Improving Prostate MR Image Quality Toolkit

From the 2024 Quality Improvement Summit:
Advancing Diagnostic Excellence in Prostate Cancer— Improving Prostate MR Image Quality

Magnetic resonance imaging (MRI) can be a valuable tool to help risk-stratify who should undergo a prostate biopsy while averting biopsy in others. In addition, prostate MRI can improve detection of prostate cancer requiring treatment while reducing detection of low-risk prostate cancer (overdiagnosis). This requires a reliable, high-quality MRI. This toolkit is designed to equip urologists with the tools needed to collaborate with radiologists to enhance prostate MR image quality, ultimately improving the detection of clinically significant prostate cancer.

Prostate MRI Prior to Biopsy

Benefits of Prostate MRI

When conducted prior to biopsy, prostate MRI leads to:

- Increased or maintained detection of clinically significant cancers.
- Decreased overdiagnosis and overtreatment of insignificant cancers.
- Reduction in unnecessary biopsies (by 25-50%).
- Lower healthcare costs.[i]

Impact of Poor-Quality Prostate MRIs

Over a third of prostate MRI exams have insufficient image quality, which:

- Decreases the ability to detect significant cancers.
- Increases the number of equivocal results.
- Leads to more unnecessary biopsies.[ii]

Poor image quality can impact the entire diagnostic process, from MR-informed biopsy to biopsy interpretation to treatment decisions.

PI-RADS

PI-RADS, or Prostate Imaging – Reporting and Data System, is a standardized 5-point scale reporting system used to determine the likelihood of harboring clinically significant cancer in a lesion.[iii] The PI-RADS score determined from a high-quality MRI is a valuable tool that can help urologists risk-stratify and select men for prostate biopsy.

PI-RADS v2.1 Assessment Categories	
PI-RADS 1	Very low (clinically significant cancer is highly unlikely to be present)
PI-RADS 2	Low (clinically significant cancer is unlikely to be present)
PI-RADS 3	Intermediate (the presence of clinically significant cancer is equivocal)
PI-RADS 4	High (clinically significant cancer is likely to be present)
PI-RADS 5	Very high (clinically significant cancer is highly likely to be present)

The European Society of Urogenital Radiology (ESUR) developed PI-RADS v1 in 2012. The ESUR, the American College of Radiology (ACR), and the AdMeTech Foundation collaborated to update the tool in 2015, termed PI-RADS v2. In 2019, the tool was updated to the current version, PI-RADS v2.1.[iv]

In the *Early Detection of Prostate Cancer: AUA/SUO Guideline (2023)*, it is recommended that "radiologists should utilize PI-RADS in the reporting of multi-parametric MRI (mpMRI) imaging. (Moderate Recommendation; Evidence Level: Grade C)."[v] To promote the uptake of PI-RADS, urologists can ask the radiologist to include PI-RADS categories in their reports, as PI-RADS can provide crucial information to help guide the decision to perform or forgo a biopsy.

ACR Resources on PI-RADS

ACR PI-RADS Webpage

- PI-RADS v2.1 Lexicon
- PI-RADS v2.1 Report Template (TXT | PDF)
- PI-RADS 2019 v2.1 Standards
- Summary of Changes from PI-RADS v2.0 to v2.1

PI-QUAL

Prostate image quality can influence the subsequent steps in the diagnostic pathway. PI-QUAL, or Prostate Imaging Quality, is a three-point scale used to describe the quality of a prostate MR image (performed with or without IV contrast) and can be used to guide decisions on whether to repeat a scan or not.[vi]

