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Racial variation in the pattern and quality of care for prostate cancer in the USA: mind the gap

Daniel A. Barocas[*,†] and **David F. Penson**[*,†,‡]

[*]Department of Urologic Surgery, Vanderbilt University Medical Center, Nashville, TN, USA

[†]the Center for Surgical Quality and Outcomes Research, and Nashville, TN, USA

[‡]VA Tennessee Valley Healthcare System, Nashville, TN, USA

Abstract

Objective—To review the literature on racial variation in the pattern of care (PoC) and quality of care (QoC) for prostate cancer, as there are known racial disparities in the incidence and outcomes of prostate cancer. While there are some biological explanations for these differences, they do not completely explain the variation. Differences in the appropriateness and QoC delivered to men of different racial groups may contribute to disparities in outcome.

Methods—We searched the USA National Library of Medicine PubMed system for articles pertaining to quality indicators in prostate cancer and racial disparities in QoC for prostate cancer.

Results—While standards for appropriate treatment are not clearly defined, racial variation in the PoC has been reported in several studies, suggesting that African-American men may receive less aggressive treatment. There are validated QoC indicators in prostate cancer, and researchers have begun to evaluate racial variation in adherence to these quality indicators. Further quality comparisons, particularly in structural measures, may need to be performed to fully evaluate differences in QoC.

Conclusions—There is mounting evidence for racial variation in the PoC and QoC for prostate cancer, which may contribute to observed differences in outcome. While some of the sources of racial variation in quality and outcome have been identified through the development of evidence-based guidelines and validated quality indicators, opportunities exist to identify, study and attempt to resolve other components of the quality gap.

Keywords

prostate cancer; racial disparities; quality of care; pattern of care

Introduction

There is a variation between racial groups in the incidence and outcomes of prostate cancer [1]. The incidence of prostate cancer among White American men is 156.7 per 100 000 population, compared with 248.5 for Black Americans, or a rate-ratio of 1.59 for Black men. The difference in mortality is even greater: 24.6 per 100 000 of the population for Caucasians and 59.4 for African-Americans, or a rate-ratio of 2.41. There are a number of hypotheses to explain the differences in incidence and outcomes. These include biological explanations, as well as differences in screening behaviour, access to care and quality of

Correspondence: Daniel A. Barocas, A-1302 Medical Center North, Nashville, TN 37232, USA. dan.barocas@vanderbilt.edu.

care (QoC). In this review, we will briefly describe the reported racial disparities in outcomes of prostate cancer and explore the evidence on variation in the pattern of care (PoC) and QoC for prostate cancer between Black and White American men.

Racial disparities in presentation and cancer outcomes

Many lines of evidence point to the presence of significant racial disparities in cancer care and outcomes in the USA. In fact, the Institute of Medicine published '*Unequal Treatment*' in 2003 to highlight racial disparities in healthcare [2]. The authors singled out cancer as one area of medicine in which racial disparities have been documented and needed to be addressed through research and policy. In 2009, the American Society of Clinical Oncology published a policy statement on disparities in cancer care, calling for 'enhancing awareness of disparities; improving access to care; and supporting research on health disparities.' [3]

Available research on racial disparities in cancer outcomes substantiates the concern of these national entities. For example, a recent study by Tehranifar *et al*. [4] evaluated outcomes of almost 600 000 cancer cases in the National Cancer Institute's Surveillance, Epidemiology and End Results (SEER) database from 1995 to 1999. They showed racial and ethnic variation in survival outcomes across cancers as a whole and showed that the most striking disparities were in the cancers that are most amenable to early detection and/or treatment, such as prostate cancer. Similarly, Albain *et al*. [5] identified racial disparities in overall survival across several cancer sites by pooling data from 35 randomized phase III trials from the Southwest Oncology Group. They stratified by cancer site and found that Black men with advanced prostate cancer had increased mortality compared with White men (hazard ratio [HR] 1.21, 95% CI 1.08–1.37).

In general, Black men with prostate cancer tend to present with higher-risk disease characteristics, have a higher likelihood of disease recurrence after treatment and have higher prostate cancer-specific mortality [1,6–10]. For example, Latini *et al*. [6] analysed the presenting disease characteristics in men with newly diagnosed prostate cancer from the Cancer of the Prostate Strategic Urologic Research Endeavor (CaPSURE) database and found that Black men presented at a younger age (mean age 64.6 years vs 66.8 years, $P < 0.01$), had higher median PSA (9.8 ng/mL vs. 6.7 ng/mL, $P < 0.01$), higher clinical Gleason score (43% Gleason score ≥ 7 vs 33%, $P < 0.01$) and higher stage at presentation (stage ≥ T3a, or N+ or M+ 10% vs 4%, $P < 0.01$). Other cohort studies have corroborated these findings. In the population-based Prostate Cancer Outcomes Study (PCOS), among 3173 men diagnosed in 1994 and 1995, race was a significant independent predictor of advanced disease at presentation (odds ratio [OR] 2.26, 95% CI 1.43–3.58) when controlling for socioeconomic status, biopsy grade, and a host of other factors [8].

