OPEN ACCESS

University of BRISTOL

Ito, H., Young, G., Lewis, A. L., Blair, P. S., Cotterill, N., Lane, A. A., Sakamaki, K., Drake, M. J., & Abrams, P. H. (2020). Grading severity and bother using the IPSS and ICIQ-MLUTS scores in men seeking lower urinary tract symptoms therapy. *The Journal of urology*. https://doi.org/10.1097/JU.0000000000001149

Peer reviewed version

Link to published version (if available):
10.1097/JU.0000000000001149

Link to publication record on the Bristol Research Portal
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via American Urological Association at https://doi.org/10.1097/JU.0000000000001149 . Please refer to any applicable terms of use of the publisher.

University of Bristol – Bristol Research Portal
General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:
http://www.bristol.ac.uk/red/research-policy/pure/user-guides/brp-terms/

Supplementary Table S1. Univariate regression model of IPSS-QoL scores rated between “mostly dissatisfied” and “unhappy” (N=627)

Variable	Average values of each categories	Coefficient (as continuous) *[Note: same as Table 2]*	Coefficient when considering difference of average values**	Coefficient (as categorized) *[Note: same as Table 2]*
Total IPSS (as continuous value)	*	0.130		
c2 (≥20 vs ≤19)	c2 (24.95 vs 13.24)		1.52 (=0.13*(24.95-13.24))	1.380
c3 (15 - 26 vs ≤14)	c3 (20.49 vs 9.95)		1.37 (=0.13*(20.49-9.95))	1.162
c3 (≥27 vs ≤14)	c3 (29.48 vs 9.95)		2.54 (=0.13*(29.48-9.95))	3.261
Total ICIQ-MLUTS/severity (as continuous value)	*	0.135		
c2 (≥19 vs ≤18)	c2 (24.00 vs 12.87)		1.5 (=0.135*(24.00-12.87))	1.330
c3 (16 - 25 vs ≤15)	c3 (20.07 vs 11.08)		1.21 (=0.135*(20.07-11.08))	0.977
c3 (≥26 vs ≤15)	c3 (29.20 vs 11.08)		2.45 (=0.135*(29.20-11.08))	2.828
Total ICIQ-MLUTS/bother (as continuous value)	*	0.037		
c2 (≥62 vs ≤61)	c2 (82.92 vs 33.44)		1.83 (=0.037*(82.92-33.44))	1.625
c3 (22 - 80 vs ≤21)	c3 (50.67 vs 11.82)		1.44 (=0.037*(50.67-11.82))	1.606
c3 (≥81 vs ≤21)	c3 (96.10 vs 11.82)		3.12 (=0.037*(96.10-11.82))	3.706

* See Table 2

** Coefficient for categorized value derived from continuous value coefficients (0.130, 0.135 and 0.037 for IPSS, ICIQ-MLUTS/severity and ICIQ-MLUTS/bother, respectively)

c2: Comparing ranges of scores in both categorized groups when distinguishing 2 groups (i.e. categorizing as mild or severe). The cut-off point predicting QoL impact (IPSS-QoL of <5 vs. ≥5) was 20 for IPSS, 19 for ICIQ-MLUTS/severity and 62 for ICIQ-MLUTS/bother. c3: Comparing ranges of scores in each categorized group, when distinguishing 3 groups (i.e. categorizing as mild, moderate or severe). Cut-off points are given in results section

ICIQ-MLUTS: International Consultation on Incontinence Questionnaires Male Lower Urinary Tract Symptoms; IPSS: International Prostate Symptom Score

Supplementary Table S2. The change of global QoL derived from IPSS-QoL (A) and bother derived from ICIQ-MLUTS bother scores (B1; voiding LUTS, B2; post voiding LUTS and B3; storage LUTS) associated with LUTS following surgery for those men who underwent surgery during the trial.

A. IPSS-QoL score

		No. of pts	Change of score at 18 months		
			Improvement	No change	Worse
baseline	0	0	0	0	0
	1	**2**	**1 (50%)**	**1 (50%)**	**0**
	2	**14**	**7 (50%)**	**1 (7.1%)**	**6 (42.9%)**
	3	46	36 (78.3%)	4 (8.7%)	6 (13%)
	4	50	43 (86%)	2 (4%)	5 (10%)
	5	97	86 (88.7%)	9 (9.3%)	2 (2.1%)
	6	54	48 (88.9%)	6 (11.1%)	0
	Total	263	221	23	19

B1. Voiding LUTS in ICIQ-MLUTS bother scores

Slow stream		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	66	59 (89.4%)	7 (10.6%)	0
	Moderate (5-7)	51	43 (84.3%)	6 (11.8%)	2 (3.9%)
	High (8-10)	92	73 (79.3%)	14 (15.2%)	5 (5.4%)
			175	27	7

