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Local coverage determination policy and the use of stereotactic body radiation therapy for prostate cancer

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Abstract

Introduction—Local coverage determinations (LCDs) are local decisions that regulate healthcare coverage. We evaluated the impact of LCDs as well as patient, tumor, and market characteristics on the adoption of stereotactic body radiation therapy (SBRT) for prostate cancer.

Methods—Using Surveillance, Epidemiology, and End Results (SEER)-Medicare, we identified men treated with SBRT, intensity-modulated radiotherapy (IMRT), and robotic prostatectomy. We compared demographics, clinical characteristics, and market factors among these three treatments. Our primary exposure was LCD policy; using the Medicare Coverage Database, we categorized LCDs as favorable (SBRT covered), neutral (SBRT covered in the context of a clinical trial or registry), unfavorable (SBRT not covered), or absent (i.e., SBRT not governed by an LCD at the time of treatment). We fit a multivariable multinomial logistic regression model and generated predicted probabilities to examine the relation between LCDs and SBRT.

Results—During this early period of SBRT adoption, IMRT was the most common of the three treatments followed by robotic prostatectomy and then SBRT. SBRT use was high when governed

by favorable and neutral LCDs and lowest when governed by unfavorable LCDs. Compared with favorable LCDs, areas where LCDs were absent were associated with higher SBRT use compared with IMRT (odds ratio [OR] 1.56; 95% CI, 1.07–2.25) and robotic prostatectomy (OR 1.84; 95% CI, 1.25–2.69).

Conclusions—When present, LCDs appear to regulate early SBRT adoption, but, when absent, are associated with increased SBRT use. Although SBRT use was uncommon, it varied across a wide range of patient, tumor, and market characteristics.

Keywords

stereotactic body radiation therapy; prostate cancer; local coverage determination; health policy; SEER-Medicare

INTRODUCTION

Stereotactic body radiation therapy (SBRT) is one of several new technologies that has emerged for the treatment of prostate cancer over the past several years. Preliminary studies of SBRT have demonstrated excellent cancer control and minimal morbidity.^{1–3} Excitement for SBRT revolves around its ability to deliver higher doses of radiation per treatment session and, therefore, use fewer treatment sessions than conventional radiation.⁴ While conventional radiation delivers approximately 40 sessions over 8 weeks, SBRT delivers 5 or fewer sessions over 2–3 weeks.⁴ This triad of good cancer control, limited morbidity, and reduced treatment duration has generated enthusiasm about SBRT's potential to improve prostate cancer care.

However, the extent to which SBRT has disseminated relative to other new, yet more established technologies for prostate cancer (i.e., robotic prostatectomy and intensity-modulated radiotherapy [IMRT]) is unknown. Further, what factors influence SBRT's adoption are unclear. On the one hand, SBRT may be used more among patients from advantaged backgrounds and from more urban areas,⁵ as was the case with the initial adoption of robotic prostatectomy and IMRT. On the other hand, SBRT may attract more patients from rural areas since it requires fewer treatment sessions. Alternatively, SBRT's dissemination may depend more on market factors than patient characteristics. For instance, Medicare's coverage of SBRT varies by region in the form of local coverage determinations (LCDs), which in turn affects reimbursement.⁶ As a result, the geographic location of a patient may dictate the receipt of SBRT more so than clinical characteristics.

For these reasons, we performed a study to better characterize the adoption of SBRT relative to other new technologies for prostate cancer treatment. Understanding the factors surrounding the dissemination of SBRT in the wake of the rapid adoption of robotic prostatectomy and IMRT is important as newer technologies emerge in a healthcare system placing ever-increasing emphasis on delivering cost-efficient, high-quality care.

METHODS

Data Source and Study Population

We used Surveillance, Epidemiology, and End Results (SEER)-Medicare data to identify men aged 65 years or older diagnosed with non-metastatic prostate cancer in 2008 and 2009, with follow-up data available through December 31, 2010. SEER is a nationally representative population-based registry that comprises approximately 26% of the U.S. population and can be linked to Medicare claims.⁷

Using the Medicare Provider Analysis and Review (MEDPAR), outpatient, and carrier files, we further identified men treated with SBRT, IMRT, and robotic prostatectomy within the first 9 months of diagnosis, according to prior methods.⁸ We included only fee-for-service beneficiaries eligible for both Medicare Parts A and B from diagnosis until 9 months after diagnosis. Using these criteria, our study population consisted of 14,020 patients treated with new technologies (i.e., SBRT, IMRT, and robotic prostatectomy).

