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## A Magnetic Resonance Imaging-Based Prediction Model for Prostate Biopsy Risk Stratification.

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**IMPORTANCE:** Multiparametric magnetic resonance imaging (MRI) in conjunction with MRI-transrectal ultrasound (TRUS) fusion-guided biopsies have improved the detection of prostate cancer. It is unclear whether MRI itself adds additional value to multivariable prediction models based on clinical parameters.

**OBJECTIVE:** To determine whether an MRI-based prediction model can reduce unnecessary biopsies in patients with suspected prostate cancer.

**DESIGN, SETTING, AND PARTICIPANTS:** Patients underwent MRI, MRI-TRUS fusion-guided biopsy, and 12-core systematic biopsy in 1 session. The development cohort used to derive the prediction model consisted of 400 patients from 1 institution enrolled between May 14, 2015,

and August 31, 2016, and the validation cohort included 251 patients from 2 independent institutions who underwent biopsies between April 1, 2013, and June 30, 2016, at 1 institution and between July 1, 2015, and October 31, 2016, at the other institution. The MRI model included MRI-derived parameters in addition to clinical variables. Area under the curve of receiver operating characteristic curves and decision curve analysis were performed.

**MAIN OUTCOMES AND MEASURES:** Risk of clinically significant prostate cancer on biopsy, defined as a Gleason score of 3 + 4 or higher in at least 1 biopsy core.

**RESULTS:** Overall, 193 (48.3%) of the 400 patients in the development cohort (mean [SD] age at biopsy, 64.3 [7.1] years) and 96 (38.2%) of the 251 patients in the validation cohort (mean [SD] age at biopsy, 64.9 [7.2] years) had clinically significant prostate cancer, defined as a Gleason score greater than or equal to 3 + 4. By applying the model to the external validation cohort, the area under the curve increased from 64% to 84% compared with the baseline model ( $P < .001$ ). At a risk threshold of 20%, the MRI model had a lower false-positive rate than the baseline model (46% [95% CI, 32%-66%] vs 92% [95% CI, 70%-100%]), with only a small reduction in the true-positive rate (89% [95% CI, 85%-96%] vs 99% [95% CI, 89%-100%]). Eighteen of 100 fewer biopsies could have been performed, with no increase in the number of patients with missed clinically significant prostate cancers.

**CONCLUSIONS AND RELEVANCE:** The inclusion of MRI-derived parameters in a risk model could reduce the number of unnecessary biopsies while maintaining a high rate of diagnosis of clinically significant prostate cancers.

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