Predictors of Patient Reported Outcomes and Cost of Care in Younger Men With Newly Diagnosed Prostate Cancer

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BACKGROUND. The proportion of younger men (<65 years) diagnosed with prostate cancer (PCa) has increased significantly. We sought to analyze the association between race/ethnicity, biochemical recurrence risk and outcomes in younger men with PCa.

METHODS. In this prospective cohort study, we recruited 318 younger men with newly diagnosed PCa. Participants completed generic and prostate-specific Health Related Quality of Life (HRQoL), out-of-pocket cost and satisfaction with care surveys at baseline and at 3, 6, 12, and 24 months of follow-up. Health resource utilization and cost data were obtained from the hospital based administrative databases. We compared time to return to baseline (RTB) of HRQoL scores across groups. Survival curves were used to compare mean time to RTB across groups. Linear mixed effects (LMEs) and generalized linear (GLM) models were used to analyze the association of race/ethnicity and biochemical recurrence groups with outcomes.

RESULTS. African Americans reported lower generic and prostate-specific HRQoL scores at diagnosis and required more time to RTB values for generic HRQoL. The results of LME models showed that low risk of biochemical recurrence was associated with better physical function, vitality, mental health, and general health. For prostate-specific HRQoL items, low risk of biochemical recurrence was associated with impaired urinary function and better bowel function and bowel bother. GLM model showed that treatment, hospital type and comorbidity were associated with cost.

CONCLUSIONS. Biochemical recurrence risk and treatment groups, not ethnicity, were associated poorer post-treatment outcomes. This information is important in planning for and communicating with patients about post-treatment care. *Prostate 69: 1067–1076, 2009.*

KEY WORDS: **patient reported outcome; clinically important difference; minimally important difference; cost; ethnicity; Health Related Quality of Life; satisfaction with care**

INTRODUCTION

Over the last decade there has been a significant migration of prostate cancer diagnosis from older to younger patients and from distant to localized or regional cancer [1,2]. While prostate cancer remains the leading cancer diagnosed among men in the US, the median age at diagnosis has lowered to 69 years [1]. Race/ethnicity and age influence prostate cancer

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diagnosis, treatment and outcomes [2–11]. African American men receiving radical prostatectomy (RP) have often exhibited more adverse pathological features than Caucasians [4,9]. After adjusting for age, prostate-specific antigen (PSA) level, grade and stage, an ethnic variation was observed in progression free survival of localized prostate cancer patients treated with RP [2,4–8].

The higher incidence of prostate cancer observed during the 1990s, largely attributed to increased use of the PSA test for screening, was paralleled by a shift toward younger age at diagnosis and increased use of RP as initial treatment [4–8]. As a result, more men are living longer with prostate cancer and treatment-associated morbidities (e.g., generic and prostate specific function). Younger men are often diagnosed with organ confined low risk prostate cancer and live long post-diagnosis and desire to maximize the quality of life. Younger patients may react differently when they choose their prostate cancer treatment. Health Related Quality of Life (HRQoL) issues are a vital concern for the majority of younger patients seeking intervention for their prostate cancer. Due to uncertainty in the effectiveness of screening and treatment of prostate cancer, debate on HRQoL, satisfaction with care and cost of care associated with prostate cancer care continues. The optimal management for patients with localized prostate cancer is unclear [2–11].

RP is the treatment of choice among younger patients with localized prostate cancer. However, very few studies have directly assessed the patient reported outcomes among this population. Post-treatment recovery of generic and prostate-specific HRQoL is a major concern in post-treatment care of prostate cancer. Despite the expanding literature on disparity in treatment and survival in older patients, little is known about the ethnic disparities in outcomes among younger prostate cancer patients. Additionally, risk of biochemical recurrence has gained increased attention in prostate cancer research and clinical decisions. Thus, we sought to analyze the association between race/ethnicity, risk of biochemical recurrence and recovery pattern of patient reported outcomes such as satisfaction with care, HRQoL (generic and prostate-specific) and cost in younger men with newly diagnosed prostate cancer. We hypothesized that younger African Americans will have impaired HRQoL outcomes (generic and prostate-specific) and will present with higher cost, compared to younger Caucasian prostate cancer patients.

