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Multilevel Factors Influencing Active Surveillance Initiation Among Elderly Medicare Beneficiaries Newly Diagnosed with Low-Risk and Favorable Intermediate-Risk Prostate Cancer: An Active Comparator New User Retrospective Cohort Study in the United States

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Background

- Active surveillance (AS) is guideline-recommended strategy for managing low-risk and favorable intermediate-risk localized prostate cancer (LIPCa: cT1-cT2c, cN0, cM0, ≤Gleason pattern, 3 + 4) due to its quality-of-life benefits and comparable survival to radical treatment (RT).[1]
- However, AS uptake among elderly Medicare beneficiaries remains suboptimal (2014 to 2021: 26.5% to 59.6%), and varies across neighborhood, physician (0% to 100%), and practice(4% to 78%) contexts.[2]

Objectives

- This study quantified the associations between explanatory factors (i.e., patient-level characteristics, Census tract-level SDoH, physician- and practice-level factors) and AS initiation compared to radical treatment.

Methods

Study Design and Data Source

- We conducted an active-comparator new-user retrospective cohort study using the Surveillance, Epidemiology, and End Results (SEER)-Medicare 100% Prostate Cancer file (2006-2020) linked to PolicyMap Census tract-level social determinants of health (SDoH) measures.[3,4]
- The SEER-Medicare linked to PolicyMap tract-level SDoH data provide comprehensive information on prostate cancer diagnoses, cancer-directed treatments, tract-level socioeconomic measures, and provider characteristics required for this study.[4]

Study Population

- This study identified patients 66 to 75 years newly diagnosed LIPCa (2007 to 2019), and who initiated AS, or RT during the 18 months post-initial diagnosis period.
- Utilized the American Joint Committee on Cancer's (AJCC) clinical tumor-node-metastasis (TNM) staging variables, and the American Urological Association (AUA) risk stratification algorithm[1] to identify and categorize patients as LIPCa (cT1-cT2c, cN0, cM0 with Gleason score≤3+4).
- The study required 18 months pre-index date (baseline period) continuous enrollment for Medicare Part A, B, and D coverage to allow for adequate time window for confirmatory testing, and covariate assessment.
- The index date was defined as the date of initiating AS, or RT during the confirmatory testing time window:
- For the AS cohort, the date of the first day after the 18-month confirmatory testing time window constituted the index date; For the RT cohort, the earlier of the SEER reported date of RT initiation/date of first observed claim with RT constituted the index date.

Study Outcome

- The primary outcome was AS initiation, identified by applying a modified version of a validated Medicare claim-based algorithm originally developed by Modi et al.[5]
- AS initiation definition: No curative treatment within 18 months after the date of initial LIPCa diagnosis, comorbidity score < 3, and age 66 to 75 years.
- Patients who received radical prostatectomy, radical radiotherapy, and systemic therapy were categorized in the RT group;[6] RT group were identified from both the SEER cancer file and Medicare claims, using specified variables and procedure codes (can be provided on request).

Pre-Index Date Multilevel Factors

- Patient-level: Risk group, and age group in years, sociodemographic information; tumor-level (i.e., Clinical T stage, Gleason grade group [GG], prebiopsy PSA level); clinical (e.g., Charlson Comorbidity Index (CCI), hyperlipidemia, obesity, benign prostatic hyperplasia (BPH), alcohol use disorder, confirmatory biopsy type, year of treatment initiation).
- Census tract-level SDoH measures: Education, household income, poverty, Yost index, homeowners cost burden, food insecurity, internet access, and public transportation access.[7]
- Physician/Practice-level: Physician specialty and Medicare LIPCa case volume (average cumulative Medicare volume, ACMV).[8]

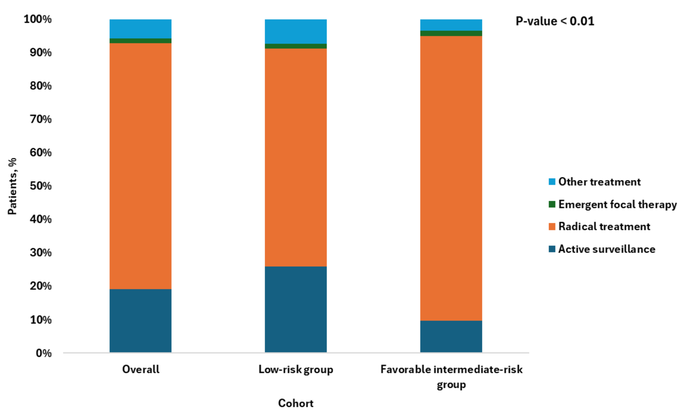
Statistical Analysis

- Generalized linear mixed effect models, specifying binary distribution, a log link, and physician random intercept was fit to quantify the associations between patient-level/contextual factors and AS initiation.[9]
- Variable specification: Informed by data-driven insights, published literature, and clinical guidance.[8]
- Subject-specific adjusted odds ratios (aORs; 95% confidence intervals [CIs]) and intraclass correlation coefficients were reported.
- A p-value of 0.05 or less was considered statistically significant.
- Sensitivity analyses evaluated 12-month AS window and risk-stratified subgroups.
- All statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

