Place of Residence and Primary Treatment of Prostate Cancer: Examining Trends in Rural and Nonrural Areas in Wisconsin

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OBJECTIVE To determine whether rural residents were at a disadvantage compared with urban residents with regard to the receipt of curative therapy for prostate cancer.

MATERIALS AND METHODS Using the Breast and Prostate Cancer Data Quality and Patterns of Care Study II, patients with prostate cancer who were diagnosed in 2004 were identified. Registrars reviewed the medical records of randomly selected patients with incident prostate cancer (n = 1906). The patients' residential address was geocoded and linked to the census tract from the 2000 U.S. Census. The place of residence was defined as rural or nonrural according to the census tract and rural-urban commuting area categorization. The distance from the residence to the nearest radiation oncology facility was calculated. The odds ratio and 95% confidence intervals associated with receipt of noncurative treatment was calculated from logistic regression models and adjusted for several potential confounders.

RESULTS Of the incident patients, 39.1% lived in urban census tracts, 41.5% lived in mixed tracts, and 19.4% lived in rural tracts. Hormone-only or active surveillance was received by 15.4% of the patients. Relative to the urban patients, the odds ratio for noncurative treatment was 1.01 (95% confidence interval 0.59-1.74) for those living in mixed tracts and 0.96 (95% confidence interval 0.52-1.77) for those living in rural tracts. No association was found for noncurative treatment according to the Rural-Urban Commuting Area categorization. The linear trend was null between noncurative treatment and the distance to nearest radiation oncology facility ($P = .92$).

CONCLUSION The choice of curative treatment did not significantly depend on the patient's place of residence, suggesting a lack of geographic disparity for the primary treatment of prostate cancer. UROLOGY 81: 540–547, 2013. © 2013 Elsevier Inc.

Prostate cancer is the most common cancer among men in the United States. During 2011, an estimated 240,890 new cases of prostate cancer were diagnosed and 33,720 deaths occurred from the disease.[1] Most patients present with localized disease and therefore are curable.[2] Because of insufficient evidence, no consensus has been reached on the optimal treatment of localized prostate cancer, and curative treatment—radical prostatectomy, external beam radiotherapy and brachytherapy therapy—are considered to have equivalent therapeutic outcomes.[3] The choice between these options depends on a number of factors, including pretreatment risk classification; the patient's health status, knowledge, and preferences; the physician's preferences and skills; and the patient's socioeconomic status.[4-6] Available evidence suggests that noncurative treatments—in particular, active surveillance—might be important treatment considerations for some men diagnosed with localized disease,[7,8] depending on patient age, comorbidities, cancer stage, and other tumor characteristics.[9]

In the absence of strong scientific evidence to support decision making, studies have revealed large variations in the treatment of localized prostate cancer.[10] However, limited evidence is available on the effect of geography—where a patient lives—on treatment, particularly in North America. One hypothesis is that men living in rural areas have greater difficulty accessing care, such as

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radiation facilities, than their nonrural counterparts[11] and, thus, are less likely to receive curative therapy and more likely to receive noncurative treatment. The evidence that exists is inconsistent. A Virginia study found that neither the distance to the radiation facility nor the residence (rural or urban) affected receipt of surgery vs radiation for prostate cancer but that living in an urban area decreased the likelihood of receiving any curative treatment.[12] The same study found that the receipt of hormonal therapy (compared with surgery or radiation) was less common in men living farther away from the radiation facilities. A recent Georgia study showed that rural patients with prostate cancer were more likely to receive external beam radiotherapy than surgery.[13] A study in the Lake Superior region (including parts of Minnesota, Wisconsin, and Michigan) showed that rural patients with prostate cancer were at a disadvantage in terms of undergoing disease staging, initial management procedures, and participation in cancer clinical trials, but the study did not compare treatment.[14]

Understanding the variation in the treatment of prostate cancer by patient residence is vital, especially in the context of evidence that prostate cancer mortality is greater in rural areas of the United States.[15] Using a statewide, population-based sample of patients with prostate cancer, we explored the relationship between geography and primary treatment of locoregional prostate cancer in Wisconsin men. Wisconsin as a state has a relatively large rural population in which nearly one third of the population lives in rural areas.[16]