MATERIALS AND METHODS

An observational prospective cohort design was used to recruit younger (<65 years) patients with newly diagnosed prostate cancer. The study was approved by local Institutional Review Boards. All participants provided informed consent and health information portability and accountability act education form, prior to enrollment. Study inclusion criteria were: self identified African American or Caucasian men of age <65 years at the time of diagnosis, newly diagnosed for prostate cancer in the prior 4 months and yet to initiate treatment. The diagnosis of prostate cancer was based on prostate biopsy complemented by prostate specific antigen (PSA) level and staging. Patients were excluded if they were diagnosed with metastatic cancer, had visited the clinics for a second opinion only, were unable to communicate in English, were cognitively impaired and/or were unavailable via mail or telephone.

Subject Selection and Recruitment

Recruitment. Newly diagnosed prostate cancer cases were identified and recruited at the urology clinics of a healthcare system and a Veteran Administration medical center. Potential participants received study information from their urologists during clinic visits. Study research assistants then contacted those who expressed an interest in participating in the study. At this stage, a potential participant could agree to participate in the study and complete the consent form. If a person was interested but wanted to be contacted later, the research assistant did so. During the telephone contact, if the potential participant agreed to participate, he was mailed a consent form and a prepaid return envelope.

Baseline Data Collection

Baseline data on generic and prostate-specific HRQoL was obtained prior to initiation of treatment. A self-report questionnaire was used to obtain data on ethnicity, education, marital status, living arrangement and income. Structured medical chart review was used to collect data on age, PCa diagnosis date, treatment, PSA score, Gleason score, TNM stage, and comorbidity. Prostate cancer treatment was classified as RP, external beam radiation therapy (EBRT), hormone therapy and no treatment.

Risk groups. Risk group for PSA failure were categorized as follows: low risk-TNM Stage T1c–T2a and PSA level $\leq$10 ng/ml and Gleason score $\leq$6; intermediate risk-TNM Stage T2b and PSA level >10 ng/ml and Gleason score of 7; and high risk-Stage T2c or higher and PSA level >20 ng/ml and Gleason score $\geq$8 [12].

Retention. After obtaining baseline data, participants were contacted by mail at 3, 6, 12, and 24 months. Non-respondents were contacted over telephone after 10 days. A second mail survey was sent to non-respondents within 4 weeks of the first mailing. Importance of active participation was emphasized during study enrollment and clinic visits.

Outcome Measures

Patient reported outcomes. To assess generic and prostate-specific HRQoL and satisfaction with care, participants completed self-administered surveys at baseline and at 3, 6, 12, and 24 months of follow-up. Prostate-specific HRQoL was assessed using the UCLA Prostate Cancer Index (PCI). This is a comprehensive self-administered 20 item questionnaire that quantifies prostate specific HRQoL in 6 domains (urinary function, urinary bother, sexual function, sexual bother, bowel function, and bowel bother). PCI has performed well in older populations, is easy to understand and complete and has good psychometric properties [13]. Generic HRQoL was measured using the Medical Outcomes Study Short Form (SF-36) a single multi-item scale that assesses eight health concepts. It was constructed for self-administration or for administration by a trained interviewer, either in person or by telephone and was tested for reliability and validity [14]. The range of possible score for each sub-scale is 100–0%. A higher score on SF-36 and PCI indicates a higher quality of life.

Satisfaction with care. Satisfaction with care is defined as a pleasant feeling caused by the fulfillment of expectations [15] and is measured using the self-administered Client Satisfaction Questionnaire (CSQ-8). This questionnaire has been extensively studied and has demonstrated good psychometric properties [15]. A higher score on CSQ-8 indicates greater patient satisfaction with care.

Health resource utilization and medical care cost. Health resource utilization (HRU) and direct medical care cost (DMC) data for 3 years (1 year pre-diagnosis and 2 years post-treatment) were obtained from Pennsylvania Integrated Clinical and Research Database (PICARD). The DMC are defined as reimbursements for specific services by any part of the healthcare organization and consist of [1]: hospital costs [2], physician, professional and nurse payments [3], diagnostic and therapeutic procedures costs, and [4] outpatient and emergency room (ER) costs. Data on HRU, procedures and DMC for non-VA patients were obtained from PICARD. For VA participants, DMC were obtained from the VHA services using Patient Treatment File (PTF or inpatient file) and the Outpatient Care Files (OPC). For each participant, outpatient events (visits, procedures, and labs) and inpatient DRG and events are captured from the patient-specific clinical databases of Veterans Health Information Systems and Technology Architecture (VISTA) system, local electronic medical record [16]. Data on type and number of services received by a patient, including those attributable to PCa, were obtained using CPT codes. These data were obtained from hospital based administrative databases. Additionally, we developed a two-part self-administered indirect cost survey to document out-of-pocket expenses and patient and care givers time. These data, along with self-reported income, were used to derive total annual indirect cost for the follow-up period. Baseline Charlson comorbidity index was computed using ICD9 codes for all inpatient and outpatient events in 3 months prior to PCa diagnosis [17].