Results

- Among 14,728 patients, 20.7% initiated AS (Figure 1).
- AS was more likely among those aged ≥70 (aOR: 1.898, 95% CI: 1.534–2.347), residing in Western US (aOR: 2.131, 95% CI: 1.558–2.914), obese (aOR: 1.543, 95% CI: 1.088–2.188), or more recent years (2014–2015 vs. 2007–2009: aOR: 5.437, 95% CI: 3.524–8.389) as presented in Figure 2 below.
- Patients without confirmatory biopsy or MRI had higher odds of AS (aOR: 1.762, 95% CI: 1.389–2.236), while MRI-guided biopsy (aOR: 0.605, 95% CI: 0.447–0.818) and GG2 tumors (aOR: 0.374, 95% CI: 0.252–0.553) reduced AS use.
- AS was more likely among patients with ≥cT2 and CCI≥2 (aOR: 3.135, 95% CI: 1.445–6.800), tracts with moderate public transport access (aOR: 1.439, 95% CI: 1.028–2.014) or low-education older adults (aOR: 2.069, 95% CI: 1.026–4.170).
- High-volume physicians (aOR: 16.184, 95% CI: 11.859–22.084) and practices (aOR: 1.590, 95% CI: 1.229–2.056) were associated with higher AS odds; radiation oncologists and interventional radiologists had lower AS odds.
- Sensitivity analyses findings were consistent with the base case results.

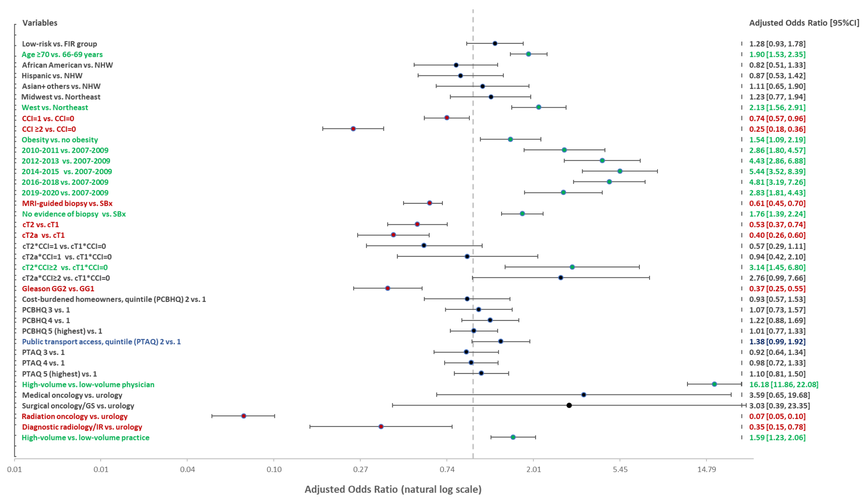
Figure 1. Treatment Initiated Among Patients with LIPCa, Overall and by Risk Group, 2007-2020



AS preferred management strategy for low-risk prostate cancer?

AS: Active surveillance.
LIPCa: Low-risk and favorable intermediate-risk localized prostate cancer .

Figure 2. Factors Associated with AS vs. RT Initiation Among Patients diagnosed with LIPCa, 2007-2020



AS: Active surveillance.
CCI: Charlson Comorbidity Index.
cT: Clinical T stage.
GG: Gleason grade group.
GS: General surgery
LIPCa: Low-risk and favorable intermediate-risk localized prostate cancer.
PCBHQ: Percentage of cost-burdened homeowners, quintile.
PTAQ: Public transport access, quintile.
RT: Radical treatments, including radical prostatectomy, radical radiotherapy, and systemic therapy.

Discussion

- Using a representative sample of Medicare beneficiaries aged 66-75 years with LIPCa, this study quantified the association between patient-level factors, Census tract-level SDOH measures, physician- and practice-level factors with AS initiation compared to RT to inform treatment decision-making.
- Despite the influence of multiple patient-level factors and contextual factors on AS initiation, physicians' expertise and experience in managing LIPCa appeared to exert the greatest influence AS uptake, highlighting the value of multidisciplinary care.
- Additionally, the co-occurrence of higher comorbidity burden and advanced clinical T stage was associated with greater likelihood of AS initiation, highlighting the value of integrating comorbidities into broader patient risk stratification beyond tumor characteristics alone.[1-3]
- Our study results may be limited by unmeasured confounding, potential misclassification of AS initiation, incomplete modeling of clustering effects, and generalizability to Medicare Fee-for-Service beneficiaries aged 66 to 75 years with LIPCa from 2007 to 2020.

Conclusions

- Among elderly Medicare beneficiaries with LIPCa, AS initiation was influenced by multilevel factors, with physician specialty and average cumulative Medicare volume being the strongest determinants.
- Future research should integrate SEER-Medicare with complementary data sources to examine unmeasured factors influencing AS initiation and evaluate findings in the Medicare Advantage population.

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