Straining		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)

baseline	Low (0-4)	101	95 (94.1%)	6 (5.9%)	0
	Moderate (5-7)	51	44 (86.3%)	7 (13.7%)	0
	High (8-10)	38	29 (76.3%)	4 (10.5%)	5 (13.2%)
			168	17	5

B2. Post voiding LUTS in ICIQ-MLUTS bother scores

PMD		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	98	83 (84.7%)	7 (7.1%)	8 (8.2%)
	Moderate (5-7)	44	34 (77.3%)	5 (11.4%)	5 (11.4%)
	High (8-10)	72	43 (59.7%)	9 (12.5%)	20 (27.8%)
			160	21	33

Sensation of incomplete emptying		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	84	77 (91.7%)	7 (8.3%)	0
	Moderate (5-7)	49	44 (89.8%)	3 (6.1%)	2 (4.1%)
	High (8-10)	77	55 (71.4%)	8 (10.4%)	14 (18.2%)
			176	18	16

B3. Storage LUTS in ICIQ-MLUTS bother scores

Nocturia		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	60	52 (86.7%)	7 (11.7%)	1 (1.7%)
	Moderate (5-7)	55	46 (83.6%)	6 (10.9%)	3 (5.5%)
	High (8-10)	101	66 (65.3%)	13 (12.9%)	22 (21.8%)

			164	26	26

Increased daytime frequency		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	82	74 (90.2%)	7 (8.5%)	1 (1.2%)
	Moderate (5-7)	60	48 (80%)	9 (15%)	3 (5%)
	High (8-10)	72	47 (65.3%)	7 (9.7%)	18 (25%)
			169	23	22

Urgency		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	63	54 (85.7%)	8 (12.7%)	1 (1.6%)
	Moderate (5-7)	56	43 (76.8%)	10 (17.9%)	3 (5.4%)
	High (8-10)	97	64 (66%)	16 (16.5%)	17 (17.5%)
			161	34	21

Urgency UI		No. of pts	Score at 18 months		
			Low (0-4)	Moderate (5-7)	High (8-10)
baseline	Low (0-4)	88	79 (89.8%)	6 (6.8%)	3 (3.4%)
	Moderate (5-7)	35	23 (65.7%)	8 (22.9%)	4 (11.4%)
	High (8-10)	85	53 (62.4%)	11 (12.9%)	21 (24.7%)
			155	25	28

Table 1. Patient characteristics in the analysis set (N=627)

		Number of patients	Mean ± SD	Median (Min - Max)
Age		627	67.4 ± 9.0	68 (30-91)
Uroflowmetry	Q_{max}	598	12.4 ± 7.3	11.0 (1.4 – 58.3)
	Voided volume	604	250.3 ± 142.3	224.0 (7.0 - 947.0)
	PVR	603	136.4 ± 148.1	100.0 (0.0 - 1600.0)
IPSS-QoL		627	4.1 ± 1.3	4 (0 - 6)
IPSS		627	18.8 ± 7.1	19 (1 - 35)
ICIQ-MLUTS	Symptom severity	627	18.1 ± 6.8	18 (3 - 40)
	Bother	627	52.3 ± 29.2	51 (0 – 130)

SD: standard deviation; Q_{max}: maximum flow rate; PVR: post-void residual urine; IPSS-QoL: International Prostate Symptom Score Quality of Life; IPSS: International Prostate Symptom Score; ICIQ-MLUTS: International Consultation on Incontinence Questionnaires Male Lower Urinary Tract Symptoms.

Table 2. Univariate regression model of IPSS-QoL scores rated between “mostly dissatisfied” and “unhappy” (N=627)

Variable	Coefficient	Lower CI	Upper CI	P value	AIC
Age	-0.009	-0.027	0.009	0.318	867.377
Q_{max}	0.003	-0.019	0.025	0.780	828.399
Voided volume	-0.001	-0.003	0	0.021	832.351
PVR	0	-0.001	0.002	0.433	835.651
Total IPSS*	**0.130**	**0.104**	**0.159**	**<0.001**	**762.002**
c2 (≥20 vs ≤19)	1.380	1.05	1.716	<0.001	798.494
c3 (15 - 26 vs ≤14)	1.162	0.756	1.586	<0.001	755.457
c3 (≥27 vs ≤14)	3.261	2.572	4.033		
Total ICIQ-MLUTS/severity*	**0.135**	**0.107**	**0.165**	**<0.001**	**762.99**
c2 (≥19 vs ≤18)	1.330	1.001	1.665	<0.001	803.266
c3 (16 - 25 vs ≤15)	0.977	0.612	1.351	<0.001	768.34
c3 (≥26 vs ≤15)	2.828	2.203	3.523		
Total ICIQ-MLUTS/bother*	**0.037**	**0.03**	**0.044**	**<0.001**	**732.015**
c2 (≥62 vs ≤61)	1.625	1.279	1.979	<0.001	778.136
c3 (22 - 80 vs ≤21)	1.606	1.041	2.240	<0.001	736.026
c3 (≥80 vs ≤21)	3.706	2.968	4.517		