Identifying Local Coverage Determination

As others have done,⁹ we identified LCDs using the Medicare Coverage Database provided by the Centers for Medicare and Medicaid Services⁶ to determine the coverage of SBRT at the state level. Each state contains LCDs from Medicare administrative contractors (MACs), which include Medicare Fiscal Intermediaries for Part A (inpatient claims) and Medicare Carrier for Part B (outpatient claims).⁹ SBRT for prostate cancer is delivered primarily in the outpatient setting. Thus, we focused on LCDs from carrier contractors, which cover outpatient services provided in both freestanding centers and hospitals and directly affect physician reimbursement.⁹

Outcomes

The objective of our study was to evaluate factors associated with the receipt of SBRT, as opposed to IMRT or robotic prostatectomy. Our primary exposure was LCD policy; we categorized LCDs as favorable (SBRT covered), neutral (SBRT covered in the context of a clinical trial or registry), unfavorable (SBRT not covered), or absent (i.e., SBRT not governed by an LCD at the time of treatment). Local coverage determinations may change over time; thus, patients were assigned to LCDs by SEER region according to treatment date.

Statistical Analysis

We first compared demographics, clinical characteristics, and market factors of patients treated with SBRT, IMRT, and robotic prostatectomy using chi-square tests. We then assessed the frequency distribution of treatment by year. Next, we fit a univariable multinomial logistic regression model to assess factors associated with treatment type.¹⁰ Results from this analysis along with clinical judgment informed our multivariable multinomial logistic regression.

Race and ethnicity were self-determined by the patient and were examined because they can influence cancer treatment.¹¹ Patient comorbidities were identified by classifying all

inpatient and outpatient Medicare claims for the 12-month period preceding prostate cancer diagnosis into 46 categories, based on the well-established Elixhauser method.¹² As described previously,¹³ disease risk was classified based on the NCCN (National Comprehensive Cancer Network) criteria.

Next, we fit a multivariable multinomial logistic regression model with patient age, race, comorbidity, disease risk, year of diagnosis, population of county of residence, median household income in census tract of residence, and LCD type for SBRT as covariates. Lastly, we generated predicted probabilities to examine the relation between LCDs and SBRT use.

All analyses were performed using SAS v9.2 (Cary, NC). Statistical significance was set at 0.05. All tests were two-sided. The study protocol was approved by the Institutional Review Board.

RESULTS

Characteristics of men undergoing SBRT, IMRT, and robotic prostatectomy are demonstrated in Table 1. Compared to IMRT and robotic prostatectomy, patients receiving SBRT were more likely to have low-risk disease and live in a census tract with a higher median income. A greater proportion of SBRT patients also resided in areas where LCDs for SBRT were absent. During this early period of SBRT adoption, IMRT was the most common of the three treatments followed by robotic prostatectomy and then SBRT (Figure 1). The proportionate use of the three treatments was stable over the two-year period.

We fit a univariable multinomial logistic regression analysis to examine predictors of SBRT use (Table 2). Compared with IMRT, SBRT was more commonly used in wealthier areas and in areas with absent LCDs; SBRT was less frequently used among blacks or other/unknown races, those with intermediate, high, or unknown risk disease, and in less populated areas. Compared with robotic prostatectomy, SBRT was more commonly used among older patients, those with more comorbidities, and in areas with absent LCDs. It was less frequently used among patients with higher risk disease, who lived in wealthier areas, and in areas governed by unfavorable LCDs.

Results from the multivariable multinomial logistic regression analysis are shown in Table 3. Compared with IMRT, SBRT was more commonly used in areas where LCDs were absent. The likelihood of using SBRT was lower than IMRT among patients who were black or other/unknown race, and among those with intermediate, high, or unknown disease risk. Compared with robotic prostatectomy, SBRT was more commonly used among patients who were ages 70–74, ages 75 and older, had 2 or more comorbidities, lived in a county with 250,000 to 999,999 people, and lived in areas where LCDs were absent. The likelihood of using SBRT was lower than robotic prostatectomy among patients with other/unknown race, intermediate, high, or unknown disease risk, median income in census tract of residence > \$40,000–\$60,000, and in areas governed by unfavorable LCDs.

The adjusted percent of SBRT use relative to IMRT and robotic prostatectomy is demonstrated in Figure 2. Across all types of LCDs for SBRT, the use of SBRT was low. Its use was highest in areas where LCDs were absent (1.54%; 95% CI, 0.95–2.13%) and lowest

in areas where LCDs were unfavorable (0.36%; 95% CI, 0.04–0.68%). Areas governed by favorable and neutral LCDs shared similar proportions of SBRT use that were in between the proportions seen in areas with absent or unfavorable LCDs.

