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# Author's Accepted Manuscript

Effect of Level of Urology Training on Gleason Score and Prostate Volume Estimation Agreement Between Transrectal Ultrasound-Guided Biopsy and Radical Prostatectomy Specimen

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32 **Abstract**

33

34 **Introduction:** TRUS-guided prostatic biopsy may be performed by operators with different level  
35 of training. Little is known about the impact of training level on biopsy results. This study aims  
36 to evaluate the effect of level of training on the accuracy of TRUS-guided prostate biopsy  
37 findings.

38 **Methods:** We retrospectively reviewed 500 consecutive patients who underwent TRUS-guided  
39 prostate biopsy and subsequent radical prostatectomy (RP).

40 TRUS operators were stratified based on level of training: junior, senior, chief, fellow, or staff.

41 Linear regression was performed to analyze the effect of training level on volume estimates. A  
42 weighted Kappa statistic evaluated agreement between biopsy and pathologic Gleason scores,  
43 while an adjusted cumulative logistic regression model analyzed effects of training level.

44 **Results:** 482 patients were included in the final analysis. TRUS biopsy was performed by staff in  
45 78 (16%) patients, by fellows in 18 (4%), chief residents in 48 (10%), senior residents in 126  
46 (26%), and by junior residents in 212 (44%). There was no significant difference between TRUS  
47 and RP specimen volume estimates between the training levels. Level of training was not  
48 significantly associated with pathologic features including Gleason score, primary Gleason  
49 grade, highest single Gleason grade, and estimated tumor volume. Limitations include the  
50 retrospective design, and the variability between members of the same group.

51 **Conclusions:** Agreement between biopsy and pathologic Gleason scores is high for all levels of  
52 training. Level of training has no impact on prostate volume estimations or prediction of  
53 pathologic features.

54

**55 Introduction:**

56

57 Transrectal ultrasound (TRUS) was first introduced in the field of urology approximately 40  
58 years ago, and became one of the most important diagnostic tools available to the urologist<sup>1</sup>.

59 Today, its most common use remains imaging of the prostate especially in the setting of prostate  
60 core needle biopsies: despite being increasingly challenged by MRI-guided techniques, TRUS-  
61 guided biopsy still remains the gold standard for prostate cancer diagnosis. A wide range of  
62 cancer detection rates have been reported for TRUS biopsy, ranging from 25-49%, the variation  
63 depending on the indications used for biopsy as well number of cores taken and various  
64 templates used over the years<sup>2-8</sup>.

65

66 Numerous studies evaluated templates for both the optimum number and location of cores to be  
67 sampled. Overall detection rates were shown to increase with the number of cores taken<sup>9</sup>. Use  
68 of extended 10-12 core systematic biopsy templates, which include samples of the lateral  
69 peripheral zone, in addition to sampling suspicious lesions was shown to improve cancer  
70 detection rates<sup>9-13</sup>. In addition, an extended template biopsy has been shown to decrease the  
71 probability of a positive repeat biopsy following an initial negative extended biopsy<sup>14</sup>.

72 Furthermore, the extended 12 core biopsy template has been shown to have no significant

73 difference in quality of life and return to daily activity, work, or exercise compared to a sextant

74 biopsy<sup>15</sup>. The constellation of these findings, along with other similar studies, led to the adoption

75 of a 12 core template including sextant and lateral peripheral zone sampling at base, mid-gland

76 and apex bilaterally for TRUS-guided prostate biopsy in addition to biopsy of any palpable

77 abnormalities on DRE or suspicious lesion on TRUS as the standard of care according to NCCN  
78 and EAU guidelines<sup>16, 17</sup>.

79

80 In addition to guiding prostate biopsy, prostate volume estimation is another tool that TRUS  
81 offers to the urologist; this is commonly calculated using an ellipsoid formula. Volume  
82 measurements may be helpful in surgical planning and are necessary in calculating PSA density  
83 which may be used adjunctively in determining whether to recommend a biopsy or in prognostic  
84 models to predict surgical outcomes<sup>18-20</sup>.