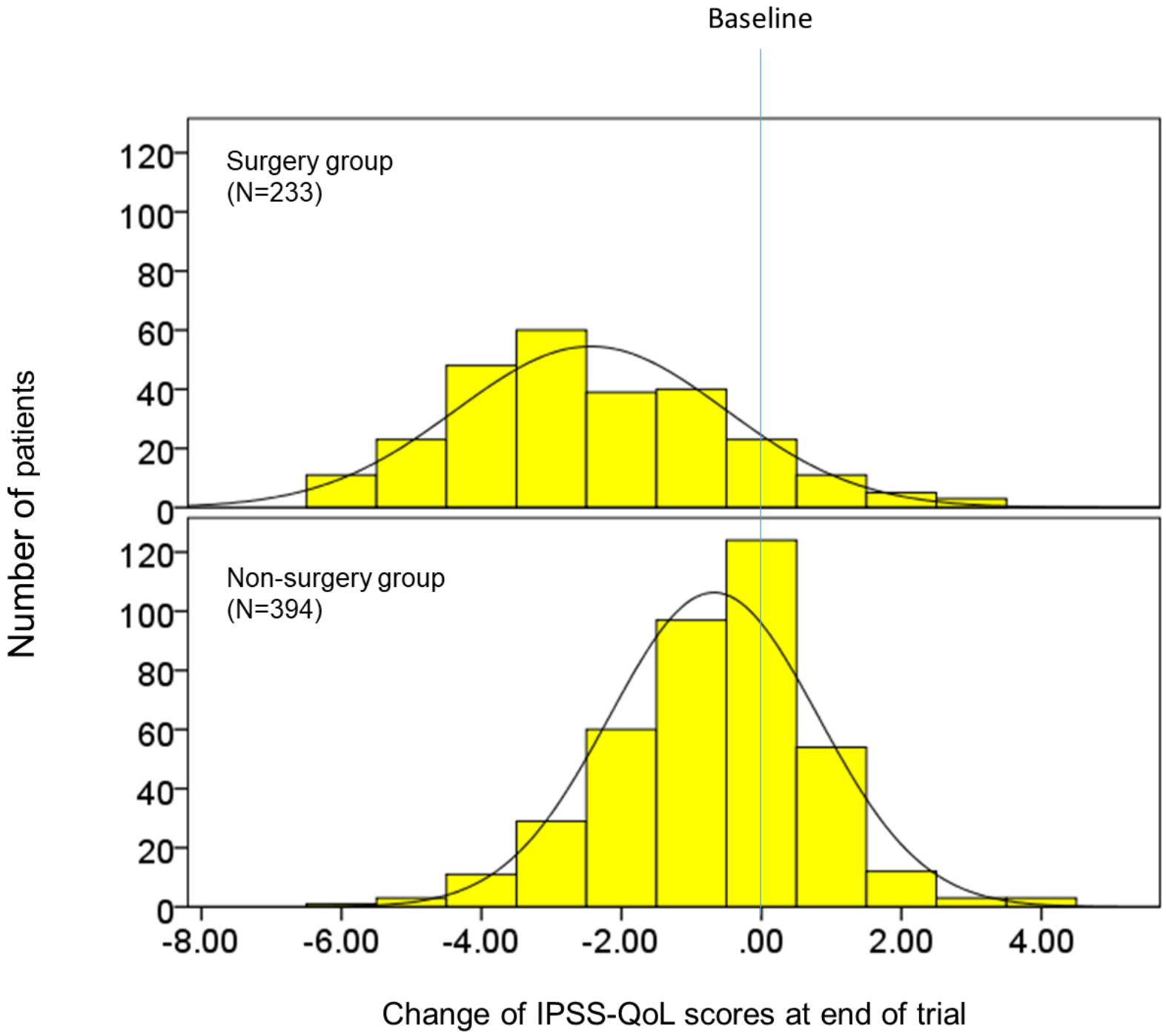
* Items in bold indicate analysis for continuous values. c2 and c3 indicate categorized values; c2: Comparing ranges of scores in both categorized groups when distinguishing 2 groups (i.e. categorizing as mild or severe). The cut-off point predicting QoL impact (IPSS-QoL of <5 vs. ≥5) was 20 for IPSS, 19 for ICIQ-MLUTS/severity and 62 for ICIQ-MLUTS/bother. c3: Comparing ranges of scores in each categorized group, when distinguishing 3 groups (i.e. categorizing as mild, moderate or severe). Cut-off points are given in results section

