Exploring the Value of Using Patient-Oriented MRI Reports in Clinical Practice

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Abstract

Purpose

Standard radiology reports (SRR) are designed to communicate information between doctors. With many patients having instantaneous access to SRRs on patient portals, interpretation without guidance from doctors can cause anxiety and panic. We designed a patient-centred prostate MRI template report (PACERR) to address some of these challenges and tested whether PACERRs improve patient knowledge and experience.

Materials and Methods

Patients booked for clinical prostate MRI were randomly assigned to SRR or SRR + PACERR. Questionnaires included multiple-choice that targeted 4 domains (understanding, usefulness, next steps, emotional experience) hypothesized to improve with patient-centred reports and short answer questions, testing knowledge regarding MRI results. Clinical encounters were observed and recorded to explore whether adding PACERR improved communication. Likert scaled-responses and short-answer questions were compared using Mann-Whitney U test and Kruskal-Wallis test.

Results

Of the 40 participants, the majority were MRI naïve (70%). Patients receiving a PACERR had higher scores in the categories of patient understanding (mean: 4.17 vs. 3.39, $p=0.006$), usefulness (mean: 4.58 vs. 3.07, $p<0.001$), and identifying next steps (mean: 1.89 vs. 3.03, $p=0.003$) but not emotional experience (mean: 4.18 vs. 3.79, $p=0.22$). PACERR participants found the layout and design more patient friendly (mean: 4.47 vs. 2.61, $p<0.001$) and easier to understand (mean: 4.37 vs. 2.38, $p<0.001$). In the knowledge section, overall, the PACERR arm scored better (87% vs. 56%, $p=0.004$).

Conclusion

With the addition of Prostate MRI PACERR, participants had better understanding of their results and felt more prepared to involve themselves in discussions with their doctor.

Introduction

Multiparametric prostate MRI (mpMRI) and mpMRI-fusion prostate biopsy are integral for prostate cancer (PCa) diagnosis [1]. MpMRI can direct biopsies towards lesions that are occult on ultrasound yielding more clinically significant PCa and less clinically insignificant PCa than systematic biopsy alone [2,3]. MpMRI is also used to monitor patients on active surveillance, limiting repeat biopsies [4].

To be transparent, many organizations are connecting patients to their radiology reports via online patient portals. This enhanced access to medical records can make patients feel more in control [5,6]. However, in general, the quality of online records is variable [7].

Radiology reports contain vital information that is relied on for patients and families to discuss diagnosis, treatment, and prognosis with healthcare providers [8]. While medical records have become more accessible for patients, reports are not designed for patients. “Standard” radiology reports (SRR) are intended for communication amongst doctors. Despite standardization by the Prostate Imaging – Reporting and Data System v2.1 (PI-RADS v2.1), prostate mpMRI is a case study in reports that are difficult for patients to understand [9]. This is because they contain very technical medical language, esoteric scoring, and countless abbreviations.

In fact, sharing records that require high health literacy does not promote understanding and could harm patients [10]. Without knowledge to interpret reports or doctor-guidance, patients are left to speculate the implications of reports. Thus, a different

approach is needed. To improve clinical encounters, several groups have proposed a workflow where patients have immediate access to augmented, patient-centred reports, in addition to the standard ones, to help transmit an appropriate amount of information with language and design intended for patients [11,12].

To address this gap, in collaboration with patients and expert groups, our team designed a patient-centered radiology report for prostate MRI (PACERR) [13]. PACERRs are individualized radiology reports with an annotated image of a prostate and explanation of any identified lesions. The aim of the current study is to test the usefulness of PACERR in a clinical setting. We hypothesize that, in comparison to SRRs alone, adding PACERRs improves patient understanding of key findings on MRI, allows for a more patient-oriented clinic visit, and improves doctor-patient communication.

Methods

Patients and trial workflow

A prospective clinical trial in accordance with research ethics guidelines and Ontario Personal Health Information Protection Act (PHIPA) was performed with institutional research ethics approval (REB #18-6240) between June and October 2019. Patients with upcoming prostate MRIs were approached for study participation. Eligible patients were 18+, English speaking and pending prostate MRI for active surveillance, prior negative biopsy but rising PSA, or biopsy naïve with elevated PSA. After informed consent was provided, patients were alternately assigned to receive their prostate MRI report as either an SRR alone or an SRR and PACERR. Group assignment was stratified by MRI status (normal MRI vs abnormal MRI result). Basic clinicopathologic data (e.g., age, PSA, clinical state) were collected.