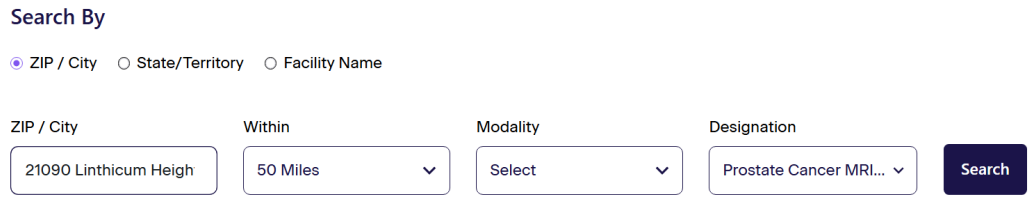
PI-QUAL v2		
PI-QUAL Score	**Clinical Interpretation**	**Considerations**
PI-QUAL 1	Inadequate scan, should be repeated	If inadequate due to patient-related factors (e.g. movement, insufficient bowel prep, etc.), attempt to alleviate these issues; if inadequate due to machine-related factors, rescan using a different machine.
PI-QUAL 2	Acceptable scan, consider repeat scan	Rescanning is not always needed. Rescan if the image is deemed insufficient to make a diagnosis. If inadequate due to patient-related factors, attempt to alleviate these issues; if inadequate due to machine-related factors, consider rescanning using a different machine.
PI-QUAL 3	Optimal scan, of highest diagnostic quality	A scan of optimal quality is of particular importance for those on active surveillance or those who have received prostate cancer treatment.

PI-QUAL v1 was developed by researchers from the PRECISION (PRostate Evaluation for Clinically Important Disease: Sampling Using Image-guidance Or Not?) trial in 2020. PI-QUAL v1 used a five-point Likert scale to assess prostate MR image quality.[vii] In 2024, a group of experts convened by the ESUR developed PI-QUAL v2 which uses a three-point scale.

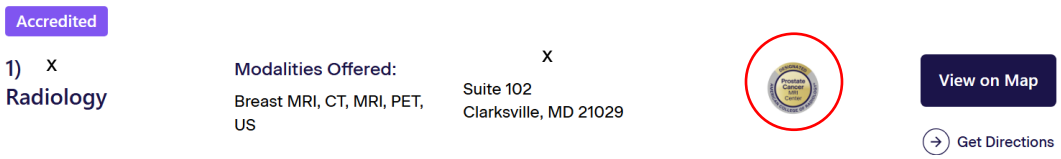
Urologist's Role in Improving Prostate MR Image Quality

Urologists, in collaboration with radiologists, play a crucial role in improving prostate MR image quality. Below are several ways in which urologists can address the issue of poor image quality:

- Urologists can request that both PI-RADS and PI-QUAL scores be included in reports to provide a comprehensive view of the MRI's diagnostic quality and to guide subsequent clinical decisions. The following templates can help radiologists incorporate PI-RADS and PI-QUAL information in their reports.
    - PI-RADS v2.1 Report Template (TXT | PDF)
    - PI-QUAL v2 Scoring Sheet
- Urologists can identify and refer to high-quality imaging centers.
    - Urologists can look for centers with the ACR Prostate Cancer MRI Center Designation, which demonstrates a radiology center's commitment to meeting the highest standards of prostate imaging. If there isn't a designated site near them, urologists should, at minimum, refer to a center with an MRI accreditation (there are over 7,000 sites in the U.S.). The ACR is one of the entities that offer MRI accreditation.
        - To find an imaging facility with the ACR Prostate Cancer MRI Center Designation:
            - Visit https://www.acr.org/Accreditation/Accredited-Facility-Search
            - Select if you would like to search by zip/city state/territory, or facility name
            - Enter the zip/city (and if you would like results within 5, 10, 25, or 50 miles), state/territory, or facility name.
            - Under "Modality," select "N/A"
            - Under "Designation," select "Prostate Cancer MRI Center"
            - Click "Search"

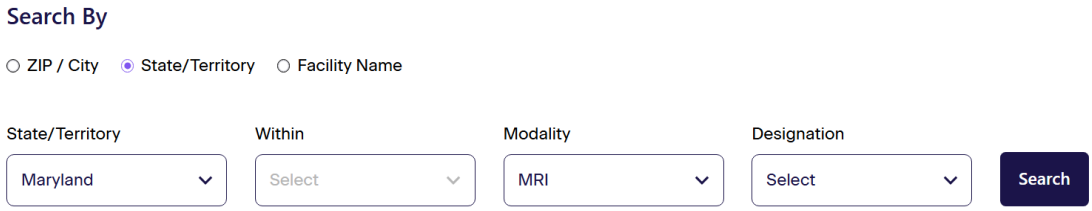


            - The search results will appear at the bottom of the page and will display the Prostate Cancer MRI Center badge



        - To find an imagining facility with the ACR MRI Accreditation:
            - Visit https://www.acr.org/Accreditation/Accredited-Facility-Search
            - You may search by 1. zip/city (within 5, 10, 25, or 50 miles), 2. state/territory, or 3. facility name
            - Under "Modality," select "MRI"
            - Under "Designation," select "N/A"