Statistical Analysis

Demographic and clinical variables were compared between race/ethnicity using *t*-test and Chi-square. Mean HRQoL at baseline and follow-up points were compared. Post-treatment satisfaction with care was compared using Chi-square. Return to baseline (RTB) HRQoL at a follow-up point was defined in two ways. First, a change of seven points or less, which is considered to be a clinically significant difference [14,18], was defined as ''RTB.'' During the follow-up period, participants were considered to have ''RTB'' for a HRQoL item if the difference in baseline and follow-up scores was seven or less. Alternatively, we defined ''RTB'' as a ''minimally important difference'' of 0.5 times the standard deviation for each item [18]. We compared the proportion of participants RTB and those who never RTB, across race/ethnicity at different follow-up points for all HRQoL items. The mean time to RTB was determined by survival analysis and compared between ethnicity.

Linear mixed effect (LME) model was used to determine the association of ethnicity and biochemical recurrence risk with HRQoL scores for prostate-specific and generic items, after adjusting for age, education, marital status, Charlson comorbidity score, baseline score, and treatment [19]. Mean DMC per patient over the 24 months period was computed. Generalized linear model (log-link) was used to determine the association of ethnicity and biochemical recurrence risk with cost, after adjusting for age, education, marital status, Charlson comorbidity score, and treatment. Variables were dichotomized as follows: biochemical recurrence risk group: 1 = low risk; 0 = intermediate/

high risk; race: 1 = African American, 0 = Caucasian; marital status: 1 = married, 0 = other; education: 1 = HS or less, 0 ≥ HS; treatment: 1 = RP, 0 = EBRT; and hospital type: 1 = non-VA; 0 = VA. Simple means statistical imputation method was used to handle missing data. The data were assumed to be missing at random conditional on observed subject characteristics and the individual components [20]. To account for multiple testing, we applied Bonferroni correction to generate adjusted *P* values [21].

RESULTS

We recruited 318 (104 = African Americans and 214 = Caucasian) younger (<65 years) patients with newly diagnosed PCa. Of these, 295 participants completed 3-month follow-up, 284 completed 6-month follow-up, 282 participants completed 12-month follow-up and 279 completed 24-month follow-up. Comparisons of demographics and clinical characteristics of the study population are presented in Table I. African American participants were older (mean = 57.7; SD = 4.6) at the time of diagnosis, compared to Caucasian men (mean = 56.8; SD = 4.9) though the difference was not statistically significant. Majority of the Caucasian men were college-educated, married and had an annual income of $40,000 or more. Higher proportion of African American men reported having to urinate too often and had pain/aches in the back, hips, or legs. Clinical and pathologic stages ranged from T1N0M0 (clinically inapparent tumor not palpable or visible by imaging [T1], no regional lymph node metastasis [N0], and no distant metastasis [M0]) to T3bN0M0 (tumor extends through the prostate capsule [T3], no regional lymph node metastasis [N0], and no distant metastasis [M0]). Majority of the participants were between stages T1c and T2a. Tumors were moderately differentiated with a mean Gleason score of 6.3 (SD = 0.65) for Caucasians versus 6.4 (SD = 0.99) for African Americans. Mean Gleason score, PSA score and stage of cancer at diagnosis were comparable between groups ($P = 0.26$). Treatment differed by ethnicity, higher proportion of African Americans received EBRT, whereas a higher proportion of Caucasians received RP ($P = 0.0016$).

