SYMPTOM-BASED CLUSTERING OF MALE LUTS PARTICIPANTS IN THE SYMPTOMS OF LOWER URINARY TRACT DYSFUNCTION RESEARCH NETWORK (LURN) STUDY

Gang Liu[1], Victor P. Andreev[1], Margaret E. Helmuth[1], Claire C. Yang[2], Abigail R Smith[1], Jonathan B. Wiseman[1], Robert M. Merion[1], H. Henry Lai[3], Bradley A. Erickson[4], David Cella[5], James W. Griffith[5], John O. L. DeLancey[6], Ziya Kirkali[7], and the LURN Study Group.

[1]Arbor Research Collaborative for Health, Ann Arbor, MI [2]University of Washington, Seattle WA [3]Washington University School of Medicine, St. Louis, MO [4]University of Iowa, Iowa City, IA [5]Northwestern University, Chicago, IL [6]University of Michigan, Ann Arbor, MI
[7]National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD

Background

Management of lower urinary tract symptoms (LUTS) in male patients using current diagnostic categories, such as benign prostatic hyperplasia (BPH), or based on a single symptom, such as urgency urinary incontinence (UUI), is sometimes unsatisfactory.

Objective

To improve our understanding of the subtypes of men with LUTS, and to explore an alternative to extant diagnostic categories using a novel method of unbiased classification of symptom clusters based on detailed multi-symptom information.

Methods

We analyzed baseline urinary symptom questionnaire data from 503 care-seeking men enrolled in the LURN Observational Cohort study. Symptoms were measured using the LUTS Tool and AUA Symptom Index (52 questions total). A probability-based consensus clustering algorithm was used to identify groups with distinct symptom signatures.

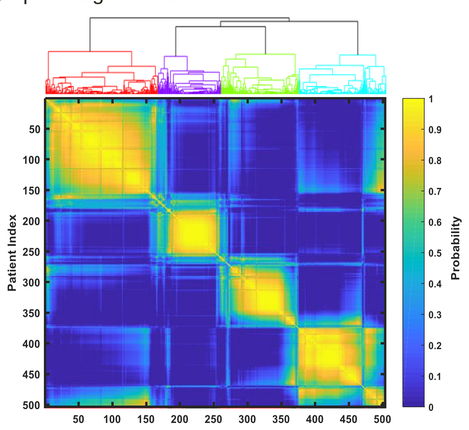

Figure 1. Consensus matrix as a color map and dendrogram for hierarchical clustering. Each element of the 503 by 503 matrix represents the probability that the respective pair of participants both belong to the same cluster. Probability is color-coded: bright yellow represents probability close to one, dark blue – probability close to zero. Four bright yellow squares along the diagonal represent four identified clusters of participants. The dendrogram on top of the consensus matrix demonstrates four distinct clusters as well.

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Results

Figure 2: Symptom signatures of four clusters as radar plots

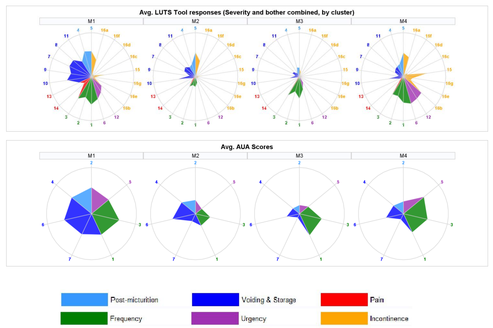


Figure 3: Pairwise comparison of the clusters. Severity of LUT symptoms

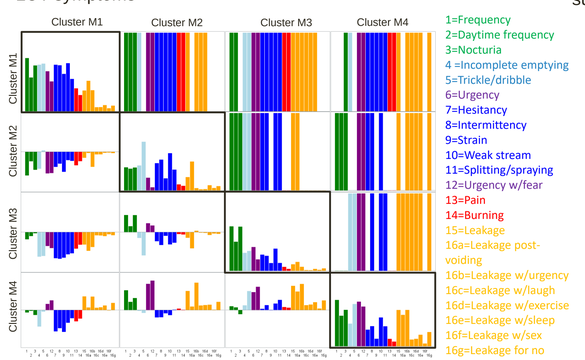


Figure 4: Pairwise comparison of the clusters. Patient reported outcomes (PROs) not used for clustering