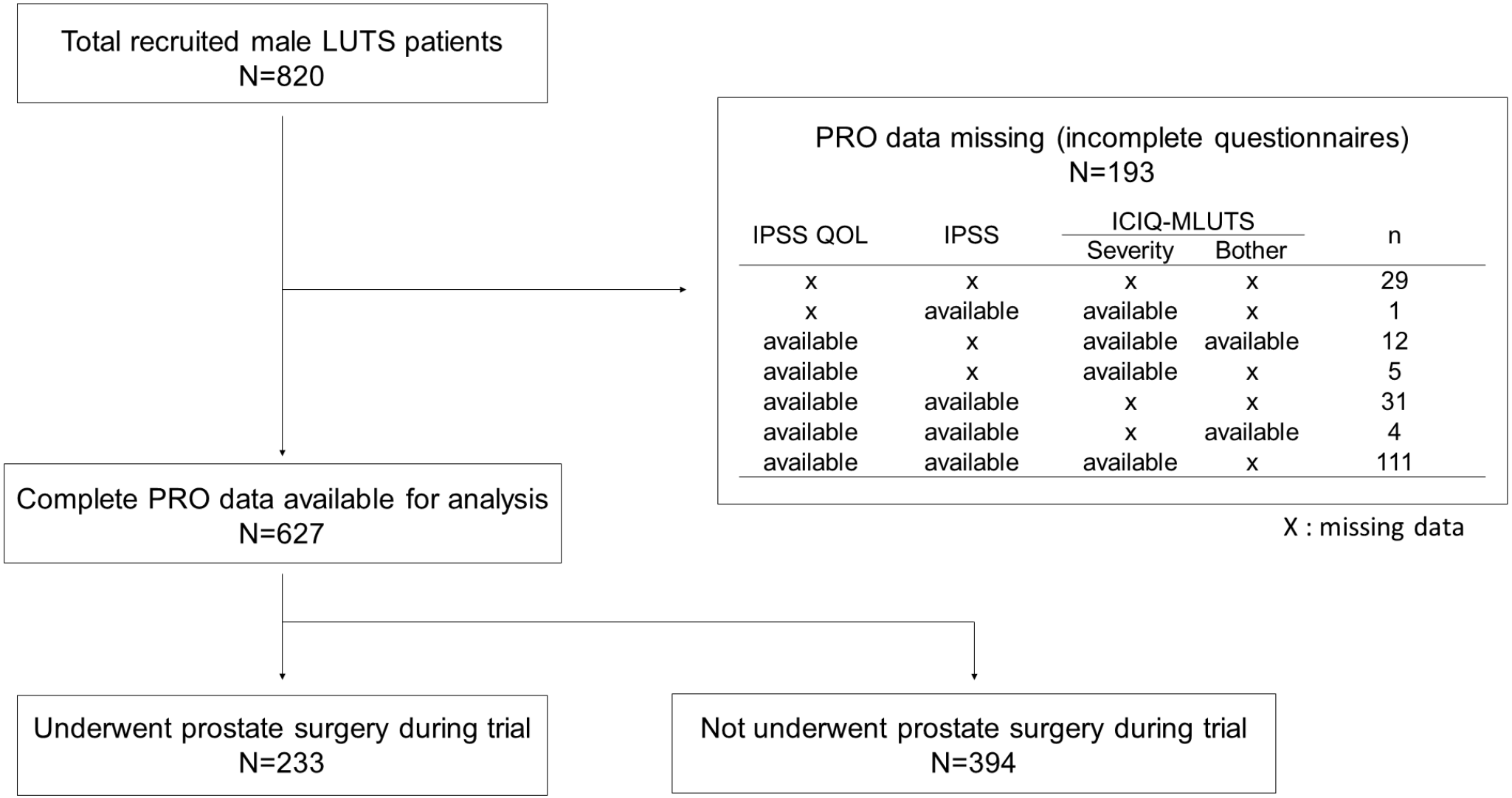
AIC: Akaike’s information criteria; CI: confidence interval; ICIQ-MLUTS: International Consultation on Incontinence Questionnaires Male Lower Urinary Tract Symptoms; IPSS: International Prostate Symptom Score; PVR: post-void residual urine

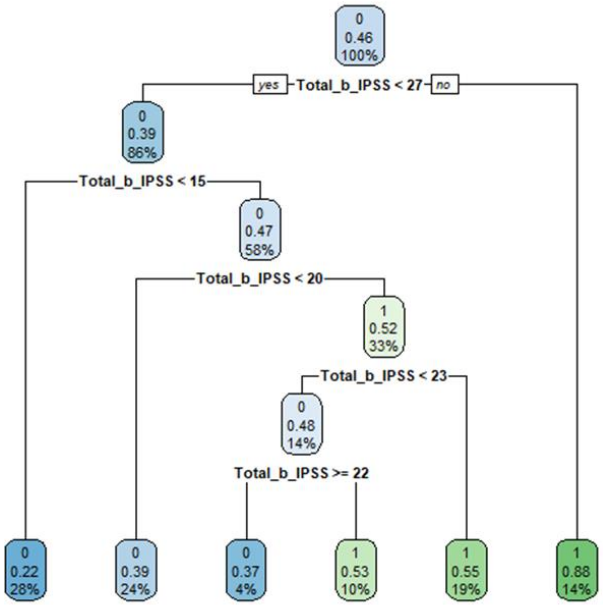
Table 3. The rankings for prevalence of severe symptoms according to symptom severity scores in IPSS and ICIQ-MLUTS and bother score in ICIQ-MLUTS