MATERIAL AND METHODS

Patients

As a part of the Breast and Prostate Cancer Data Quality and Patterns of Care Study II (a collaboration of the Centers for Disease Control and Prevention, the National Program of Cancer Registries, and cancer registries from 7 U.S. states).[17] Patients with prostate cancer diagnosed in 2004 with pathologically confirmed disease were identified through the Wisconsin Cancer Reporting System, a state statutory-mandated cancer registry. Patients previously diagnosed with cancer or treated at Veterans Affairs hospitals and cases reported on autopsy or by death certificate only were ineligible for the present study. Of 3220 eligible subjects, 1169 patients were randomly selected and their medical records abstracted. Cases of invasive prostate cancer were randomly selected across strata defined by race/ethnicity and state-specific factors such as patient volume of the facility. Minorities were oversampled to increase the statistical power to compare factors by race and ethnicity. The institutional review board at the University of Wisconsin-Madison approved the present study.

Data Collection

Certified, trained cancer registrars reviewed and abstracted the inpatient and outpatient records from >60 medical facilities across Wisconsin in 2008 and 2009. Patient comorbidities (using the Adult Comorbidity Evaluation-27,[18] an index with a wide range of coexisting conditions relevant to cancer therapy choice and outcome), demographic data, diagnostics, tumor characteristics, primary treatment type, and follow-up data for 1 year starting from diagnosis were abstracted using the study protocol. Registrars entered the data into Abstract Plus (a comprehensive, standardized software program provided by the Centers for Disease Control and Prevention) while on-site at the medical facility.

Statistical Analysis

Patients with prostate cancer with a diagnosis of metastatic disease (n = 49) or with an unknown disease stage (n = 12) were excluded from the present analysis. An additional 12 patients with unknown treatment plans were also excluded. Thus, of the 1169 patients with abstracted data, 1096 were included in the final analysis. Curative treatment was defined as prostatectomy, external beam radiotherapy, brachytherapy, or cryotherapy as the first course of treatment of prostate cancer. Noncurative treatment was defined as receiving hormonal therapy only or active surveillance or watchful waiting. For the purposes of the present analysis, active surveillance and watchful waiting were considered equivalent and both categorized as active surveillance.

Several geographic variables were constructed according to the patient's residence at diagnosis. First, the residential addresses were geocoded and linked to the census tracts (2000 U.S. Census), and each address was assigned a value for the percentage of census tract classified as urban. Second, a code for the rural-urban commuting area (RUCA) was assigned to each patient by census tract. RUCA is a classification scheme developed by the Office of Rural Health Policy that characterizes each census tract according to the proportion of urbanized population from the U.S. Census and information on commuting flow.[19] Each patient's residence was further categorized as either urban focused, large rural/town focused, small rural town focused, or isolated small rural town focused, using the RUCA 4-tiered taxonomy.[20] Third, the radiation oncology facility locations in and bordering Wisconsin were geocoded. The distance from the patient's residence to the nearest radiation oncology facility was calculated using the *North American Association of Central Cancer Registries*' great circle distance calculator.[21]

A secondary analysis assessed the association of receiving radiotherapy vs surgery for patients with prostate cancer according to the urban-rural residential classification. Using multivariate logistic regression models, we calculated the odds ratios and 95% confidence intervals to assess the association of noncurative treatment with the geographic variables. The percentage of census tracts classified as urban and the distance from the residence to the nearest radiation oncology facility were analyzed categorically and continuously in separate models. The RUCA classification was assessed categorically. The models were adjusted for covariates chosen a priori: age at diagnosis (20-54, 55-59, 60-64, 65-69, 70-74, and ≥75 years), race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, non-Hispanic Asian or Pacific Islander, non-Hispanic Native American, or Alaskan Native), Adult Comorbidity Evaluation-27 overall comorbidity score (none, mild, moderate, severe, unknown), Gleason score (<5, 6, 7, ≥8, test not done, unknown), insurance category (no insurance, private insurance, Medicaid, Medicare, or other public insurance, unknown), disease stage (localized, regional), and prediagnosis prostate-specific antigen level (<10 vs ≥10 ng/mL). We accounted for the sampling design using sampling weights in logistic regression models and in the calculation of percentages. *P* trends represent