Baseline HRQoL

Comparison of unadjusted baseline assessment of generic HRQoL showed that African American men reported significantly lower scores for all generic and prostate-specific HRQoL items, compared to Caucasians (Table II). Table III presents RTB analysis. The proportion RTB for some of the items varied between race/ethnicity at 3 and 12 months, but not at 6 months. At 24-month follow-up, the proportion RTB differed between race/ethnicity for most of the generic and prostate specific HRQoL items. African Americans took longer time to RTB for almost all items of generic and prostate specific HRQoL items, and a higher proportion of them never RTB for some of the HRQoL items. We repeated the analysis using a ''minimally important difference'' (0.5 times the standard deviation) as the criteria for ''RTB.'' The results (not reported) were comparable with those obtained by using clinically important difference.

The results of LME models to determine predictors of generic and prostate-specific HRQoL scores are presented in Tables IV and V. In addition to other covariates, we also controlled for baseline HRQoL scores to account for their differences across ethnicity at baseline. Low risk of biochemical recurrence was associated with better physical function (OR = 7.6), vitality (OR = 3.3), mental health (OR = 1.1), and general health (OR = 1.4). As shown in Table V, for prostate-specific HRQoL items, low risk of biochemical recurrence was associated with impaired urinary function (OR = 0.85) and improved bowel function (OR = 1.1) and bowel bother (OR = 1.2).

Satisfaction With Care

Unadjusted satisfaction with care varied significantly between African American and Caucasians. Compared to African American participants, Caucasian participants consistently reported higher satisfaction at 3 month (25.8 vs. 28.8, $P \leq 0.001$), 6 month (26.7 vs. 28.8, $P \leq 0.001$), 12 month, (26.3 vs. 28.4, $P = 0.002$) and 24-month follow-up (26.4 vs. 28.3, $P = 0.002$). With respect to items of satisfaction with care survey, 11% of African Americans and 8% of Caucasians reported poor ratings for the services they received. Nine percent of the African American group and 3% of the Caucasian group reported not receiving the services they wanted ($P < 0.0001$). Also, 14% of the African Americans reported that the program did not adequately meet their needs and were dissatisfied with the help they received, compared to 4% of the Caucasians ($P < 0.0001$). Similar dissatisfaction with services being helpful to effectively deal with problems was also reported by 15% of the African Americans, compared to 2% of Caucasians ($P < 0.0001$). Overall, about 16% from African American group and 5% from the Caucasian group were not satisfied with the services they received ($P < 0.0001$). Results of the mixed effect model indicated that total satisfaction with care was comparable between African Americans and Caucasians (OR = 1.05; $P = 0.236$), after adjusting for demographic and clinical covariates.

Health Resource Utilization and Cost of Care

Comparison of unadjusted inpatient, outpatient and ER costs between African Americans and Caucasians

TABLE I. Demographics and Clinical Characteristics of Study Population (n = 318)

Covariates	Caucasians (n = 214)	AA (n = 104)	*P*-value
Age (mean ± SD)	56.8 (4.9)	57.7 (4.6)	0.1220
Charlson comorbidity (mean ± SD)	0.96 (2.0)	1.8 (2.6)	0.0048
Education (%)			
HS or less	25.00	40.59	0.0056
College or more	75.00	59.41	
Marital status (%)			
Single/widowed/div	21.65	38.00	0.0028
Married	78.35	62.00	
Employment status (%)			
Full-time	32.12	68.37	<0.0001
Part-time/other	67.88	31.63	
Income level (%)			
<$40,000	19.05	61.70	<0.0001
>$40,000	80.95	38.30	
Signs and symptoms (%)			
Difficulty or discomfort urinating	17.44	28.00	0.0350
Having to urinate too often	35.94	55.56	0.0013
Weak urinary stream	31.44	36.36	0.3993
Infection of bladder or prostate	6.19	9.49	0.3118
Blood in urine	5.15	13.29	0.0151
Pain or aches in back, hips or legs	15.54	54.08	<0.0001
More tired or worn out than usual	18.56	34.04	0.0039
PSA-at diagnosis (ng/ml) (mean ± SD)	6.8 ± 7.1	8.9 ± 12.5	0.2640
Gleason score (mean ± SD)	6.3 ± 0.65	6.4 ± 0.99	0.8842
Clinical stage (%)			0.0661
T1a to T1c	68.55	71.74	
T2a to T2c	17.74	26.09	
T3a to T3b	13.71	2.17	
Risk group (%)			0.7620
Low	67.69	65.31	
Intermediate/high	32.31	34.69	
Treatment (%)			0.0016
Radical prostatectomy	83.15	65.88	
External beam radiation therapy	16.85	34.12	

HS, high school; AA, African American; PSA, prostate specific antigen.

for pre-treatment, treatment and post-treatment phases indicated significant variation. As shown in Table VI during pre-diagnosis phase, African Americans reported higher mean annual total cost than Caucasians. During treatment and post-treatment phase Caucasians reported higher total annual cost. However, results of GLM model indicated that after adjusting for demographic and clinical characteristics, neither ethnicity nor biochemical risk was associated with total cost (Table VII).