DISCUSSION

The adoption of SBRT appears to be influenced by LCDs. When present, LCDs regulate the early adoption of SBRT. The MAC evaluates whether a claim complies with an LCD policy's provision in deciding whether or not to pay for it.¹⁴ Not surprisingly, as LCDs for SBRT become more favorable, there is an increase in SBRT use. Although the overall use of SBRT is uncommon, its use in areas governed by favorable LCDs is nearly triple that in areas governed by unfavorable LCDs. Interestingly, SBRT use is highest in areas where LCDs are absent. This likely occurs because when relevant coverage policies for a claim are absent, it is processed using existing procedure and diagnosis codes.¹⁴ It is also possible that some patients who want to be treated with SBRT travel to unregulated areas. Alternatively, the political environment in a region that precedes an LCD policy may influence the subsequent type of LCD that becomes implemented.

The politics surrounding LCDs have evolved over several years. In 1965, Medicare authorized local contractors to process claims as a buffer between providers and the government.¹⁵ In 1990, MACs acquired the authority to issue LCDs,¹⁶ which represented a decision by a MAC as to whether to cover a service on a contractor-wide basis in accordance with Section 1862(a)(1)(A) of the Social Security Act (i.e., a determination as to whether the service is reasonable and necessary).¹⁷ Local coverage determination is developed when there is no national coverage determination or when there is a need to further define a national coverage determination.⁶

Local coverage determinations are frequently applied to new technologies to regulate use and to inform providers under what conditions reimbursement is available.¹⁸ Nearly one-third of the LCDs governing procedures are for new technologies.¹⁹ Proponents of LCDs point out that they fittingly adapt to local conditions, which influence geographic variation in medical care.²⁰ Critics argue, however, that LCDs create inequities wherein patients with similar medical conditions receive different treatments based on where they receive their care.²¹

In managing these two opposing goals of adaptation to local conditions and uniform coverage decisions across geographic areas,²² the Centers for Medicare and Medicaid Services walk a fine line. On the one hand, adaptation is beneficial because it allows policies to reflect geographic variations in practice.²⁰ This is supported by the medical technology industry, which argues that there is no evidence that LCDs are inequitable and that national coverage determinations are inefficient.^{22, 23} However, this very adaptation can lead to policy variation, which creates differential access to care.²⁴ Many experts argue that national coverage policies are more efficient and fair.^{22, 23} The Medicare Payment Advisory Commission lobbied for the elimination of local policies to reduce the “current complexity, inconsistency, and uncertainty” of care²⁵ and the United States General Accounting Office

disapproved of the current decentralized system, stating that Medicare should not develop any new local coverage policies.²¹

Regardless of the varying opinions surrounding LCDs, they are supposed to follow a specific format in evaluating coverage for services. Policies must provide a description of the service covered, diagnosis codes to support medical necessity, indications for coverage, reasons for denial, supporting evidence, and the policy's effective date.^{18, 22} Proposed LCDs must also have a comment period.¹⁴ Carrier contractors must establish a Carrier Advisory Committee composed primarily of physicians and consult with the committee to develop LCDs.¹⁴ Despite these uniform requirements, there is variation in the size and resources of contracting organizations that may lead to inconsistencies in their conclusions.²²

In addition to differences in SBRT use according to the governing LCD, it varied across a wide range of patient, tumor, and market characteristics. Compared with both IMRT and robotic prostatectomy, SBRT was less likely to be used among patients with higher risk disease. Among the two radiotherapies (SBRT and IMRT), SBRT was less likely to be used among minorities. Older age, increased comorbidities, and lower income were predictors of SBRT use relative to robotic prostatectomy but not IMRT.

It makes sense that SBRT was less likely to be used among patients with intermediate- and high-risk disease. Of these three technologies, SBRT was the latest to be adopted, and thus, had the least amount of evidence supporting its use. Many of the LCDs will only cover SBRT for prostate cancer in the setting of lower risk disease.⁶ In addition, clinical trials examining SBRT tend to exclude patients with high-risk disease.²⁶ As evidence grows in support of SBRT's safety and efficacy, we will likely see more treatment of higher risk patients.

