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Background

MRI is increasingly used in the diagnostic pathway of prostate cancer. However, inadequate image quality in up to 40% of biparametric exams results in diagnostic errors. The Prostate MR Imaging Quality Improvement Collaborative seeks to improve clinically significant prostate cancer detection and localization. Improvement collaborative participation supports site teams with creating a standardized system for improving the percentage of MR prostate exams that meet quality criteria according to Prostate Image Quality (PI-QUAL) criteria. (1)

Problem Statement

Non-diagnostic MR prostate diffusion exams can lead to deficient quality images and repeat studies.

Global Aim

To improve clinically significant prostate cancer detection and localization.

SMART Goal

To improve the percentage of MR prostate exams that meet criteria from **89% to 94%** by November 2022.

Prostate MRI Auditing Scale

Used Prostate Imaging Quality Control (PI-QUAL) Scoring that implemented 3 classical scoring sequences (T2-WI, DWI, DCE) into one final score.

Interventions Made

1. Implement Effective Patient Preparation (Figure 2)

Revised AdventHealth Prostate Prep

- Contact patient 2-3 days prior to their appointment
- Nothing to eat or drink 6 hours before appointment; but you can drink water.
- Avoid caffeinated and carbonated drinks the day of your exam.
- Can take medications.
- Refrain from ejaculation 72 hours prior to appointment.
- Give yourself a saline enema the evening before appointment. Purchase from local pharmacy and follow instructions.
- Give yourself a saline enema 2-3 hours prior to appointment.

Note: If have a colostomy or ileostomy, do not instruct to use enemas.

Revised Patient Coaching & Bathroom Instructions

- Use restroom before exam: Empty bladder; Empty bowels; Push out Air
- Find comfortable position and remain still during the MRI exam
- Slow, Shallow Breathing
- Provide Patient "Squeeze Ball"

2. Standardize DWI Parameters

- Based on updated PI-QUAL scoring, where a combined score of T2-Weighted, Diffusion-Weighted, and Dynamic Contrast Enhanced (T2-WI, DWI, DCE) sequences are combined to give an overall score.
- A score of 3 means that at least 2 of the audit scales have met the minimum in regard to diagnostic quality.
- A score of 5 implies that all three sequences are optimal for diagnostics. (2)

3. Gain Alignment (Progress noted in figure 3)

- Implement quality feedback program
- Images showing good and poor quality
- Educate technicians.

4. Optimize Protocol Management

- Implement standardized prostate sequence order (Figure 4)
- Develop standards for when patients cannot receive contrast