Out-of-Pocket and Indirect Cost Expenses

Self reported out-of-pocket and indirect cost comparison between groups indicated that the mean monthly non-medication expenses related to PCa were higher for African American group ($371 vs. 76, $P = 0.0163$). Also, during the post-treatment phase, African Americans reported: taking more time for traveling (46.85% vs. 10%, $P = 0.004$), additional time requirement for doing usual work (45% vs. 22.5%, $P = 0.005$) and requiring more help from care givers (20.6% vs. 4.6%, $P = 0.006$). However, out-of-pocket pharmacy expenses and time lost did not differ between groups.

DISCUSSION

Due to enhanced PSA screening rate, PCa prevalence has been on a steady rise among younger men over the past decade, with implications for healthcare delivery and outcomes. Using a prospective cohort study of

TABLE II. Comparison of Baseline HRQoL by Ethnicity (Mean ± SD)

Variable	Caucasian (n = 214)	African American (n = 104)	*P*-value
Generic HRQoL			
Physical function	69.9 ± 17.2	55.8 ± 23.5	<0.0001
Role physical	84.0 ± 32.1	61.1 ± 44.3	<0.0001
Role emotional	77.4 ± 36.4	66.3 ± 43.8	<0.0001
Vitality	68.0 ± 22.2	59.0 ± 22.5	<0.0001
Mental health	76.1 ± 18.7	70.4 ± 19.7	0.0249
Social function	84.9 ± 21.7	70.6 ± 28.1	0.0309
Bodily pain	88.3 ± 20.9	68.8 ± 29.5	0.0010
General health	71.4 ± 22.7	61.2 ± 24.6	0.0012
Prostate-specific HRQoL			
Urinary function	90.9 ± 19.1	87.2 ± 18.4	0.0138
Bowel function	89.9 ± 12.4	83.7 ± 15.3	0.0157
Sexual function	61.7 ± 27.1	57.3 ± 28.4	<0.0001
Urinary bother	87.9 ± 21.6	80.3 ± 26.3	<0.0001
Bowel bother	91.4 ± 18.1	85.8 ± 22.9	<0.0001
Sexual bother	69.2 ± 35.5	55.8 ± 39.6	<0.0001

HRQoL, Health Related Quality of Life.

318 men, we evaluated the effects of race/ethnicity and risk of biochemical recurrence on outcomes among younger PCa patients. The main findings of this study are [1]: Ethnicity/race is not a predictor of generic and prostate-specific HRQoL, after adjusting for demographic and clinical variables [2]; Younger African American men take longer time to recover function for generic HRQoL items of physical function, role physical, role emotional and general health [3]; For prostate-specific HRQoL items, younger African Americans took longer time to RTB values for bowl function and bowl bother. Younger Caucasians, on the other hand, took longer time to RTB values for urinary and sexual function [4]; Biochemical risk was associated with physical function, vitality, mental health, general health, urinary function, bowel function, bowel bother and sexual bother [5]; LME models demonstrated that not ethnicity, but risk of biochemical recurrence was associated with generic and prostate-specific HRQoL, after controlling for treatment and other covariates [6]; Hospital type, treatment and comorbidity were associated with total cost; and [7] Satisfaction with care was comparable between racial/ethnic groups and across time.

