Standardized reporting templates with mandatory reporting fields and "pick-list" options improve use of Prostate Imaging and Data Reporting System version 2 in clinical practice: A plan-do-study-act analysis

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Introduction

The Prostate Imaging and Data Reporting System version 2 (PI-RADS v2) aims to simplify performance, interpretation, and reporting of prostate magnetic resonance imaging (MRI).[1] PI-RADS v2 introduced probability scores (assessment categories, Table 1), which indicate the likelihood of clinically significant cancer (Gleason score ≥7)[2] based upon MRI findings. PI-RADS v2 has been validated as accurate for detection of cancers and improves interobserver agreement.[3] Despite this, in our experience, use of PI-RADS v2 scores in practice is variable. This study evaluated a method to improve use of PI-RADS v2 scores by using a plan-do-study-act (PDSA) analysis.

Methods

This retrospective, single-institution study was conducted under a waiver from the institutional review board. Our PDSA cycle included: 1) a "plan" to improve use of PI-RADS v2 scores; 2) "doing" through education (lectures on PI-RADS v2 given by the Director of Prostate Imaging [Nicola Schieda]; and distributed literature highlighting PI-RADS v2) and providing a standardized reporting template with "pick-list" fields for PI-RADS v2 scores; 3) "studying" use; and 4) "acting" through feedback on use and urologist satisfaction with reporting.

Time periods

1. Pre-intervention (January 1 to June 30, 2016): Prior to education and standardized reporting and one-year following publication of PI-RADS v2.
2. Intervention (July 1 to December 30, 2016): Following educational activities and creation of reporting templates. The standardized template (shown in Supplementary Fig. 1) included "pick-lists" (Powerscribe 360, Nuance Communications) for PI-RADS v2 scores under the "Impression" heading.
3. Post-intervention (January 1 to April 1, 2017): Following feedback indicating non-universal use of templates, PI-RADS v2 scores and urologist dissatisfaction with non-standardized reporting.

All MRI studies were reported by fellowship-trained radiologists (n=11). A search of our imaging archive (Horizon Medical Imaging v11, McKesson Corporation) from January 2016 to April 2017 identified 619 men who underwent multiparametric MRI at 3-Tesla. After exclusion, 309 men were eligible for study (Fig. 1). A radiology resident (Kevin Moran) recorded: use of reporting templates and PI-RADS score, MRI result (positive or negative), if targeted biopsies (TB) were performed, and interval between positive MRI and TB.

Statistical analysis

Comparisons were performed using the Chi-square test and ANOVA. Statistical analysis was performed using STATA v13 (Statcorp).

Results

Distribution of patients was: 35.6% (110/309) pre-intervention, 37.2% (115/309) intervention, and 27.2% (84/309) post-intervention. Mean patient age was 64.1±8.9 years with no difference across time periods (p=0.39). Studies were

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Table 1. Summary of Prostate Imaging and Data Reporting System (PI-RADS) version 2 assessment categories

Assessment category	Definition
1	Very low (clinically significant cancer is highly unlikely to be present)
2	Low (clinically significant cancer is unlikely to be present)
3	Intermediate (the presence of clinically significant cancer is equivocal)
4	High (clinically significant cancer is likely to be present)
5	Very high (clinically significant cancer is highly likely to be present)

performed for: 37.2% (115/309) elevated prostate-specific antigen (PSA)/abnormal digital rectal exam (DRE) with previously negative template biopsy, 60.5% (187/309) active surveillance (AS), and 1.6% (5/309) pre-biopsy. There was no difference in indications across time periods (p=0.84). Reporting templates were not used pre-intervention, increased to 38.3% (44/115) with intervention and 60.7% (51/84) post-intervention, (p<0.001). Only 4.5% (5/110) of reports included PI-RADS v2 scores pre-intervention compared to 43.5% (50/115) with intervention and 59.5% (50/84) post-intervention (p<0.001). PI-RADS v2 score use increased from 17.8% (38/214) without templates to 69.6% (66/95) with templates (p<0.001). Radiologists were less likely to provide PI-RADS v2 scores for negative MRI (42.1% [90/214] positive MRI vs. 14.7% [14/95] negative MRI; p<0.001).

