



Internal and External Validation of a 90-Day Percentage Erection Fullness Model Predicting Potency Recovery following Robot-assisted Radical Prostatectomy



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1. Introduction

Erectile dysfunction (ED) post-radical prostatectomy (RP) is of significant impact to patient quality of life. In 2018, we introduced the percent erection fullness score as a qualitative adjunct to the IIEF-5. While patients reporting 25-100% percent erection fullness at 90-days reliably recovered potency by 2 years, patients reporting 0-24% fullness were approximately 6 times more likely to suffer from long-term impotence.

The present study seeks to internally and externally validate the 90-day percent erection fullness scale in a prospective, multi-center patient populations.

2. Materials and Methods

- ❖ Previous % fullness model [Huynh, BJUI 2018] was re-developed with a 1-year potency endpoint.
- ❖ Potency was defined as affirmative answers to erections sufficient for intercourse (ESI).
- ❖ The model was then applied to a multi-center cohort of 91 patients across 5 surgeons for external validation.
- ❖ Only % fullness tertile was significantly associated with potency recovery (AUC=0.875) in internal validation.

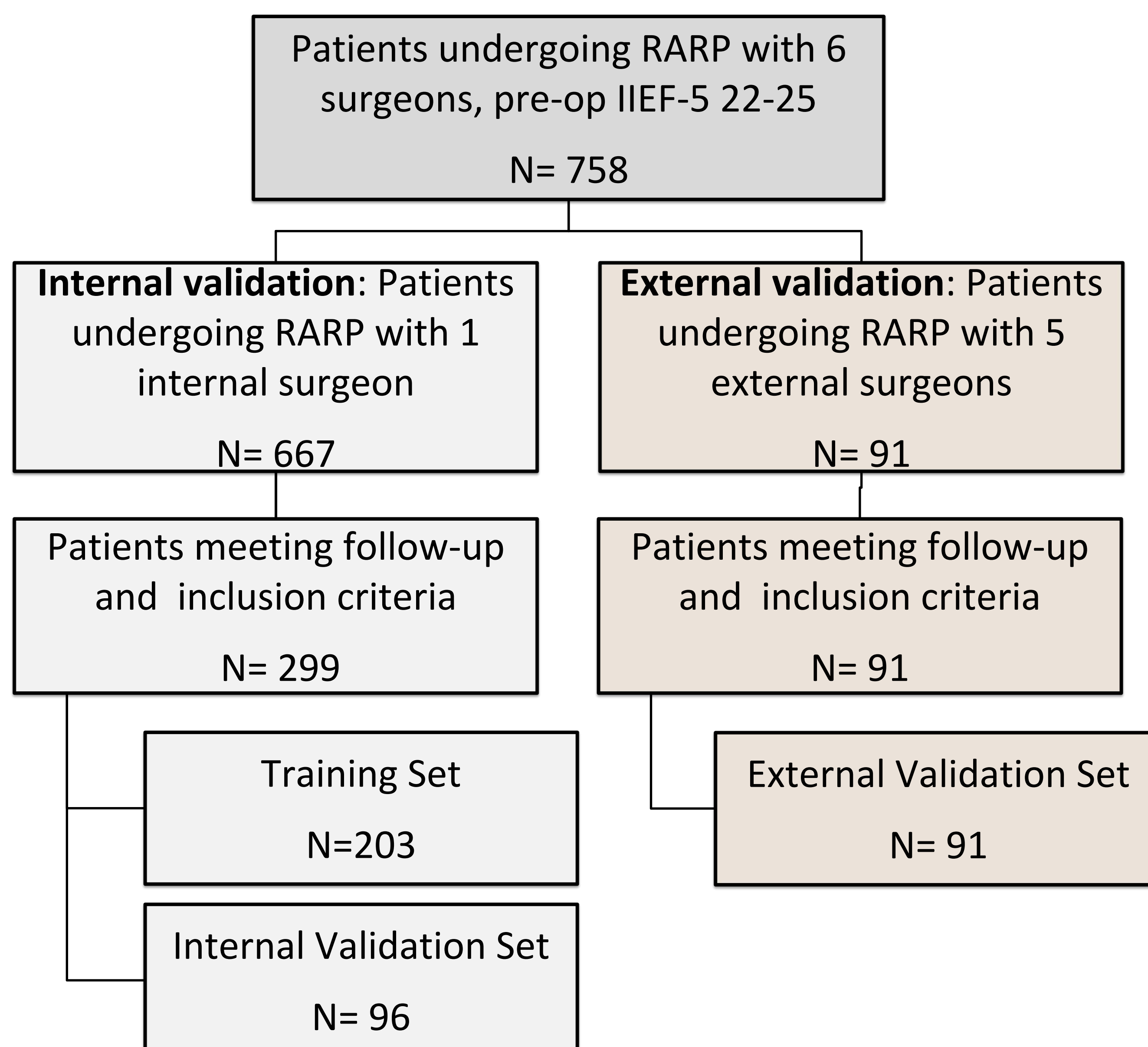


Table 1: Baseline Characteristics of Validation Cohort

Table 1: Baseline characteristics of training and validation set

	Training Set (N=203)		Internal Validation (N = 96)		External Validation (N = 91)	
	Mean	SD	Mean	SD	Mean	SD
Age (years)	58.34	7.11	59.38	6.35	60.58	9.53
Preop IIEF-5	24.33	0.88	22.51	5.74	24.15	0.91
PSA (ng/mL)	5.52	3.53	6.73	5.96	9.29	7.61
BMI (kg/m ²)	26.7	3.21	27.05	3.00	27.01	4.75
	N	%	N	%	N	%
Clinical Stage						
T1	149	74.5%	64	68.8%	38	42.7%
T2	50	25.0%	28	30.1%	51	57.3%
T3	1	0.5%	1	1.1%	0	0.0%
pGS						
≤3+3	118	58.1%	29	30.2%	31	34.1%
3+4	44	21.7%	46	47.9%	28	30.8%
4+3	18	8.9%	16	16.7%	21	23.1%
≤4+4	23	11.3%	5	5.2%	11	12.1%
Nerve-sparing						
None	1	0.5%	1	1.0%	0	0.0%
Unilateral	27	11.8%	12	12.5%	17	18.7%
Bilateral	178	87.7%	83	86.5%	74	81.3%
LN Dissection	75	37.0%	30	31.3%	25	27.5%

Figure 1: ROC Curve Analysis of 90-Day Percent Fullness

Figure 1a: (24 month potency) a 25% fullness threshold has sensitivity and specificity of 97.3% and 87.3, AUC=0.870.

