Improved Detection of Clinically Significant Prostate Cancer Using a Structured Prostate Imaging – Reporting Data System (PI-RADS) Template

Abstract #17-130

ACR Annual Meeting 2017
Presenting Author: Whitney Feltus, MD

Co-authors: Firas Ahmad MD, Jonathan Steinman MD, Hiram Shaish MD

Disclaimer
There are no financial or non-financial disclosures
Background

- Prostate cancer is the most common solid tumor malignancy in males, with approximately 180,000 new cases reported in 2016 (1).
- Prostate MRI plays an increasingly important role in detecting clinically significant prostate cancer (2).
- Structured templates are recommended by the American College of Radiology to promote use of practice guidelines (3).
- Prior to July 2016, prostate MRIs at our institution were reported using a generic template.
- Problems with using the generic template included:
  - Inconsistent use of PI-RADS lexicon
  - Confusion among urologists reading the reports
  - Variability among interpreting radiologists
  - Low accuracy
Purpose

To explore the effect of using a structured PI-RADS reporting template on radiologists’ adherence to PI-RADS and on the accuracy of prostate MRI for detecting clinically significant prostate cancer
Methods

• In July 2016, a structured reporting template based on drop down menus incorporating PIRADS v2 lexicon was instituted.

• Patients who had a prostate MRI followed by MRI-US fusion targeted and systematic biopsies pre- and post-template change from October 2015 through December 2016 were retrospectively reviewed.

• Lesion and patient characteristics were extracted from MRI reports and patients’ charts.

• Adherence of the MRI report to PI-RADS classification decision rules was recorded and compared before and after the institution of the standardized template using Fisher’s exact test.
Methods

• Using a threshold of PI-RADS 4 for positivity, we tested the sensitivity, specificity, and accuracy of MRI to detect clinically significant prostate cancer (Gleason score >7)

• Histopathology of the combined targeted and non-targeted biopsy cores served as the reference standard

• Sensitivity, specificity, and accuracy were compared before and after instituting the standardized PI-RADS template

• No other change/intervention was undertaken during the studied period aside from template change

• MRIs were interpreted by one of six radiologists with at least 2 years experience in interpreting prostate MRIs
PIRADS v2 Template

- **Clinical information:** patient age, presenting symptoms, PSA, prior biopsy with Gleason score if available
- **Technique:** contrast with volume, MRI field strength, endorectal coil (yes or no)
- **Findings:**
  - Prostate gland: size/volume, presence of post-biopsy hemorrhage, intravesicular protrusion
  - Individual lesion: PIRADS v2 assessment, T2-weighted, diffusion-weighted/ADC, and dynamic contrast enhancement properties, size, location, zone, extra-prostatic extension
  - Additional findings: invasion of seminal vesicles, lymph nodes, osseous structures
- **Impression:**
  - Summary of individual lesions with respective PIRADS categories
  - Relevant additional findings
Axial images through the prostate gland show a **T2 hypointense lesion** in the right anterior midgland/base transition zone (a) which demonstrates **restricted diffusion** with associated **low signal on ADC** (b,c), and **early enhancement** on dynamic post-contrast images (d)
“...Findings: ...

There is a 2.0 x 0.9 cm low T2 signal nodule in the right paracentral anterior mid gland/base, inseparable from anterior fibromuscular stroma (7:13) with restricted diffusion (8:98, 10:13), low signal on a DC (9:14), with early postcontrast enhancement (15:9), suspicious for high-grade neoplasm.

...

IMPRESSION:

Low signal nodule of right anterior gland with restricted diffusion and early enhancement is suspicious for high-grade (> Gleason 6) intraprostatic neoplasm.

Focal bulge of anterior capsule may represent mild extracapsular extension of tumor.

PIRADS 4- High probability (clinically significant cancer is likely to be present)”
Example - Associate MRI prostate report
AFTER template change

...LESION: 1

PI-RADS Assessment Category: 5, Very high (clinically significant cancer highly likely)

T2-weighted images: 5 (Lenticular or noncircumscribed, homogenous moderately hypointense ; >= 1.5 cm or definite invasion/EPE)

Diffusion-weighted images: 5 (focal marked decreased ADC and marked increased ultra high b-value signal; >1.5 cm)

Size: 20 x 9 mm (AP x transverse) as measured on image 13 of series 7 (T2-weighted image)

Side: Midline

Location within transverse plane: Anterior

Level of prostate: Base-to-midgland

Zone: Transition zone

Extra-prostatic extension: Broad based abutment with overlying capsular irregularity
Example - Associate MRI prostate report

AFTER template change cont’d

IMPRESSION:

20 x 9 mm right anterior base-to-midgland transition zone lesion with overlying capsular irregularity. PI-RADS 5, very high (clinically significant cancer highly likely).

No evidence of seminal vesicle invasion or pathologic pelvic lymphadenopathy.
Results

- 177 lesions in 112 patients (average age 65, average PSA: 6.4 ng/mL) were included in the analysis
- 151 lesions were reported before instituting the PI-RADS standard template and 26 lesions were reported after template change
- Adherence to PI-RADS was significantly higher after template change (34.5% pre- and 75% post template change, p-value <0.0001)

<table>
<thead>
<tr>
<th>Performance of Prostate MRI Before Changing to PIRADS v2 Template</th>
<th>Performance of Prostate MRI After Changing to PIRADS v2 Template</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>60%</td>
</tr>
<tr>
<td>Specificity</td>
<td>56%</td>
</tr>
<tr>
<td>Accuracy</td>
<td>58%</td>
</tr>
</tbody>
</table>
Limitations

• Small sample size post template change
• Possibility of improved proficiency of the interpreting radiologists over time, unrelated to the template change
• Possibility of improved lesion marking and prostate segmentation over time
• Possibility of improved biopsy technique by the urologist over time
• Retrospective analysis
Conclusion

Based on these results a standardized PI-RADS MRI reporting template may improve radiologists’ adherence to PI-RADS as well as possibly the sensitivity, specificity, and accuracy of prostate MRI for detecting clinically significant prostate cancer.
References