Individualized PACERRs were generated with Adobe Acrobat by investigators using information from the SRRs (see Figure 1 for example PACERR). Scoring rules were designated by consensus during pilot testing and used to determine various MRI results (e.g., “enlarged prostate”) and tumour characteristics (e.g. “small spot” - Appendix I).

There were no validated questionnaires available to assess understanding and experience with medical reports. Thus, study investigators designed a questionnaire based on patient input during prototype development. Questionnaires included 16 multiple-choice that target 4 domains hypothesized to improve with patient-oriented reports (understanding, usefulness, next steps, emotional experience) and 11 short answer questions, testing knowledge regarding MRI results.

Prostate MRI reports (either SRR alone or SRR + PACERR) were emailed to patients once available. There was typically a one-week delay between report production and the clinic visit where patients would be reviewing results with their doctor. Patients completed the questionnaire twice. The pre-visit questionnaire (Appendix II) was completed within 7 days of receiving the MRI report(s), while the post-visit questionnaire (Appendix III) was administered within 30 days of the clinical visit. During the clinical visit, there was also an observational component exploring doctor and patient behavior. The observational component was scored by a clinical research assistant observing the clinical interaction, tabulating various ways reports were being used (e.g. sketching on report) and calculating visit time (see scoring table - Appendix IV).

Sample size calculation and statistical analysis

We anticipated that patients in the PACERR group could score 10% higher on knowledge questions. With 20 patients in each group there is 80% power to detect a 10% difference between the two groups at a significance level of 5%. We also felt that 20 patients would be sufficient to perform factor analysis to assess if questions were performing as expected.

Patient demographics, stratified by arm, were summarized using descriptive statistics and compared using Fisher's Exact and Mann-Whitney U tests. Factor analysis and thematic synthesis were used to organize questionnaire questions into categories. Oblimin rotation and a loading cutoff of 0.4 were utilized for the factor analysis. Cronbach's alpha was used to evaluate the internal consistency of each group. To analyze differences in responses to the multiple-choice questionnaire, responses were coded as ordinal outcomes (1 = strongly disagree, 2 = somewhat disagree, 3 = neutral, 4 = somewhat agree, 5 = strongly agree). The group score was calculated by taking the mean of its components. Differences in response distribution between arms were

visualized using density plots. Patients' understanding was quantified by assessing the ability to correctly identify spots, likelihood of cancer and accuracy of additional findings. Multiple choice and observational data were summarized using descriptive statistics, and differences between arms were evaluated using the Mann-Whitney U test. Subgroup analyses stratified by arm and MRI positivity status were explored, and differences between subgroups were assessed using Kruskal-Wallis tests. All statistical tests were 2-tailed and $p < 0.05$ was considered statistically significant. Statistical analysis was performed using R version 3.6.1 (R Foundation for Statistical Computing, Vienna, Austria).

Results

Patient and Clinical Characteristics

We contacted 90 participants for enrolment in this study. Forty-two patients consented (enrolment rate 47%) and 2 patients withdrew (retention rate 95%). Thirty-seven participants completed the pre-visit questionnaire and 40 participants completed the post-visit questionnaire. Patient and clinical characteristics were well-balanced between groups except for age (Table I). Most patients had no prior prostate MRI (70%). 62% of MRIs were abnormal.

Questionnaire Design

Thematic synthesis and factor analysis identified four categories within the multiple-choice section of the questionnaire that were combined for analysis in this study: (a) patient understanding (Question 1-4), (b) emotional experience (Question 5 [reverse-coded], 12-16), (c) usefulness (Question 8-11) and (d) identifying next steps (Question 6,7) (Table II and Appendix V). Internal consistency of the four questions relating to understanding was *acceptable* (Cronbach's $\alpha = 0.65$; 95% CI [0.52-0.78]), and *good* for the six questions relating to emotional experience (Cronbach's $\alpha = 0.82$; 95% CI [0.76-0.89]), and the four questions in usefulness (Cronbach's $\alpha = 0.84$; 95% CI [0.79-0.89]). Thematic groupings for short answer questions are in Appendix VI.