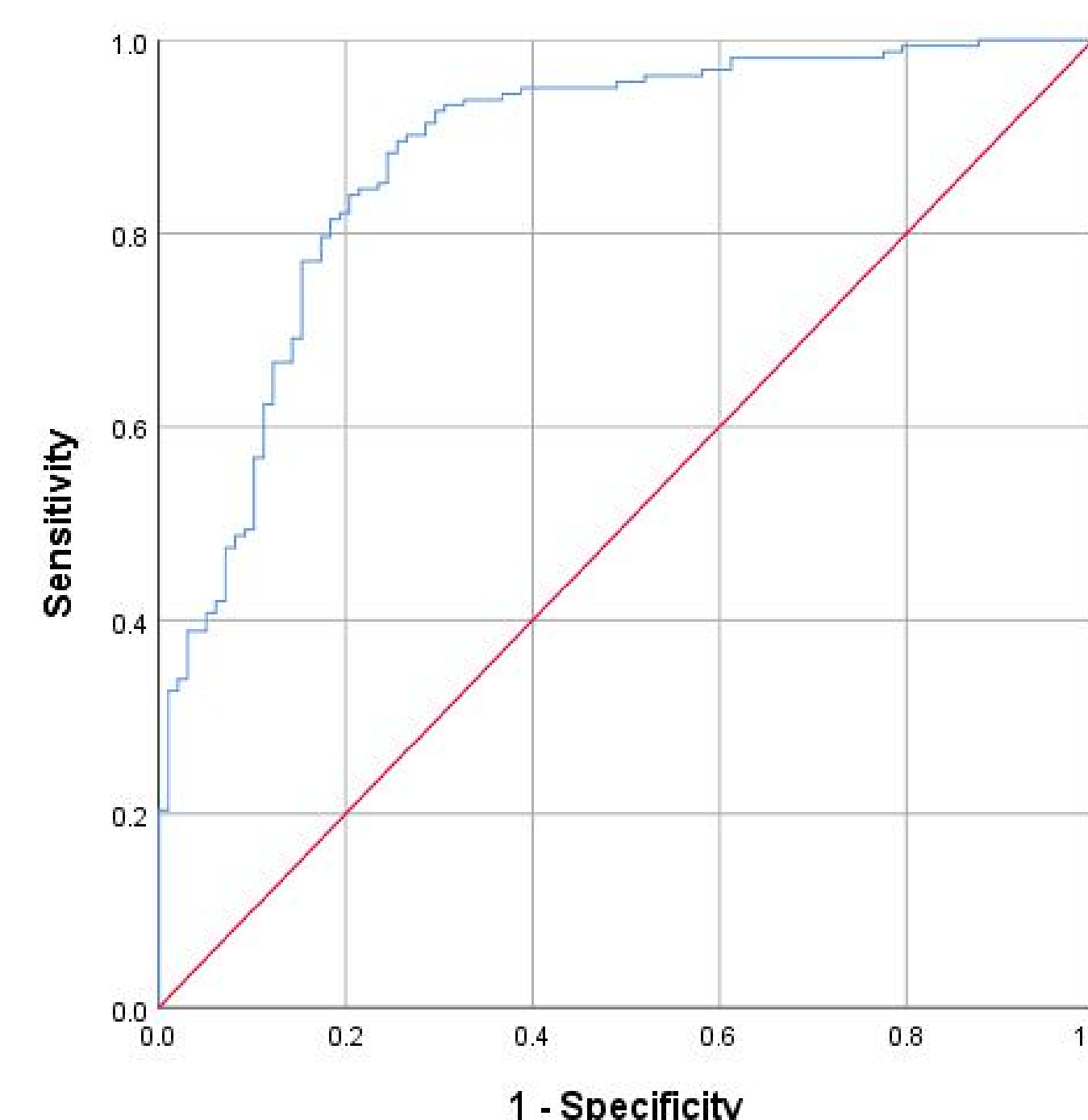


Figure 1b: (12 month potency) a 25% fullness threshold has sensitivity and specificity 97.3% and 88.1%, AUC=0.801.

