EDITORIAL

PI-QUAL v.1: the first step towards good-quality prostate MRI

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Key Points

- *It is mandatory to evaluate the image quality of a prostate MRI scan, and to mention this quality in the report.*
- *PI-QUAL v1 is an essential starting tool to standardize the evaluation of the quality of prostate MR-images as objectively as possible.*
- *PI-QUAL will step by step develop into a reliable quality assessment tool to ensure that the first step of the MRIpathway is as accurate as possible.*

Prostate MRI is recommended as a primary diagnostic test for men suspected of prostate cancer (PCa) [1]. An MRI-guided diagnostic pathway is supported by Level 1 evidence in Western populations [2–4]; its high negative predictive value and sensitivity allow safe avoidance of unnecessary prostate biopsy and reduce overtreatment of indolent tumors. In addition, MRI can reliably identify clinically significant cancer suspicious regions for targeted biopsy, thereby optimizing tissue sampling.

The associated downside of the increased use of prostate MRI is variable image quality between centers and scanners [5]. Good-quality prostate MRI is the starting point and prerequisite for optimal patient management, which affects all downstream steps in the diagnostic pathway [6]. Sub-optimal image quality can lead to decreased diagnostic accuracy and increased uncertainty. Experts of the European Society of Urogenital Radiology (ESUR) and the EAU Section of Urologic Imaging (ESUI) stressed the importance of image quality assessment in a consensus document on quality requirements for image acquisition, interpretation, and training of radiologists [7]. One of the consensus-based recommendations was to assess the image quality of the MRI scan and to mention this in the report. The image quality assessment was suggested to consist of a visual analysis of the scan by the radiologists.

Giganti and colleagues addressed this problem by developing a 5-point Likert scale Prostate Imaging Quality (PI-QUAL) assessment system, which ranges from very poor (PI-QUAL 1) to excellent image quality (PI-QUAL 5) [8, 9]. The assessment is based on adherence to both the technical recommendations of the Prostate Imaging Reporting and Data System (PI-RADS) and more subjective image quality criteria to score T2-weighted imaging (T2W), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced MRI (DCE) [10]. The authors must be commended for paving the way for standardizing prostate image quality. Development of such an assessment system with subjective criteria that are tried to be as objective as possible is not only important but also challenging. The paper by Giganti and colleagues in the current issue of *European Radiology* [11] shows promising reproducibility rates of their PI-QUAL v.1 assessment system with a strong weighted kappa (0.82) when clustering PI-QUAL in three quality groups (PI-QUAL 1-2 vs PI-QUAL 3 vs PI-QUAL 4-5).

When studying their results, there are several remarks that should be recognized in the next version of PI-QUAL (v.2).

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Firstly, the proposed PI-QUAL v.1 assessment automatically includes clinical implications into the observed image quality score. For example, a PI-QUAL score of 4 and higher implies that prostate image quality is high enough to rule in and rule out all clinically significant lesions, while this is impossible when an examination that is assessed as PI-QUAL ≤ 2. It is indeed important to make recommendations on the clinical implications of an overall assessment, but deriving this automatically from the observed PI-QUAL assessment may not be helpful in all clinical scenarios. A large suspicious lesion can be detected even in an unsatisfactory quality scan (PI-QUAL 1), while a small significant tumor can be missed on a good-quality image (PI-QUAL 4). Thus, a two-step approach seems more logical. The first step involves an assessment system that evaluates image quality as objective as possible without a derived clinical impact. The second step determines the clinical impact of an observed image quality, that is to repeat the scan or not. This clinical impact is based on the interpretation of the reporting radiologist as well as of the other multidisciplinary team members.

The second comment refers to the technical recommendations of PI-RADS. The PI-QUAL v.1 assessment system includes technical parameters from the PI-RADS guidelines that have set minimal and optimal technical standards for MRI acquisition. It is important to note that compliance with these recommendations does not guarantee optimal quality imaging [5]. For example, a (slight) deviation of these technical recommendations in a particular situation can provide better quality images [12]. Therefore, one should identify sub-optimal image quality without scoring and without even partially linking it to the technical PI-RADS parameters. In order to be accepted by the radiological community, PI-QUAL needs to be—like PI-RADS—as simple as possible.

The PI-QUAL v.1 assessment system was developed in a single institution, and two radiologists from this center, a senior who trained the junior, have assessed the examination. This can affect the reproducibility and generalization of results to other readers and other centers. The scoring system should, therefore, be tested on different readers in different centers. These readers should be ideally trained, for example, through an online or paper-based lexicon, like the CORADS Score Practice initiatives for COVID-19 CT severity on the Grand Challenge platform (grand-challenge.org) [13].

The proposed PI-QUAL v.1 assessment system is an essential starting tool to standardize the reporting of prostate image quality as objectively as possible. With further refinements, as mentioned above, and reproducibility and generalizability studies to confirm its high inter- and intra-reader agreement, the PI-QUAL assessment system can serve as

an international standard. An international working group with representatives of ESUR and ESUI, among others, is currently working on an updated version of PI-QUAL (v.2), and testing it. Like the PI-RADS guidelines, the PI-QUAL guidelines will be a "living document" that will evolve with increasing clinical experience and scientific data.

Successful delivery of the MRI-guided PCa pathway requires imaging to be performed and reported to a sufficiently high level. Sub-optimal quality will have a negative impact on each component of the downstream MRI pathway. This first described PI-QUAL assessment system is of utmost importance. It will develop step by step into a reliable quality assessment tool, ensuring that the first step of the MRI pathway is as accurate as possible.

Declarations

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