

ROADMAP: Hospital and Physician Characteristics Associated with Imaging, Genetic Testing and Molecular Diagnostics

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During the preparation of this work the authors used DeepL and GPT 4.0 Open AI for language editing and feedback. However, the content and analysis presented were independently generated and did not involve the use of any AI model.

Introduction

Despite recommendations from major guidelines, pre-diagnostic prostate MRI remains underutilized

across the United States. Similarly, germline genetic testing is broadly recommended for prostate cancer patients based on clinicopathologic criteria and family history, yet uptake remains low—especially in rural areas. Both represent critical quality measures in prostate cancer care, but the drivers of their underuse are poorly understood. We evaluated patient- and hospital-level factors associated with variation in utilization of these and other advanced diagnostic services among Medicare beneficiaries.

Materials and Methods

We conducted two retrospective studies using full Medicare claims (2019–2023) linked with American Hospital Association (AHA) Annual Survey data. For pre-diagnostic MRI, we identified beneficiaries with newly elevated PSA and for germline testing, we identified patients with newly diagnosed prostate cancer, assigning each to their treating hospitals. Comprehensive patient sociodemographic and clinical characteristics and hospital-level attributes were analyzed in generalized linear mixed models. The relative contribution of patient- versus hospital-level factors was evaluated using pseudo- R^2 (Cox and Snell) statistics.

Results

Among 304,161 patients at 2,657 hospitals with elevated PSA, the median pre-diagnostic MRI rate was 4.4% (IQR: 2.1–6.1%). Increasing age was associated with lower MRI use, while Black patients (OR: 1.15, 95% CI: 1.06–1.26) and those in metropolitan areas were more likely to receive MRI. At the hospital level, robotic surgery access (OR: 1.18, 95% CI: 1.06–1.30) and major teaching status (OR: 1.19, 95% CI: 1.07–1.32) were associated with higher MRI use. Patient-level factors explained 44.6% of the variance, while hospital factors accounted for <1%. Among 270,246 prostate cancer patients at 2,617 hospitals, 7,635 (2.8%) underwent germline testing, with a median hospital rate of 2.2% (IQR: 0.6–3.7%). Older age (≥ 81 years: aOR 0.49, 95% CI: 0.45–0.52) and Medicare/Medicaid dual eligibility (aOR 0.89, 95% CI: 0.81–0.99) were associated with lower testing odds. Later diagnosis years were associated with higher uptake, with substantial regional variation. Combined models explained 58% of testing variation, with patient-level factors contributing far more (23.8%) than hospital factors (0.8%).

Conclusions

Pre-diagnostic MRI and germline genetic testing are both markedly underutilized in U.S. prostate cancer care. Across both measures, patient-level characteristics were the primary determinants of use, with hospital-level factors contributing minimally. Efforts to improve equity and quality should focus on addressing patient-level barriers, enhancing awareness, and standardizing referral and implementation practices across institutions.

Table, Cox and Snell Pseudo- R^2 , * R^2 change when patient characteristics are added to hospital model (Full model R^2 minus Hospital-only model R^2); ** R^2 change when patient characteristics are added to patient model (Full model R^2 minus Patient-only model R^2)

Contribution to total variability of germline genetic test use (yes/no): Cox and Snell Pseudo- R^2 by model		
Model	Explained Variability (Cox and Snell Pseudo- R^2)	Contribution to Variability (ΔR^2)
Full model (patient + hospital covariates)	58.1%	
Hospital covariates only model	34.4%	0.9% *
Patient covariates only model	57.3%	23.8% **

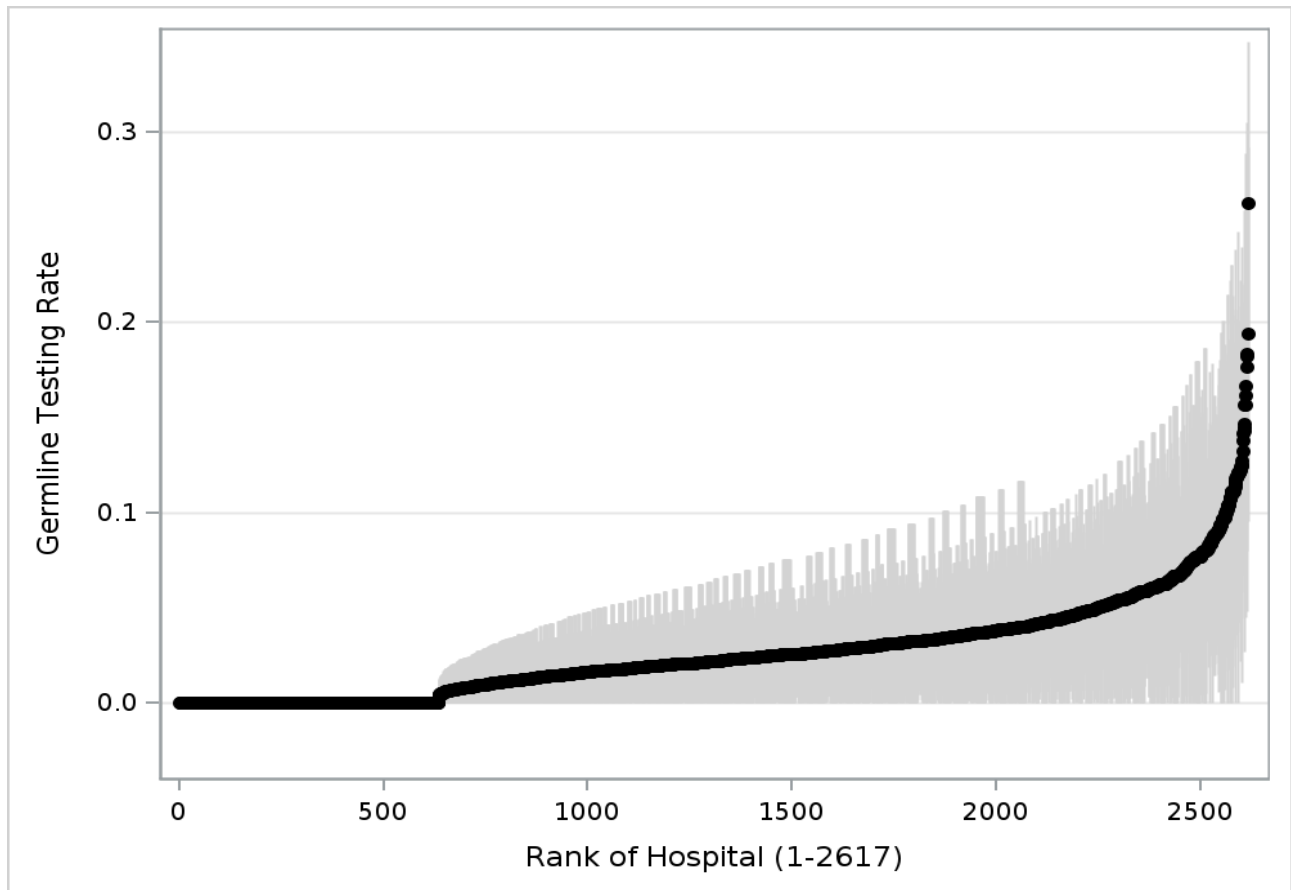


Figure 1, Caterpillar plot showing germline genetic testing rates across individual hospital sites. Each point represents a hospital site ordered by increasing testing rate. Black dots indicate the testing rate and grey bars show 95% confidence intervals.