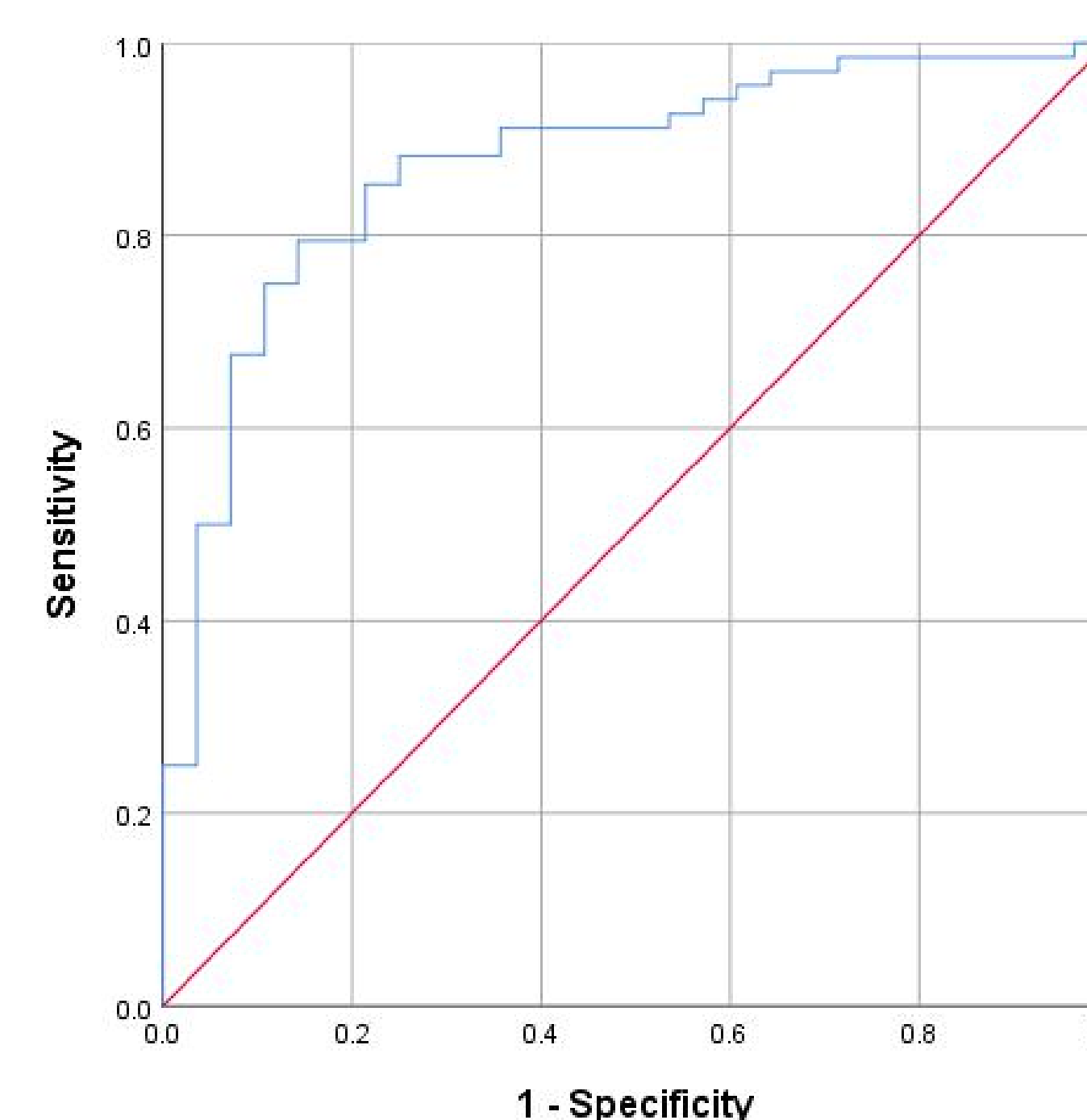


Table 2: Logistic Regression of Factors Predicting Long-Term Potency

Table 2a: Multivariate analysis of factors contributing to potency at 24 months, after controlling for covariates (AUC=0.887)

	B	S.E.	Wald	Sig.	OR	95% C.I.	
						Low	High
Age (cont.)	-0.035	0.038	0.852	0.356	0.965	0.895	1.041
Nerve-sparing [uni- vs. bi-]	0.370	0.734	0.255	0.614	1.448	0.344	6.105
% fullness [<25% vs. 25-100%]	1.767	0.583	9.175	0.002	5.854	1.866	18.36
Preoperative IIEF-5 (cont.)	-0.047	0.285	0.027	0.869	0.954	0.546	1.667
Preoperative PSA (cont.)	-0.029	0.049	0.349	0.554	0.971	0.882	1.070
C-stage [cT1 vs. cT2/3]	-0.647	0.553	1.372	0.241	0.523	0.177	1.546
Constant	1.371	7.804	0.031	0.861	3.940		

Table 2b: Multivariate analysis of factors contributing to potency at 12 months, after controlling for covariates (AUC=0.895)

	B	S.E.	Wald	Sig.	OR	95% C.I.	
						Low	High
Age (cont.)	-0.044	0.036	1.460	0.227	0.957	0.892	1.028
Nerve-sparing [uni- vs. bi-]	0.494	0.702	0.494	0.482	1.639	0.414	6.491
% fullness [<25% vs. 25-100%]	1.800	0.556	10.50	0.001	6.049	2.036	17.97
Preoperative IIEF-5 (cont.)	0.007	0.288	0.001	0.981	1.007	0.573	1.769
Preoperative PSA (cont.)	-0.021	0.042	0.256	0.613	0.979	0.902	1.063
C-stage [cT1 vs. cT2/3]	-0.403	0.516	0.609	0.435	0.668	0.243	1.838
Constant	0.981	7.713	0.016	0.899	2.666		

The mean ± SD predicted probability of 1-year potency recovery was 39.7% ± 3.2%, compared to an actual 36.26% patients recovering potency at 1 year. Since the actual proportion fell within one standard deviation of the models' predicted proportion the model shows good predictability.

4. Conclusions

We present internal and external validation of a 90-day percentage erection fullness score, confirming that the metric is a robust predictor of post-RP EF recovery.

Overall, percentage erection fullness at 3 months post-RP discriminates well between patients with a low or a high probability of recovery of EF, which can facilitate identification of need for early EF rehabilitation.