A machine-readable representation of PI-RADS reports using the DICOM standard

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Introduction and objective The Prostate Imaging - Reporting and Data System (PI-RADS) [1] is widely used to formalize the process of interpretation of multiparametric MRI (mpMRI). Numerous studies and years of experience with PI-RADS have confirmed its utility for improving uniformity of prostate cancer (PCa) mpMRI evaluation, but also identified opportunities for improvement. Known limitations of the PI-RADS include the lack of a structured reporting template formalizing the organization of the report and a lexicon that defines just some of the terms to be used in the report. There is evidence that the use of PI-RADS structured reporting not only results in improved compliance, but can dramatically improve sensitivity of PI-RADS in detecting clinically-significant PCa[2]. PI-RADS also lacks an interoperable machine-readable representation of the result that is suitable for automatic processing.

Specific aims In this work we report on the status of on-going work to formalize the machine-readable structured representation of PI-RADS reports using the Digital Imaging and Communications in Medicine (DICOM) standard.

Rationale and background DICOM is broadly adopted in the clinic for communicating image data between acquisition, viewing and archival devices. The DICOM standard also includes support of Structured Reporting (SR) objects, which can be used to represent content for consumption by both human readers and by automated data extraction and analysis tools. At present, commercial vendors of PI-RADS workstations use platform-specific approaches for encoding and communicating generated reports, which complicates the integration of data across systems and limits its reuse in research applications. Specific provisions (SR templates) for communicating prostate MRI reports are not yet included in the DICOM standard, but would help improve interoperability, as well as potentially improve compliance with PI-RADS and report quality.

Methods and materials We are following the standard process for contributing additions to DICOM, which involves writing a supplement document describing the additions, engaging in discussions with the community (including the PI-RADS committee, vendors of PI-RADS workstations) and making refinements accordingly. The supplement will then be presented for letter ballot before final inclusion into the standard. During development of the supplement, we are also implementing a demonstration prototype PI-RADS reporting extension to the 3D Slicer platform (https://slicer.org)[3], which will support some of the proposed amendments to the standard.

Results A work item to develop support of PI-RADS in DICOM has already been approved by the DICOM Standards Committee in April 2019. An early draft of the supplement is available for review by the interested parties. The supplement introduces a family of reporting templates that cover various components of the PI-RADS report, context groups (value sets) containing coded terms to be used to formalize specific attributes of the report, and example reports that demonstrate the application of the proposed standard.

Discussion and conclusion With this abstract and poster, our objective is to educate the community about this development and to seek feedback by engaging community stakeholders to review the content of the supplement. Commercial vendors of PI-RADS workstations are particularly encouraged to consider testing of the proposed DICOM reporting capabilities in order to evaluate and test interoperability as well as application to specific use cases.

References

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