Prediction of Prostate Cancer Risk Among Men Undergoing Combined MRI-targeted and Systematic Biopsy Using Novel Pre-biopsy Nomograms That Incorporate MRI Findings

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Abstract

Objective: To develop nomograms that predict the probability of overall prostate cancer (PCa) and clinically significant PCa (Gleason ≥7) on magnetic resonance imaging (MRI)-targeted, and combined MRI-targeted and systematic, prostate biopsy.

Materials and methods: From June 2012 to August 2014, magnetic resonance imaging to ultrasound fusion-targeted prostate biopsy was performed on 464 men with suspicious regions identified on pre-biopsy 3T MRI along with systematic 12 core biopsy. Logistic regression modeling was used to evaluate predictors of overall and clinically significant PCa, and corresponding nomograms were generated for men who were not previously biopsied or had 1 or more prior negative biopsies. Models were created with 70% of a randomly selected training sample and bias-corrected using bootstrap resampling. The models were then validated with the remaining 30% testing sample pool.

Results: A total of 459 patients were included for analysis (median age 66 years, prostate-specific antigen [PSA] 5.2 ng/mL, prostate volume 49 cc). Independent predictors of PCa on targeted and systematic prostate biopsy were PSA density, age, and MRI suspicion score. PCa probability nomograms were generated for each cohort using the predictors. Bias-corrected areas under the receiver-operating characteristic curves for overall and clinically significant PCa detection were 0.82 (0.78) and 0.91 (0.84) for men without prior biopsy and 0.76 (0.65) and 0.86 (0.87) for men with a prior negative biopsy in the training (testing) samples.

Conclusion: PSA density, age, and MRI suspicion score predict PCa on combined MRI-targeted and systematic biopsy. Our generated nomograms demonstrate high diagnostic accuracy and may further aid in the decision to perform biopsy in men with clinical suspicion of PCa.