Some have also identified Black race as an adverse prognostic factor for outcome, while others have refuted this, particularly in organ-confined disease [10,11–14]. Several broad, population-based cohort studies have been performed to evaluate racial variation in outcomes after treatment. Cohen *et al*. [15] studied over 25 000 men from the SEER-Medicare database who were diagnosed with prostate cancer between 1986 and 1998 in five SEER sites. They found that the 75th percentile disease-free survival time was 13 months less for Black than for White men (95% CI 6.2–19.8 months). On multivariate analysis, Black race was an independent predictor of shorter disease-free survival among surgical patients. A similar study of the SEER-Medicare database by Godley *et al*. [16] showed that median survival time for Black men diagnosed with prostate cancer between 1986 and 1996 was 1.7 years (95% CI 1.6–1.9) less than for White men. Black men had significantly shorter median overall survival and cancer-specific survival, regardless of treatment and even after adjustment for multiple covariates. In another approach to this issue, Hebert *et al*.

[17] compared the age-adjusted mortality-to-incidence ratio (MIR) between African-Americans and Europeanorigin Americans in the South Carolina state tumour registry from 2001 to 2005. For Black men, the MIR was 0.259 (95% CI 0.241–0.277), compared with 0.164 (95% CI 0.241–0.2770.155–0.174) for White men. This was highly statistically significant and was among the largest differences identified, together with female breast and oral cancers.

Overall, these studies show that African-Americans are at increased risk for disease recurrence after treatment and mortality from various cancers, and prostate cancer in particular. The variation in outcome is not completely explained by differences in baseline disease characteristics or other demographic factors, suggesting that there are other contributing factors. However, the relative contribution of biological factors and other factors remains a topic of debate.

Sources of racial variation in outcome

There is a wide range of possible causes of the reported differences between racial groups in incidence and outcomes from prostate cancer, or, for that matter, any disease. These include biological factors, such as genetic pre-dispositions and differences in the biology of disease in different hosts [18]. For example, many investigators have explored racial differences in the androgen/androgen receptor pathway as a source of racial disparities in prostate cancer incidence and outcome [19].

In support of the role of access and related non-biological factors, Freeman *et al*. [20] studied the presenting disease characteristics and cancer control outcomes in two cohorts: one in an equal-access Veterans Affairs (VA) setting and one in private hospitals. They found that the disparity in stage at presentation was attenuated in the VA setting, where 43.8% of Black men and 56.6% of White men presented with localized disease (compared with 34.2% and 56.9%, respectively, in private hospitals). On multivariate survival analysis controlling for stage, grade, primary treatment, age and mean per capita income estimated from ZIP code, race was associated with overall mortality (HR 1.68, 95% CI 1.06–2.67) and disease-specific mortality (HR 2.67, 95% CI 1.35–5.27) in the private hospital setting, but was not a significant predictor of mortality in the VA setting. The differences between equal-access and private hospital settings in this study are highly suggestive of non-biological causes of variation.

In considering non-biological sources of variation, patient beliefs, preferences and behaviours such as perceived risk, dietary habits, exercise, involvement in screening, and acceptance of treatment recommendations may play a role in differences in incidence and outcome [18,21,22]. Aspects of patient-provider communication, such as trust, cultural differences, healthcare literacy, and patient participation in decision making can also influence screening and treatment decisions, ultimately influencing the patient's outcome [21,22]. In addition, there are characteristics of the healthcare system that could contribute, such as limitation of access to healthcare (particularly among economically disadvantaged persons, uninsured or under-insured persons, non-English speaking persons, and persons of low educational attainment). Delivery of inappropriate or inferior QoC to racial minority persons is another potential source of such variation.