Pre-visit Questionnaire: Multiple-choice

Scores for each multiple-choice question, stratified by group assignment, are presented in Table II. In the pre-visit questionnaire, patients receiving a PACERR had higher scores in the patient understanding (mean: 4.17 vs. 3.39, $p = 0.006$), usefulness (mean: 4.58 vs. 3.07, $p < 0.001$), and identifying next steps (mean: 1.89 vs. 3.03, $p = 0.003$) domains (Figure I). There was no statistically significant difference identified between groups for the emotional experience domain (mean: 4.18 vs. 3.79, $p = 0.22$).

PACERR participants found the layout and design of the reports to be more patient friendly (mean: 4.47 vs. 2.61, $p < 0.001$) and easier to understand (mean: 4.37 vs. 2.38, $p < 0.001$) compared to those only receiving the SRR. Patients with a standard radiology report were significantly more likely to think they needed a prostate biopsy (mean: 1.95 vs. 2.89, $p = 0.036$) based on their MRI results and believed that the MRI results changed the available treatment options for them (mean: 1.83 vs. 3.06, $p = 0.006$). The content and design of PACERR was felt to help in discussing next steps with their doctor (mean: 4.95 vs. 4.50, $p = 0.003$) as well as communicating results to family and friends (mean: 4.53 vs. 2.89, $p < 0.001$).

In the subgroup analysis, presented in Figure II and Appendix VII, results were further stratified by MRI status (i.e., whether patients had a positive or negative MRI result). In general, the differences between SRR and PACERR groups were similar to the main analysis regardless of MRI result. However, some of the questions in the emotional experience domain demonstrated differences between the groups that were not apparent in main analysis. For example, despite similar distribution of PIRADs scored between arms, patients in the SRR arm with an abnormal MRI were significantly more likely to feel that they received very bad news compared to those in the PACERR arm with an abnormal MRI (36% vs. 8%, $p = 0.036$). Furthermore, patients with an abnormal PACERR were significantly more likely to state that receiving their MRI report ahead of time lowered their anxiety compared with SRR patients who received an abnormal report (75% vs. 45%, $p = 0.029$).

Pre-visit Questionnaire results – short-answer section

In the short-answer knowledge section, overall, patients in the PACERR arm scored better than patients in the SRR arm (87% vs. 56%, $p = 0.004$). 80% of participants with PACERR correctly acknowledged the presence of potentially malignant abnormality in their prostate on MRI report as compared to 38% of SRR participants ($p = 0.051$). 84% of patients in the PACERR arm correctly

identified the likelihood of cancer in a particular spot on their MRI compared to 50% of participants who received the SRR alone ($p=0.041$). The proportion of patients in the PACERR and SRR arms that correctly identified abnormalities on their MRI was 88% and 67%, respectively, though the difference was not statistically significant ($p=0.22$).

Doctor and Patient Behaviors

Identified behaviors from the clinical encounter stratified by group assignment are shown in Table III. There was no difference in the clinical encounter time between the two arms (PACERR median 7 minutes, range 2-27 minutes; SRR median 8 minutes, range 2-37 minutes). Results stratified by arm and MRI status are presented in Appendix VIII. The PACERR abnormal report was verbally referred to by doctors significantly more than the SRR abnormal report (mean = 2.79 times and 0.9 times, respectively ($p=0.027$)).

Post-visit Questionnaire

There were no statistically significant differences in questionnaire responses between arms or significant interactions for the post-visit questionnaire.

Discussion

PACERR prostate MRI was designed to improve patients' understanding of their MRI report, improve their experience and enable them to interact more productively with the healthcare system. In this trial, patients undergoing prostate MRI for common clinical indications were randomly assigned to usual care with standard radiology reports versus adding an individualized patient-centred report.

Patients who received both an SRR and PACERR reported that their MRI reports were easy to understand and useful for discussing treatment plans with their medical team.

Patients in the PACERR group were also better able to determine whether there were possible sites of malignant abnormality in their reports. Interestingly, even though there was an additional report to review, the PACERR did not increase the length of clinical encounters. While most observed behaviors were similar between interactions with and without a PACERR, it was noted that doctors more regularly referred to results during clinical encounters with PACERRs than SRRs. Thus, although the main aim of PACERR is to improve patient understanding and experience, doctors also found them useful for communication.

