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Commentary

Redefining Prostate Cancer Diagnostics in China: The Emerging Role of MRI alongside PSA Testing

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Prostate cancer remains a significant global health issue, consistently ranking as the second most common cancer among men worldwide and a leading cause of cancer-related deaths.[1,2] In the United States, prostate cancer is the most frequently diagnosed malignancy in men and the second leading cause of cancer-related death.[2] The conventional diagnostic regime, heavily reliant on Prostate-Specific Antigen (PSA) levels, is increasingly recognized for its limitations due to high sensitivity that results in a substantial rate of false positives.[3,4] As an alternative, Magnetic Resonance Imaging (MRI) has emerged as a promising complementary diagnostic tool.[5,6] Pivotal studies by Robinson *et al*. and the ReIMAGINE research group have highlighted MRI's potential to diminish biopsy rates and enhance the accuracy of tumor-grade detection.[7,8] Nevertheless, these advancements underscore the necessity for careful patient selection to avoid an uptick in false negatives. This commentary aims to dissect the impact of MRI within the context of prostate cancer diagnostics, proposing an integrated approach that combines MRI with traditional PSA testing, and exploring the ramifications of this dual strategy for improving clinical outcomes.

Prostate cancer remains a persistent global health challenge, but recent advancements have significantly improved the accuracy and efficiency of diagnostics. The pioneering ReIMAGINE and Robinson studies have provided invaluable insights into the potential of MRI in prostate cancer screening, suggesting a transformative shift in detection strategies. The ReIMAGINE study, a prospective cohort research initiative, specifically focused on MRI as a primary screening tool, independent of PSA levels. This study involved men aged 50 to 75 from diverse general practice (GP) undergoing MRI and PSA tests with those showing positive MRI findings or elevated PSA density (>0.12 ng/mL) subsequently referred for further comprehensive assessment by the National Health Service (NHS). Robinson and colleagues analyzed data from 23,802 men in the Jönköping Region of Sweden, observing that the integration of MRI led to a significant decline in biopsy rates and an improved accuracy in tumor grading, indicating MRI's substantial impact on prostate cancer diagnostics (Fig. 1).

Notably, the ReIMAGINE study revealed the effectiveness of MRI in detecting clinically significant prostate cancers and its potential to reduce unnecessary biopsies, even in men with PSA levels considered "safe" (below 3 ng/mL). Among the 457 men who responded to the GP's invitation and underwent both MRI and PSA screening tests, 16% (48 out of 303) exhibited positive MRI results, indicating possible prostate lesions. Additionally, 5% (16 out of 303) displayed elevated PSA density, regardless of their MRI outcome. After the NHS assessment, 9.6% (29 men) received diagnoses of clinically significant prostate cancer, while 1% (3 men) were diagnosed with less severe forms. Notably, it is important to highlight that two-thirds of men with positive MRI results, as well as over half of those diagnosed with clinically significant cancers, had PSA levels below 3 ng/ml.

These findings and insights from both studies collectively underscore the revolutionary potential of MRI in prostate cancer screening. MRI's integration into the diagnostic process could drastically improve cancer detection rates, particularly for clinically significant cancers. These revelations strongly advocate for an MRI-first approach, emphasizing the need for further research to perfect prostate cancer detection and treatment protocols.

While the ReIMAGINE and Swedish studies have provided valuable insights into the potential of MRI in prostate cancer diagnostics, a comprehensive perspective requires acknowledgment of their inherent limitations. The ReIMAGINE study, which primarily focused on men aged 50–75 from specific GP, may not fully capture prostate cancer dynamics outside this age range. Additionally, the study's 22% response rate raises concerns about the generalizability of findings, as it resulted in the overrepresentation of older white men and underrepresentation of black men. Moreover, translating findings from randomized clinical trials, as highlighted in the Swedish JAMA Network Open study, to practical clinical scenarios is challenging due to potential variations in MRI interpretations, equipment quality, and accessibility, which could yield divergent results. Sweden's unique diagnostic environment, as portrayed in the JAMA Network Open study, presents distinctive aspects, including a higher prostate cancer mortality rate and elective PSA testing, possibly introducing biases that could skew the findings. While the studies emphasize MRI's diagnostic capa-

Abbreviations: GP, general practice; MRI, Magnetic Resonance Imaging; NHS, National Health Service; PSA, Prostate-Specific Antigen.