Non-biological sources of racial differences in outcome are, by their nature, challenging to study. Even the classification of persons with respect to race is problematic. For example, race might be reported differently by a patient than by an observer, and may be influenced by the response options on a questionnaire [23]. It can be challenging to classify patients from blended backgrounds and those of Hispanic ethnicity [23,24]. Another problem encountered in studies of racial variation in health outcomes is that persons of different

racial groups may differ in important baseline characteristics (such as income, education, insurance status, clinical disease parameters), which may be inadequately documented in the large administrative datasets that are often used because of the large number of patients included [25]. On the other hand, cohort studies, in which patients can be accurately characterized for baseline characteristics, often lack sufficient numbers of minority patients to document important differences in outcome measures [26], A additional level of complexity is that reported variations in care and outcome must consider the larger societal context, which is fraught with inequities in terms of income, wealth, employment, insurance, education and more subtle inequities (Table 1) [27–29]. Finally, racial disparities research in prostate cancer has also been hampered by uncertainty about appropriate treatment and uncertainty about the most useful metrics of QoC. While there are many obstacles to the study of non-biological variation in outcomes of prostate cancer, if these challenges can be overcome, the potential exists to reduce racial disparities in outcomes through some combination of policy, education and outreach.

Variations in the PoC

One method for evaluating disparities in care is to identify variation in the PoC across groups of patients. The premise underlying this line of study is that, absent racial disparities in the administration of appropriate care, different groups of people ought to receive similar treatment for similar disease. Such ‘PoC’ studies have been used to show regional and racial variation in many diseases. Studies of the PoC in prostate cancer are somewhat controversial, as in many instances, the best treatment is not known. Nonetheless, several studies have shown racial variation in the PoC that suggest African-American men received less aggressive and, potentially, inferior care.

For example, Krupski *et al*. [30] studied close to 100 000 men with local/regional prostate cancer from the SEER database (1995–99). They found that African-American race was independently associated with a lower likelihood of surgical treatment (OR 0.52, 95% CI 0.48–0.56) and radiation treatment (OR 0.84, 95% CI 0.78–0.91). They also identified substantial variability in the treatment of prostate cancer based on geographical region and income, in addition to the anticipated influence of tumour grade and age. However, this study and others using the SEER database are limited by the absence of comorbidity information, which could confound the relationship between race and treatment choice.

Several other studies have found that African-Americans are less likely to undergo appropriate, definitive treatment for prostate cancer than Caucasians [31–35]. For example, Harlan *et al*. [31] evaluated almost 70 000 incident cases of prostate cancer from the SEER database and reported that African-American men were twice as likely to receive no treatment (12.5% vs 6.6%). Similarly, Imperato *et al*. [32] reported that the odds of utilization of radical prostatectomy (RP) for prostate cancer were 24–41% lower among African American Medicare recipients in New York compared with Caucasians. A recent observational study, using the Florida Cancer Data System for 1994–2003, showed that African-Americans (non-Hispanic Black) under-utilized brachytherapy compared with Caucasians (OR 0.71, 95% CI 0.66–0.76), after adjustment for other demographics (age, marital status, insurance status), disease characteristics (tumour grade) and treatment setting (year, urban/rural facility, and practice volume size) [36]. Again, these studies did not control for comorbidity, which can influence treatment choice.

However, Zeliadt *et al*. [35] investigated this issue in the SEER-Medicare dataset (1991–99) and were able to adjust for comorbid conditions. Among 90 000 men with incident nonmetastatic prostate cancer, African-American men had 26% lower odds of receiving aggressive therapy than White men (OR 0.74, 95% CI 0.70–0.79) [35]. In addition, African-

Americans were less likely to receive androgen therapy, either as a component of conservative management or as adjuvant treatment along with radiotherapy. Klabunde *et al*. [33] also analysed utilization of RP among 4505 Black and 52 915 White men from the SEER-Medicare database, diagnosed between 1986 and 1993. On multivariate regression for aggressive treatment (radiation or surgery) vs conservative treatment, adjusted for comorbidity, socio-economic status, age, SEER site, year, biopsy grade and mode of diagnosis, Black men diagnosed on TRUS biopsy had significantly lower odds of receiving aggressive treatment than White men (OR 0.48, 95% CI 0.43–0.53). However, White men and Black men diagnosed by transurethral resection had similarly low odds of receiving aggressive treatment (OR 0.14, 95% CI 0.13–0.14 for White men and OR 0.13, 95% CI 0.10–0.15 for Black men). According to their analysis, sociodemographic and clinical characteristics explained about half of the difference between Black and White men in the utilization of surgery. In the PCOS, which is unique in terms of collection of a wide range of patient-level covariates through direct interviews with SEER-site patients, Harlan *et al*. [37] found that African-Americans aged > 60 years were far more likely to undergo conservative treatment (defined as surveillance or hormone therapy).

