Supplemental Figure 1: 73-year-old male with a history of prostate cancer and PSA of 1.37 at the time of the scan. ^{68}Ga-PSMA PET/MRI (A, B) demonstrates a solitary rib lesion with associated contrast enhancement on MRI (C). The patient underwent stereotactic body radiotherapy to the lesion; however, PSA continued to climb despite radiation therapy. Findings were considered a false positive.
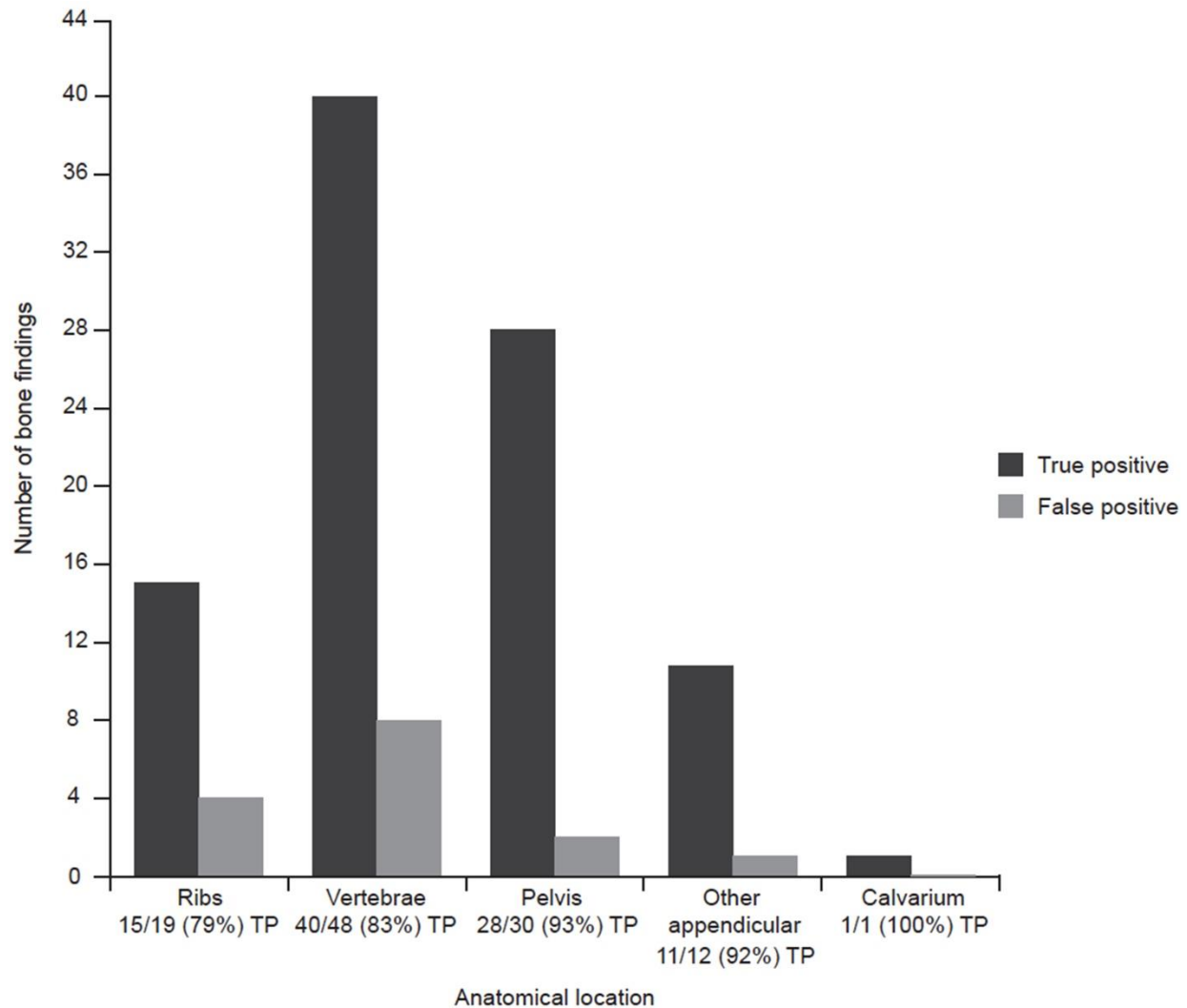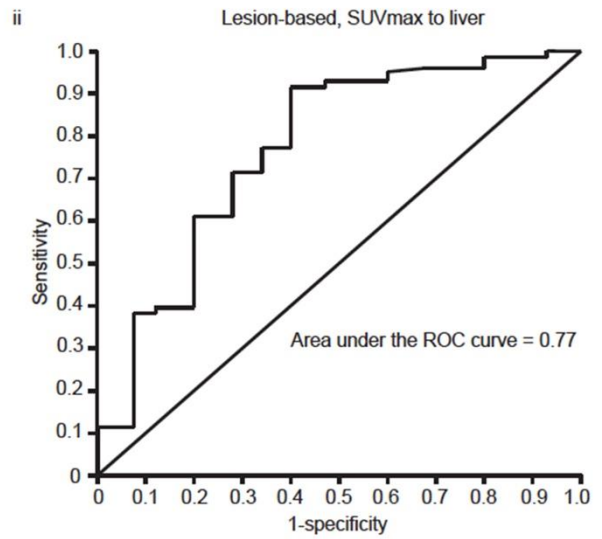