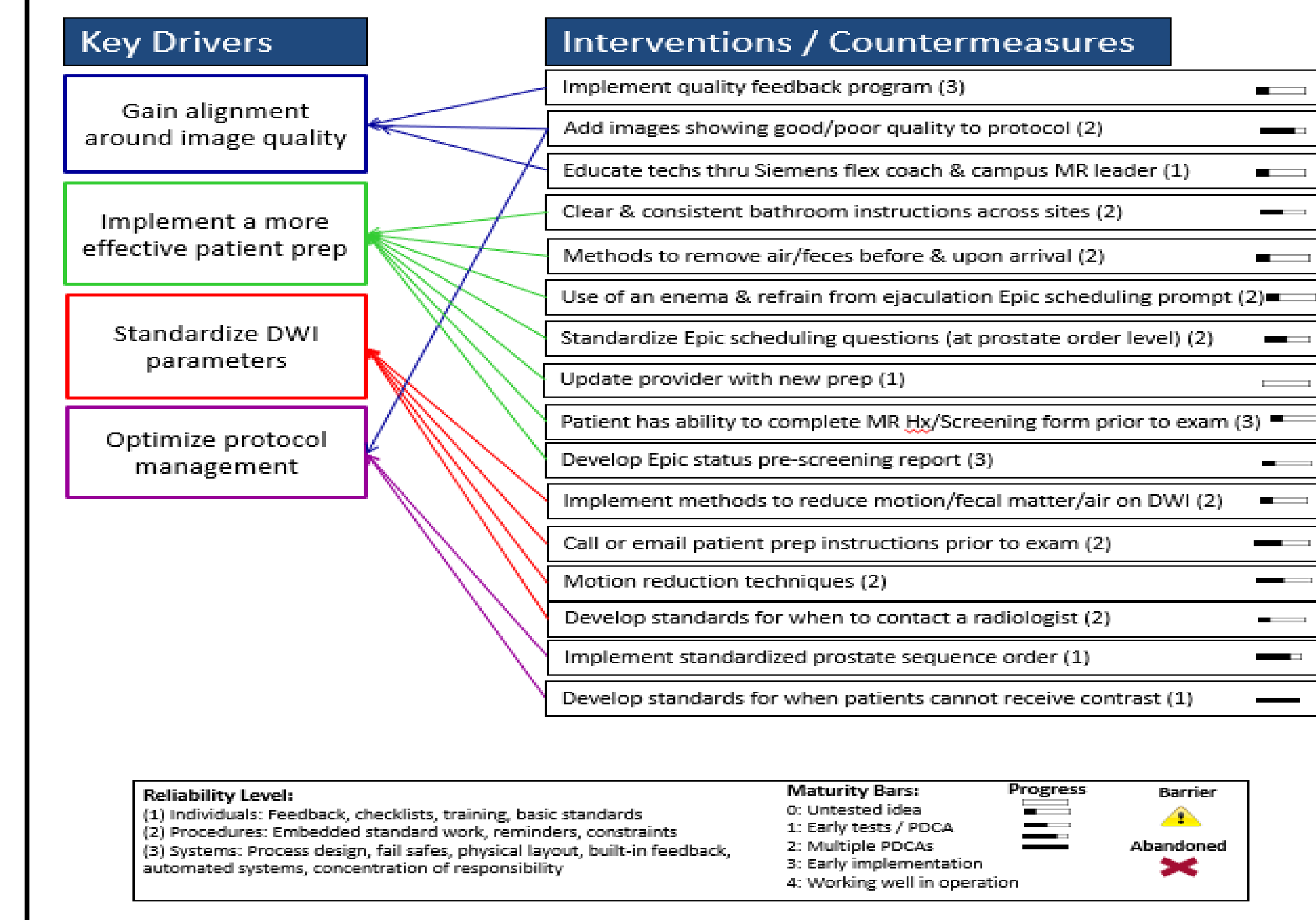


Figure 3

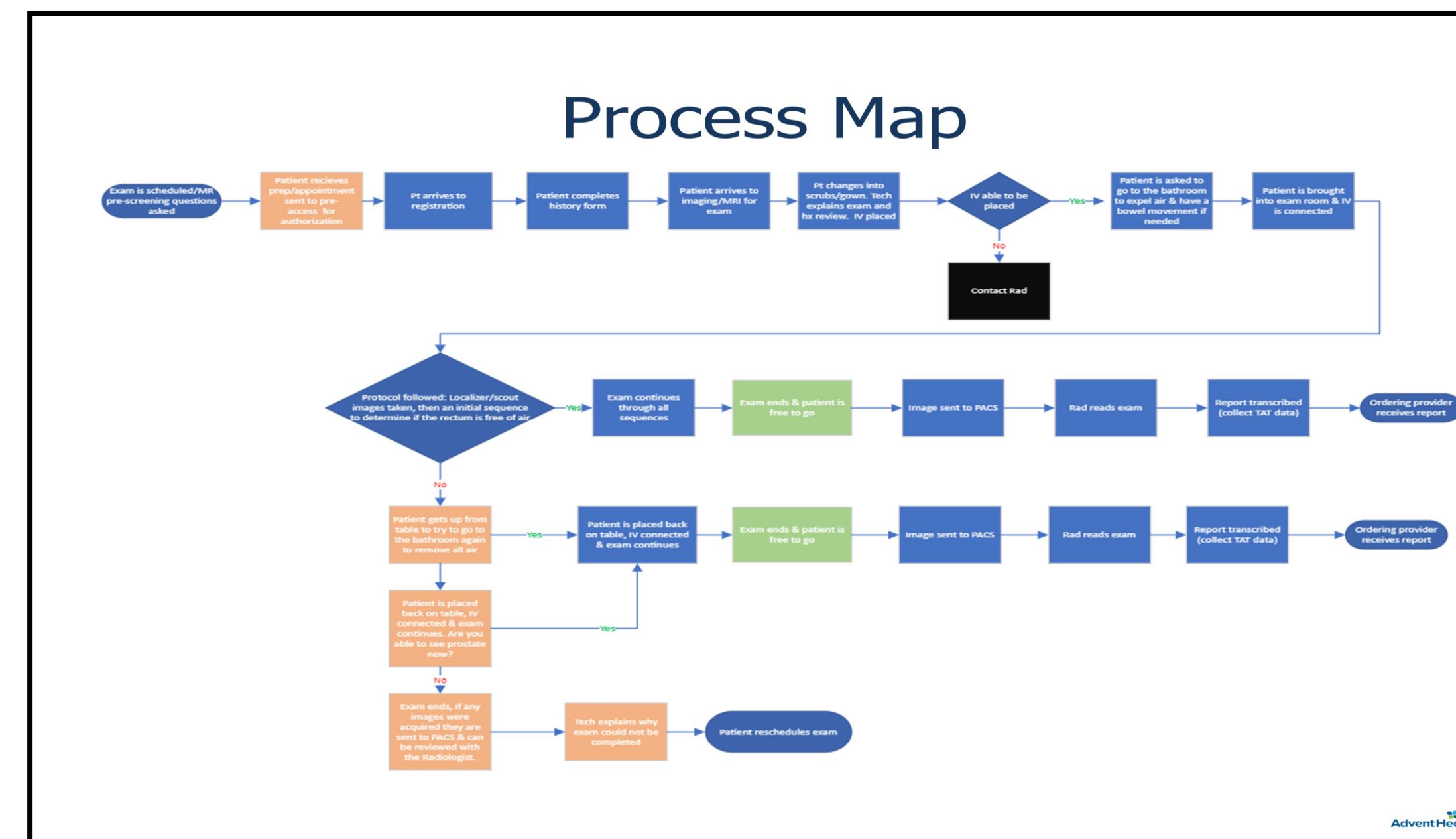


Figure 4

Results

After improvements were implemented prostate exams that met the criteria were able to reach the target goal of 94%. (See Figure 5 below) Reducing our scan time by 30 minutes has potential to create additional patient capacity in our community. This is possible by having a more robust patient prep and not having to get the patient on and off the table to expel air and feces. This results in over half a million dollars of additional potential reimbursement. Technologist productivity can also be positively impacted.