Interestingly, the differences that were seen between groups, when the questionnaire was administered prior to the clinical encounter (i.e., pre-visit), were not present when the questionnaire was re-administered after the clinical encounter (i.e., post-visit). We hypothesize that this is, at least in part, because by the time the post-visit questionnaire was administered, patients already had the opportunity to review results with their doctors, contemplate the implications of the report and educate themselves in other ways. Thus, it appears that the PACERR is most beneficial in the period between the publication of the SRR and the clinical encounter.

We believed that providing patients with comprehensible information would allow them to approach the clinical visit informed and prepared for productive interactions. Indeed, patients in the PACERR arm had higher scores when asked how confident they were to take part in the decision-making process. Interestingly, the benefits of having a patient-centred report are not uniform and sometimes can depend on the actual test result. For example, we found that patients with a PACERR and a lesion on MRI were less worried and anxious about the result compared to patients who had a standard report with a lesion. It is possible that the design, language and targeted information present in the PACERR better prepares patients to receive difficult results on the report.

The patient centered report improved the overall patient experience and created a more patient-oriented visit by encouraging doctors to interactively use the report to refer to results and support their decision-making process. The PACERR also encouraged patients to use their report as an interactive take home tool, which was evidenced by the fact that the PACERR was drawn and written on more frequently than the SRR. We also believe that, despite having an extra document to review, the clinical encounter time was not prolonged with PACERR because patients had better understanding of the results.

This study has several limitations. We limited inclusion to English speaking patients so it is unknown whether non-English speakers, a group that might benefit most from a patient-centred report, benefit from PACERR. Household income and education

level are likely associated with comprehension and communication with doctors. This study contained a wealthier and highly educated population which may not be representative of the general population. Furthermore, with a small sample size we were unable to demonstrate statistically significant differences in several domains which were hypothesized to be improved with PACERR. For example, this was apparent in the questions about lowering anxiety which showed potentially important differences in score distribution but did not reach statistical significance. Finally, non-validated questionnaires were used. We use a non-validated questionnaire because there were no validated ones available that targeted patients' experiences with medical records. Statistical assessment of the in-house developed questionnaires demonstrated good consistency and grouping. However, there are some unique strengths including using a PACERR that was developed with patient-input at every design step [13]. Also, doctors who were in the trial had no exposure to the PACERRs prior to the clinical trial, so it mimics a more real-world roll-out of such technology.

Conclusion

Through plain language and simple design, our team has created a patient centered radiology report that increases patients' self-reported understanding and their ability to accurately identify lesions and their approximate likelihood of cancer. Participants were empowered to actively involve themselves in discussions with their doctors, communicate their results to family and friends, and think realistically about the future. Future work will focus on encompassing patient demographics not adequately represented in this study and expanding to other disease sites and pathology reports in addition to automating the creation of individualized patient-centred reports.

Declarations

Funding

Dr. Perlis reports from Canadian Urological Association Scholarship Foundation (CUASF) - Early Investigator Research Scholarship, during the conduct of the study.

Conflicts of interest/Competing interests

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Availability of data and material

Not applicable

Code availability

Not applicable

Ethics approval

REB approval and institutional authorization was obtained by University Health Network Research ethics board committee prior to the conduct of this study. This study was performed in line with the principles of the Declaration of Helsinki

Consent to participate

All participants were made aware of the study risks, benefits, and procedures prior to participation and consent was obtained for all participants. Participants were given ample time to contemplate the decision to participate and could withdraw at any time

without consequence. Participants consented to anonymous transcripts being produced and used for publication purposes.

Consent for publication

The Funding agency has no holds on publication.

Disclosure Statement

Dr. Perlis reports from Canadian Urological Association Scholarship Foundation (CUASF) - Early Investigator Research Scholarship, during the conduct of the study.