The receipt of SBRT was less common among minority groups. On the one hand, this is aligned with prior evidence that shows a decrease in the adoption of new technologies among minorities. Among Medicare beneficiaries, blacks had a significantly lower rate than whites of receiving 1 of 5 emerging medical technologies (tissue replacement of aortic valve, internal mammary artery coronary bypass grafting, dual-chambered pacemaker implantation, and lumbar spinal fusion).²⁷ Another study found blacks to be less likely than whites to receive cervical disc arthroplasty in the 3 years after the approval of cervical disc arthroplasty devices.²⁸ However, this disparity does not surface when examining the adoption of IMRT and robotic prostatectomy. In the first 7 years of IMRT adoption, there were only marginal racial differences in the likelihood of receiving IMRT.²⁹ Similarly, within hospitals that provide robotic prostatectomy, the chance of receiving a robotic prostatectomy was similar among whites and blacks.³⁰ To fully understand the relationship between race and SBRT adoption, we will need follow-up studies with increased numbers of patients.

Our findings in this study should be interpreted in the context of several limitations. First, there are a relatively modest number of patients treated with SBRT during the study period. Nonetheless, this study provides an initial view of factors associated with the early adoption of SBRT. Waiting to study the adoption of SBRT until there are a large number of cases (i.e.,

waiting until it has widely disseminated) may be too late to influence practice patterns. Second, our findings are based on observational data, which may be biased by unmeasured differences among the three treatment types. Although we cannot account for unmeasured heterogeneity specifically, we adjusted for several patient, tumor, and market characteristics to minimize confounding. Third, we did not include brachytherapy patients in our analysis. Brachytherapy represents a competing radiotherapy during this time period. In related work evaluating the adoption of SBRT, we performed a sensitivity analysis with and without brachytherapy patients and found no substantive differences in our findings (unpublished data).

CONCLUSIONS

Our study suggests that variation in LCD policies promotes differential access to SBRT. This finding supports prior claims that LCDs subject Medicare beneficiaries to unequal access to new technologies wherein a patient in one state may have access to a treatment that is not covered in another.^{19, 21} One solution is to eliminate LCD policies altogether in favor of national coverage determination. While national coverage determination may slow down the process of evaluating coverage policy for new technologies and may result in less public input about coverage policies,²¹ this trade off may be worthwhile to help reduce the local disparities that currently exist.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Frequency distribution (%) of SBRT, IMRT, and robotic prostatectomy for prostate cancer by year

During this early period of SBRT adoption, IMRT was the most common of the three treatments followed by robotic prostatectomy and then SBRT. The proportionate use of the three treatments was stable over the two-year period.

Abbreviations: IMRT, intensity-modulated radiotherapy; SBRT, stereotactic body radiation treatment

Figure 2. Use of SBRT relative to IMRT and robotic prostatectomy

Across all types of LCDs for SBRT, the use of SBRT was low. Its use was highest in areas where LCDs were absent (1.54%; 95% CI, 0.95–2.13%) and lowest in areas where LCDs were unfavorable (0.36%; 95% CI, 0.04–0.68%). Areas governed by favorable and neutral LCDs shared similar proportions of SBRT use that were in between the proportions seen in areas with absent or unfavorable LCDs.

*Adjusted for age, race, comorbidity, disease risk, year of diagnosis, population of county of residence, and median household income in census tract of residence

Abbreviations: CI, confidence interval; IMRT, intensity-modulated radiotherapy; LCDs, local coverage determinations; SBRT, stereotactic body radiation treatment