85

86 TRUS-guided prostate biopsy is one of the first urologic procedures taught to urology residents.

87 Whether experienced urologists better sample the prostate during biopsy compared to urology

88 residents has not been extensively studied: quality standards for prostate biopsy have been

89 established and include length of the core and percentage of cores with no prostatic tissues.

90 Accuracy of prostate cancer detection has been shown to be influenced by the length of biopsy

91 cores<sup>21</sup>. Benchikh et al studied average length of biopsy cores taken by residents and reported

92 significant improvement in average core length from the first to twelfth biopsies performed, after

93 which point average core length plateaued<sup>22</sup>. A few studies have examined the performance of

94 urology residents in TRUS prostate biopsies with regards to cancer detection, and have shown

95 residents at all levels of training perform equally well<sup>22, 23</sup>. In our program, prior to autonomy,

96 residents have formal didactics and supervised training during their internship (PGY-1) year.

97

98 The objective of this study is to evaluate the performance of residents at various levels of  
99 training to accurately biopsy the prostate and estimate volume, using the RP specimen as a gold  
100 standard.

101

## 102 **Materials and Methods:**

103 We retrospectively reviewed 500 consecutive patients who underwent TRUS-guided transrectal  
104 prostate biopsy and subsequent RP for definitive treatment of prostate cancer at our institution  
105 from 2005-2007. The minimum standard was a 12-core biopsy template. TRUS operators were  
106 stratified based on level of training : junior resident (PGY2), senior resident (PGY3-4), chief  
107 resident (PGY5-6), fellow, or staff.

108

## 109 **Prostate volume:**

110 Prostate dimensions in terms of length (craniocaudal), width, and height (anteroposterior) were  
111 measured using TRUS. Prostate volume was estimated by applying an ellipsoid equation  
112  $(\pi/6 * l * w * h)$ .

113 Volume of the RP specimen was calculated from the true dimensions of the fresh specimen  
114 applying the same ellipsoid equation. Differences between TRUS-estimated and RP specimen-  
115 estimated volumes were compared within each level of training as were differences between the  
116 various levels of training. Logarithmic transformation of both volume estimates was performed  
117 to facilitate linear regression analysis to assess the value of TRUS volume and level of training  
118 as predictors of RP specimen-estimated volume.

119

120 **Gleason Score:** For practical purposes, Gleason scores were categorized into three different  
121 groups – low (Gleason 6), intermediate (Gleason 7), and high (Gleason 8-10) – in accordance  
122 with prostate cancer risk stratification. Both biopsy and RP specimen examinations were  
123 performed by experienced uropathologists at our institution. Analysis of agreement between  
124 biopsy and pathologic Gleason scores for each level of training was done using a weighted  
125 Kappa statistic. Kappa values  $<0.2$  indicate poor to slight agreement while values of 0.2-0.4,  
126 0.4-0.6, 0.6-0.8 and  $>0.8$  indicate fair, moderate, substantial, and near perfect agreement,  
127 respectively. An adjusted cumulative logistic regression model was used to evaluate how  
128 prediction of pathologic Gleason score from the biopsy Gleason score was affected by level of  
129 training. Sub-analyses evaluating the highest single (3, 4, or 5) clinical and pathologic Gleason  
130 grades as well as the primary clinical and pathologic Gleason grades (3, 4, or 5) were done using  
131 the same methods.

132  
133 The percentage of positive core from each individual biopsy core was summed and divided by  
134 the sum of each individual biopsy core length to calculate percentage of positive cores for the  
135 entire biopsy. Tumor volume was estimated using the ellipsoid formula and the pathologic  
136 specimen. Logarithmic transformation of estimated tumor volume was performed to facilitate  
137 linear regression analysis to evaluate percentage of positive cores in the biopsy and level of  
138 training as predictors of estimated tumor volume.