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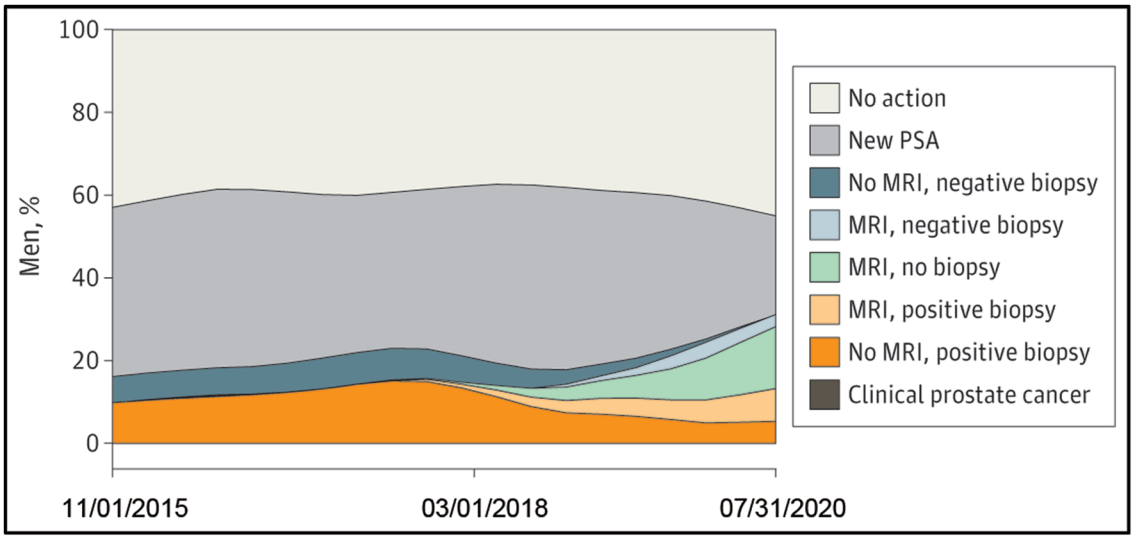

Fig. 1. MRI's impact on biopsy. In the Jönköping Region of Sweden, PSA measurements were taken for 23,802 men from November 1, 2011, to July 31, 2020, with follow-up concluded on January 31, 2021. Participants were categorized into 8 groups (see right side of the figure) based on screenings and evaluations conducted within 180 days after the initial PSA test. The study observed that about half of the men with PSA levels ranging from 3 to 20 ng/mL were diagnosed with prostate cancer without prior MRI examinations. Notably, a significant decline in the proportion of negative biopsies, from 28% to 7%, was observed. The figure illustrates the relationship between the increasing number of MRI examinations, a decrease in the number of biopsies, and an increase in the positive biopsy rate. Adapted from Robinson's paper.[7] PSA, prostate-specific antigen; MRI, magnetic response imaging.

bilities, it is crucial to avoid placing an overemphasis on MRI-only diagnostics, as this risks overlooking a holistic diagnostic approach that leverages multiple tools. Furthermore, there is a notable gap in discussing subsequent treatment strategies, especially for cancers with a Gleason score of 7 or higher. Moreover, considering that the studies were primarily based in the UK and Sweden's Jönköping Region, their findings' generalizability to other global contexts remains uncertain. Regional variations in healthcare paradigms, patient demographics, and technological infrastructure may lead to varying outcomes, emphasizing the need for cautious interpretation and adaptation to different healthcare settings.

Recent research highlights MRI's transformative potential in prostate cancer diagnostics, particularly in reducing the need for biopsies, and the ReIMAGINE study emphasizes that MRI integration offers the primary advantage of potentially reducing the number of biopsies. While biopsies are crucial, they are invasive and associated with complications such as infections, bleeding, and discomfort. MRI's ability to identify significant cancers, even in men with "safe" PSA levels, represents progress in minimizing unnecessary biopsies, thereby enhancing patient safety and comfort.

The findings from both the ReIMAGINE and Robinson studies signify a paradigm shift in prostate cancer diagnostics. The emerging MRI-first approach has the potential to identify significant prostate cancers, even when PSA levels are considered safe. This suggests potential reductions in over-diagnosis and over-treatment, highlighting the importance of timely intervention in high-risk cases. Additionally, the ReIMAGINE study challenges the longstanding reliance on PSA levels as the sole diagnostic measure. MRI's success in detecting cancers that might go unnoticed based on PSA alone indicates a potential overhaul in prostate cancer screening methods, elevating MRI's role in the diagnostic process. The insights from the ReIMAGINE study and Robinson *et al*. align with prior research, strengthening the case for an MRI-first approach, and such consistent findings across different studies could prompt a reevaluation of standardized diagnostic guidelines, making them more responsive to evolving clinical evidence. The collective evidence from these studies necessitates a thorough reconsideration of prevailing diagnostic protocols. As the benefits of an MRI-centric approach become increasingly evident, healthcare policymakers might lean more toward its adoption, promising not only enhanced diagnostic accuracy but also more efficient resource allocation, focusing on genuine risks while reducing unwarranted procedures.