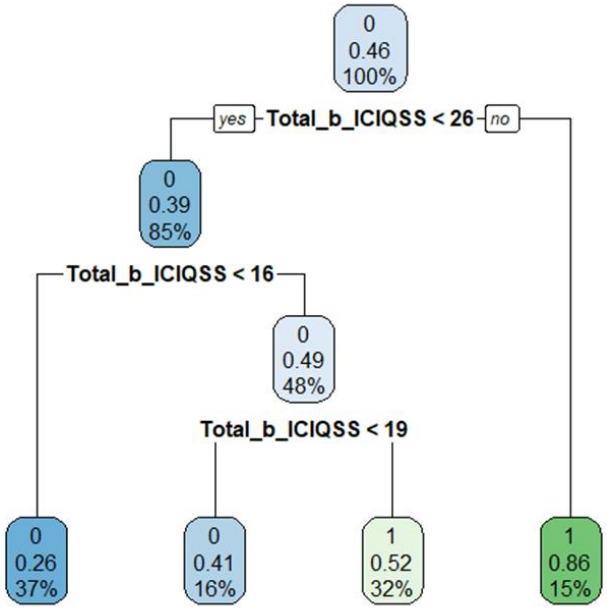
Ranking	IPSS (N=751)		ICIQ-MLUTS			
			Symptom severity scores (N=739)		Bother scores (N=643)	
	"Severe (More than half and Almost always)"	%	"Severe (Most of the time and All of the time)"	%	"Severe (8, 9 and 10)"	%
1	Weak stream	55.5	Increased daytime frequency	60.1	Nocturia	48.1
2	Nocturia	53.0	Weak stream	52.3	Urgency	45.7
3	Incomplete emptying	40.5	Incomplete emptying	41.8	Urgency UI	39.2
4	Intermittency	31.7	Urgency	39.0	Increased daytime frequency	35.5
5	Urgency	28.4	Intermittency	37.5	Incomplete emptying	35.0
6	Delay	22.9	Nocturia	26.0	Post micturition dribble	33.3
7	Increased daytime frequency	18.8	Straining	18.6	Weak stream	29.7

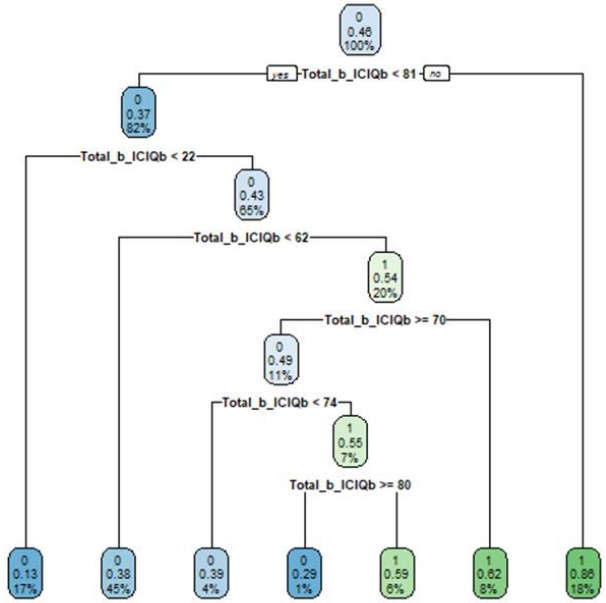
AIC	Akaike information criterion
ICIQ-MLUTS	International Consultation on Incontinence Questionnaire Male LUTS
IPSS	International Prostate Symptom Score
LUTS	Lower urinary tract symptoms
Qmax	Maximum flow rate
PROM	Patient reported outcomes measures
PMD	Post micturition dribble
PVR	Post void residual
QoL	Quality of life
ROC	Receiver operating characteristic
UI	Urinary incontinence
VV	Voided volume