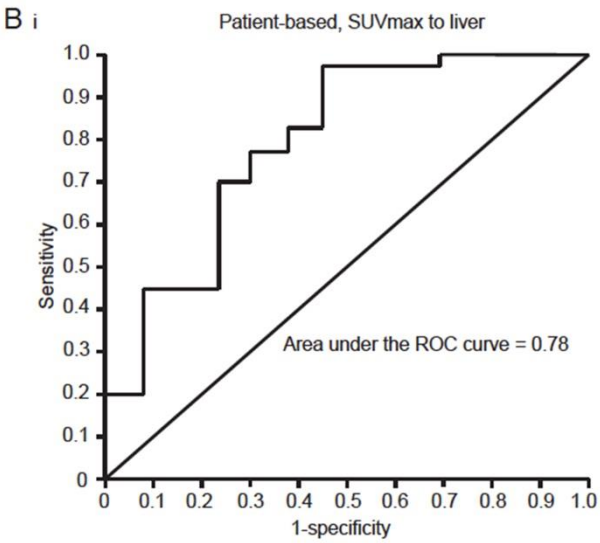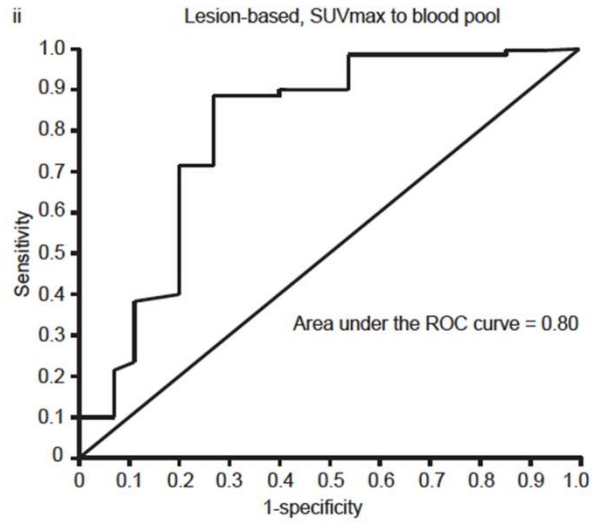
Supplemental Figure 2: Anatomical locations of PSMA-avid lesions between true and false positives for prostate cancer metastases. Other appendicular locations include the humerus, femoral neck, lesser trochanter, sternum, scapula, clavicle, and glenoid. No statistically significant difference was found between the proportions of true and false positive lesions identified at each location ($p > 0.05$).