139

140 **Results:**

141



142 This IRB approved study included 482 patients who provided their consent for research  
143 purposes. TRUS biopsy was performed exclusively by staff in 16.2% (78/482), fellows in 3.7%  
144 (18/482), chief residents in 10% (48/482), senior residents in 26.1% (126/482), and junior  
145 residents in 44% (212/482).

146  
147 Mean and median TRUS-estimated and RP specimen-estimated volumes stratified by level of  
148 training are displayed in Table 2. Overall, there was no significant difference between TRUS-  
149 estimated volume and RP specimen-estimated volume ( $p=0.33$ ) nor were there any significant  
150 differences between volume estimations within each experience level (Table 1). The differences  
151 between the various experience levels were not significant ( $p=0.24$ ).

152  
153 Overall, level of training did not significantly affect prediction of the RP specimen-estimated  
154 volume ( $p=0.26$ ) nor did the TRUS volume slope vary by level of training ( $p=0.58$ ). There was a  
155 significant difference in the prediction of RP specimen-estimated volume by junior residents  
156 compared to staff ( $p=0.045$ ). Preoperative PSA and TRUS volume were found to be  
157 significantly associated with RP specimen-estimated volume (Table 2).

158  
159 Using the three different classifications of Gleason score, agreement between clinical and  
160 pathologic Gleason scores for junior residents, senior residents, chief residents, fellows and staff  
161 was 76.7%, 72.2%, 72.3%, 83.3%, and 87.0%, respectively. Using the weighted Kappa statistic,  
162 the highest concordance indices were observed for staff and fellows (both  $\kappa = 0.72$ ) and the  
163 lowest for senior residents ( $\kappa = 0.46$ ); however, this method does not allow adjustment for  
164 covariates. When clinical and pathologic Gleason scores differed, biopsy Gleason score was

165 more frequently lower than pathologic Gleason score, a trend consistent across all levels of  
166 training (Table 3).

167  
168 On logistic regression, level of training had no significant effect on prediction of pathologic  
169 Gleason score by clinical Gleason score using staff as a reference ( $p = 0.30$ ). Clinical/biopsy  
170 Gleason score and estimated tumor volume were found to be significant predictors of pathologic  
171 Gleason score (Table 4). Additionally, there was no evidence that the effect of training varied by  
172 clinical Gleason score ( $p = 0.13$ ).

173  
174 Similar sub-analyses evaluating agreement between single highest clinical and pathologic  
175 Gleason grades (Supplementary Tables 1-2), and primary clinical and pathologic Gleason grades  
176 (Supplementary Tables 3-4) were performed. Results from both these focused analyses mirrored  
177 those of the total clinical and pathologic Gleason scores in that level of training did not  
178 significantly impact prediction of these pathologic features.

179  
180 Finally, the prediction of estimated tumor volume by the percentage of positive cores in the  
181 biopsy was not affected by level of training overall ( $p=0.08$ ) nor did its effect vary significantly  
182 by maximum clinical Gleason grade ( $p=0.50$ ). The percentage of positive cores in the biopsies  
183 and preoperative PSA were significant predictors of estimated tumor volume (Table 5).

184  
185 **Discussion:**

186

187 To our knowledge, the findings of resident-performed TRUS-guided prostate biopsies –  
188 specifically Gleason score and volume estimation have not been compared to radical  
189 prostatectomy (RP) specimens to determine the potential effect the level of training may have on  
190 their accuracy.

191  
192 Experience has previously been studied for potential effect on cancer detection for TRUS-guided  
193 prostate biopsy. Lawrentschuk et al evaluated the difference in prostate cancer detection in over  
194 4500 TRUS biopsies performed by four different uro-radiologists<sup>3</sup>. The authors reported cancer  
195 detection ranged from 43.8-52.4% among the four operators and noted the operator to be a  
196 significant predictor of cancer detection; however, no learning curve was detected. Rather,  
197 differences in cancer detection rates between operators were concluded to be the result of  
198 difference in expertise and/or technique.