As we contemplate the integration of MRI into prostate cancer diagnostics, it is imperative to understand its implications within the specific context of China's healthcare landscape. The economic considerations are paramount, given that the widespread adoption of MRI must be balanced against the cost-effectiveness of PSA testing, which has been a staple due to its affordability and accessibility. In China, where healthcare expenditures are closely scrutinized, the higher costs associated with MRI need to be justified by demonstrable improvements in clinical outcomes.

Furthermore, the availability of MRI technology is not uniform across China. Urban centers and more affluent regions have better access to advanced imaging technologies compared to rural areas, which may lead to disparities in diagnostic accuracy and cancer care. A phased integration approach, prioritizing regions with higher incidences of prostate cancer and greater healthcare resources, may be a practical initial strategy.

Current practice patterns in China also lean heavily towards PSA testing, and any shift towards an integrated MRI-PSA model would necessitate substantial changes in clinical practice. This includes clinician education, updated referral pathways, and revised treatment protocols. Furthermore, insurance coverage and national healthcare policies play a critical role in determining the feasibility of adopting such an integrated diagnostic approach.

Given these considerations, this article further delves into the strategies that could facilitate the adoption of MRI in conjunction with PSA testing in China, ensuring that clinical advancements are accessible and beneficial across diverse patient populations. We propose a framework that considers not only the clinical benefits

of MRI but also the economic, logistical, and systemic factors that influence healthcare delivery in China.

Emerging research, including the ReIMAGINE study, is reshaping prostate cancer diagnostics by challenging established reliance on PSA levels and underscoring the potential of MRI to detect significant cancers that might be missed with PSA screening alone. This revolution in diagnostics is particularly pertinent as we consider the integration of MRI within China's unique healthcare landscape. Economic factors are crucial; while PSA testing remains a cost-effective standard, the higher costs associated with MRI necessitate a clear demonstration of improved clinical outcomes to justify its broader adoption. The uneven availability of MRI across China, with better access in urban centers compared to rural areas, further complicates the narrative, potentially leading to disparities in diagnostic accuracy and care. Looking ahead, MRI's potential to become the dominant diagnostic tool may redefine prostate cancer screening, emphasizing detailed imaging over PSA-based metrics. Preparing for this MRI-driven diagnostic landscape requires global healthcare systems to prioritize MRI accessibility, enhance training for prostate cancer-specific MRI interpretations, and launch public health campaigns promoting MRI-centric screenings.

As we navigate the advancements in MRI for prostate cancer diagnosis, future researchers in China must embark on a multifaceted exploration. This should include a rigorous cost-benefit analysis to assess the economic impact of MRI alongside PSA testing, considering both direct costs and the potential for improved clinical outcomes. Equally important is investigating accessibility challenges, especially the stark contrast between urban and rural healthcare facilities, to develop strategies that democratize access to MRI technologies. Prospective multicenter clinical trials are vital to validate the efficacy of integrated MRI-PSA screening protocols across China's diverse populations. Policy-oriented research should also evaluate how healthcare reforms and insurance models can be designed to support MRI integration. Furthermore, technological advancements that reduce MRI costs and training programs that enhance MRI interpretation skills among clinicians will be crucial. Finally, patient-centered outcomes research should not be overlooked, focusing on educational initiatives that empower patients in their healthcare journey. These research directions will not only fill current knowledge gaps but also inform best practices and policy-making, ultimately steering the future of prostate cancer diagnostics toward a more effective, equitable, and patient-aligned approach.

Recent pivotal studies by Robinson *et al*. and the ReIMAGINE research team, mark a transformative shift in prostate cancer diagnostics, advocating for the integration of MRI alongside traditional PSA testing.[7,9,10] These studies highlight the potential of MRI to refine diagnostic precision, thereby enhancing early detection, minimizing invasive procedures, and ultimately optimizing patient care. The adoption of such advanced technologies, while groundbreaking, necessitates a nuanced approach that acknowledges the specific needs and constraints of different healthcare systems, particularly within China's dynamic medical landscape.