A i — Patient-based, SUVmax to blood pool — Area under the ROC curve = 0.83

ii — Lesion-based, SUVmax to blood pool — Area under the ROC curve = 0.80

B i — Patient-based, SUVmax to liver — Area under the ROC curve = 0.78

ii — Lesion-based, SUVmax to liver — Area under the ROC curve = 0.77

C i — Patient-based, SUVmax to bone — Area under the ROC curve = 0.86

ii — Lesion-based, SUVmax to bone — Area under the ROC curve = 0.83
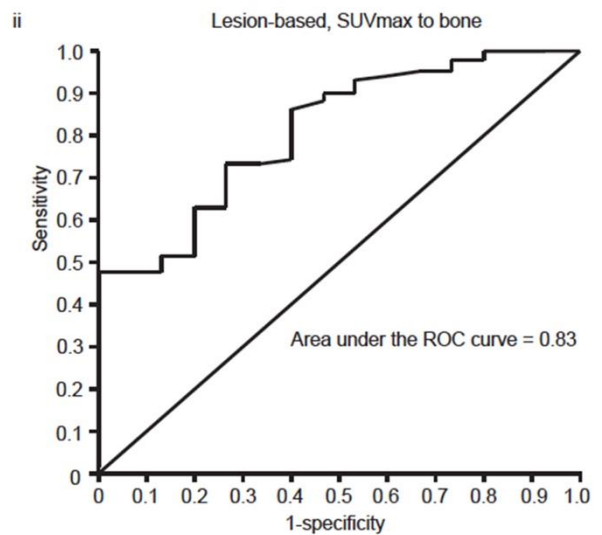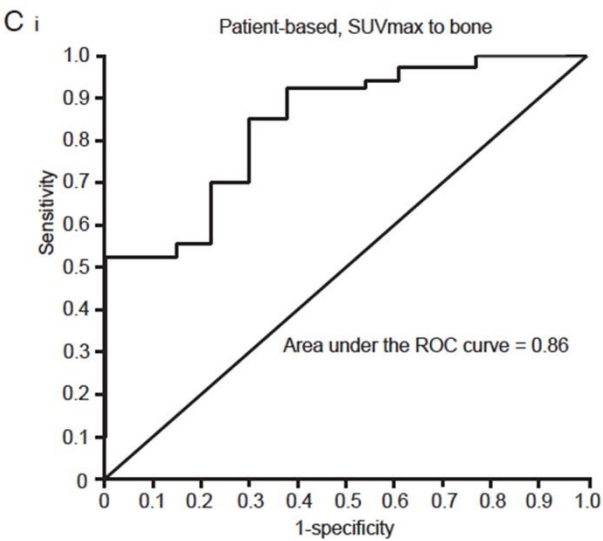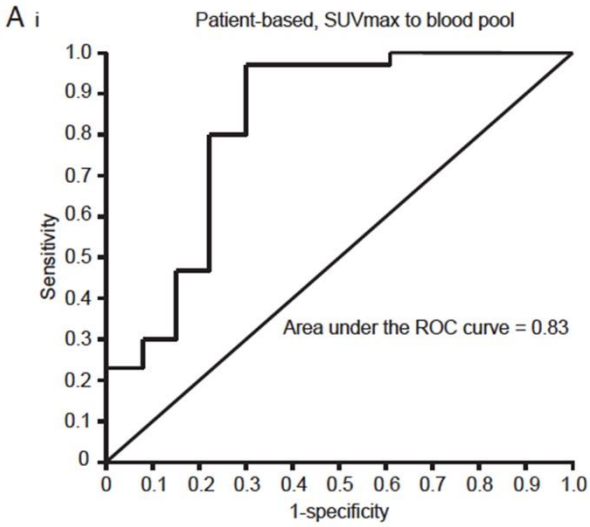
Supplemental Figure 3: Receiver operating characteristic (ROC) curves for SUVmax to reference organs

A) i. Patient-based ROC curve for SUVmax ratio to blood pool (n=53; n=13 patients with false positive lesions and n=40 patients with true positive lesions).

ii. Lesion-based ROC curve for SUVmax ratio to blood pool (n=104; n=15 patients with false positive lesions and n=89 patients with true positive lesions).

B) i. Patient-based ROC curve for SUVmax ratio to liver (n=53; n=13 patients with false positive lesions and n=40 patients with true positive lesions).

ii. Lesion-based ROC curve for SUVmax ratio to liver (n=104; n=15 patients with false positive lesions and n=89 patients with true positive lesions).

C) i. Patient-based ROC curve for SUVmax ratio to bone (n=53; n=13 patients with false positive lesions and n=40 patients with true positive lesions).

ii. Lesion-based ROC curve for SUVmax ratio to bone (n=104; n=15 patients with false positive lesions and n=89 patients with true positive lesions).