199  
200 Previous studies have examined how level of training impacts the rate of cancer detection when  
201 performing TRUS-guided prostate biopsy and found no significant differences between resident  
202 training levels in overall cancer detection<sup>22-24</sup>. Benchikh et al described a learning curve for  
203 residents on the basis of improvement of the average biopsy core length, which plateaued after  
204 12 procedures<sup>22</sup>. However, this learning curve did not seem to affect cancer detection rates,  
205 which were stable throughout the study period<sup>22</sup>.

206  
207 Our study evaluates the impact level of training may have on the accuracy of prostate biopsy by  
208 comparing the Gleason score from the RP specimen to that from the TRUS-biopsy. Obviously,  
209 even in the most experienced hands there is not 100% concordance between clinical/biopsy and

210 pathologic/RP-specimen Gleason scores. At all levels, clinical variables appropriately predicted  
211 the corresponding pathological variables. Using staff performance as a reference, we found level  
212 of training to have no significant effect on predicting the pathologic Gleason score.

213

214 In sub-analyses of the both the highest single Gleason grade and the primary Gleason grade, both  
215 biopsy Gleason grades remained predictive of their pathologic counterpart and no significant  
216 differences were observed between levels of training. It should be noted that when biopsy  
217 Gleason score was not in agreement with pathologic Gleason score, biopsy Gleason score was  
218 more frequently lower than pathologic Gleason score. This was true for overall, maximum, and  
219 primary Gleason scores, with no relationship to the level of training. When examining individual  
220 contrasts with staff, it was noted that senior residents differ from staff in prediction of primary  
221 Gleason grade (OR 5.530;  $p=0.015$ ).

222

223 We also evaluated the effect of level of training on the accuracy of TRUS prostate volume  
224 estimations. TRUS, in the hands of experienced operators, yields precise volume estimations  
225 such that there is good agreement when TRUS is either repeated by the same operator or  
226 performed by different, experienced operators<sup>25</sup>. Sech et al evaluated the effect level of training  
227 had on TRUS-estimated prostate volumes having a junior resident, senior resident, and attending  
228 physician perform TRUS on the same 121 patients<sup>26</sup>. The study authors reported an  
229 intraexaminer correlation of 0.96 (0.95-0.97) for total volume<sup>26</sup>.

230

231 However, while TRUS has been shown to be precise in its volume estimations, its accuracy has  
232 been questioned as studies have shown TRUS generally underestimates prostate volume by as

233 much as 20% when compared to prostate specimen weight following RP<sup>27-29</sup>. More recently,  
234 Rodriguez et al suggested the ellipsoid formula is the primary source for inconsistency in TRUS  
235 prostate volume estimations as they showed volume estimations using an ellipsoid formula and  
236 measurements from RP specimens also underestimated actual gland weight<sup>29</sup>.

237

238 We compared TRUS-generated volume estimates to volume estimates from RP specimens  
239 calculated using the same ellipsoid formula and dimensions of the RP specimen, similar to  
240 Rodriguez et al. Since both estimations use the same ellipsoid formula, the formula is not a  
241 confounder in our evaluation of level of training's potential effect on accuracy of the TRUS-  
242 volume estimation.

243

244 Within each level of training, there was no significant difference between TRUS-estimated  
245 volume and RP specimen-estimated volume. Furthermore, the differences between TRUS-  
246 estimations and RP specimen estimations were not significantly different for the various levels of  
247 training. Trends were noted for both junior residents and chief residents to overestimate prostate  
248 volume with TRUS by a median of 0.9 cc and 3.0 cc ( $p=0.06$  and  $p=0.09$ ), respectively.

249

250 Linear regression analysis confirmed that prediction of RP specimen-estimated volume, as  
251 expected, is affected by changes in TRUS volume and preoperative PSA (Table 2). However,  
252 level of training overall did not significantly affect the prediction of RP specimen-estimated  
253 volume. When examining individual contrasts with staff, junior residents differed from staff in  
254 their prediction of RP specimen-estimated volume ( $p=0.045$ ). However, given the modest  $p$ -  
255 value and the number of comparisons, the actual relevance of this finding is uncertain.