This commentary underscores the importance of this integrated diagnostic framework, taking into consideration China's economic, logistical, and clinical contexts. As the global medical community leans towards MRI integration, it is essential to address the disparities in access, standardize interpretation protocols, and manage the economic implications to make these advancements truly universal.

Moving forward, the emphasis on patient experiences and outcomes remains paramount. Ensuring that educational, engagement, and supportive care strategies are in place is critical for aligning the transition to advanced diagnostics with the principles of patient-centered care.

In summary, the global relevance of MRI in prostate cancer diagnostics is clear, yet its integration is a complex process that requires thoughtful adaptation to regional healthcare environments. The collective insights from recent studies catalyze change, pushing the medical community towards a future where innovative diagnostic methods are implemented with practicality, ensuring equitable and precision-based patient care.

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Conflict of interest

The authors have no conflicts of interest related to this publication.

Author contributions

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Availability of data and materials

The data and material used in the current study are available from the corresponding author upon reasonable request.

References

[1] Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, *et al*. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin 2021;71(3):209–249. doi:10.3322/caac.21660, PMID:33538338.

[2] Siegel RL, Miller KD, Wagle NS, Jemal A. Cancer statistics, 2023. CA Cancer J Clin 2023;73(1):17–48. doi:10.3322/caac.21763, PMID:36633525.

[3] Thompson IM, Pauler DK, Goodman PJ, Tangen CM, Lucia MS, Parnes HL, *et al*. Prevalence of prostate cancer among men with a prostate-specific antigen level < or =4.0 ng per milliliter. N Engl J Med 2004;350(22):2239–2246. doi:10.1056/NEJMoa031918, PMID:15163773.

[4] Merriel SWD, Pocock L, Gilbert E, Creavin S, Walter FM, Spencer A, *et al*. Systematic review and meta-analysis of the diagnostic accuracy of prostate-specific antigen (PSA) for the detection of prostate cancer in symptomatic patients. BMC Med 2022;20(1):54. doi:10.1186/s12916-021-02230-y, PMID:35125113.

[5] Deniffel D, Healy GM, Dong X, Ghai S, Salinas-Miranda E, Fleshner N, *et al*. Avoiding Unnecessary Biopsy: MRI-based Risk Models versus a PI-RADS and PSA Density Strategy for Clinically Significant Prostate Cancer. Radiology 2021;300(2):369–379. doi:10.1148/radiol.2021204112, PMID:34032510.

[6] Stavrinides V, Eksi E, Finn R, Texeira-Mendes L, Rana S, Trahearn N, *et al*. Magnetic Resonance Imaging Follow-up of Targeted Biopsy-negative Prostate Lesions. Eur Urol Focus 2023;9(5):781–787. doi:10.1016/j.euf.2023.03.011, PMID:37031096.

[7] Robinson D, Abdulkareem R, Nasrollah D, Ljung A, Hintze P, Wallby

S, *et al*. Frequency of Biopsy and Tumor Grade Before vs After Introduction of Prostate Magnetic Resonance Imaging. JAMA Netw Open 2023;6(8):e2330233. doi:10.1001/jamanetworkopen.2023.30233, PMID:37606924.

[8] Moore CM FE, McCartan N, Santaolalla A, Kopcke D, Brembilla G, Hadley J, *et al*. Prevalence of MRI Lesions in Men Responding to a Gp-Led Invitation for a Prostate Health Check: A Prospective Cohort Study. BMJ Oncology 2023;2:e000057. doi:10.1136/bmjonc-2023-000057.

[9] Marsden T, Lomas DJ, McCartan N, Hadley J, Tuck S, Brown L, *et al*. ReIMAGINE Prostate Cancer Screening Study: protocol for a single-centre feasibility study inviting men for prostate cancer screening using MRI. BMJ Open 2021;11(9):e048144. doi:10.1136/bmjopen-2020-048144, PMID:34593491.

[10] Marsden T, McCartan N, Brown L, Rodriguez-Justo M, Syer T, Brembilla G, *et al*. The ReIMAGINE prostate cancer risk study protocol: A prospective cohort study in men with a suspicion of prostate cancer who are referred onto an MRI-based diagnostic pathway with donation of tissue, blood and urine for biomarker analyses. PLoS One 2022;17(2):e0259672. doi:10.1371/journal.pone.0259672, PMID: 35202397.