D i — Patient-based, biological volume. Area under the ROC curve = 0.53
ii — Lesion-based, biological volume. Area under the ROC curve = 0.52
E i — Patient-based, size. Area under the ROC curve = 0.62
ii. — Lesion-based, size. Area under the ROC curve = 0.55
F i — Patient-based, PSMA RADS. Area under the ROC curve = 0.81
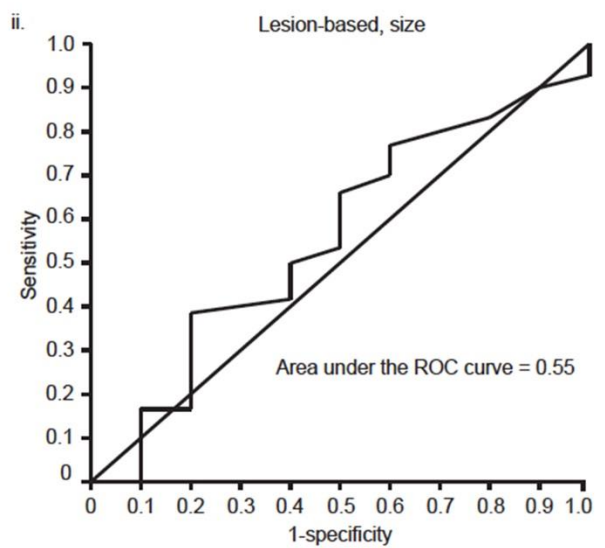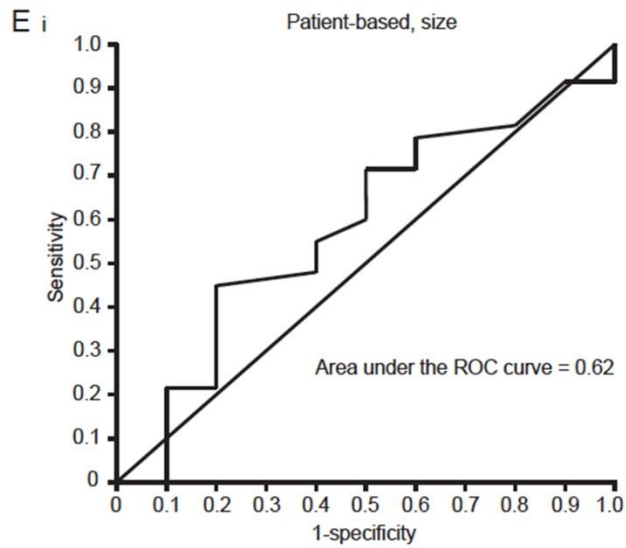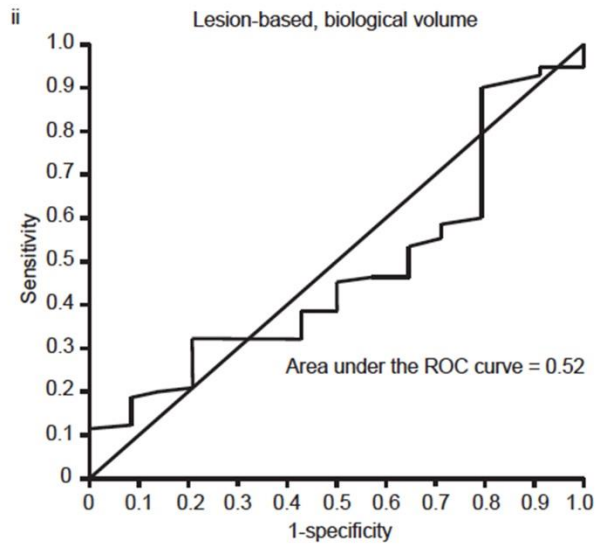ii. — Lesion-based, PSMA RADS. Area under the ROC curve = 0.80
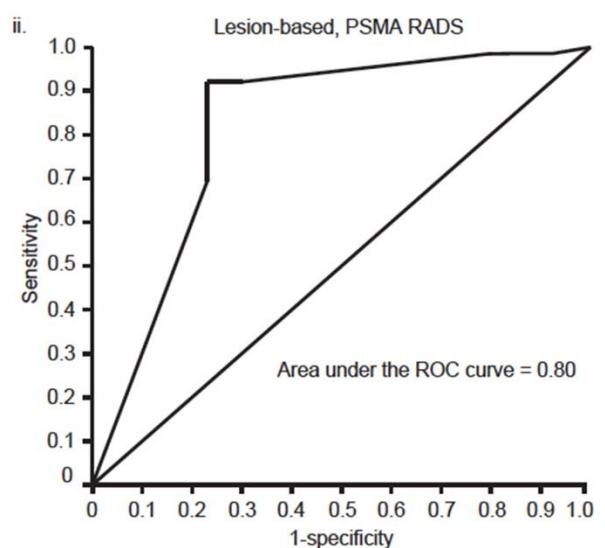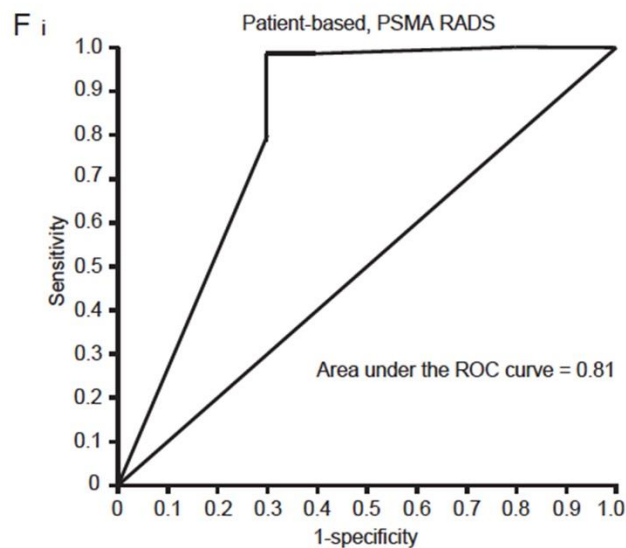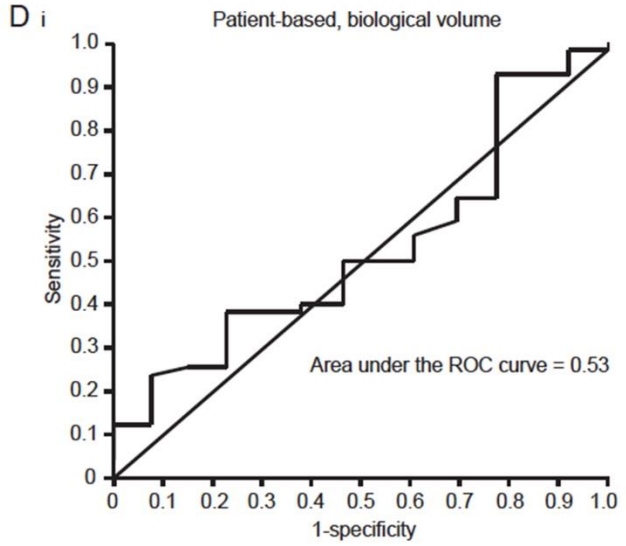
Supplemental Figure 4: Receiver operating characteristic (ROC) curves for biological

