Original article

Treatment of men with high-risk prostate cancer based on race, insurance coverage, and access to advanced technology

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Abstract

\textbf{Purpose:} We characterized factors related to nondefinitive management (NDM) of patients with high-risk prostate cancer and assessed impact from race, insurance status, and facility-level volume of technologically advanced prostate cancer treatments (i.e., intensity-modulated radiation therapy, robotic-assisted laparoscopic radical prostatectomy) on this outcome.

\textbf{Methods:} We identified men with high-risk localized prostate cancer (based on D'Amico criteria) in the National Cancer Database (2010–2012). Primary outcome was NDM (i.e., delayed/no treatment with prostatectomy/radiation therapy or androgen-deprivation monotherapy). Treating facilities were classified by quartiles of proportions of patients treated with advanced technology. Multivariable regression estimated odds of primary outcome based on race, insurance status, and facility-level technology use, and evaluated for interactions between these covariates.

\textbf{Results:} Among 60,300 patients, 9,265 (15.4\%) received NDM. This was more common among non-White men ($P < 0.001$), Medicaid/uninsured patients ($P < 0.001$), and those managed at facilities in the lowest quartile of technology use (25.1\% vs. 11.0\% highest, $P < 0.001$). Though NDM was common among non-White men with Medicaid/no insurance treated at low-technology centers (43\% vs. 10\% White, private/Medicare, high-tech facility; adjusted odds ratios = 7.18, $P < 0.001$), this was less likely if this group was managed at a high-tech hospital (22\% vs. 43\% low-tech, $P < 0.001$).

\textbf{Conclusions:} Technology use at a facility correlates with high-quality prostate cancer care and is associated with diminished disparities based on insurance status and patient race. More research is required to characterize other facility-level factors explaining these findings.

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\bf{Keywords:} Disparities; Technology; Prostate cancer; Insurance coverage; African-Americans

1. Introduction

Delivery of equitable high-quality cancer care remains a challenge since the Institute of Medicare reported on disparities in health care in 2002 [1]. These issues persist for non-White men considering prostate cancer treatment. For men with high-risk prostate cancer (HRCaP), guidelines
recommend therapy with radiation therapy (RT) in conjunction with androgen-deprivation therapy (ADT) or radical prostatectomy (RP) with pelvic lymphadenectomy [2]. This is based on the finding that many patients with HRCaP managed with observation will die of prostate cancer within 10 years from diagnosis [3]. Despite this, definitive treatment for men with HRCaP is underutilized [4], and disparities exist based on race and insurance status [5,6].

One major underpinning to these disparities is impaired access to quality cancer care, as medically underserved populations do not differ in response to prostate cancer treatment [7]. Health systems permitting more equal access (e.g., Veterans Health Administration) have not demonstrated racial disparities in cancer care seen elsewhere [8]. One barrier to equitable care could be access to novel technology for prostate cancer treatment, such as robotic-assisted laparoscopic radical prostatectomy (RALRP) and intensity-modulated radiation therapy (IMRT). Adoption of these technologies is associated with increased treatment volume [9,10], and considerable attention has been given to implications of this adoption on overtreatment of men with indolent prostate cancer [10]. However, it is unknown whether this technology adoption is associated with more appropriate treatment of patients with HRCaP. Additionally, it is unclear whether medically underserved patients—based on race and insurance status—have impaired access to these technologically advanced treatment sites, and this access would be associated with diminished disparities in HRCaP treatment.

To that end, we evaluated relationships between (1) patient race and insurance coverage and (2) hospital-level volume of advanced prostate cancer treatment (i.e., RALRP/IMRT) with receipt of nondefinitive management (NDM) of men with HRCaP. We hypothesized that non-White and Medicaid/uninsured patients would be less likely to receive prompt treatment of high-risk tumors, and access to high-technology cancer centers would be associated with more equitable HRCaP treatment. If confirmed, our findings would have implications for patients with prostate cancer seeking high-quality treatment, and policymakers eager to identify targets to diminish disparities in delivery of appropriate cancer care.

2. Methods

2.1. Data source

We used the National Cancer Database (NCDB) that captures ~70% of newly diagnosed cancers in the United States diagnosed or treated at hospitals recognized by the American College of Surgeons’ Commission on Cancer [11].

2.2. Cohort identification

We identified men ≥30 years old diagnosed with T1-3N0M0 CaP from 2010 through 2012 (n = 311,693) (Supplementary Fig.). We excluded patients who were (1) diagnosed at autopsy, (2) received all treatment at a non-reporting facility, (3) previously diagnosed with another cancer, (4) missing race or rural/urban status, or (5) followed for ≤6 months after diagnosis. To ensure statistical reliability of facility-level measures, we excluded patients at facilities diagnosing ≤30 patients. We limited this cohort to patients with HRCaP based on D’Amico criteria (i.e., Gleason score ≥ 8, clinical T3 stage, prostate-specific antigen [PSA] ≥ 20.0 ng/ml) [12].

2.3. Outcome of interest

Our primary outcome of interest was NDM of HRCaP defined as (1) no primary treatment with RP/RT, (2) RP/RT ≥ 6 months after diagnosis, and (3) androgen-deprivation monotherapy. Our cutoff of 6 months for delayed treatment is based on a recent systematic review for the appropriate window between diagnosis and treatment of HRCaP [13]. Patients with an unknown date of treatment were considered as having received definitive treatment, based on finding that <10% of patients in our cohort who underwent RP/RT were treated ≥6 months after diagnosis.

2.4. Exposures of interest and other covariates

We dichotomized race and insurance coverage as “White” vs. “non-White” and “private/Medicare” vs. “Medicaid/uninsured,” respectively. We considered IMRT or RALRP as technologically advanced (vs. 3D-conformal RT or open retropubic RP). To calculate facility-level use, we utilized the entire cohort diagnosed with localized CaP from 2010 through 2012, regardless of risk. Calculated proportions used the number of localized CaP cases treated with RP/RT per facility per year as the denominator, and the number of cases treated with IMRT/RALRP per facility per year as the numerator. We stratified facilities into quartiles of advanced treatment based on these proportions.

We also considered potentially confounding variables, including patient/geographic characteristics (age, distance to facility, rural/urban status, comorbidity, and region), area, socioeconomic factors (percentage without high school degree, median income), and facility factors (i.e., academic/community hospital). Census-tract–based socioeconomic factors were based on data from 2008 to 2012. Rural-urban status was defined using rural-urban commuting area codes assigned using 2013 data [14], and categorized as metropolitan vs. suburban/rural. Distance to facility is defined by the NCDB as the great circle distance from patient residence and diagnosing facility.

2.5. Statistical analysis

We performed parametric and nonparametric testing to generate summary statistics and evaluate associations...
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