Table 1

Characteristics of the study population

Characteristics	SBRT (n=315)	IMRT (n=9836)	Robotic Prostatectomy (n=3869)	P Value *
Age, years (%)				<0.001
65–69	87 (28)	2587 (26)	2291 (59)	
70–74	114 (36)	3424 (35)	1280 (33)	
75+	114 (36)	3825 (39)	298 (8)	
Race (%) **				<0.001
White	>279 (>88)	8077 (82)	3384 (87)	
Black	21 (7)	1153 (12)	248 (6)	
Other/Unknown	<15 (<5)	606 (6)	237 (6)	
Hispanic ethnicity (%) **				
Not Hispanic	>283 (>90)	8962 (91)	3597 (93)	<0.001
Hispanic	17 (5)	611 (6)	209 (5)	
Unknown	<15 (<5)	263 (3)	63 (2)	
Marital status (%)				<0.001
Married	234 (74)	6792 (69)	3039 (79)	
Not married	54 (17)	2020 (21)	586 (15)	
Unknown	27 (9)	1024 (10)	244 (6)	
Comorbidity (%)				<0.001
0	55 (17)	1868 (19)	1218 (31)	
1	83 (26)	2334 (24)	1121 (29)	
2 or more	177 (56)	5634 (57)	1530 (40)	
Disease risk classification (%)				<0.001
Low	125 (40)	2028 (21)	722 (19)	
Intermediate	112 (36)	3625 (37)	1898 (49)	
High	29 (9)	2787 (28)	613 (16)	
Unknown	49 (16)	1396 (14)	636 (16)	
Year of diagnosis (%)				0.10
2008	155 (49)	5050 (51)	1910 (49)	
2009	160 (51)	4786 (49)	1959 (51)	
Population of county of residence (%)				<0.001
1,000,000 or more	185 (59)	5399 (55)	2307 (60)	
250,000 to 999,999	68 (22)	1757 (18)	662 (17)	
0 to 249,999	62 (20)	2680 (27)	900 (23)	
Less than a high school education in census tract of residence (%) **				<0.001
Low (0–25)	>237 (>75)	7287 (74)	3170 (82)	
Medium (>25–50)	63 (20)	2288 (23)	632 (16)	
High (>50)	<15 (<5)	261 (3)	67 (2)	

Characteristics	SBRT (n=315)	IMRT (n=9836)	Robotic Prostatectomy (n=3869)	P Value *
Median household income in census tract of residence, dollars (%)				<0.001
25,000 or less	19 (6)	804 (8)	167 (4)	
> 25,000–40,000	69 (22)	2807 (29)	899 (23)	
> 40,000–60,000	83 (26)	3330 (34)	1323 (34)	
> 60,000	144 (46)	2895 (29)	1480 (38)	
Local coverage determination for SBRT (%) **				
Favorable	35 (11)	1581 (16)	542 (14)	<0.001
Neutral	75 (24)	2679 (27)	1428 (37)	
Unfavorable	<16 (<5)	576 (6)	351 (9)	
Absent	>190 (>60)	5000 (51)	1548 (40)	

Abbreviations: IMRT, intensity-modulated radiotherapy; SBRT, stereotactic body radiation treatment

* P values generated from chi-square tests

** Exact numbers not shown in order to be compliant with SEER-Medicare guidelines Percentages might not sum to 100 because of rounding

Table 2

Estimated effect (unadjusted OR and 95% CI) of each predictor on the use of SBRT versus IMRT or robotic prostatectomy: Results of a univariable multinomial logistic regression analysis

Predictor	SBRT vs. IMRT	P value	SBRT vs. robotic prostatectomy	P value
Age, years				<0.001
65–69	1	–	1	–
70–74	0.99 (0.75–1.31)	0.95	2.35 (1.76–3.13)	<0.001
75+	0.89 (0.67–1.18)	0.40	10.10 (7.41–13.70)	<0.001
Race				<0.001
White	1	–	1	–
Black	0.51 (0.33–0.80)	0.003	0.99 (0.63–1.57)	0.97
Other/unknown	0.23 (0.10–0.56)	0.001	0.25 (0.10–0.60)	0.002
Hispanic ethnicity				0.002
Not Hispanic	1	–	1	–
Hispanic	0.87 (0.53–1.42)	0.57	1.02 (0.61–1.69)	0.95
Unknown	1.18 (0.62–2.25)	0.61	1.98 (1.01–3.91)	0.04
Marital status				<0.001
Married	1	–	1	–
Not married	0.78 (0.58–1.05)	0.10	1.20 (0.88–1.63)	0.25
Unknown	0.77 (0.51–1.15)	0.19	1.44 (0.95–2.18)	0.09
Comorbidity				<0.001
0	1	–	1	–
1	1.21 (0.85–1.71)	0.29	1.64 (1.15–2.33)	0.01
2 or more	1.07 (0.78–1.45)	0.68	2.56 (1.88–3.50)	<0.001
Disease risk classification				<0.001
Low	1	–	1	–
Intermediate	0.50 (0.39–0.65)	<0.001	0.34 (0.26–0.45)	<0.001
High	0.17 (0.11–0.25)	<0.001	0.27 (0.18–0.42)	<0.001
Unknown	0.57 (0.41–0.80)	0.001	0.44 (0.31–0.63)	<0.001
Year of diagnosis				0.10
2008	1	–	1	–
2009	1.09 (0.87–1.36)	0.46	1.01 (0.80–1.27)	0.96
Population of county of residence				<0.001
1,000,000 or more	1	–	1	–
250,000 to 999,999	1.13 (0.85–1.50)	0.40	1.28 (0.96–1.72)	0.10
0 to 249,999	0.68 (0.50–0.90)	0.01	0.86 (0.64–1.16)	0.32
Less than a high school education in census tract of residence				<0.001
Low (0–25)	1	–	1	–
Medium (>25–50)	0.81 (0.61–1.07)	0.14	1.27 (0.95–1.70)	0.10