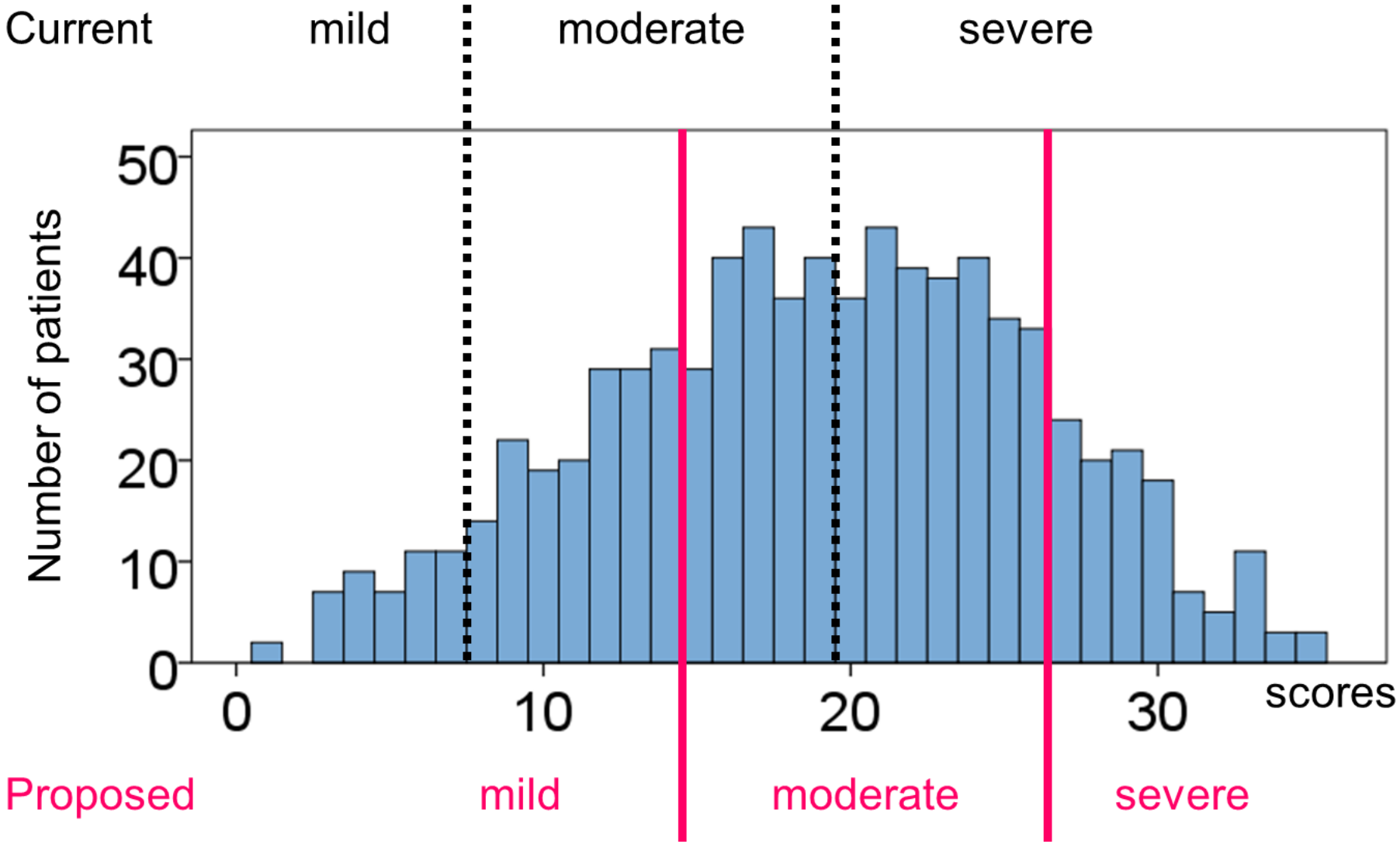

Baseline
Surgery group
(N=233)
Non-surgery group
(N=394)
Number of patients
120
100
80
60
40
20
0
-8.00
-6.00
-4.00
-2.00
.00
2.00
4.00
Change of IPSS-QoL scores at end of trial


Total recruited male LUTS patients
N=820
PRO data missing (incomplete questionnaires)
N=193
IPSS QOL
IPSS
ICIQ-MLUTS
Severity
Bother
n
x x x x 29
x available available x 1
available x available available 12
available x available x 5
available available x x 31
available available x available 4
available available available x 111
X : missing data
Complete PRO data available for analysis
N=627
Underwent prostate surgery during trial
N=233
Not underwent prostate surgery during trial
N=394