Other studies have shown that ethnicity influences treatment and affects cancer recurrence and outcome in elderly patients [6–11,23–25]. African American men have a higher incidence of PCa, exhibit poorer stage-specific survival than Caucasians and have a higher rate of presentation with late stage disease [1,9,22]. For localized and regional disease stages, Caucasians are more likely to receive RP, whereas African Americans

TABLE III. Percent of Patients Returning to Baseline Scores During 24 Months of Follow-Up

	3 months (%)		6 months (%)		12 months (%)		24 months (%)		Percent of patient not returning to baseline values		Mean (days) to return to baseline values	
	CA	AA	CA	AA	CA	AA	CA	AA	CA	AA	CA	AA
Generic HRQoL												
Physical function	62.09	54.93	78.08	68.92	83.97	68.18*	77.86	66.67	10.61	19.78*	228	281*
Role physical	55.56	50.70	78.08	70.27	87.19	71.21*	87.02	73.81*	7.26	18.68*	220	282*
Role emotional	78.43	63.38*	86.99	79.73	1.038	81.82*	93.89	78.57*	4.47	15.38*	181	244*
Vitality	59.48	63.38	68.49	68.92	75.00	69.70	77.86	61.90*	12.29	16.48	250	247
Mental health	77.12	64.79*	80.82	75.68	82.69	77.27	81.68	64.29*	4.47	9.89	173	173
Social function	56.86	49.30	69.86	67.57	78.21	72.73	77.10	52.38*	11.73	16.48	240	269
Bodily pain	56.86	56.34	67.12	71.62	71.15	59.09	61.83	54.76	11.73	18.68	245	265
General health	83.66	63.38*	74.66	66.22	75.00	59.09*	73.28	54.76*	9.5	25.27*	190	294*
Prostate-specific HRQoL												
Urinary function	32.68	46.48*	37.67	50.00	44.87	40.91	47.33	33.33	42.46	41.76	435	228*
Bowel function	73.20	67.61	73.29	62.16	78.85	62.12*	81.68	59.52*	7.26	19.78*	210	281*
Sexual function	17.65	33.80*	17.12	27.03	16.67	19.70	18.32	30.95	73.18	57.14*	590	486*
Urinary bother	37.25	54.93*	60.96	56.76	63.46	50.00	65.65	57.14	27.93	31.87	336	341
Bowel bother	81.05	69.01*	82.88	74.32	84.62	63.64*	87.02	64.29*	5.03	14.29*	181	227*
Sexual bother	35.29	47.89	36.30	45.95	28.21	37.88	35.88	40.48	50.84	43.96	461	409

HRQoL, Health Related Quality of Life; AA, African American; CA, Caucasian.
*$P < 0.05$.

TABLE IV. Predictors of Generic Health Related Quality of Life

Covariates	Physical function OR (SE)	Role physical OR (SE)	Role emotional OR (SE)	Vitality OR (SE)	Mental health OR (SE)	Social function OR (SE)	Bodily pain OR (SE)	General health OR (SE)
Intercept	0.79 (0.97)	0.001 (2.0)*	0.01 (2.1)*	7.8 (0.67)*	27 (0.15)*	6.2 (0.59)*	7.3 (0.56)*	8.7 (0.33)*
Baseline values	1.0 (0.005)*	1.1 (0.005)*	1.1 (0.005)*	1.0 (0.01)*	1.0 (0.006)*	1.0 (0.002)*	1.0 (0.002)*	1.0 (0.001)*
Risk group	7.6 (0.43)*	2.8 (0.92)	4.8 (0.94)	3.3 (0.29)*	1.1 (0.06)*	1.5 (0.26)	1.1 (0.25)	1.4 (0.15)*
Age at treatment	1.0 (0.02)	1.0 (0.03)	1.0 (0.04)	0.99 (0.01)	1.0 (0.002)	1.0 (0.009)	1.0 (0.01)	1.0 (0.001)
AA-ethnicity	0.96 (0.30)	0.04 (0.65)	0.8 (0.68)	1.2 (0.21)	1.0 (0.05)	0.95 (0.19)	0.96 (0.17)	1.1 (0.10)
Education	0.88 (0.16)	1.1 (0.36)	0.8 (0.37)	1.1 (0.11)	0.98 (0.03)	1.1 (0.10)	0.96 (0.09)	0.96 (0.06)
Married	0.77 (0.19)	0.9 (0.42)	2.3 (0.4)	0.89 (0.14)	1.1 (0.3)*	0.84 (0.13)	0.82 (0.11)	1.0 (0.07)
RP-treatment	6.0 (0.36)*	4.5 (0.76)*	6.3 (0.78)*	3.7 (0.24)*	1.2 (0.05)*	1.4 (0.21)	0.99 (0.20)	1.7 (0.12)*
Charlson comorbidity	0.96 (0.03)	0.9 (0.07)	0.94 (0.07)	0.99 (0.02)	1.0 (0.005)	1.0 (0.02)	0.98 (0.02)	1.0 (0.01)
Non-VA hospital	0.68 (0.27)	4.2 (0.54)*	1.8 (0.56)	1.0 (0.17)	1.0 (0.04)	1.5 (0.15)*	1.7 (0.15)*	0.84 (0.08)*