Interestingly, a similar study was performed in a cohort of ≈1500 men with prostate cancer in the UK, where healthcare is provided to all residents regardless of socio-economic status. After adjustment for treatment centre, age, grade, stage and comorbidity, Black men had a slightly, but not significantly, lower odds of receiving surgery or radiation compared with conservative treatment (OR 0.71, 95% CI 0.49–1.03, $P = 0.07$). In the same study, a Delphi panel rated the appropriateness of certain interventions (CT, surgery, radiation, hormone treatment and surveillance) and found no significant differences in appropriate care between Black and White men [38].

Taken together, these studies suggests that there is variation in the PoC in the USA, such that Black men with prostate cancer undergo less aggressive treatment, even after adjustment for important indicators of socio-economic status and comorbidities. Is less aggressive treatment worse treatment? In prostate cancer, this remains hotly debated, as many men may be best served by conservative management. However, variation in the PoC may be one explanation for variation in outcome.

QoC-metrics in prostate cancer treatment

It is also relevant to ask whether, once a treatment has been selected, African-American men receive comparable QoC to their Caucasian counterparts [39]. If, in fact, African-Americans receive inferior QoC, this would represent a potentially modifiable source of racial disparities in prostate cancer care and would reveal an opportunity to correct an injustice and to reduce the extra costs associated with low-QoC.

While ‘QoC’ is difficult to define and quantify, the study of variation in quality is aided by the development of clinical guidelines and quality indicators. In many cases, such standards are ill defined in prostate cancer care, but, of late, clinical guidelines have become increasingly rigorous and evidence-based [40–42]. Furthermore, researchers have developed specific quality metrics for prostate cancer care, some of which have been developed into national quality standards [43,44]. The most significant of these efforts is the work of Spencer and colleagues at RAND, who used the structural framework established by Donabedian [45] to compile and test a list of candidate QoC measures for prostate cancer, using an extensive literature review, patient focus groups and expert ‘Delphi’ panels. The domains of quality in this model include measures of structure (such as hospital resources and provider qualifications), process (including appropriate use of tests and treatments, appropriate communication between doctor and patient and appropriate documentation), and

outcome (including recurrence and survival, complications, health-related quality-of-life and satisfaction). They endorsed 49 QoC indicators and 14 covariates to control for in assessing the quality measures [43] (Table 2) [43,46]. The feasibility and validity of these quality indicators were then tested in a series of cohorts of men with prostate cancer [43,47–49]. For example, Krupski *et al*. [47] selected the 16 quality indicators that were supported by Level III evidence and sought to determine the extent to which adherence to quality measures differed between public and private hospitals for 84 patients treated in the Improving Access, Counseling and Treatment for Californians with prostate carcinoma (IMPACT) cohort. They found that the information required to determine adherence to the quality indicators was present for 13 of the 16 indicators. Adherence to quality indicators differed between surgical patients and radiation patients, as well as between those treated at private vs public institutions. However, they did not directly address the question of racial variation in adherence to quality indicators. In a similar study, Miller *et al*. [48] evaluated compliance with quality indicators across treatments (radiation vs surgery) and found that it was feasible to collect data on 19 of the 22 structure, process and outcome indicators they sought to study. In general, patients treated with radiation therapy had better documentation of pretreatment clinical parameters and functional status.

In perhaps the only study to specifically assess adherence to the RAND quality indicators across racial groups, Spencer *et al*. [50] compared the performance on 29 quality measures between White men and Black men with prostate cancer in a weighted sample of > 55 000 cases from the National Cancer Data Base (2000–2001). The authors found considerable geographical variation in compliance with quality indicators and variation by hospital type. For racial differences, the only disparity identified was lower use of adequate radiation dose among African-Americans (71.7% vs 77.5%, $P < 0.05$). None of the four structure indicators studied (hospital with at least one board-certified urologist; hospital with at least one board-certified radiation oncologist, facility with conformal radiation therapy available, facility with psychological counselling available) varied across racial group. However, none of these indicators was evaluated at the level of the provider (i.e. was the provider for this particular patient board-certified?), leaving open the question of how a provider's qualifications and experience impact QoC and whether there may be differences in these structural measures across racial groups.

Racial disparities in quality: structural inequities

In the early 1980s, Wyszewianski and Donabedian [39] wrote, 'structural inequities are present whenever certain groups receive a greater proportion of their care from individual providers or healthcare organizations that are either not optimal or are inappropriate for the needs of the individual persons within the group.' However, there have been few studies of structural inequities in prostate cancer care to date.