There was no difference in positive MRI across time periods (67.3% [74/110] positive MRI pre-intervention, 68.7% [79/115] positive MRI intervention, and 72.6% [61/84] positive MRI post-intervention; p=0.52). Most (55.6%, 119/214) men with positive MRI underwent TB (58.1% [43/74] pre-intervention, 55.7% [44/79] in intervention, and 52.5% [32/61] post-intervention). There was no difference in number of TB performed across time periods (p=0.47). Time interval between positive MRI and TB decreased across time periods (102±104 days pre-intervention, 84±53 days intervention, and 62±33 days post-intervention; p=0.028) (Fig. 2). A total of 44.4% (95/214) of men with positive MRI had no TB, including PI-RADS v2 score 3 lesions and 77.9% (74/95) of patients who were enrolled in AS.

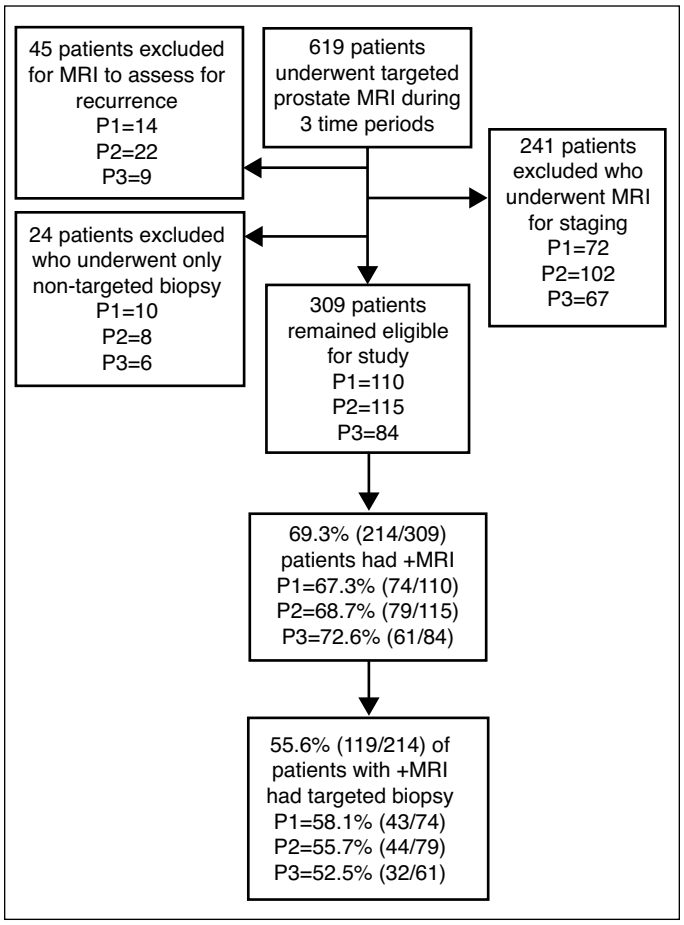

Fig. 1. Summary of patient inclusion and exclusion criteria. P1=time period to intervention; P2=time period during intervention; P3=time period after intervention during feedback. MRI: magnetic resonance imaging.

Discussion

In this study, a simple intervention improved the use of prostate MRI reporting templates and PI-RADS v2 scoring. An association between reduced time from positive MRI and subsequent TB likely indicates enhanced communication between urologists and radiologists. The simple strategy of

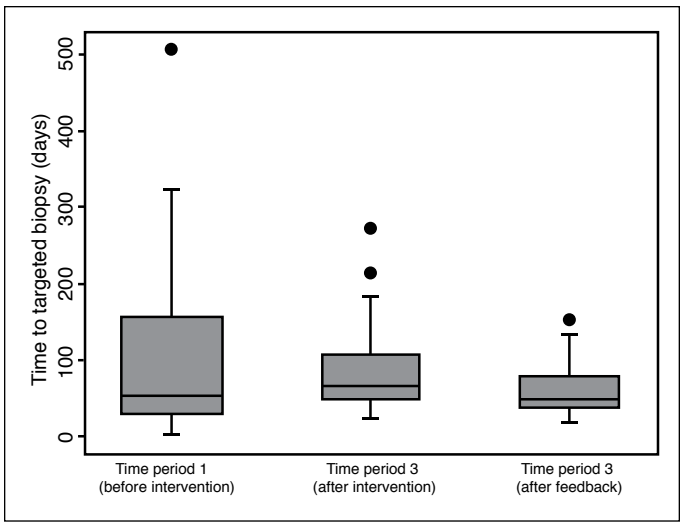

Fig. 2. Box and whisker plots showing the mean time between positive magnetic resonance imaging (MRI) examinations and subsequent biopsy decreased in this study through increased use of standardized reporting templates and Prostate Imaging and Data Reporting System (PI-RADS) v2 assessment categories with no differences in patient access in the three study periods to otherwise explain the finding.

a standardized prostate MRI report, which includes "pick-list" options for PI-RADS v2 scores, could be implemented in most radiology departments.