AA, African American; RP, radical prostatectomy.
*$P < 0.05$.

are more likely to receive radiation [4,22]. Using Cancer of the Prostate Strategic Urologic Research Endeavor (CaPSURE) database, Lubeck et al. showed significant differences in clinical presentation, socio-demographics and HRQoL between black and white PCa patients. The HRQoL differences persisted at 1 year post-treatment [6]. Among men receiving RP, African Americans had poorer outcomes in terms of PSA level, compared to Caucasians [12]. Johnson et al. found that among prostatectomy patients, African Americans reported higher sexual and urinary function at 5 years post-diagnosis than Caucasians. However, the ethnic difference in recovery of sexual and bowel function among radiation therapy patients was comparable [8]. In this study, participants were asked to complete baseline assessment retrospectively at 6 months, generic HRQoL was not reported and comorbidity was not controlled for in the analysis. Unlike our study, Gleason score showed significant variation across race/ethnicity.

For some HRQoL items, younger African American PCa patients may take more time to recover, as shown in our study. In our study we observed a racial and ethnic variation in mean time to RTB generic and prostate-specific functions. It is possible that these variations are attributable to treatment type. Therefore, we analyzed the disparity in RTB separately for each treatment groups and observed comparable trends. However, these comparisons were unadjusted and in the final LME model, after adjusting for covariates, ethnicity was not associated with generic or prostate-specific HRQoL. In a prospective study, Knight et al.

TABLE V. Predictors of Prostate Specific Health Related Quality of Life

Covariates	Urinary function OR (SE)	Bowel function OR (SE)	Sexual function OR (SE)	Urinary bother OR (SE)	Bowel bother OR (SE)	Sexual bother OR (SE)
Intercept	37 (0.63)*	33 (0.14)*	1.4 (01.8)	1.9 (1.6)	13 (0.73)*	0.09 (3.2)
Baseline values	1.0 (0.002)*	1.0 (0.001)*	1.1 (0.001)*	1.0 (0.005)*	1.0 (0.003)*	1.1 (0.007)*
Risk group	0.85 (0.24)*	1.1 (0.05)*	4.2 (0.7)	1.3 (0.67)	1.2 (0.29)*	5.8 (1.4)*
Age at treatment	0.99 (0.01)	0.99 (0.002)	0.98 (0.03)	1.0 (0.02)	0.99 (0.01)	0.95 (0.05)
AA-ethnicity	0.89 (0.18)	0.99 (0.04)	0.84 (0.54)	1.2 (0.48)	1.1 (0.21)	0.97 (0.99)
Education	0.91 (0.10)	0.99 (0.02)	0.59 (0.29)	0.64 (0.27)	1.1 (0.12)	0.43 (0.55)
Married	0.86 (0.12)	1.1 (0.03)	1.1 (0.35)	0.97 (0.32)	1.4 (0.14)*	2.8 (0.65)
RP-treatment	0.58 (0.20)*	1.1 (0.05)*	1.9 (0.65)	0.93 (0.55)	1.8 (0.24)*	1.1 (0.12)*
Charlson comorbidity	1.0 (0.02)	1.0 (0.004)	0.99 (0.06)	1.0 (0.05)	0.94 (0.23)*	1.1 (0.11)
Non-VA hospital	2.2 (0.14)*	1.1 (0.03)*	2.2 (0.44)	2.1 (0.40)	0.89 (0.17)	0.76 (0.82)

*$P < 0.05$.