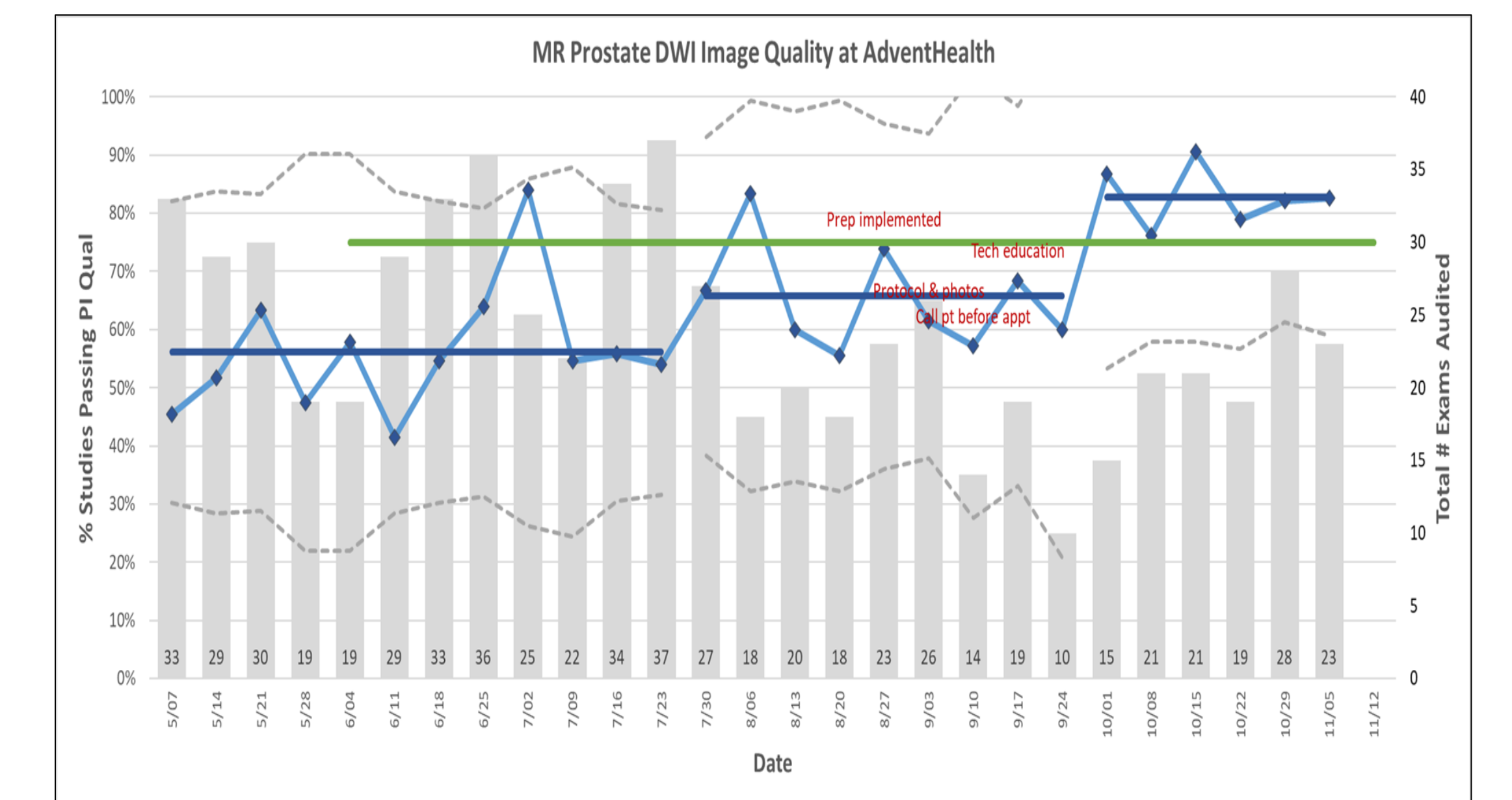


Figure 5

Re-occurring Issues

- Motion on Diffusion
- Air/Fecal Matter
- Patient did not follow NPO prep (See Figure 6 below)