Author Contribution

All authors contributed to the study conception and design. Prototypes were designed by Odelia Lee, Mike Lovas, David Wiljer, Joseph Cafazzo. All authors helped to further refine content within prototypes. Material preparation, data collection and analysis were performed by Amelia Di Meo, and Alexis Lund. Data analysis was completed by Katherine Lajkosz. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

References

1. Kasivisvanathan V, Rannikko AS, Borghi M et al. MRI-targeted or standard biopsy for prostate-cancer diagnosis. *New England Journal of Medicine*. 2018 May 10;378(19):1767-77.
2. Klotz L, Chin J, Black PC et al. Comparison of multiparametric magnetic resonance imaging–targeted biopsy with systematic transrectal ultrasonography biopsy for biopsy-naïve men at risk for prostate cancer: a phase 3 randomized clinical trial. *JAMA oncology*. 2021 Apr 1;7(4):534-42.
3. Ahmed HU, Bosaily AE, Brown LC et al. Diagnostic accuracy of multi-parametric MRI and TRUS biopsy in prostate cancer (PROMIS): a paired validating confirmatory study. *The Lancet*. 2017 Feb 25;389(10071):815-22.
4. Klotz L, Pond G, Loblaw A, et al. Randomized study of systematic biopsy versus magnetic resonance imaging and targeted and systematic biopsy in men on active surveillance (ASIST): 2-year postbiopsy follow-up. *European Urology*. 2020 Mar 1;77(3):311-7.
5. Traber Davis Giardina, Shailaja Menon, Danielle E Parrish et al. Patient access to medical records and healthcare outcomes: a systematic review, *Journal of the American Medical Informatics Association*, Volume 21, Issue 4, July 2014, Pages 737–741, <https://doi.org/10.1136/amiajnl-2013-002239>
6. Ross, Stephen E, and Chen-Tan Lin. "The effects of promoting patient access to medical records: a review." *Journal of the American Medical Informatics Association : JAMIA* vol. 10,2 (2003): 129-38. doi:10.1197/jamia.m1147
7. Charow R, Snow M, Fathima S et al. Evaluation of the scope, quality, and health literacy demand of Internet-based anal cancer information. *J Med Libr Assoc*. 2019 Oct;107(4):527-537. doi: 10.5195/jmla.2019.393. Epub 2019 Oct 1. PMID: 31607810; PMCID: PMC6774557.
8. Peppercorn JM, Smith TJ, Helft PR, et al: American Society of Clinical Oncology Statement: Toward individualized care for patients with advanced cancer. 2011
9. Turkbey B, Rosenkrantz AB, Haider MA et al. Prostate Imaging Reporting and Data System Version 2.1: 2019 Update of Prostate Imaging Reporting and Data System Version 2. *Eur Urol*. 2019;76(3):340–51.
10. Reynolds, Tera L et al. "Understanding Patient Questions about their Medical Records in an Online Health Forum: Opportunity for Patient Portal Design." *AMIA ... Annual Symposium proceedings. AMIA Symposium* vol. 2017 1468-1477. 16 Apr. 2018
11. Mossanen M, Macleod LC, Chu A et al. Comparative effectiveness of a patient centered pathology report for bladder cancer care. *The Journal of urology*. 2016 Nov 1;196(5):1383-9.

12. Nayak JG, Scalzo N, Chu A et al. The development and comparative effectiveness of a patient-centered prostate biopsy report: a prospective, randomized study. *Prostate Cancer Prostatic Dis.* 2020 Mar;23(1):144-150. doi: 10.1038/s41391-019-0169-7. Epub 2019 Aug 28. PMID: 31462701.

13. Perlis N, Finelli A, Lovas M et al. Creating patient-centered radiology reports to empower patients undergoing prostate magnetic resonance imaging. *Can Urol Assoc J.* 2020 Sep 28. doi: 10.5489/cuaj.6585. Epub ahead of print. PMID: 33007175.

Tables

Table I: Patient and clinical characteristics of entire cohort and stratified by group assignment. PACERR = patient-centred radiology report, SRR= standard radiology report, SD= standard deviation, AS= Active surveillance, BN= Biopsy naïve, PSA= prostate specific antigen

