Supplemental Table 1: Uni- and multivariable (Cox regression) association of biochemical failure with baseline demographic, clinical, and treatment characteristics

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|  |  | **Univariable**  (HR, 95% CI; P value) | **Multivariable**  (HR, 95% CI, P value) |
| **Age (yrs)** | Continuous | 1.008, (0.965, 1.053); 0.723 | - |
| **Race/Ethnicity**  (white referent) | Black | 1.620, (0.388, 6.753); 0.508 | - |
| **Pre-operative PSA (ng/mL)** | Continuous | 0.995, (0.956, 1.035); 0.794 | - |
| **Pathologic Tumor Stage**  (T2 referent) | T3 | 1.526, (0.804, 2.898); 0.196 | - |
| T4+unknown | 0.876, (0.116, 6.614); 0.898 | - |
| **Pathologic Nodal Stage** (referent N0) | N1 | 1.127, (0.399, 3.185); 0.822 | - |
| Unknown | 0.727 (0.099, 5.343); 0.754 | - |
| **Pathologic Gleason Score** (referent score 7) | <7 | 0.466, (0.109, 1.99); 0.303 | 0.396, (0.093, 1.695); 0.212 |
| >7 | 3.080, (1.597, 5.939); **0.001** | 3.530, (1.824, 6.833); **<0.001** |
| **Margin Status**  (referent margin negative) | Positive | 1.084, (0.552, 2.129); 0.815 | - |
| **Pre-RT PSA (ng/mL)** | Mean (Range) | 0.828, (0.601, 1.141); 0.248 | - |
| **Months Post-operative** | Median (Range) | 0.994, (0.985, 1.003); 0.168 | - |
| **Field**  (referent PB field) | Whole pelvis and prostate bed | 0.378, (0.134, 1.065); **0.066** | 0.238 (0.083, 0.684); **0.008** |
| **Modality**  (referent proton only) | Proton and IMRT | 0.569, (0.270, 1.199); 0.138 | - |
| **Proton Technique**  (referent PBS) | Passive Scattering | 0.451, (0.156, 1.305); 0.142 | - |
| **Prescribed dose (Gy RBE)**  (referent 70.2) | 66.6 | 2.426, (0.581, 10.127); 0.224 | - |
| 75.6 | 0.316, (0.043, 2.308); 0.256 | - |
| **Concurrent Androgen Deprivation Therapy**  (referent none) | Yes | 0.860, (0.435, 1.702); 0.665 | - |

PSA: prostate specific antigen; RT: radiotherapy; IMRT: intensity-modulated radiation therapy; RBE: relative biological effectiveness.

Supplemental Table 2. Comparison of Current Proton Therapy Study with Salvage Photon Therapy Studies and Clinical Trials

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| --- | --- | --- | --- | --- |
| **Salvage RT**  **studies** | **Cohort** | **Biochemical failure definition** | **5 yr BFFS** | **5 yr OS** |
| **Current study** | N = 100  Univ of Penn  2010-2016 | 2 consecutive PSA rises above the nadir, clinical progression, or initiation of salvage therapy (e.g. ADT) | 56% | 99% |
| **Tendulkar RD, et al. 2016** | N = 2,460  10 tertiary care centers  1987-2013 | PSA nadir+0.2 ng/mL, confirmed by a second higher PSA, or a continued rise in PSA, or initiation of ADT | 56% | Not reported |
| **Carrie C, et al. 2019** | N = 743  2006-2010  43 centers in France | PSA nadir+0.5 ng/mL, or clinical progression | 62% RT  80% RT+ADT | 96% RT  95% RT+ADT |
| **Pollack A, et al. 2018** | N = 1,792  centers in the US, Canada, and Israel  2008-2015 | 1) maintenance of a PSA less than the nadir+2 ng/mL, absence of clinical failure, and absence of death from any cause for 5 years  2) PSA ≥ 0.4 ng/mL and rising at 5 years after randomization (secondary BF endpoint), the development of hormone refractory disease (3 rises in PSA during ADT) | 71.7% PBRT  82.7% PBRT+ADT  89.1% WPPB+ADT | Not yet reported |

RT: radiotherapy; BFFS: biochemical failure-free survival; OS: overall survival; PSA: prostate specific antigen; ADT: androgen deprivation therapy; PB: prostate bed field; WP: whole pelvis field.

Supplemental Figure 1. Kaplan-Meier survival estimates for biochemical failure-free survival for (A) Gleason score greater than, less than, or equal to 7, (B) pelvic nodal irradiation (whole pelvis (WP)) vs prostate bed (PB) only, for post-prostatectomy proton therapy.



