

## Modified PROMISE Criteria for Standardized Interpretation of GRPR-targeted PET

Heying Duan<sup>1</sup>, Guido A. Davidzon<sup>1</sup>, Farshad Moradi<sup>1</sup>, Tie Liang<sup>1</sup>, Andrei Iagaru<sup>1</sup>

<sup>1</sup> Department of Radiology, Division of Nuclear Medicine and Molecular Imaging, Stanford University, Stanford, CA

**Contact author:** Heying Duan, heying@stanford.edu

**Introduction:** There are three different interpretation criteria for prostate-specific membrane antigen (PSMA)-targeted PET. As up to 10% of prostate cancer (PC) do not express PSMA, other targets such as gastrin releasing peptide receptor (GRPR) were evaluated. GRPR-targeted imaging has been increasingly used for initial staging and biochemical recurrence (BCR).

**Specific aim:** We propose a unified interpretation criteria for GRPR-targeted PET based on the Prostate Cancer Molecular Imaging Standardized Evaluation (PROMISE) criteria which was developed for PSMA-PET [1].

**Materials and Methods:** Participants who were initially prospectively enrolled in research protocols at our institution, were retrospectively reviewed. One-hundred patients, aged  $67.9 \pm 7.0$  years, underwent <sup>68</sup>Ga-RM2 PET/MRI for BCR PC. Two nuclear medicine physicians independently evaluated whole-body and dedicated delayed pelvic PET/MRI according to a modified PROMISE criteria (Figure 1). Inter-rater reliability was computed using Gwet's agreement coefficient for overall GRPR expression, prostate bed, lymph node stations, skeleton, organ, and final judgement of the scan.

**Results:** Prostate specific antigen (PSA) at <sup>68</sup>Ga-RM2 PET/MRI was  $4.8 \pm 13.22$  (range 0.2 – 124) ng/mL. The inter-rater reliability were as follows: substantial agreement was seen for GRPR expression (0.70 [95% confidence interval [CI] 0.59, 0.81]) and final judgement (0.65 [95% CI 0.53, 0.78]), and almost perfect agreement was found for the prostate bed in the whole-body (0.87 [95% CI 0.80, 0.94]) and delayed pelvic (0.83 [95% CI 0.75, 0.92]) images as well as for lymph nodes (0.92 [95% CI 0.85, 1.00]), skeleton (0.97 [95% CI 0.93, 1.00]), and organ metastases (0.97 [95% CI 0.93, 1.00]). No consensus read was performed yet.

**Discussion and conclusion:** Interpreting GRPR-targeted PET according to a modified PROMISE criteria showed its reliability with an almost perfect interrater agreement amongst all regions except for GRPR expression and final judgement, where substantial agreement was seen. This proposed standardized reporting system will aid clinicians to decrease the level of uncertainty, especially those who are starting GRPR-targeting imaging at their facility, and clinical trials to uniform evaluation and reporting of GRPR-targeted PET. Prospective studies, especially at initial staging of PC, is needed to support the robustness of this interpretation criteria.

**Figure 1:** Modified PROMISE criteria for GRPR-targeted PET imaging

GRPR expression		
Score	GRPR expression	Interpretation
0	No	< blood pool
1	Low	≥ blood pool and lower than gastrointestinal tract
2	Intermediate	≥ GIT and lower than pancreas
3	High	≥ pancreas

  

Prostate Bed		Lymph node regions		Skeleton	
Score	Interpretation	Score	Interpretation	Score	Interpretation
0	No tumor	1	Internal iliac	0	None
1	Unilateral	2	External iliac	1	Unilateral
2	Multifocal	3	Common iliac	2	Oligometastatic
3	Invading adjacent structures	4	Obturator	3	Disseminated
4	Local recurrence	5	Presacral (presciatic)	4	Diffuse
		6	Retroperitoneal	<b>Organ metastases</b>	
		7	Supradiaphragmal	<b>Score</b>	<b>Interpretation</b>
			Other pelvic (specify)	0	None
			Other extrapelvic (specify)	1	Liver
				2	Lung
				3	Other (specify)

  

Final judgement	
Score	Interpretation
1	Positive
2	Equivocal
3	Negative

**References**

1. Eiber M, Herrmann K, Calais J, Hadaschik B, Giesel FL, Hartenbach M, et al. Prostate Cancer Molecular Imaging Standardized Evaluation (PROMISE): Proposed miTNM Classification for the Interpretation of PSMA-Ligand PET/CT. J Nucl Med. 2018;59:469-78. doi:10.2967/jnumed.117.198119.