Covariate	Full Sample (n=40)	PACERR (n=21)	SRR (n=19)	p-value
Age				0.049
Mean (SD)	65.3 (7.3)	63.4 (6.7)	67.4 (7.5)	
Median (Min,Max)	65 (46,77)	63 (49,76)	70 (46,77)	
Clinical State				0.8
AS	23 (57)	11 (52)	12 (63)	
BN	4 (10)	2 (10)	2 (11)	
Negative	13 (32)	8 (38)	5 (26)	
PSA (ng/dL)				0.91
Mean (SD)	7.8 (4.7)	7.6 (4.8)	8 (4.6)	
Median (Min,Max)	6.4 (0.5,22.2)	6 (0.5,22.2)	7 (2.9,18)	
Household Income				0.92
<\$30,000	4 (11)	2 (10)	2 (12)	
\$60,000-89,999	8 (22)	5 (25)	3 (18)	
\$90,000-119,999	5 (14)	2 (10)	3 (18)	
>\$120,000	20 (54)	11 (55)	9 (53)	
Missing	3	1	2	
Education Level				0.91
High School	6 (16)	4 (19)	2 (12)	
Undergraduate/College	18 (47)	10 (48)	8 (47)	
Graduate and/or PhD	14 (37)	7 (33)	7 (41)	
Missing	2	0	2	
Prior Prostate MRI				1
No	28 (70)	15 (71)	13 (68)	
Yes	12 (30)	6 (29)	6 (32)	
MRI results				1
Abnormal	25 (62)	13 (62)	12 (63)	
Normal	15 (38)	8 (38)	7 (37)	

Table II. Distribution of multiple choice questions from pre-visit questionnaire, stratified by group. Questions are combined by theme. Numbers reflect the order of the questions as listed on the questionnaire.

	Question	Arm	Totally Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Totally Agree	Mean	P-Value
Understanding	1) After reading the MRI Report, I understand why my doctor ordered it for me	PACERR	0	0	1 (5%)	1 (5%)	17 (89%)	4.84	0.095
		SRR	0	2 (11%)	1 (6%)	3 (17%)	12 (67%)	4.39	
	2) After reading my MRI report, I understand which part of my prostate might have cancer	PACERR	1 (5%)	0	5 (26%)	3 (16%)	10 (53%)	4.11	0.04
		SRR	1 (6%)	3 (17%)	4 (22%)	8 (44%)	2 (11%)	3.39	
	3) After reading my MRI report, I understand the chances that each spot might have cancer	PACERR	1 (5%)	0	5 (26%)	4 (21%)	9 (47%)	4.05	<0.001
		SRR	3 (17%)	3 (17%)	8 (44%)	4 (22%)	0	2.72	
	4) After reading the MRI report, I understand whether there is concern that cancer has spread beyond the prostate	PACERR	2 (11%)	1 (5%)	7 (37%)	0	9 (47%)	3.68	0.163
		SRR	3 (17%)	4 (22%)	3 (17%)	5 (28%)	3 (17%)	3.06	
Emotional Experience	5) After reading the MRI report, I feel that I have received very bad news	PACERR	10 (53%)	3 (16%)	5 (26%)	1 (5%)	0	1.84	0.218
		SRR	7 (39%)	2 (11%)	5 (28%)	4 (22%)	0	2.33	
	12) Overall, receiving the report before my clinic visit improved my experience	PACERR	0	0	2 (11%)	7 (37%)	10 (53%)	4.42	0.133
		SRR	0	3 (17%)	2 (11%)	7 (39%)	6 (33%)	3.89	
	13) Overall, receiving the report before my clinic visit makes me feel like my doctors trust me	PACERR	0	0	10 (53%)	3 (16%)	6 (32%)	3.79	0.55
		SRR	1 (6%)	0	5 (28%)	6 (33%)	6 (33%)	3.89	
	14) Overall, receiving the report before my clinic visit makes me feel that I am in control	PACERR	0	2 (11%)	8 (42%)	3 (16%)	6 (32%)	3.68	0.614
		SRR	2 (11%)	2 (11%)	4 (22%)	7 (39%)	3 (17%)	3.39	
	15) Overall, receiving the report before my clinic visit gives me the confidence to take part in decision	PACERR	0	0	1 (5%)	4 (21%)	14 (74%)	4.68	0.081
		SRR	0	1 (6%)	1 (6%)	8 (44%)	8 (44%)	4.28	

