4 Multivariate logistic regression models for health behaviors

	Eating Healthy Food		Trying to Lose Weight		Controlling Stress		Exercise		Alcohol Avoidance		Avoid Cigarettes		Regular Health Checkups	
	B(SE)	OR	B(SE)	OR	B(SE)	OR	B(SE)	OR	B(SE)	OR	B(SE)	OR	B(SE)	OR
Demographic variables														
Age (years)	-.029(.019)	.971	-.020(.018)	.980	-.022(.324)	.978	-.013(.018)	.988	-.009(.020)	.991	-.008(.023)	.992	-.012(.018)	.988
Gender														
Female vs male(ref)	.271(.631)	1.311	.895(.675)	2.448	-.489(.614)	.614	-.1952(.748)	.142**	2.487(1.109)	.083*	-1.199(.892)	.301	.453(.665)	1.573
Marital status														
Married vs unmarried(ref)	.414(.335)	1.513	.504(.327)	1.655	-.291(.324)	.747	.728(.333)	2.071*	-.177(.364)	.838	-.253(.426)	.776	.386(.326)	1.470
Nativity														
U.S. vs foreign born(ref)	.364(.495)	1.440	.348(.475)	1.417	1.006(.484)	2.734*	-.330(.464)	1.391	-.826(.526)	.438	-1.022(.614)	.360	1.049(.496)	2.855*
Income														
\$25,000 + vs. <\$25,000(ref)	-.604(.344)	.547	.124(.329)	1.131	.608(.332)	1.836	-.247(.331)	.781	.222(.368)	.801	-.524(.443)	.592	-.117(.333)	.890
Language														
English vs Spanish(ref)	-1.199(.630)	.302	-.027(.610)	.974	-.726(.618)	.484	.267(.602)	1.306	.640(.682)	1.897	-.092(.937)	.912	-.772(.638)	.462
English vs Bilingual(ref)	-1.157(.524)	.314*	-.263(.508)	.769	-.271(.516)	.763	.457(.512)	1.580	.199(.586)	1.220	-.912(.846)	.402	.127(.523)	1.135
Bilingual vs Spanish(ref)	-.042(.483)	.959	.236(.462)	1.266	-.455(.459)	.634	-.191(.449)	.826	.441(.492)	1.554	.820(.552)	2.270	-.899(.469)	.407
Medical variables														
Time since diagnosis (months)	.027(.014)	1.028	.002(.009)	1.002	.004(.009)	1.004	.012(.009)	1.012	-.002(.010)	.998	-.003(.013)	.997	-.002(.009)	.998
Cancer type														
Prostate vs breast(ref)	.319(.774)	1.376	.748(.795)	2.113	-.731(.744)	.482	-.1921(.860)	.146*	-1.935(1.195)	.144	-1.310(1.058)	.270	.567(.791)	1.764
Colorectal vs breast(ref)	.057(.575)	1.059	-.718(.565)	.488	-.983(.557)	.374	-1.442(.706)	.236*	-1.544(1.083)	.214	-.414(.857)	.661	.631(.605)	1.880
Prostate vs colorectal(ref)	.262(.525)	1.300	1.466(.571)	4.333**	.252(.510)	1.287	-.479(.504)	.620	-.391(.529)	.677	-.896(.640)	.408	-.064(.520)	.938
Cancer stage (0-IV)	-.400(.229)	.670	.0062(.217)	1.006	-.025(.215)	.975	-.071(.216)	.931	-.211(.237)	.809	.072(.273)	1.074	-.151(.216)	.860
Cardiometabolic comorbidity, 1 + vs none(ref)	.103(.345)	1.109	.046(.326)	1.047	.331(.329)	1.392	-.218(.327)	.804	.249(.365)	1.283	.607(.434)	1.834	-.234(.329)	.791
Cox and Snell R ²			.104*		.093		.078		.084			.080		.049
Nagelkerke R ²			.143*		.125		.0104		.084			.130		.067

ref; reference group

* $p < .05$

** $p < .01$

*** $p < .001$

Hispanic/Latino cancer survivors with or without cardiometabolic comorbidities, as these factors may identify survivors who may experience less confidence in patient-provider communication and require additional support.

Although some Hispanic/Latino cancer survivors reported increasing efforts to eat a healthy diet and manage stress following their diagnosis, increases in weight loss, exercise, and abstinence from alcohol were not as common. Furthermore, increases in cardioprotective health behaviors did not differ between survivors with and without cardiometabolic comorbidities. The current findings suggest that more work is needed to better understand barriers to exercise, weight loss, and abstinence from alcohol and to optimize engagement in healthy behaviors among Hispanic/Latino cancer survivors, particularly those who have cardiometabolic comorbidities. Abstinence from alcohol is an important area for further study in light of the recent statement by the World Health Organization that there is no level of alcohol consumption that is known to be safe for human health [42]. Cancer survivorship is a time when many individuals become more focused on their health and can be a teachable moment in which health behavior interventions could be more impactful. A “teachable moment” in the context of health has been defined as a cueing event that prompts patients to adopt cognitive, emotional, and/or physical changes [43]. However, cancer survivors often struggle to implement behavioral changes on their own without guided support and intervention [44]. Furthermore, given that structural factors like poverty and neighborhood characteristics influence health behaviors [17, 18], it is critical that future efforts to develop and test tailored, culturally-sensitive interventions to increase cardioprotective behaviors in Hispanic/Latino cancer survivors adopt a social ecological framework that considers environmental conditions that contribute to health behaviors and supports policy change whenever possible [45].

Limitations

Findings of the current study should be interpreted within the context of its limitations. Causal inference cannot be inferred as this study utilizes cross-sectional baseline data. An important future direction is the use of longitudinal designs to examine how relationships between cardiometabolic comorbidities and outcomes of interests unfold across time. In particular, our assessment of cardiometabolic comorbidities did not capture duration or severity of comorbidities or whether they were diagnosed prior, during, or after the cancer diagnosis. Future research should include a more granular assessment of cardiometabolic comorbidities in order to understand how these conditions emerge relative to the cancer diagnosis and treatment. Our study sample was also circumscribed and was specifically representative of Hispanics/Latinos in the Chicago metropolitan area and the

South Texas region, which limits generalizability to the general U.S. Hispanic/Latino population. Future studies should include geographically diverse Hispanic/Latino cancer survivors with primary cancer sites of disease beyond the breast, prostate, and colon/rectum and diagnoses that span the full spectrum of disease severity (i.e., stages 0 to IV). Lastly, self-report measures of health behaviors may have limited our ability assess or corroborate actual changes in health behaviors following a diagnosis of cancer. Furthermore, although the ACS measure used in the current study assesses self-reported change in health behaviors following a cancer diagnosis [33], there is an inherent limitation to not assessing the baseline level of a health behavior in order to contextualize and interpret change over time. Future research should include detailed assessments of baseline levels of relevant health behaviors as well as their change over time, and collect measurements beyond self-report (e.g., actigraphs).

Conclusions

Our findings suggest that cardiometabolic comorbidities may be highly prevalent among Hispanic/Latino cancer survivors and increase the risk of worse HRQoL and unmet supportive care needs. More research needed to develop targeted interventions to optimize health and increase healthy behaviors among survivors with cardiometabolic comorbidities.

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Data availability The de-identified data that support the findings of this study are available upon reasonable request from the corresponding author P.I.M. The data are not publicly available because they contain private health information that could compromise research participant privacy/consent.

Declarations

Ethics approval All procedures were approved by the institutional review board of each institution (Northwestern University and UT Health San Antonio) and were compliant with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants in the study.

Competing interests The authors have no conflicts of interest to declare.

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