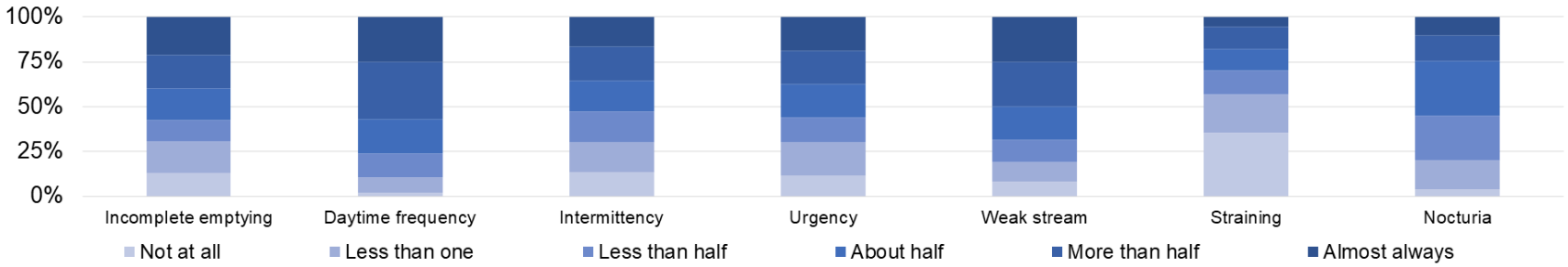

0
0.46
100%
yes
Total_b_IPSS < 27
no
0
0.39
86%
Total_b_IPSS < 15
0
0.47
58%
Total_b_IPSS < 20
1
0.52
33%
Total_b_IPSS < 23
0
0.48
14%
Total_b_IPSS >= 22
0
0.22
28%
0
0.39
24%
0
0.37
4%
1
0.53
10%
1
0.55
19%
1
0.88
14%


0
0.46
100%
yes
Total_b_ICIQSS < 26
no
0
0.39
85%
Total_b_ICIQSS < 16
0
0.49
48%
Total_b_ICIQSS < 19
0
0.26
37%
0
0.41
16%
1
0.52
32%
1
0.86
15%

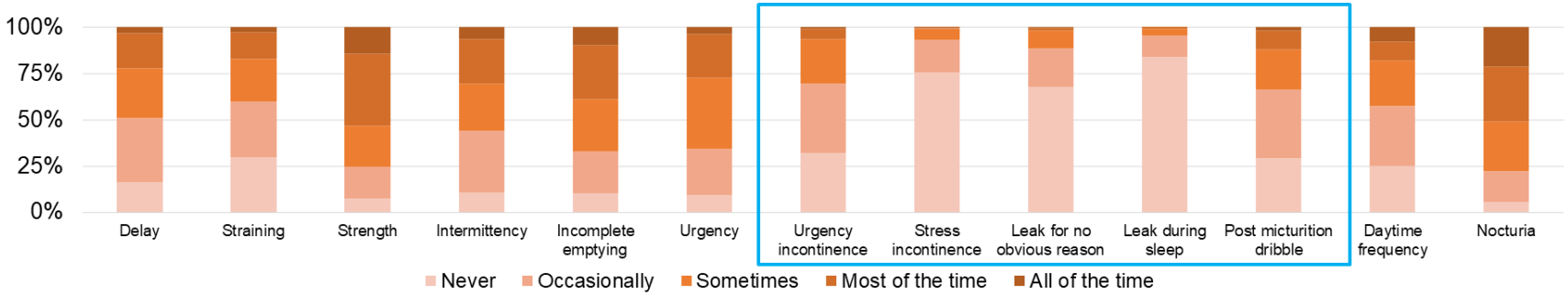

0
0.46
100%
yes
Total_b_ICIQb < 81
no
0
0.37
82%
Total_b_ICIQb < 22
0
0.43
65%
Total_b_ICIQb < 62
1
0.54
20%
Total_b_ICIQb >= 70
0
0.49
11%
Total_b_ICIQb < 74
1
0.55
7%
Total_b_ICIQb >= 80
0
0.13
17%
0
0.38
45%
0
0.39
4%
0
0.29
1%
1
0.59
6%
1
0.62
8%
1
0.86
18%


Current
mild
moderate
severe
Number of patients
50
40
30
20
10
0
0
10
20
30
scores
Proposed
mild
moderate
severe

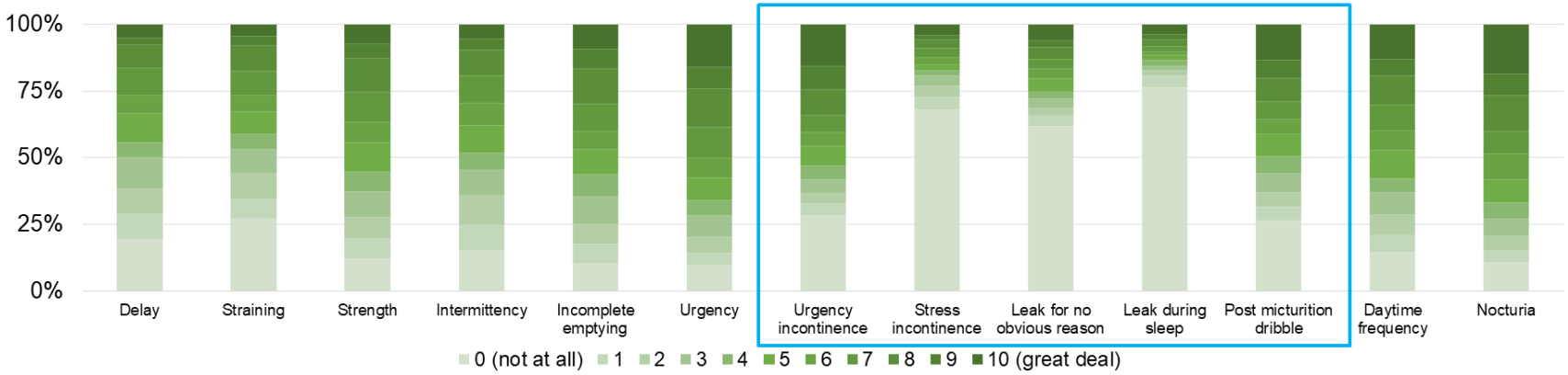
A
IPSS score (N=774)