	making related to my prostate								
	16) Overall, receiving the report before my clinic visit lowers my anxiety about my prostate	PACERR	0	0	3 (16%)	6 (32%)	10 (53%)	4.37	0.094
		SRR	2 (11%)	2 (11%)	3 (17%)	5 (28%)	6 (33%)	3.61	
Next Steps	6) After reading the MRI reports, I think that I will definitely need a prostate biopsy	PACERR	9 (47%)	4 (21%)	5 (26%)	0	1 (5%)	1.95	0.036
		SRR	4 (22%)	3 (17%)	5 (28%)	3 (17%)	3 (17%)	2.89	
	7) After reading the MRI report, I think that the results will change the treatment options	PACERR	10 (56%)	2 (11%)	5 (28%)	1 (6%)	0	1.83	0.006
		SRR	2 (12%)	3 (18%)	7 (41%)	2 (12%)	3 (18%)	3.06	
	8) Overall, I believe that the content of this MRI report is useful for discussing next steps with my doctor	PACERR	0	0	0	1 (5%)	18 (95%)	4.95	0.003
		SRR	0	0	0	9 (50%)	9 (50%)	4.50	
Usefulness	9) Overall, I believe that the content of this MRI report is useful for communicating the results to my family and friends	PACERR	0	1 (5%)	2 (11%)	2 (11%)	14 (74%)	4.53	<0.001
		SRR	3 (17%)	4 (22%)	5 (28%)	4 (22%)	2 (11%)	2.89	
	10) Overall, the language in this MRI report is easy for me to understand	PACERR	0	1 (5%)	2 (11%)	5 (26%)	11 (58%)	4.37	<0.001
		SRR	5 (28%)	7 (39%)	3 (17%)	2 (11%)	1 (6%)	2.28	
	11) Overall, the layout and design of this MRI report is patient friendly	PACERR	0	1 (5%)	0	7 (37%)	11 (58%)	4.47	<0.001
		SRR	4 (22%)	5 (28%)	4 (22%)	4 (22%)	1 (6%)	2.61	

Table III: Results from observational component of clinical encounter where MRI result was discussed between doctor and patient as documented by observer

Behaviour	Full Sample (n=38)	PACERR (n=19)	SRR (n=19)	p-value
Doctor refers to result on report				0.0045
Mean (SD)	1.39 (1.87)	2.16 (2.29)	0.63 (0.83)	
Median (Range)	1 (0,10)	1 (0,10)	0 (0,2)	
0	14 (37)	3 (16)	11 (58)	
1+	24 (63)	16 (84)	8 (42)	
Doctor writes on report				0.65
Mean (SD)	0.74 (1.88)	0.74 (1.41)	0.74 (2.31)	
Median (Range)	0 (0,10)	0 (0,4)	0 (0,10)	
0	29 (76)	14 (74)	15 (79)	
1+	9 (24)	5 (26)	4 (21)	
Doctor clarifies language				0.27
Mean (SD)	0.84 (1.15)	0.58 (0.77)	1.11 (1.41)	
Median (Range)	0.5 (0,5)	0 (0,2)	1 (0,5)	
0	19 (50)	11 (58)	8 (42)	
1+	19 (50)	8 (42)	11 (58)	
Doctor uses report to support decision				0.3
Mean (SD)	1.08 (0.88)	1.26 (0.99)	0.89 (0.74)	
Median (Range)	1 (0,4)	1 (0,4)	1 (0,2)	
0	9 (24)	3 (16)	6 (32)	
1+	29 (76)	16 (84)	13 (68)	
Patient asks for clarification				0.91
Mean (SD)	0.68 (1.16)	0.84 (1.54)	0.53 (0.61)	
Median (Range)	0 (0,6)	0 (0,6)	0 (0,2)	
0	23 (61)	13 (68)	10 (53)	
1+	15 (39)	6 (32)	9 (47)	
Patient writes on report				0.93
Mean (SD)	0.74 (3.33)	1.32 (4.67)	0.16 (0.5)	
Median (Range)	0 (0,20)	0 (0,20)	0 (0,2)	
0	34 (89)	17 (89)	17 (89)	
1+	4 (11)	2 (11)	2 (11)	
Patient uses report to support decision				0.3
Mean (SD)	0.13 (0.41)	0.05 (0.23)	0.21 (0.54)	
Median (Range)	0 (0,2)	0 (0,1)	0 (0,2)	
0	34 (89)	18 (95)	16 (84)	
1+	4 (11)	1 (5)	3 (16)	