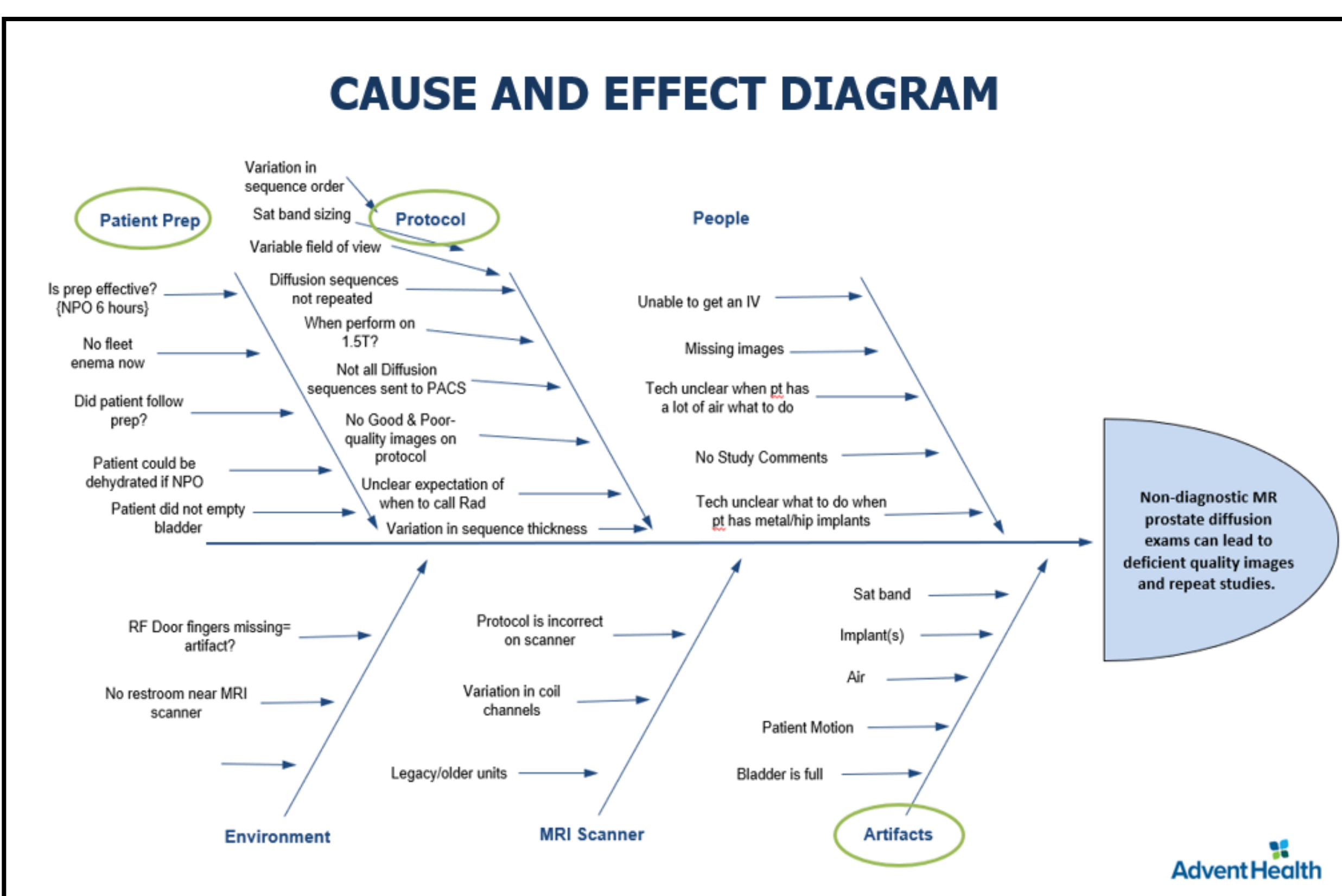


Figure 1

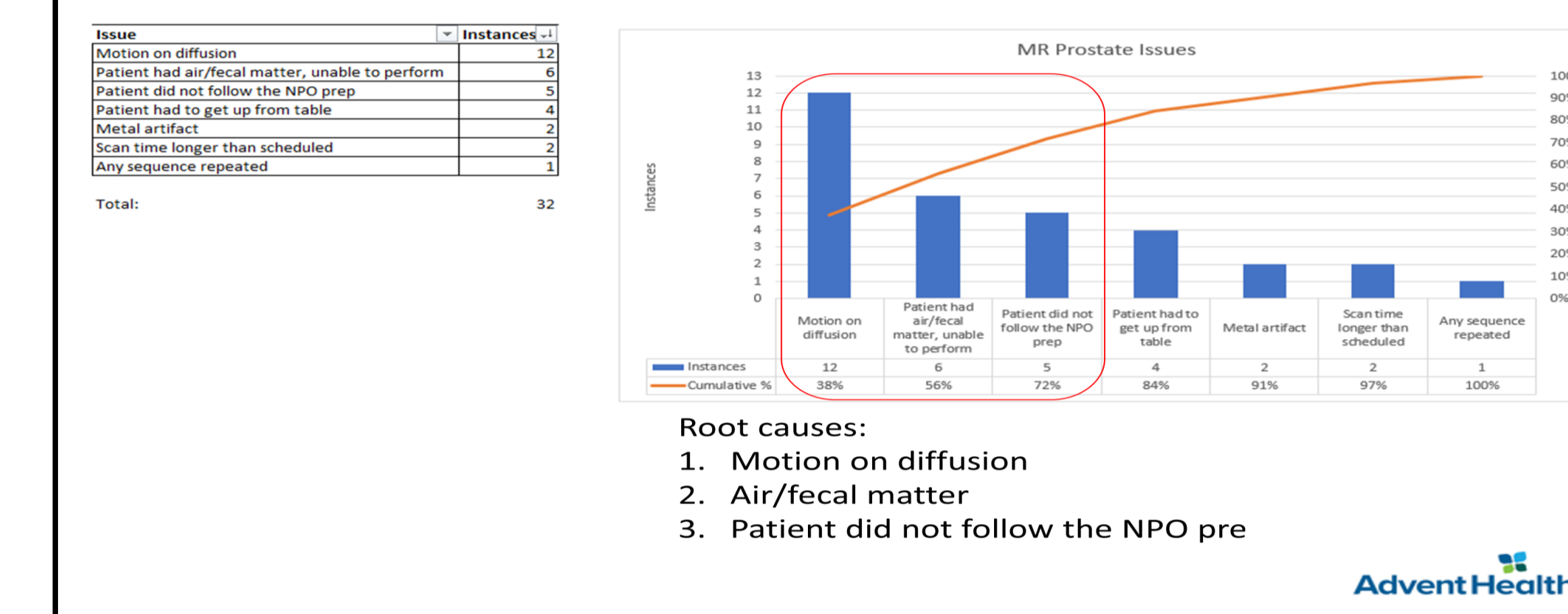
Method	Instructions	Expected Results	Cost	Patient Discomfort
Saline Enema	<ul style="list-style-type: none"> 1st enema: Evening before appointment 2nd enema: 2-3 hours prior to appointment. <p>Notes:</p> <ul style="list-style-type: none"> Educate patient "important rectum is empty for MRI scan". Instruct patient to obtain from local pharmacy and follow instructions. Describe medication prescription not required. Explain if patient concerned with timing, has a long drive, medical reasons, etc.; they can do 2nd enema earlier. Suggest patient speak to local pharmacist if additional questions on what to purchase, how to use it, label warnings, etc. Some patients may know this as a "Fleets enema". Proceed without enema prep if patient has end-stage renal disease due to the risk of electrolyte imbalances. 	+++ susceptibility artifacts and geometric distortion on DWI	< \$15.00	Low/Moderate
Dietary Restriction	<ul style="list-style-type: none"> Nothing to eat or drink 6 hours before appointment; but can drink water. Avoid caffeinated and carbonated drinks the day of exam. Can take medications. 	+ susceptibility artifacts and geometric distortion on DWI + motion/blurring of T2WI	None	Moderate