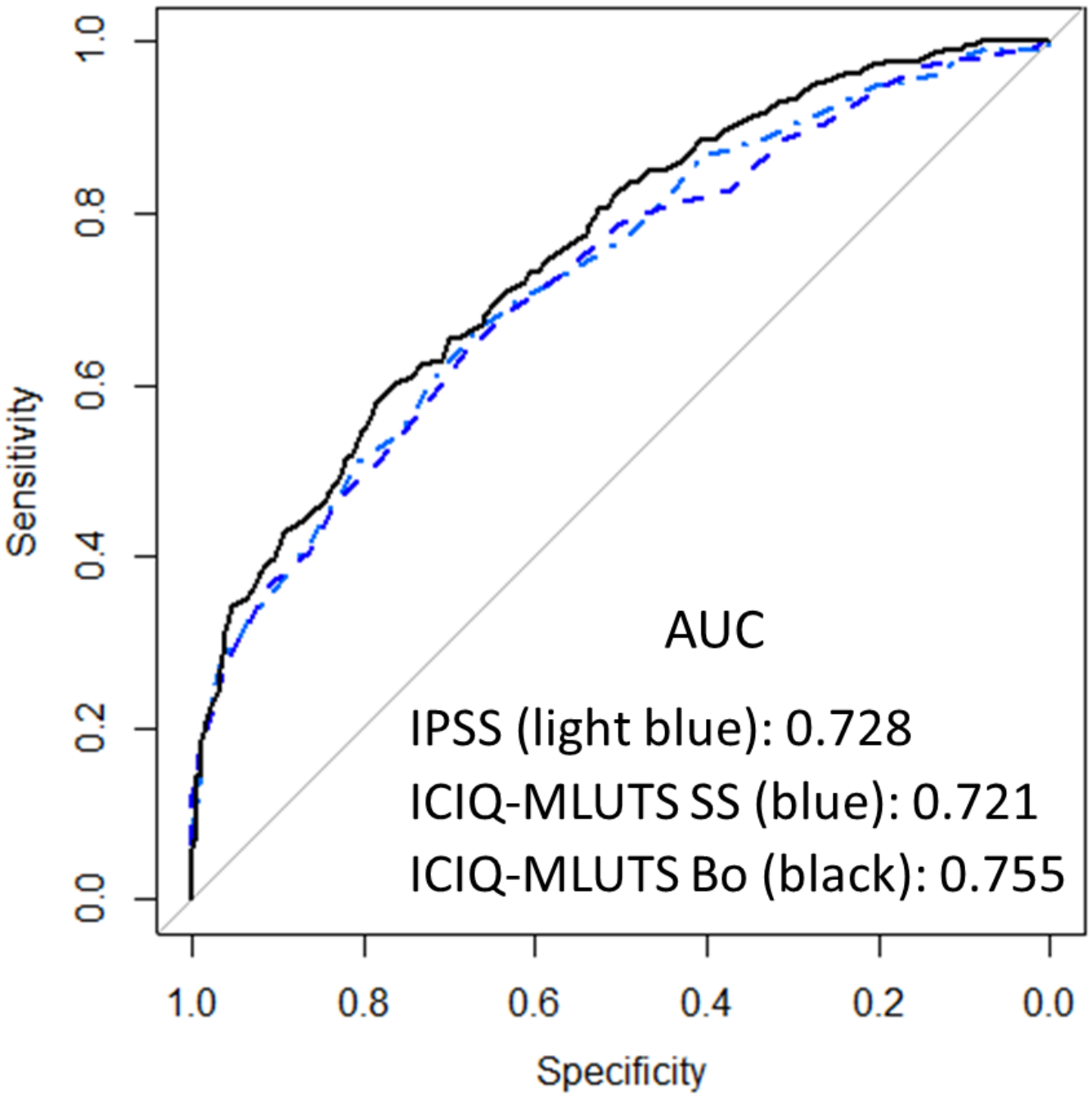


B
Symptom severity scores of ICIQ-MLUTS (N=756)



C
Bother scores of ICIQ-MLUTS (N=643)




Sensitivity
1.0
0.8
0.6
0.4
0.2
0.0
1.0
0.8
0.6
0.4
0.2
0.0
Specificity
AUC
IPSS (light blue): 0.728
ICIQ-MLUTS SS (blue): 0.721
ICIQ-MLUTS Bo (black): 0.755