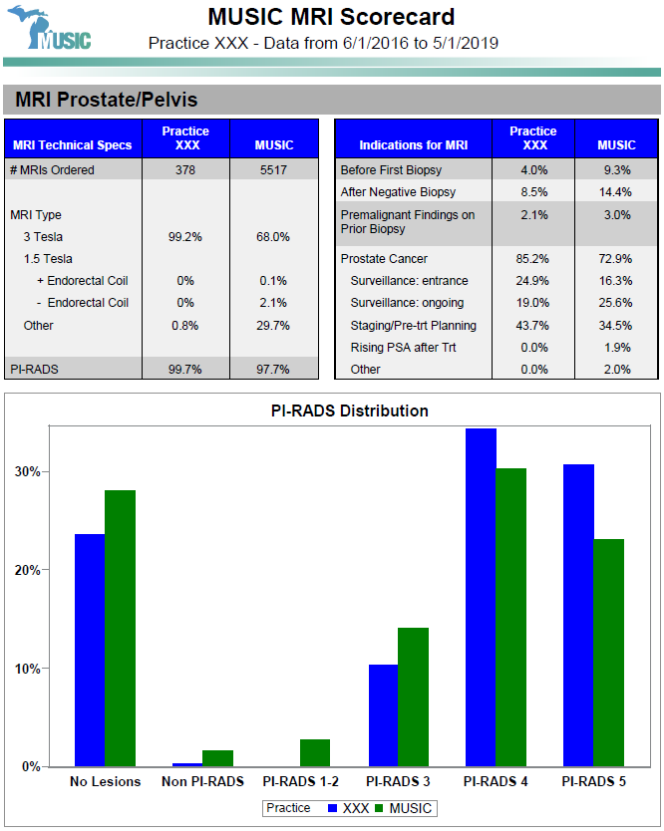
- Click “Search”

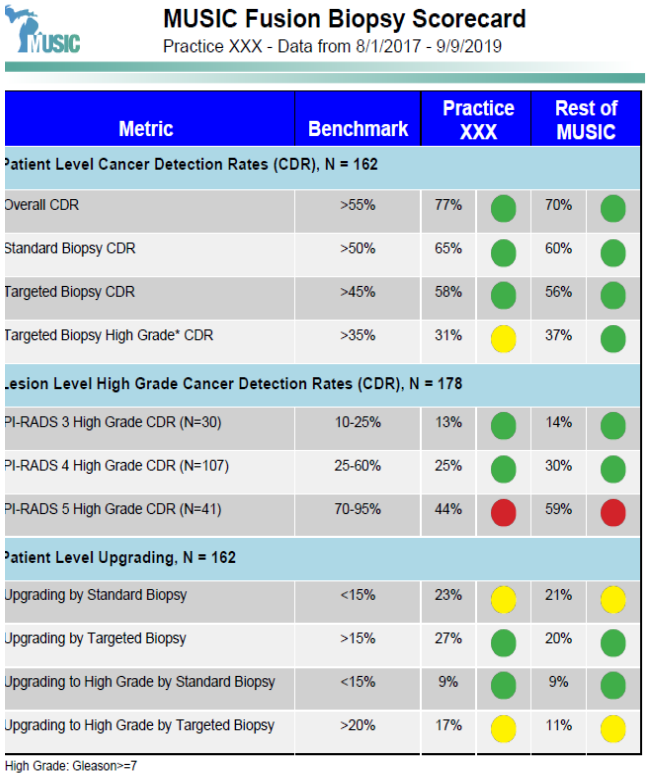


  - The search results will appear at the bottom of the page
- Urologists can collect center-specific data on image quality to inform referral choices. Urologists may find it helpful to collect data on the following:

Imaging Center Name	Imaging Center Location	Radiologist’s Name	PI-RADS v2.1 Compliance (Yes/No)	MRI Field Strength (3T/1.5T)	Use of Endorectal Coil (Yes/No)	PI-QUAL Score (1-3)

- Urologists should engage their radiologists in continuous quality assurance and performance improvement. As an example, Michigan Urological Surgery Improvement Collaborative (MUSIC) collects data on MRI and fusion biopsy and provides practices with a scorecard that compares the practice-level data to that of all MUSIC practices.