256 Additionally, the smaller magnitude of the regression coefficient (0.09) for this difference from  
257 staff may carry little clinical significance.

258  
259 While this study is novel in assessing accuracy of TRUS biopsy findings among different levels  
260 of training, it is not devoid of limitations beginning with its retrospective nature. We also did not  
261 utilize a strictly prospective and standardized biopsy protocol. However, all residents are  
262 required to complete the same ultrasonography training course in which they are taught  
263 appropriate technique for prostate biopsy prior to performing biopsies in clinic, thus there is  
264 minimal variation in their education regarding how to perform this procedure. Of interest, no  
265 staff members were regularly present in the room when residents/fellows performed the biopsy,  
266 thus minimizing the possible external influence on the operator. However, use of a standardized  
267 biopsy protocol is likely to increase both inter-group and interobserver agreement, further  
268 reducing the differences among different training level groups. Additionally, there was no  
269 distinction made between office-based biopsies and those conducted in an outpatient surgical  
270 center setting; in spite of that, in our clinical practice we do not observe any difference in core  
271 number among different training groups.

272 Finally, there are some aspects that could limit the applicability of our findings. First of all, the  
273 present study was carried out at an academic institution with a structured training program,  
274 therefore it might only partially apply to institutions without a well-organized training program.  
275 Moreover, while the use of RP pathology as a reliable gold standard is an advantage of the  
276 present work, on the other hand, this choice could theoretically limit the generalization of our  
277 findings to other groups of patients such as those managed with active surveillance of radiation  
278 therapy.

279

280 Nonetheless, this novel study provides evidence to support the idea that prostate cancer

281 management is not compromised when residents perform TRUS-guided prostate biopsy.

282 However, confirmation of these training level and achievement of appropriate skills will need to

283 be re-assessed as more advanced biopsy techniques are introduced into our biopsy schemes.

284

285 In conclusion, our findings show that the level of training does not significantly impact the

286 accuracy of TRUS-guided prostate biopsy findings and the procedure can be safely performed by

287 relatively inexperienced urology residents without compromising patient care.

288

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290

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375

Table 1: Differences between TRUS-estimated and RP specimen-estimated volumes for level of training and comparison between these differences by level of training

	<b>Junior</b> mean (SD) median	<b>Senior</b> mean (SD) median	<b>Chief</b> mean (SD) median	<b>Fellow</b> mean (SD) median	<b>Staff</b> mean (SD) median	<b>Total</b> mean (SD) median	
<b>TRUS volume</b>	41.5 (20.2) 36.8	41.9 (22.1) 37.3	42.2 (21.6) 36.9	36.4 (15.7) 33.4	34.9 (16.2) 30.8	40.4 (20.2) 35.9	
<b>RP volume</b>	39.6 (20.4) 34.0	41.2 (23.9) 34.0	38.8 (18.4) 33.5	38.2 (13.0) 39.6	37.0 (16.2) 33.0	39.5 (20.3) 33.9	
<b>Difference mean (SD)</b>	(n=185) -1.9 (13.3)	(n=114) +0.1 (19.3)	(n=42) -3.4 (12.6)	(n=18) +1.8 (15.8)	(n=67) +2.1 (12.5)	(n=426) -0.7 (15.1)	<b>p value</b> 0.2428
<b>p value</b>	0.0606	0.9686	0.0907	0.6307	0.1740	0.3335	

Table 2: : Linear regression of logarithm of RP specimen-estimated volume by logarithm of TRUS volume controlling by level of training, its interaction with logarithm of TRUS volume and preoperative PSA