TABLE VI. Heal Resource Utilization Cost, Direct Cost and Indirect cost (n = 318)

	Pre-diagnosis phase			Treatment phase			Post-treatment phase		
Costs	AA	Caucasian	*P*-value	AA	Caucasian	*P*-value	AA	Caucasian	*P*-value
ER cost									
Mean ± SD	29 ± 193	1.13 ± 16	0.072	21 ± 206	17 ± 224	0.755	6 ± 60	0 ± 0	0.755
Median	8,420	5,163	0.117	14,441	11,130	0.197	24,533	21,438	0.758
Inpatient									
Mean ± SD	4,775 ± 23,329	747 ± 3,880	0.045	6,819 ± 10,468	11,601 ± 25,799	0.003	972 ± 5,489	1,687 ± 11,918	0.003
Median	2,123	2,533	0.868	1,697	1,069	0.507	630	563	0.978
Outpatient									
Mean ± SD	4,306 ± 22,053	5,398 ± 22,789	<0.0001	1,234 ± 3,994	3,495 ± 17,612	<0.0001	294 ± 1,774	2,441 ± 14,893	<0.0001
Median	825	220	0.179	1,101	154	0.787	612	0	
Total direct									
Mean ± SD	9,154 ± 39,229	6,118 ± 23,311	0.476	8,086 ± 2,002	15,155 ± 34,340	0.010	1,275 ± 5,719	4,125 ± 19,542	0.059
Median	5,121	2,831	0.168	15,484	12,618	0.350	1,625	609	0.431
Total OPIC									
Mean ± SD				4,759 ± 10,715	5,222 ± 9,345	0.114	504 ± 1,940	818 ± 1,192	0.465
Median				992	499	0.006	45	50	0.369
Total									
Mean ± SD	9,154 ± 39,229	6,118 ± 23,311	0.0002	13,364 ± 15,869	20,360 ± 35,178	0.029	1,846 ± 5,900	4,491 ± 19,626	0.011
Median	5,121	2,831	0.168	9,958	13,212	0.129	1,384	720	0.171

ER, emergency room; AA, African American; OPIC, out-of-pocket + indirect cost.

TABLE VII. Generalized Linear Model Predicting Direct and Total Cost

	Direct medical care cost			Total cost (direct + indirect cost)		
	Beta	SE	*P*	Beta	SE	*P*
Intercept	7.35	1.94	0.0001	8.49	1.97	<0.0001
Risk group (1 = low risk; 0 = intermediate/high risk)	0.20	0.38	0.54	0.22	0.23	0.36
Age	0.02	0.03	0.43	0.015	0.02	0.44
Ethnicity (1 = African American; 0 = Caucasian)	−0.0002	0.65	0.997	0.057	0.38	0.77
Education (1 = High school or less; 0 ≥ HS)	−0.051	0.35	0.88	−0.155	0.21	0.28
Marital status (1 = married; 0 = non-married)	0.378	0.41	0.35	0.431	0.24	0.04
Treatment (1 = RP; 0 = EBRT)	−0.486	0.44	0.26	−0.473	0.26	0.003
Charlson comorbidity	0.0881	0.07	0.20	0.074	0.04	0.002
Hospital (1 = non-VA; 0 = VA)	1.07	0.47	0.02	0.89	0.28	0.0015

[24] observed similarities in preferences, optimism, involvement in care, and similar to our results, found differences in quality of life measures between black and white veterans. As with HRQoL, satisfaction is an important measure of care. Similar to findings of earlier studies [25], we observed high level of satisfaction with care in both racial and ethnic groups.

This study tackles an important and intriguing area of quality of care across racial and ethnic groups and makes contribution to the extant literature. Disease specific and longitudinal assessment of satisfaction with care, HRQoL and cost help in analyzing their association with ethnicity/race and risk of biochemical recurrence, and can yield robust conclusions. However, despite these strengths, there are some limitations to our study. Some of the observed associations between generic and prostate-specific HRQoL domains and risk groups may differ across treatment. This demands further research with a large sample to analyze the within and between treatment variations in outcomes. The generalizability of the findings may be limited as the population observed was from a healthcare system and a VA hospital. Causal inferences are restricted due to the non-experimental nature of the study design.

In conclusion, young African American PCa patients were more likely to take longer time to recover their baseline HRQoL function. Also, higher proportion of them did not regain their baseline function by 24 months, compared to Caucasians. However, after adjusting for demographic and clinical characteristics, ethnicity/race was not associated with outcomes in younger PCa patients. On the other hand, low risk of biochemical recurrence was mostly indicative of better generic and prostate-specific HRQoL in younger PCa patients. Additionally, we found that not ethnicity, but hospital type, treatment and comorbidities were associated with total cost. These findings have important implications for effective management and counseling of younger PCa patients as patient level and provider level attributes appear to have an impact on outcomes. These attributes merit further research.

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