(Scorecard provided courtesy of MUSIC)

- Urologists can encourage radiology practices to participate in ACR’s Prostate MRI Quality Improvement Collaborative:

  - Teams learn about the PI-QUAL system and how to implement it in practice.
  - The program focuses on four key pillars for improving prostate MRI quality:
    - Preparation: Effective, timely, and clear patient preparation.
    - Protocol: PI-RADS-compliant, standardized, and optimized prostate MRI protocols.
    - Personnel: Communication, engagement, and training for the staff involved in scheduling, performing and interpreting prostate MRI.
    - Process for auditing images: Efficient and reliable auditing process and feedback system.
- Urologists can encourage radiologists to participate in ACR prostate MR training:
  - Primer for using PI-RADS v2.1 for Prostate MRI (free registration)
  - Prostate MR (2 day in-person course, lectures and faculty interaction, opportunity to review over 200 cases with rad-path correlation)
  - Prostate MR Virtual Course – Case Review (online case review – 20 cases with rad-path correlation, recorded lectures)
- Urologists should ensure that the patient has a solid understanding of the MRI process and the necessary patient preparation.
  - Explain the purpose of the MRI and how the findings will be used to inform clinical decisions.
  - Ensure the patient understands any preparation instructions (dietary restrictions, fasting, enemas, bowel preparation, etc.).
  - Provide education on the use of anti-spasmodic medications for the MRI
  - Explain the process of the MRI, including the:
    - Length of the exam
    - Noise of the machine
    - Need for the patient to remain still and calm
    - Special considerations for patients with implants or devices
    - Potential use of intravenous contrast
    - Potential use of sedatives for claustrophobia/anxiety and other anxiety-relief strategies
    - Potential use of endorectal coils and/or rectal catheters
  - RadiologyInfo.org (sponsored by ACR and Radiological Society of North America) offers some patient education related to prostate MRI:
    - Prostate MRI
    - Ultrasound- or MRI-Guided Prostate Biopsy
    - Contrast Materials
    - How to Read Your Prostate MRI Report

---

[i] Padhani AR, Barentsz J, Villeirs G, Rosenkrantz AB, Margolis DJ, Turkbey B, Thoeny HC, Cornud F, Haider MA, Macura KJ, Tempany CM, Verma S, Weinreb JC. PI-RADS Steering Committee: The PI-RADS Multiparametric MRI and MRI-directed Biopsy Pathway. Radiology. 2019 Aug;292(2):464-474. doi: 10.1148/radiol.2019182946. Epub 2019 Jun 11. PMID: 31184561; PMCID: PMC6677282.

[ii] Purysko, AS, Weinreb, J et al. Improving Prostate MR Image Quality in Practice—Initial Results From the ACR Prostate MR Image Quality Improvement Collaborative. Journal of the American College of Radiology, Volume 21, Issue 9, 1464 – 1474.

[iii] American College of Radiology® Committee on PI-RADS®. PI-RADS 2019 v2.1. Available at: https://www.acr.org/-/media/ACR/Files/RADS/PI-RADS/PIRADS-V2-1.pdf. American College of Radiology. Accessed on Jan. 1, 2025.

[iv] Turkbey B, Purysko AS. PI-RADS: Where Next? Radiology. 2023 Jun;307(5):e223128. doi: 10.1148/radiol.223128. Epub 2023 Apr 25. PMID: 37097134; PMCID: PMC10315529.

[v] Wei JT, Barocas D, Carlsson S, et al. Early detection of prostate cancer: AUA/SUO guideline part I: prostate cancer screening. J Urol. 2023;210(1):45-53.

[vi] de Rooij, M., Allen, C., Twilt, J.J. *et al.* PI-QUAL version 2: an update of a standardised scoring system for the assessment of image quality of prostate MRI. *Eur Radiol* **34**, 7068–7079 (2024). https://doi.org/10.1007/s00330-024-10795-4

[vii] de Rooij M, Barentsz JO. PI-QUAL v.1: the first step towards good-quality prostate MRI. Eur Radiol. 2022 Feb;32(2):876-878. doi: 10.1007/s00330-021-08399-3. Epub 2021 Nov 29. PMID: 34842957; PMCID: PMC8628276.