

# INPLASY

## 18F-Labeled Prostate-Specific Membrane Antigen Positron Emission Tomography/Computed Tomography versus Magnetic Resonance Imaging in Diagnosis of Prostate Cancer: A Meta-Analysis

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Feng, HL; Su, YQ; Lu, FZ.

### Corresponding author:

hailong feng

fw1525@163.com

### Author Affiliation:

The second outpatient department of directly affiliated institutions in hebei province.

### ADMINISTRATIVE INFORMATION

**Support -** No.

**Review Stage at time of this submission -** The review has not yet started.

**Conflicts of interest -** None declared.

**INPLASY registration number:** INPLASY2025110065

**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 November 2025 and was last updated on 20 November 2025.

### INTRODUCTION

**Review question / Objective** 18F-Labeled Prostate-Specific Membrane Antigen Positron Emission Tomography/Computed Tomography versus Magnetic Resonance Imaging in Diagnosis of Prostate Cancer: A Meta-Analysis.

**Condition being studied** Prostate cancer represents the second most common malignancy in men worldwide, with an estimated 1.4 million new cases diagnosed annually.

### METHODS

**Participant or population** Population (patients with suspected or confirmed prostate cancer), Intervention (18F-PSMA PET/CT).

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**Comparator** Comparator (multiparametric MRI).

**Study designs to be included** Study design (prospective and retrospective comparative studies).

**Eligibility criteria** (1) evaluated patients with suspected or confirmed prostate cancer, (2) performed both 18F-PSMA PET/CT and MRI imaging, (3) used histopathological examination (either biopsy or radical prostatectomy specimens) as the reference standard, (4) reported sufficient data to calculate sensitivity for prostate cancer detection, (5) included at least 10 patients, and (6) were published as full-text articles in peer-reviewed journals. Studies were excluded if they: (1) used 68Ga-labeled PSMA tracers exclusively without 18F-labeled tracers, (2) lacked direct comparison between PSMA PET and MRI in the same patient cohort, (3) focused solely on staging or biochemical recurrence without primary diagnosis data, (4) were case reports, editorials, reviews without original data, or conference abstracts without full publication, (5) included

duplicate patient populations, or (6) had insufficient data for meta-analysis despite attempts to contact authors.

**Information sources** (1) PubMed/MEDLINE, (2) Embase via Ovid, (3) Web of Science Core Collection, (4) Cochrane Central Register of Controlled Trials (CENTRAL), and (5) ClinicalTrials.gov for ongoing or unpublished studies. The search strategy was developed in consultation with a medical librarian and utilized a combination of Medical Subject Headings (MeSH) terms and free-text keywords. The core search terms included variations and combinations of "prostate-specific membrane antigen," "PSMA," "positron emission tomography," "PET," "18F-DCFBC," "18F-DCFPLY," "18F-PSMA-1007," "magnetic resonance imaging," "MRI," "mpMRI," "prostate cancer," "prostatic neoplasms," "sensitivity," "specificity," and "diagnostic accuracy." Boolean operators (AND, OR) were used to combine search terms appropriately.

**Main outcome(s)** A comprehensive literature search was conducted across multiple electronic databases from inception through February 2025.

**Quality assessment / Risk of bias analysis** The methodological quality of included studies was assessed using the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool, which evaluates risk of bias and applicability concerns across four domains: patient selection, index test, reference standard, and flow and timing. Each domain was rated as having low, high, or unclear risk of bias. Additionally, the first three domains were assessed for applicability concerns. Two reviewers independently performed quality assessments, with disagreements resolved through consensus discussion. Studies were not excluded based on quality assessment results, but sensitivity analyses were performed excluding high-risk studies to evaluate the robustness of findings.

**Strategy of data synthesis** The methodological quality of included studies was assessed using the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool, which evaluates risk of bias and applicability concerns across four domains: patient selection, index test, reference standard, and flow and timing. Each domain was rated as having low, high, or unclear risk of bias. Additionally, the first three domains were assessed for applicability concerns. Two reviewers independently performed quality assessments, with disagreements resolved through consensus discussion. Studies were not excluded based on

quality assessment results, but sensitivity analyses were performed excluding high-risk studies to evaluate the robustness of findings.

**Subgroup analysis** Because our research question involves a direct head-to-head comparison of imaging modalities, we present pooled sensitivity by modality (Figure 5). 18F-PSMA PET demonstrated a pooled sensitivity of 0.50 (95% CI: 0.12-0.87). MRI showed a higher pooled sensitivity of 0.81 (95% CI: 0.42-0.96) in paired analyses. An exploratory between-modality test was not statistically significant ( $\chi^2=1.14$ ,  $df=1$ ,  $p=0.29$ ), though wide confidence intervals and small sample size limit the interpretability of this comparison.

**Sensitivity analysis** Only three studies provided extractable patient-level sensitivity data for both MRI and 18F-PSMA PET/CT within paired designs; the remaining studies reported lesion-level, extracapsular extension (EPE), or seminal vesicle invasion (SVI) outcomes and were synthesized narratively. For MRI, the pooled sensitivity was 0.81 (95% CI: 0.08-0.99), with individual study sensitivities ranging from 0.39 to 0.96. Substantial heterogeneity was observed ( $I^2=93.8\%$ ,  $\tau^2=2.07$ ,  $p<0.0001$ ) (Figure 3). For 18F-PSMA PET/CT, the pooled sensitivity was 0.50 (95% CI: 0.12-0.87) based on the same three studies, with high heterogeneity ( $I^2=96.0\%$ ,  $\tau^2=2.78$ ,  $p<0.0001$ ). Individual study sensitivities ranged from 0.17 to 0.91 (Figure 4).

**Country(ies) involved** China.

**Keywords** Prostatic Neoplasms; Positron-Emission Tomography; Magnetic Resonance Imaging; Prostate-Specific Membrane Antigen.

#### Contributions of each author

Author 1 - hailong feng.  
Email: fw1525@163.com  
Author 2 - yanqing su.  
Author 3 - fuzhi lu.