Predictor	SBRT vs. IMRT	P value	SBRT vs. robotic prostatectomy	P value
High (>50)	0.45 (0.17–1.22)	0.12	0.76 (0.28–2.11)	0.60
<i>Median household income in census tract of residence, dollars</i>				<0.001
25,000 or less	1	–	1	–
> 25,000–40,000	1.04 (0.62–1.74)	0.88	0.67 (0.40–1.15)	0.15
> 40,000–60,000	1.05 (0.64–1.75)	0.84	0.55 (0.33–0.93)	0.03
> 60,000	2.11 (1.30–3.41)	0.003	0.86 (0.52–1.42)	0.54
<i>Local coverage determination for SBRT</i>				<0.001
Favorable	1	–	1	–
Neutral	1.26 (0.84–1.90)	0.26	0.81 (0.54–1.23)	0.33
Unfavorable	0.47 (0.20–1.12)	0.09	0.26 (0.11–0.64)	0.003
Absent	1.80 (1.25–2.58)	0.002	1.99 (1.37–2.89)	<0.001

Abbreviations: CI, confidence interval; IMRT, intensity-modulated radiotherapy; OR, odds ratio; SBRT, stereotactic body radiation treatment

Table 3

Estimated effect (adjusted OR* and 95% CI) of each predictor on the use of SBRT versus IMRT or robotic prostatectomy: Results of a multivariable multinomial logistic regression analysis

Predictor	SBRT vs. IMRT	P value	SBRT vs. robotic prostatectomy	P value
Age, years				<0.001
65–69	1	–	1	–
70–74	1.02 (0.76–1.35)	0.92	2.37 (1.78–3.17)	<0.001
75+	1.01 (0.75–1.35)	0.97	11.11 (8.13–15.15)	<0.001
Race				<0.001
White	1	–	1	–
Black	0.56 (0.35–0.89)	0.01	1.00 (0.62–1.63)	0.99
Other/Unknown	0.25 (0.10–0.61)	0.003	0.29 (0.12–0.71)	0.01
Comorbidity				<0.001
0	1	–	1	–
1	1.17 (0.82–1.66)	0.38	1.38 (0.97–1.97)	0.08
2 or more	1.06 (0.78–1.46)	0.70	1.87 (1.36–2.57)	<0.001
Disease risk classification				<0.001
Low	1	–	1	–
Intermediate	0.52 (0.40–0.68)	<0.001	0.32 (0.24–0.42)	<0.001
High	0.18 (0.12–0.27)	<0.001	0.23 (0.15–0.35)	<0.001
Unknown	0.57 (0.41–0.81)	0.002	0.40 (0.28–0.57)	<0.001
Year of diagnosis				0.16
2008	1	–	1	–
2009	1.20 (0.94–1.52)	0.14	1.26 (0.98–1.61)	0.07
Population of county of residence				0.04
1,000,000 or more	1	–	1	–
250,000 to 999,999	1.29 (0.97–1.72)	0.09	1.42 (1.05–1.91)	0.02
0 to 249,999	0.88 (0.62–1.24)	0.46	0.99 (0.69–1.40)	0.94
Median household income in census tract of residence, dollars				<0.001
25,000 or less	1	–	1	–
> 25,000–40,000	0.94 (0.56–1.58)	0.81	0.66 (0.38–1.14)	0.14
> 40,000–60,000	0.89 (0.52–1.51)	0.66	0.53 (0.31–0.93)	0.03
> 60,000	1.68 (0.99–2.87)	0.06	0.82 (0.47–1.43)	0.48
Local coverage determination for SBRT				<0.001
Favorable	1	–	1	–
Neutral	1.12 (0.74–1.70)	0.59	0.75 (0.49–1.16)	0.20
Unfavorable	0.50 (0.21–1.20)	0.12	0.31 (0.13–0.76)	0.01
Absent	1.56 (1.07–2.25)	0.02	1.84 (1.25–2.69)	0.002

Abbreviations: CI, confidence interval; IMRT, intensity-modulated radiotherapy; OR, odds ratio; SBRT, stereotactic body radiation treatment

* The effect of each predictor was adjusted for all other predictors in the model.

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