bowel preparations, due to disruptions in patient care [9].

As prostate MRI has improved dramatically in recent years [10], this review outlines the studies aimed at improving prostate MRI quality that have been published in the last decade. This comprehensive review will focus on strategies which aim to improve prostate MRI quality, specifically the impact of imaging techniques, patient preparation methods, PI-QUAL, and artificial intelligence (AI).

2. Imaging technique-based quality improvement strategies

2.1. Endorectal coil vs surface coil

Prostate gland is a walnut sized organ deeply located in the pelvis. Its relatively small size and deep location make it quite challenging to get a high-quality and stable signal for MRI. In order to get a high-quality signal from the prostate, use of a cavitary coil (also known as ERC), was proposed in 1989 by Schnall et al. [11]. This method has been reported to be useful in several studies for detection and staging of prostate cancer [12–14]. Despite documented benefits of ERC for prostate cancer diagnosis and staging, a variety of drawbacks regarding the use of ERC for MRI of the prostate also exist, including higher costs, invasiveness, and patient discomfort, all of which are associated with patient reluctance to undergo prostate MRI.

With increasing use of mpMRI in prostate cancer diagnosis and management, excellent quality images with high patient tolerance are needed. PI-RADSv2.1 guidelines acknowledge that the use of ERC enables a higher signal-to-noise ratio (SNR) [5]. When integrated with external phased-array coil (PAC), ERC increases SNR in the prostate at any magnetic field strength. This is particularly true for older 1.5 T scanners; the use of combined ERC-PAC with 1.5 T scanners results in better SNR and therefore a better image quality compared to PAC only images [15,16]. This may be particularly beneficial when high spatial resolution is preferred (i.e., cancer staging). ERC usage can also be helpful for intrinsically low-SNR sequences, such as diffusion-weighted imaging (DWI) and high temporal resolution dynamic contrast-enhanced (DCE) sequences. However, a higher magnetic field strength can be translated into a better SNR. With the introduction of more advanced hardware, such as 3 T MR scanners, the question arises: is ERC still necessary for prostate MRI? Studies investigating the impact of ERC on prostate MRI quality are summarized in Table 2.

Table 1
Common terms related to MRI quality.

Terms	Definitions
Artifacts	Image features that are seen on a scan but not actually present; it can also refer to items outside the patient that may obscure or distort the image
Noise	Variability that is not part of a desired signal, appears as an irregular granular pattern and degrades image information
Motion artifact	Occurs with voluntary or involuntary patient or organ movement during image acquisition
Aliasing (wraparound)	Occurs when the field of view is smaller than the body part being imaged
Susceptibility artifact	Distortions or signal change due to local magnetic field inhomogeneities, often result from metallic object near homogeneous external magnetic field
Phase-encoded motion artifact	Occurs as a result of tissue/fluid movement during image acquisition; it manifests as ghosting or blurring in the direction of phase-encoding

Regarding the effect of ERC on prostate MRI subjective image quality, prior studies have found mixed results. In most of the studies identified in this narrative review, the image quality rating protocols were similar [17–23]. Two to six radiologists evaluated image quality and assigned a rating based on a subjective 5-point Likert scale, rating on items such as distinction of zonal anatomy, presence of motion, and artifacts. It is important to note that these studies did not blind the readers concerning the coil setup, as ERC arrangements were difficult to conceal on scans. Some studies showed no significant differences in perceived image quality on both T2-weighted imaging (T2WI) and DWI for 3 T MRI [17–19], while others reported improved image quality with ERC [20–22]. Specifically, in a prospective single institution study with 45 patients, Baur et al. [21] described better overall T2WI quality ratings with ERC-PAC compared to PAC only ($p = 0.004$). However, they

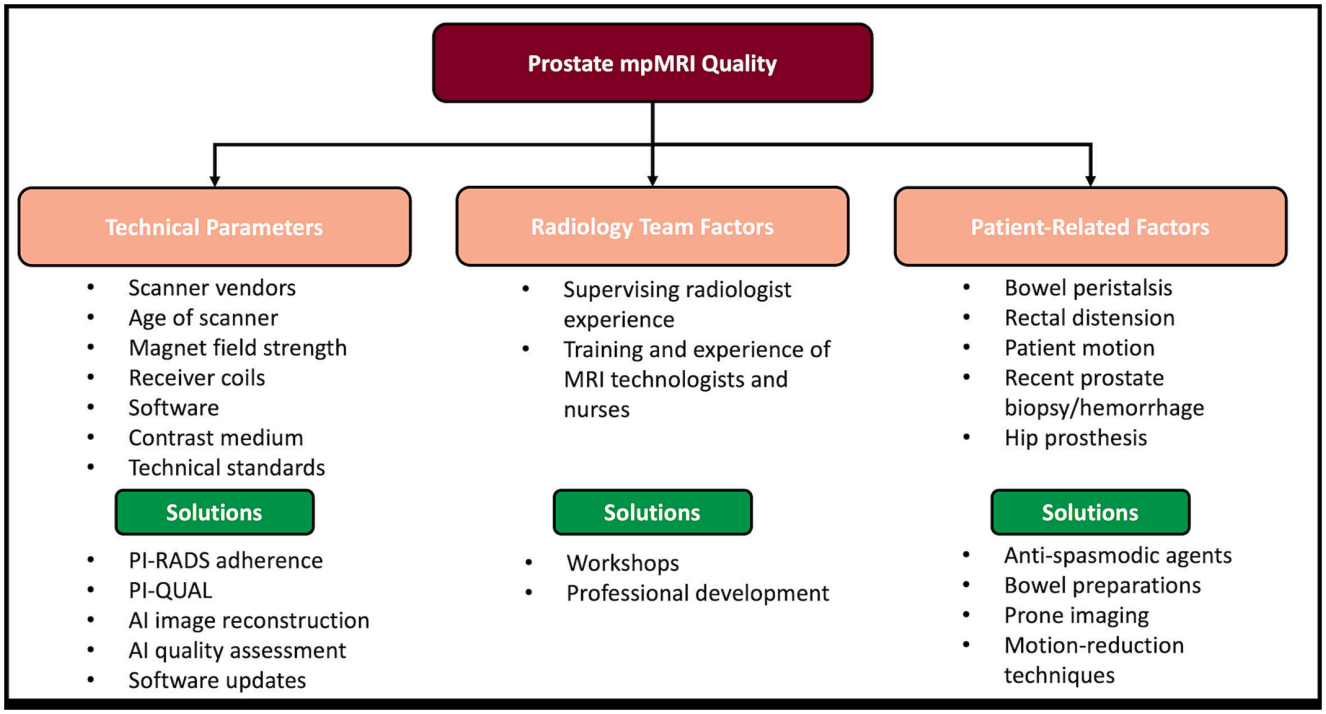

Fig. 1. Factors that can impact prostate mpMRI quality.