

19. Lawton CAF, Michalski J, El Naqa I, et al. RTOG GU radiation oncology specialists reach consensus on pelvic lymph node volumes for high-risk prostate cancer. *Int J Radiat Oncol Biol Phys.* 2009;74:383–387.
20. Verburg FA, Pfister D, Heidenreich A, et al. Extent of disease in recurrent prostate cancer determined by [68Ga]PSMA-HBED-CC PET/CT in relation to PSA levels, PSA doubling time and Gleason score. *Eur J Nucl Med Mol Imaging.* 2016;43:397–403.
21. Umezawa R, Ariga H, Ogawa Y, et al. Impact of pathological tumor stage for salvage radiotherapy after radical prostatectomy in patients with prostate-specific antigen < 1.0 ng/ml. *Radiat Oncol.* 2011;6:150.
22. Swanson GP, Hussey MA, Tangen CM, et al. Predominant treatment failure in postprostatectomy patients is local: analysis of patterns of treatment failure in SWOG 8794. *J Clin Oncol.* 2007;25:2225–2229.
23. Ost P, Jereczek-Fossa BA, As NV, et al. Progression-free survival following stereotactic body radiotherapy for oligometastatic prostate cancer treatment-naïve recurrence: a multi-institutional analysis. *Eur Urol.* 2016;69:9–12.
24. Hong JC, Salama JK. The expanding role of stereotactic body radiation therapy in oligometastatic solid tumors: what do we know and where are we going? *Cancer Treat Rev.* 2017;52:22–32.
25. Ost P, Reyniers D, Decaestecker K, et al. Surveillance or metastasis-directed therapy for oligometastatic prostate cancer recurrence: a prospective, randomized, multicenter phase II trial. *J Clin Oncol.* 2018;36:446–453.
26. Calais J, Kishan AU, Cao M, et al. Potential impact of 68Ga-PSMA-11 PET/CT on the planning of definitive radiation therapy for prostate cancer. *J Nucl Med.* 2018;59:1714–1721.
27. Bluemel C, Linke F, Herrmann K, et al. Impact of 68Ga-PSMA PET/CT on salvage radiotherapy planning in patients with prostate cancer and persisting PSA values or biochemical relapse after prostatectomy. *EJNMMI Res.* 2016;6:87.
28. Malik D, Sood A, Mittal B, et al. Nonspecific uptake of 68Ga-prostate-specific membrane antigen in diseases other than prostate malignancy on positron emission tomography/computed tomography imaging: a pictorial assay and review of literature. *Indian J Nucl Med.* 2018;33:317.

## EDITORIAL COMMENT



We appreciate the thoughtful editorial comment in regards to our manuscript.<sup>1</sup> Although it is true that just over 50% of patients included in our study demonstrated prostate-specific membrane antigen (PSMA) Positron Emission Tomography (PET) avidity, this is actually a fairly high percentage given the population study. Inclusion of patients was limited to those with a prostate-specific antigen (PSA) <2.0 ng/dL, resulting in median PSA of 0.4 (0.28-0.63). PSMA PET sensitivity has been shown to be dependent on PSA levels and kinetics, and is associated with higher risk disease.<sup>2</sup> Therefore, this population with a low PSA will inherently result in lower detection rates.

It is also noted that while 53% of patients exhibited positive findings on PSMA PET, only 20% of our population was found to have disease outside the salvage radiation fields. It is critical to recognize, however, our standard radiation targets included the prostatic fossa and pelvic lymph nodes. Salvage radiation historically is limited to the prostate bed alone. In our study, just 12% (15 of 125) of patients had PSMA detectable disease in the prostatic fossa, and 48% (60 of 125) had pelvic lymph nodes, meaning a majority of our cohort would have been insufficiently treated with traditional salvage radiation fields. Preliminary results of RTOG 0534/SPPORT trial demonstrated significantly improved 5-year freedom from progression when including

pelvic nodes in salvage radiotherapy, although still nearly 20% of patients progressed despite this treatment.<sup>3</sup> One could posit that salvage RT in these cases is missing some gross disease at the time of treatment, and that treatment of all sites of disease in these 20% of patients with PSMA avidity outside salvage RT fields could lead to improved outcomes. Furthermore, PSMA-avid nodes at our institution are dose-escalated,<sup>4</sup> so the imaging study would lead to management changes for men with disease within nodal volumes.

It is important to note that while Gallium-68 PSMA-11 PET is an exciting and novel imaging technique, it is not yet FDA approved. Alternative nuclear imaging agents such as F-18 fluciclovine and C-11 choline have been approved for use in biochemical recurrence, with much lower demonstrated sensitivity and specificity compared to PSMA PET.<sup>5</sup> Furthermore, while false positives are a limitation of any imaging modality including PSMA PET, trained readers do not interpret celiac ganglia or other known anatomic aberrations as positive.

We do not yet know if changes to radiotherapy plans based on PSMA PET imaging will improve clinical outcomes (eg, time to biochemical failure, development of distant metastases, or overall survival). Prospective study of this modality in both the salvage and definitive setting is needed. In the era of precision medicine, just as genomic examination is being utilized to tailor prostate cancer treatment, PSMA PET imaging has the potential to lead to personalized treatments with superior outcome.

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## References

1. Boreta L, Gadzinski A, Wu S, et al. Location of recurrence by Gallium-68 PSMA-11 PET scan in prostate cancer patients eligible for salvage radiotherapy. *Urology.* 2019;129:158–164.
2. Perera M, Papa N, Christidis D, et al. Sensitivity, specificity, and predictors of positive 68Ga-prostate-specific membrane antigen positron emission tomography in advanced prostate cancer: a systematic review and meta-analysis. *Eur Urol.* 2016;70:926–937.
3. Pollack A, Karrison TG, Balogh AG, et al. Short term androgen deprivation therapy without or with pelvic lymph node treatment added to prostate bed only salvage radiotherapy: the NRG oncology/RTOG 0534 SPPORT trial. *Radiat Oncol Biol.* 2018;102:1605.
4. Wu SY, Boreta L, Shinohara K, et al. Impact of staging 68Ga-PSMA-11 PET scans on radiation treatment plans in patients with prostate cancer. *Urology.* 2019;125:154–162.
5. National Comprehensive Cancer Network. Prostate cancer (2019). Available at: [https://www.nccn.org/professionals/physician\\_gls/PDF/prostate.pdf](https://www.nccn.org/professionals/physician_gls/PDF/prostate.pdf). Accessed October 3, 2019.

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## AUTHOR REPLY



The authors performed a retrospective study on 125 patients who experienced a biochemical relapse following radical prostatectomy (RP) and who were subjected to a PSMA-PET/CT in order to assess if the recurrent cancer foci were located within standard radiation target volumes.<sup>1</sup> According to their data, 53% of the