<b>Variable</b>	<b>Coefficient (SE)</b>	<b>p value</b>
Log(TRUS volume)	0.73 (0.03)	<0.001
Junior (reference is staff, junior = 1, staff = 0)	-0.09 (0.04)	0.0450
Senior (reference is staff, senior = 1, staff = 0)	-0.05 (0.05)	0.3280
Chief (reference is staff, chief = 1, staff = 0)	-0.11 (0.06)	0.0663
Fellow (reference is staff, fellow = 1, staff = 0)	-0.00 (0.08)	0.9981
Preoperative PSA	0.06 (0.01)	<0.0001

Table 3 : Kappa statistic and percent agreement between clinical and pathologic Gleason scores (grouped as 2-6, 7, and 8-10) for each level of training

<b>Level of training</b>	<b>N</b>	<b><math>\kappa</math> (SE)</b>	<b>% agreement</b>	<b>% Bx &lt; RP</b>	<b>% Bx &gt; RP</b>
<b>Junior</b>	210	0.58 (0.05)	76.7 %	18.6 %	4.7 %
<b>Senior</b>	126	0.46 (0.07)	72.2 %	22.2 %	5.6 %
<b>Chief</b>	47	0.50 (0.12)	72.3 %	14.9 %	12.8 %
<b>Fellow</b>	18	0.72 (0.14)	83.3 %	16.7 %	0.0 %
<b>Staff</b>	77	0.72 (0.09)	87.0 %	13.0 %	0.0 %
<b>Total</b>	478				

Table 4: Cumulative logistic regression odds ratios of pathologic Gleason score (2-6, 7, 8-10) by clinical Gleason score, controlling by level of training, clinical stage, logarithm of RP specimen-estimated volume, logarithm of estimated tumor volume, and preoperative PSA

	<b>OR</b>	<b>95% CI</b>	<b>p-value</b>
<b>Clinical Gleason score (unit increase in group)</b>	16.360	9.480 - 28.232	<0.0001
<b>Junior (reference is Staff)</b>	1.096	0.552 - 2.177	0.7924
<b>Senior (reference is Staff)</b>	1.541	0.739 - 3.215	0.2488
<b>Chief (reference is Staff)</b>	0.716	0.272 - 1.887	0.4999
<b>Fellow (reference is Staff)</b>	0.982	0.272 - 3.547	0.9777
<b>Clinical stage (reference is T1ab, T1c)</b>	1.246	0.749 - 2.071	0.3975
<b>Log (RP specimen-estimated volume)</b>	0.774	0.435 - 1.377	0.3836
<b>Log (estimated tumor volume)</b>	1.523	1.308 - 1.773	<0.0001
<b>Preoperative PSA</b>	1.028	0.990 - 1.067	0.1506

Table 5: Linear regression of logarithm of estimated tumor volume by percentage of positive cores controlling by level of training, interaction with percentage of positive cores, clinical stage, logarithm of RP specimen-estimated volume and preoperative PSA

	<b>Coefficient (SE)</b>	<b>p value</b>
<b>% positive cores</b>	3.94 (0.46)	<0.0001
<b>Junior (reference is staff, junior = 1, staff = 0)</b>	0.24 (0.26)	0.3468
<b>Senior (reference is staff, senior = 1, staff = 0)</b>	0.06 (0.29)	0.8276
<b>Chief (reference is staff, chief = 1, staff = 0)</b>	0.71 (0.37)	0.0564
<b>Fellow (reference is staff, fellow = 1, staff = 0)</b>	0.81 (0.54)	0.1321
<b>Clinical stage (reference is T1ab, T1c)</b>	0.31 (0.20)	0.1179
<b>Log (RP specimen-estimated volume)</b>	-0.42 (0.22)	0.0560
<b>Preoperative PSA</b>	0.03 (0.01)	0.0044



**Abbreviations:**

DRE – digital rectal examination

PGY – post-graduate year

PSA – Prostate-specific antigen

PSAD – prostate-specific antigen density

RP – radical prostatectomy

TRUS – transrectal ultrasound

Supplementary Table 1: Kappa statistic and percent agreement between clinical and pathologic highest Gleason grade for each level of training