Refrain from Ejaculation	<ul style="list-style-type: none"> ≥ 72 hours before exam 	+ seminal vesicle distension in men > 60 yrs. old	None	Low/High
Patient Coaching	<ul style="list-style-type: none"> Instruct patient to use restroom before exam: empty bladder; empty bowels; push out air Coach patient to remain still during exam and find a comfortable position. Best if patient remains awake. Slow, Shallow Breathing Provide Patient "Squeeze Ball" 	+ motion/blurring of T2WI	None	Low

Figure 2

Funding Support by AdventHealth

AdventHealth Imaging Centers (AHIC): Apopka, Lake Mary, Oviedo, Innovation Tower/Princeton, Waterford Lakes, Winter Garden, Celebration, Ormond Beach, Winter Park

Pareto Chart



- Root causes:
- Motion on diffusion
 - Air/fecal matter
 - Patient did not follow the NPO prep

Figure 6

References

- ACR <https://www.acr.org/Practice-Management-Quality-Informatics/ACR-Learning-Network/Prostate-MR-Image-Quality-Improvement>
- Giganti F, Kirkham A, Kasivisvanathan V, Papoutsaki MV, Punwani S, Emberton M, Moore CM, Allen C. Understanding PI-QUAL for prostate MRI quality: a practical primer for radiologists. Insights Imaging. 2021 May 1;12(1):59. doi: 10.1186/s13244-021-00996-6. PMID: 33932167; PMCID: PMC8088425