volume and size of lesions

    D) i. Patient-based ROC curve for biological volume of lesions (n=55; n=13 patients

        with false positive lesions and n=42 patients with true positive lesions).

        ii. Lesion-based ROC curve for biological volume of lesions (n=98; n=14 patients

        with false positive lesions and n=84 patients with true positive lesions).

    E) i. Patient-based ROC curve for lesion size (n=48; n=10 patients with false

        positive lesions and n=38 patients with true positive lesions).

        ii. Lesion-based ROC curve for lesion size (n=85; n=10 patients with false

        positive lesions and n=75 patients with true positive lesions).

    F) i. Patient-based ROC curve for PSMA RADS rating of lesions (n=53; n=13

        patients with false positive lesions and n=40 patients with true positive lesions).

        ii. Lesion-based ROC curve for PSMA RADS rating of lesions (n=92; n=15 false

        positive lesions and n=77 true positive lesions).

Supplemental Table 1: Patient-based comparison of benign and metastatic lesions

Parameter	Mean of benign lesions Range n	Mean of malignant lesions Range n	Significance
SUV_{max}	6.61 1.4-27.1	23.98 3.7-96	$p<0.001$
SUV_{max} ratio to blood pool	4.31 0.73-18.07	12.15 1.55-80.4	$p=0.004$
SUV_{max} ratio to liver	1.23 0.05-5.21	3.21 0.51-14.4	$p=0.003$
SUV_{max} ratio to bone	5.74 1.0-14.3	28.22 2.67-195	$p<0.001$
Biological volume	2.58 0.39-8.9	4.72 0.22-30	$p=0.099$
Size	2.12 0.8-8.6	1.98 0.5-6.0	$p=0.863$
PSMA RADS	3 2-5	5 3B-5	$p<0.001$

Supplemental Table 2: Lesion-based comparison of benign and metastatic lesions

Parameter	Mean of benign lesions Range n	Mean of malignant lesions Range n	Significance
SUV_{max}	6.35 1.4-27.1	17.65 1.6-78	$p<0.001$
SUV_{max} ratio to blood pool	3.90 0.73-18.07	9.41 0.76-80.4	$p=0.003$
SUV_{max} ratio to liver	1.11 0.05-5.21	2.60 0.25-14.4	$p=0.002$
SUV_{max} ratio to bone	5.53 1.0-14.3	28.22 1.78-195	$p<0.001$
Biological volume	2.62 0.39-8.9	3.58 0.16-30	$p=0.261$
Size	2.12 0.8-8.6	2.01 0.5-7.7	$p=0.885$
PSMA RADS	3B 2-5	5 2-5	$p<0.001$