<b>Level of training</b>	<b>N</b>	<b><math>\kappa</math> (SE)</b>	<b>% agreement</b>	<b>% Bx &lt; RP</b>	<b>% Bx &gt; RP</b>
<b>Junior</b>	210	0.59 (0.05)	79.0 %	18.1 %	2.9 %
<b>Senior</b>	126	0.47 (0.07)	73.0 %	22.2 %	4.8 %
<b>Chief</b>	47	0.51 (0.13)	76.6 %	17.0 %	6.4 %
<b>Fellow</b>	18	0.61 (0.07)	77.8 %	2.2 %	0.0 %
<b>Staff</b>	77	0.70 (0.09)	87.0 %	13.0 %	0.0 %

Supplementary Table 2: Cumulative logistic regression odds ratios of maximum pathologic Gleason grade by maximum clinical Gleason grade, controlling by level of training, clinical stage, logarithm of RP specimen-estimated volume, logarithm of estimated tumor volume and preoperative PSA

	<b>OR</b>	<b>95% CI</b>	<b>p-value</b>
<b>Maximum clinical Gleason grade (unit increase)</b>	23.718	12.510 - 44.971	<0.0001
<b>Junior (reference is Staff)</b>	1.106	0.543 - 2.251	0.7818
<b>Senior (reference is Staff)</b>	1.633	0.765 - 3.487	0.2052
<b>Chief (reference is Staff)</b>	1.003	0.375 - 2.682	0.9957
<b>Fellow (reference is Staff)</b>	1.200	0.331 - 4.353	0.7821
<b>Clinical stage (reference is T1ab, T1c)</b>	1.208	0.718 - 2.032	0.4767
<b>Log (RP specimen-estimated volume)</b>	0.861	0.479 - 1.549	0.6180
<b>Log (estimated tumor volume)</b>	1.553	1.330 - 1.814	<0.0001
<b>Preoperative PSA</b>	1.031	1.000 - 1.063	0.0504

Supplementary Table 3: Kappa statistic and percent agreement between clinical and pathologic primary Gleason grade for each level of training

<b>Level of training</b>	<b>N</b>	<b><math>\kappa</math> (SE)</b>	<b>% agreement</b>	<b>% Bx &lt; RP</b>	<b>% Bx &gt; RP</b>
<b>Junior</b>	210	0.78 (0.07)	95.2 %	2.4 %	2.4 %
<b>Senior</b>	126	0.47 (0.11)	87.3%	10.3 %	2.4 %
<b>Chief</b>	47	0.38 (0.19)	85.1 %	6.4 %	8.5 %
<b>Fellow</b>	18	0.63 (0.17)	88.9 %	11.1%	0.0 %
<b>Staff</b>	77	0.64 (0.19)	96.1 %	1.3 %	2.6 %

Supplementary Table 4: Cumulative logistic regression odds ratios of primary pathologic Gleason grade by primary clinical Gleason grade, controlling by level of training, clinical stage, logarithm of RP-specimen-estimated volume, logarithm of estimated tumor volume and preoperative PSA

	<b>OR</b>	<b>95% CI</b>	<b>p-value</b>
<b>Primary Gleason grade (unit increase)</b>	40.930	16.585 - 101.012	<.0001
<b>Junior (reference is Staff)</b>	1.753	0.452 - 6.800	0.4173
<b>Senior (reference is Staff)</b>	5.530	1.396 - 21.903	0.0149
<b>Chief (reference is Staff)</b>	1.414	0.254 - 7.865	0.6921
<b>Fellow (reference is Staff)</b>	5.038	0.739 - 34.361	0.0988
<b>Clinical stage (reference is T1ab, T1c)</b>	0.936	0.421 - 2.079	0.8711
<b>Log (RP specimen-estimated volume)</b>	0.736	0.299 - 1.809	0.5042
<b>Log (estimated tumor volume)</b>	1.356	1.070 - 1.717	0.0117
<b>Preoperative PSA</b>	1.006	0.973 - 1.040	0.7256