Doctor uses/draws sketch				0.78
Mean (SD)	0.71 (1.23)	0.79 (1.4)	0.63 (1.07)	
Median (Range)	0 (0,5)	0 (0,5)	0 (0,3)	
0	25 (66)	12 (63)	13 (68)	
1+	13 (34)	7 (37)	6 (32)	

Figures

MRI REPORT - PROSTATE

SUMMARY FOR PATIENTS

PATIENT INFORMATION

NAME
John Smith

DATE OF BIRTH
Dec 18, 1968

UHN ID
523419

MRI INFORMATION

ORDERING PHYSICIAN
Dr. Nathan Perlis (Urology Surgeon)

DATE OF MRI
July 12, 2018

REASON FOR MRI
Clinical concern for prostate cancer

YOUR PROSTATE MRI RESULTS

Your MRI scan shows that you have a **high chance of cancer** in your prostate. We found **4 spots of interest** which are detailed below. Additionally, you have a **very enlarged prostate**. For further explanation of your findings, please refer to attached glossary.

SPOTS ON YOUR MRI SCAN

Spot	Chance of Cancer (based on appearance)	Size of Spot	Side of Prostate
A	Very High Chance	Large (15 mm)	Left
B	High Chance	Small (8 mm)	Right
C	Low Chance	Medium (12 mm)	Middle
D	Low Chance	Small (6 mm)	Left

YOUR MRI SCAN

YOUR ADDITIONAL FINDINGS

Very Enlarged Prostate

WHAT'S THE NEXT STEP?

All results should be reviewed with your ordering physician, please contact the office if you do not have an upcoming appointment booked.

OFFICE CONTACT

GU Clinic (PMHCC)
gu.nurses@uhn.ca
416-239-1231

GLOSSARY FOR MRI REPORT

This glossary is meant to explain words found in the prostate MRI report above. If you still have additional questions, please speak with your doctor.

GENERAL MRI INFORMATION

MRI - This stands for "Magnetic Resonance Image." An MRI is an imaging test that uses magnets and radio waves to create images.

Spot(s) of Interest - Areas on an MRI that look different from normal tissue.

Chance of Cancer - To determine whether a spot of interest contains cancer, a biopsy must be done.

ANATOMY AROUND THE PROSTATE

Nerves - Tissues that carry electrical signals throughout the body.

Seminal Vesicles - Glands that add nutrients to semen (the fluid released from the penis that contains sperm). Seminal vesicles are connected to the prostate. They are located just below the bladder.

Bladder - A balloon-shaped organ that holds pee.

Prostate - This gland produces liquid that mixes with sperm from the testicles to make semen. It is located under the bladder and in front of the rectum. Part of the urethra runs through it.

Muscle Floor - The muscles below the prostate, on the pelvic floor. When these muscles are damaged or weak, pee can leak.

Urethra - A tube that carries pee from the bladder out of the body through the penis.

Rectum - The last section of the intestines. The rectum is behind the prostate.

ADDITIONAL FINDINGS

Benign - This type of tissue is not cancer and not dangerous. It will not spread to other areas of the body.

BPH - This stands for "Benign Prostatic Hyperplasia," an enlarged prostate. This is common in older men. An enlarged prostate due to BPH compresses the urethra and makes it difficult to pee.

Prostatitis - Inflammation (the body's protective response to an infection) of the prostate gland. Prostatitis may be caused by an infection. Men of all ages can be affected. When men have prostatitis they can have painful prostates and can experience irritation when they pee.

Lymphadenopathy - Abnormal growth of the lymph nodes. This may be due to cancer or due to benign inflammation.

Metastasis - When cancer cells from one part of the body (e.g. prostate) spread to another part of the body.

HELPFUL WEBSITES WITH MORE INFORMATION

Prostate Cancer Canada - www.prostatecancer.ca

Canadian Cancer Society - www.cancer.ca/en/cancer-information/cancer-type/prostate/prostate-cancer/?region=on

Figure 1

Final Patient Centered Radiology Report for Prostate cancer prototype

Figure 2

Grouped pre-visit response distributions for multiple-choice questions, stratified by (A) arm (PACERR+SRR vs SRR), and (B) arm and status (normal vs abnormal MRI result).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AppendixItoVIII.docx](#)