The success of this study is multifaceted. The first relates to ease of use of the new system, allowing radiologists to use a predetermined "pick-list" for PI-RADS v2 scores. Second may be how the radiologists in this study viewed structured reporting positively, overall (templates are commonly used at our institution) and after re-enforcement through feedback from urologists. Hawkins et al[4] demonstrated radiologists preferred structured reports after an internal review. Similarly, Stilseth et al[5] showed that urologists prefer fully structured prostate MRI reporting, whereas radiologists prefer hybrid reporting. Radiologist preference may be a potential roadblock towards universal adoption of structured reporting; however, through education and feedback, this could be improved. Rosenkrantz et al[6] showed the benefit of long-term followup after intervention to maintain adherence to providing a summary score on prostate MRI.

Radiologists in our study seldom provided PI-RADS v2 scores for negative studies, exposing a potential lack of understanding regarding use of PI-RADS v2. Stilseth et al[5] showed that among surveyed radiologists and urologists, roughly half thought PI-RADS v2 was not applied correctly by radiologists. Impediments to use were speculated to be due to urologist/radiologist inexperience and lack of standardized template reporting. Larson et al[7] found consensus-building efforts to be critical in development and implementation of structured reports, and that department-wide structured reporting can be implemented in such a way that radiologists prefer to use the standard reports.

PI-RADS v2 and the present study aim to enhance communication between radiologists and urologists through the use of probability scores. Our study indicates that PI-RADS v2 scores improve communication, with a significant decrease in time between positive MRI and TB without any other differences in patient access to account for the observation. In our study, roughly 40% of positive MRIs had no immediate TB, likely related to high number of AS patients in our cohort and inclusion of PI-RADS v2 score 3 lesions, where biopsy could be delayed to coincide with AS protocols when there is stability in other clinical factors. Barentsz et al[8] stress that PI-RADS v2 scores must be incorporated with clinical factors when determining need and strategy for biopsy.

Conclusion

Our study demonstrates that through education, the use structured reporting templates, "pick-list" options for PI-RADS v2 assessment categories, and through user feedback and support from urologists, the use of PI-RADS v2 can be improved in clinical practice.

Competing interests: Dr. Cagiannos has been an advisory board member for Abbvie and Ferring; and has received speaker honoraria from Abbvie, Acerus, and Ferring. Dr. Lavallée has been an advisory board member Ferring and Sanofi; and has received grant from Sanofi. Dr. Morash has been an advisory board member for Abbvie, Astellas, Ferring, Janssen, and Sanofi; and participated in the CRONOS II clinical trial supported by Abbvie. The remaining authors report no competing personal or financial interests related to this work.

This paper has been peer-reviewed.

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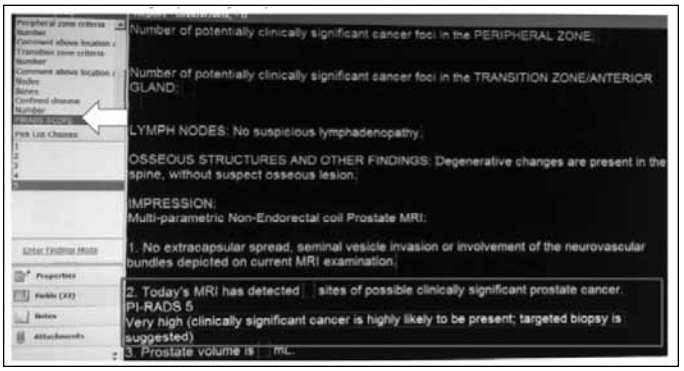

Supplementary Fig. 1. Illustration of standardized reporting template for magnetic resonance imaging used at our institution in commercially available software (Powerscribe 360, Nuance Communications) to improve use of Prostate Imaging and Data Reporting System (PI-RADS) v2. A mandatory field under the "Impression" heading was created (box) where radiologists are required to populate a PI-RADS v2 template field assigning the appropriate PI-RADS v2 assessment category using a "pick-list" tool (white arrow).