Sup 220: Prostate MRI
Structured Reporting

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Prostate Imaging-Reporting Data System (PI-RADS)

PI-RADS™ v2 is designed to improve detection, localization, characterization, and risk stratification in patients with suspected cancer in treatment naïve prostate glands. The overall objective is to improve outcomes for patients. The specific aims are to:

- Establish minimum acceptable technical parameters for prostate mpMRI
- Simplify and standardize the terminology and content of radiology reports
- Facilitate the use of MRI data for targeted biopsy
- Develop assessment categories that summarize levels of suspicion or risk and can be used to select patients for biopsies and management (e.g., observation strategy vs. immediate intervention)
- Enable data collection and outcome monitoring
- Educate radiologists on prostate MRI reporting and reduce variability in imaging interpretations
- Enhance interdisciplinary communications with referring clinicians
mpMRI assessment

Figure 1. Flowchart showing the PI-RADS version 2 assessment categories. DCE = dynamic contrast-enhanced MR imaging, T2-WI = T2-weighted MR imaging.

2. PI-RADS Assessment for T2W

<table>
<thead>
<tr>
<th>Score</th>
<th>Peripheral Zone (PZ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uniform hyperintense signal intensity (normal)</td>
</tr>
<tr>
<td>2</td>
<td>Linear or wedge-shaped hypointensity or diffuse mild hypointensity, usually indistinct margin</td>
</tr>
<tr>
<td>3</td>
<td>Heterogeneous signal intensity or non-circumscribed, rounded, moderate hypointensity</td>
</tr>
<tr>
<td></td>
<td>Includes others that do not qualify as 2, 4, or 5</td>
</tr>
<tr>
<td>4</td>
<td>Circumscribed, homogenous moderate hypointense focus/mass confined to prostate and ≤1.5 cm in greatest dimension</td>
</tr>
<tr>
<td>5</td>
<td>Same as 4 but ≥1.5 cm in greatest dimension or definite extraprostatic extension/invasive behavior</td>
</tr>
</tbody>
</table>

PI-RADS is more than defining the lesion score

- Clinical consideration (e.g., prior tests, family history of PCa)
- Technical specifications of the acquisition
- Prostate anatomy definition
- Staging of the lesions
- Prostate gland and lesion measurement
- High-level report organization and lexicon
  - Most of the lexicon and PI-RADS terms are available in RadLex
Motivating use cases

● Structured representation of PI-RADS reports for training AI tools
● Interchange of reports and image annotations between the radiology review workstations and biopsy systems
● Integration of AI tools producing structured PI-RADS reports into the radiology/interventional workflows
● Aggregation of structured clinical evidence documents across institutions for more robust evidence collection
● Integration of structured information annotating clinical findings longitudinally and across radiology, urology and digital pathology sub-specialties
Design considerations

- Define framework in DICOM for prostate imaging structured reporting
- Allow for applications of mpMRI interpretation beyond screening
  - PI-RADS reporting as initial application
  - Potential other applications: treatment response, biopsy planning, active surveillance
- Formalize representation suitable for machine learning applications
  - … while keeping many items optional and allowing for parallel TEXT content items
- Heavy use of coded terms as opposed to text sections
- Do not attempt to mirror the organization of the narrated report template
  - Assume organization can be derived by transformation rules from machine-oriented representation
  - Focus on capturing evaluations associated with the annotated image findings
  - Thus approach is different from that adopted for DICOM BI-RADS reporting
- Leverage any existing relevant components of the standard
  - Measurements, image quality assessment, image library
Top-level template organization
Findings containers