One structure measure that has been studied in some detail in many technically demanding procedures is the relationship between provider or hospital volume and outcome [51,52]. For RP, both surgeon volume and hospital volume have been shown to impact outcomes in large, well-designed observational studies [53,54]. Despite there being variation among high-volume surgeons [55], volume remains an important surrogate measure, or indicator of quality. Higher hospital volume is associated with decreased intensive-care unit utilization, decreased transfusion, decreased hospital stay, lower rate of re-admissions, lower rate of perioperative complications and perioperative mortalities, fewer late urinary complications and fewer treatment failures [53–65]. Higher surgeon volume is associated with decreased hospital stay, lower rate of perioperative complications, late urinary complications and long-term incontinence, lower rate of positive margins and, importantly, lower likelihood of treatment failure [53–55,58,62,64,66–68].

There is only one published study that specifically evaluated the role of hospital and surgeon volume in the outcome of RP across racial groups [64]. The authors studied 8349 cases diagnosed between 1993 and 1999 from the SEER-Medicare dataset. They found that Black men had significantly lower utilization of high-volume surgeons (18.3% vs 33.3%), despite higher utilization of high-volume hospitals (43.9% vs 32.3%). Black men had poorer recurrence-free survival overall and men who were treated by low-volume surgeons or in low-volume hospitals had worse recurrence-free survival in both racial groups. However, Black men had poorer recurrence-free survival, even when the cohort was stratified by surgeon volume tercile or hospital volume tercile, suggesting that surgeon and hospital volume are not entirely responsible for the difference in outcome.

The question of whether there are racial disparities in the utilization of high-volume surgeons and high-volume hospitals remains incompletely explored. Furthermore, there are other face-valid indicators of hospital structure that may contribute to quality and warrant further study, such as number of beds, teaching hospital status, cancer centre status, rural vs urban status, and availability of an intensive-care unit. Similarly, for provider factors, fellowship training status and years since completing residency may be important determinants of experience that would engender quality. Finally, there may be racial variation in access to minimally invasive surgery and other new technology. In short, we know far too little about structural inequities in prostate cancer care and their contribution to racial variation in outcomes.

Conclusions

The vast racial differences in the incidence and outcomes of American men with prostate cancer are incompletely explained by biological causes. There is mounting evidence for racial variation in the PoC and QoC for prostate cancer, which may contribute to the differences in outcome. While some of the sources of racial variation in quality and outcome have been identified through the development of evidence-based guidelines and validated quality indicators, opportunities exist to identify, study and attempt to resolve other components of the quality gap. As clinicians, patients and payers focus increasingly on evidence-based practice and QoC, it is of the utmost importance for healthcare researchers to identify quality gaps and make efforts to ameliorate them.

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Abbreviations

PoC	pattern of care
QoC	quality of care
SEER	Surveillance, Epidemiology and End Results (database)
HR	hazard ratio
PCOS	Prostate Cancer Outcomes Study
OR	odds ratio
MIR	mortality-to-incidence ratio
VA	Veterans Affairs

RP radical prostatectomy

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Table 1

Differences in income, education, health insurance and employment between Black and non-Hispanic White persons in the USA

Variable (year)	Black	Non-Hispanic White
Median household income (2008), $	34 218	55 530
Below the poverty line (2008), %	24.7	8.6
High school graduate or above (2008), %	83.2	91.5
No health insurance (2008), %	19.5	10.4
Unemployed (February 2010), %	15.8	8.8

Data from the USA Census Bureau and the Bureau of Labor Statistics.

Table 2

Selected quality indicators from the RAND measure set

Quality indicator category	Example
Structure indicators:	
Volume (number) of patients treated	
Availability of psychological counselling services	
Board certification of providers	
Availability of conformal radiation therapy facilities	
Process Indicators:	
Pre-therapy disease severity assessment	Documentation of pretreatment PSA level, clinical stage, Gleason score, family history of prostate cancer, comorbidity
Pre-therapy functional assessment	Documentation of pretreatment urinary, erectile and bowel function
Patient counselling	Documentation of discussion of treatment alternatives;
	Opportunity to consult with alternative providers;
	Discussion of risks based on provider's own experience;
	Communication with primary care provider
Operative blood loss	
Pathological evaluation per College of American	
Pathologists RP practice protocol	
Appropriate radiation therapy planning and practice	Use of CT in treatment planning;
	Immobilization of the patient during treatment;
	Delivery of appropriate radiation dose;
	Protection of the rectum
Use of clinical and pathological TNM staging	
Follow-up	At least two follow-up visits with treating physician in the first year after treatment.
Outcome indicators:	
Primary treatment failure	Detectable PSA level after RP
Patient assessment of functional outcome	Assessment of urinary, sexual and bowel function
following treatment	using a validated instrument
Patient satisfaction with treatment choice, continence and potency	

Adapted from Spencer *et al*. [43] and Miller *et al*. [46].