

INIFY Prostate cancer predictions on biopsies

– performance and efficiency study on WSIs from two pathology labs in the US

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Background

Prostate cancer is one of the most common cancers in men. Artificial intelligence algorithms can be used to facilitate its diagnosis and help pathologists in the beginning of their career. In this study, the impact of INIFY Prostate on the diagnostic performance and efficiency (i.e., time for review) of two 4th year resident pathologists was evaluated. 484 biopsies (one slide per biopsy) were selected retrospectively: 242 from Tufts Medical Center (Boston) and 242 from The Ohio State University Wexner Medical Center (Ohio). The slides represented benign and cancer cases with different Grade Groups.

Study design

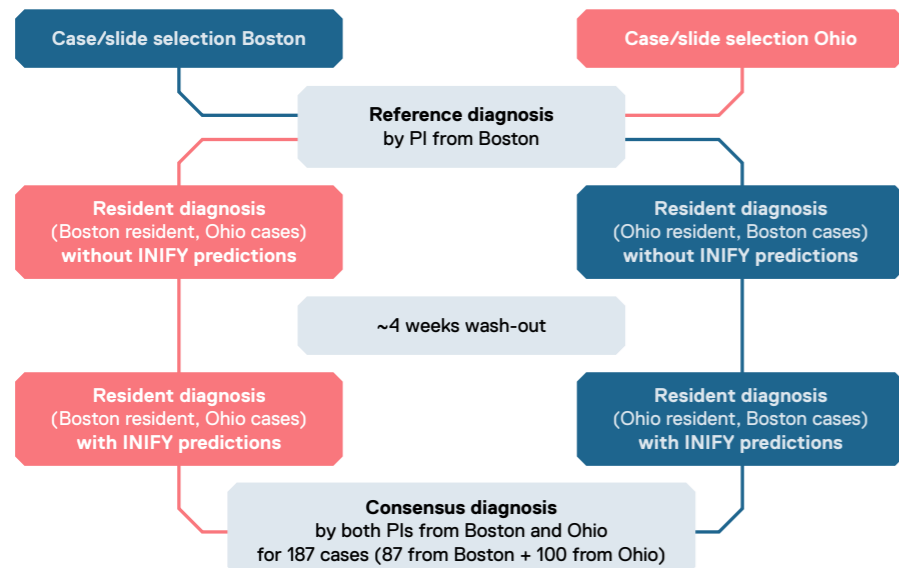


Figure 1 — Study design. 187 consensus diagnosis cases with incorrect resident diagnosis on cancer/benign level, incorrect GG and incorrect % cancer (by at least 10%).

Results

The overall sensitivity of resident diagnosis was 90%, and specificity was 92.8% (see table 1). The sensitivity increased 2.6% to 92.6% when INIFY predictions were available, while there was a slight drop in specificity (-0.4%). The site differences are presented in the table. Both residents were significantly faster and saved about 1 min per image diagnosis with INIFY predictions available ($p < .00001$).

Figure 2 and Figure 3 show examples where the resident changed their diagnoses with INIFY predictions outlining areas of suspicious cancer.

	N	No INIFY	INIFY	Difference	P-value (McNemar)
All cases					
Sensitivity	231	90,0	92,6	2,6	.13
Specificity	250	92,8	92,4	-0,4	.81
Boston cases					
Sensitivity	112	92,9	96,4	3,6	.16
Specificity	129	93,0	93,8	0,8	.76
Ohio cases					
Sensitivity	119	87,4	89,1	1,7	.48
Specificity	121	92,6	90,9	-1,7	.48

Table 1 — Sensitivity and specificity of residents without (No INIFY) and with INIFY. Overall results as well as results for Boston cases and Ohio cases, respectively.



Figure 2 — The resident missed image with small focus cancer (0.4 mmm) on Ohio slide without INIFY (upper image), but found it when INIFY outlined it (lower images).

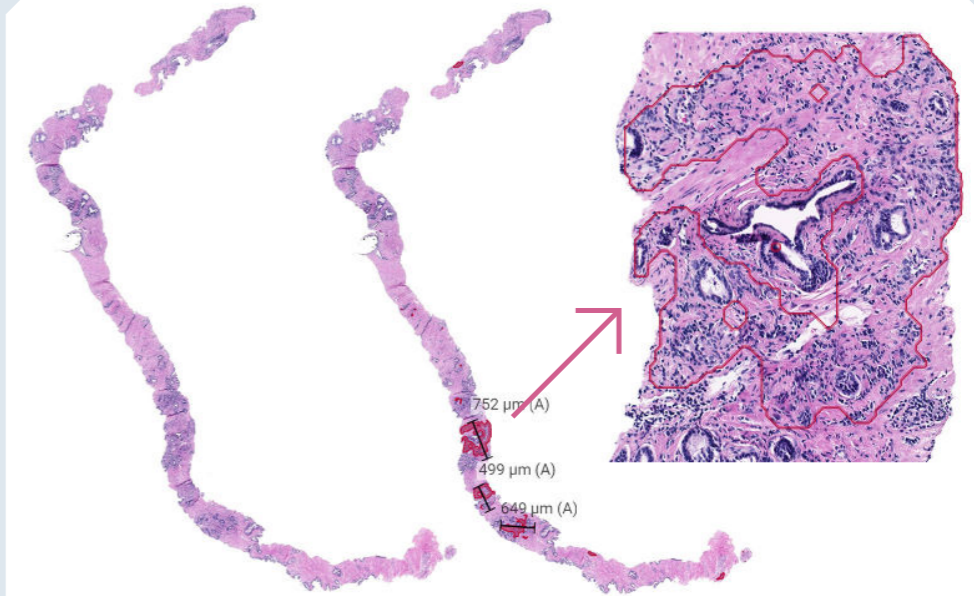


Figure 3 — An example where the resident over-diagnosed a benign slide where INIFY identified suspicious areas with inflammatory cells (decreased specificity). The resident correctly diagnosed benign image from Boston initially (to the left), but over-diagnosed inflammatory cells outlined by INIFY as suspicious – the resident annotated 1.9 mm cancer and assign it to Gleason score 5+4 (to the right).

Conclusions

By using INIFY Prostate predictions on slides, residents from two labs performed their diagnoses significantly faster than without using INIFY. The time saving was 30–40%, without any loss of performance. In fact, the sensitivity increased by about 2–4% with INIFY predictions, allowing the residents to identify 2–4 more cancers cases per 100 cancer cases correctly during the study.

The CE-marked INIFY® Prostate was developed by ContextVision AB for exclusive use by Inify Laboratories.