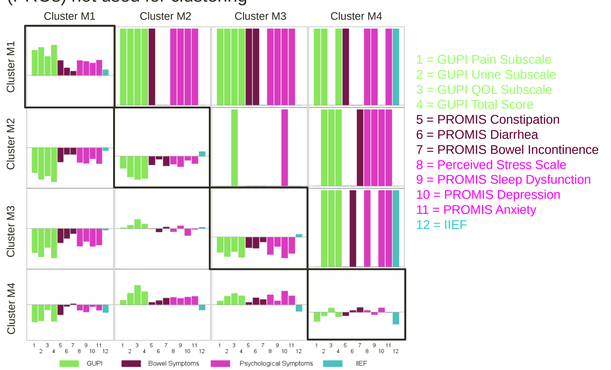
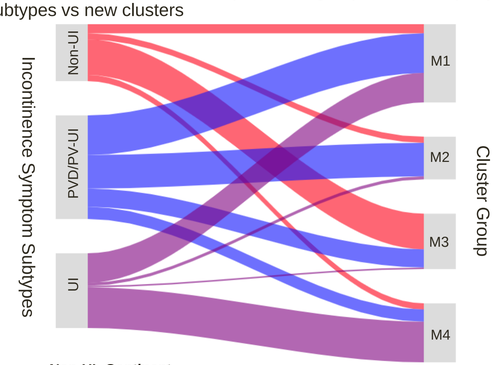


Figure 5: Sankey diagram comparison of group membership. Symptom subtypes vs new clusters



Non-UI: Continent
PVD/PV-UI: Post-Void Dribble/Post-Void Urinary Incontinence
UI: Urinary Incontinence

Table: Demographic Data for Each of the Clusters

		Cluster M1 (N=166)	Cluster M2 (N=93)	Cluster M3 (N=114)	Cluster M4 (N=130)	P-value
Age	Mean (SD)	60.2 (12.8)	57.6 (14.1)	61.3 (13.4)	64.7 (12.8)	0.0009
Race						0.0152
	White	120 (72.3%)	84 (90.3%)	93 (81.6%)	107 (82.3%)	
	Black	23 (13.9%)	3 (3.2%)	9 (7.9%)	13 (10.0%)	
	Asian	13 (7.8%)	3 (3.2%)	3 (2.6%)	1 (0.8%)	
	Other	10 (6.6%)	3 (3.2%)	9 (7.9%)	9 (6.9%)	
Ethnicity						0.7557
	Non-Hispanic	155 (93.4%)	86 (92.5%)	110 (96.5%)	122 (93.8%)	
	Hispanic	8 (4.8%)	5 (5.4%)	3 (2.6%)	6 (4.6%)	
	Unknown	3 (1.8%)	2 (2.2%)	1 (0.9%)	2 (1.5%)	
Obesity						0.4103
	Not Obese	100 (60.2%)	61 (65.6%)	69 (60.5%)	71 (54.6%)	
	Obese	65 (39.2%)	31 (33.3%)	45 (39.5%)	58 (44.6%)	
Alcohol Use						0.2576
	Never	46 (27.7%)	14 (15.1%)	16 (14.0%)	25 (19.2%)	
	0-3 Drinks Per Week	78 (47.0%)	46 (49.5%)	65 (57.0%)	69 (53.1%)	
	4-7 Drinks Per Week	24 (14.5%)	19 (20.4%)	18 (15.8%)	19 (14.6%)	
	More than 7 Drinks Per Week	15 (9.0%)	14 (15.1%)	14 (12.3%)	17 (13.1%)	
Smoking Status						0.3425
	Never Smoker	80 (48.2%)	50 (53.8%)	63 (55.3%)	73 (56.2%)	
	Former Smoker	63 (38.0%)	35 (37.6%)	45 (39.5%)	49 (37.7%)	
	Current Smoker	22 (13.3%)	7 (7.5%)	6 (5.3%)	8 (6.2%)	
	Unknown	1 (0.6%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	

Summary / Conclusions

Four distinct clusters of men with LUTS were identified. Patients in cluster M1 (n=166) had predominant symptoms of frequency, hesitancy, straining, weak stream, intermittency and incomplete bladder emptying, consistent with “classic” bladder outlet obstruction. Patients in cluster M2 (n=93) endorsed mainly post-micturition symptoms (e.g., post-voiding dribbling), with some weak stream and post-void leakage. Patients in cluster M3 (n=114) reported mostly frequency while those in cluster M4 (n=130) reported severe frequency, urgency and urinary incontinence. The majority of symptoms were statistically different between pairs of clusters. Patient reported outcomes of bowel symptoms, mental health, sleep dysfunction, erectile function, and urologic pain presented at significantly different levels across the clusters. Further subtype refinement will incorporate clinical assessments and other data collected.

Correspondence: gang.liu@ArborResearch.org