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MP 11.1

Machine-learning models in predicting viability after testicular torsion: A proof-of-concept study

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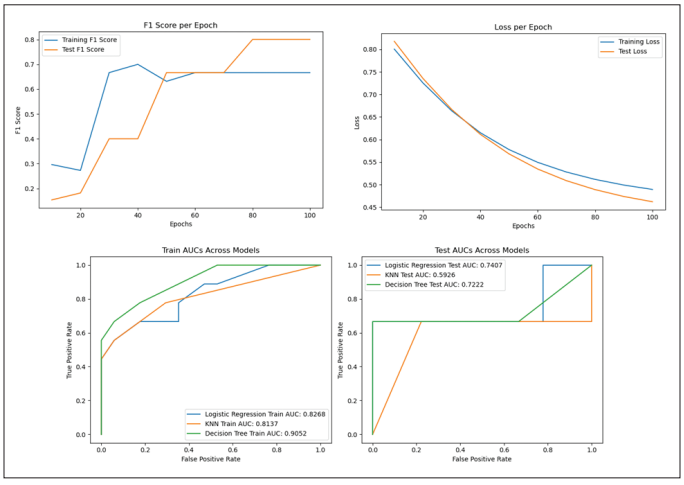
Introduction: Decision-making for orchiectomy following testicular torsion often relies on subjective clinical evaluations. This study investigated the efficacy of machine-learning (ML) models in objectively predicting post-torsion testicular viability, aiming to maintain a parenchymal ratio over 80% compared to the contralateral testicle, irrespective of initial appearance and surgical timing.

Methods: A prospective database from a single surgeon (2020–2024) covering all patients who underwent detorsion and subsequent bilateral orchidopexy was used. Followup ultrasounds were conducted at 6–12 months post-procedure. Variables included patient age (neonatal, prepubertal, post-pubertal), time from presentation to surgery, and history of torsion-detorsion events. Various ML models — regression, k-nearest neighbors, and decision trees — were assessed for accuracy and precision.

Results: The decision tree model demonstrated the highest accuracy at 90.5%, followed by the regression model at 82.7% accuracy, and the k-nearest neighbors model at 81.4% accuracy. The area under the curve (AUC) for the regression model indicated adequate predictability for testicular viability. A crucial finding was the impact of the timing of surgical intervention; surgeries conducted within four hours showed a 100% viability rate (p=0.001). Age also significantly affected outcomes, with post-pubertal patients showing a higher viability rate of 57.1% (p=0.041). Detailed performance metrics, such as precision, recall, and F1-scores for each model, further validate the predictive capacity of these ML models (Figure 1, Tables 1, 2).

Conclusions: Preliminary results suggest that ML models are viable tools for predicting testicular viability post-torsion, significantly enhancing clinical decision-making by providing an objective basis for potentially preserving testicles. Further studies with larger datasets are necessary to confirm and refine these predictions.



MP 11.1. Figure 1.

MP 11.1. Table 1. Train vs test precision, recall F-1 score accuracy, macro average, and weight average

Train				
Label	Precision	Recall	F1-score	Support
0	0.8	0.94	0.86	17
1	0.83	0.56	0.67	9
Accuracy			0.81	26
Macro avg	0.82	0.75	0.77	26
Weighted avg	0.81	0.81	0.8	26
Test				
Label	Precision	Recall	F1-score	Support
0	0.9	1	0.95	9
1	1	0.67	0.8	3
Accuracy			0.92	12
Macro avg	0.95	0.83	0.87	12
Weighted avg	0.92	0.92	0.91	12
Legend:	0	Non-residual	>75	
	1	Residual	≤75	
Coefficients		p		95% CI
Feature recurrence: -0.3638		Feature recurrence: 0.47671		Feature recurrence: [-1.3660, 0.6383]
Feature time: -0.8034		Feature time: 0.13602		Feature time: [-1.8597, 0.2529]
Feature age group: 0.7663		Feature age group: 0.19257		Feature age group: [-0.3864, 1.9189]

MP 11.2

Assessment of surgical access among patients with undescended testes in a universal healthcare system

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MP 11.1. Table 2. Univariate analysis of factors association with the post-torsion viability >80% parenchymal ratio

Predictors	Viability		Fisher-exact test
	<80% viability (n=26)	80% viability (n= 12)	p
Torsion detorsion			
No	20 (64.5%)	11 (35.5%)	0.395
Yes	6 (85.7%)	1 (14.3%)	
Time of presentation to surgery			
<4 hours	0 (0%)	2 (100%)	0.001
5-6 hours	0 (0%)	3 (100%)	
7-12 hours	5 (71.4%)	2 (28.6%)	
12-24 hours	4 (57.1%)	3 (42.9%)	
>24 hours	17 (89.5%)	2 (10.5%)	
Age group			
Neonatal	3 (75%)	1 (25%)	0.041
Prepubertal (1-12 years old)	17 (85%)	3 (15%)	
Post-pubertal (≥13 years old)	6 (42.9%)	8 (57.1%)	

Introduction: Universal healthcare aims to provide access to quality care for all. Systemic barriers may prevent timely access. Recent urologic guidelines recommend surgery for undescended testes (UDT) before 18 months of age. We evaluated access to surgical care for UDT patients in Canada.

Methods: We performed a retrospective analysis of UDT patients in Canada who received orchidopexy or orchiectomy from 2010–2018. Multivariable logistic models identified factors associated with surgery within 18 months.

Results: Most patients did not receive surgery within the recommended timeline, as only 5051/17947 (28.1%) orchidopexies and 135/1262 (10.7%) orchiectomies were performed within 18 months. Baseline and regression results are in Tables 1 and 2. Patients were more likely to receive timely orchidopexy at teaching children's (OR 1.52, CI 1.29–1.79, p<0.001) and teaching non-children's hospitals (OR 2.21, CI 1.87–2.61, p<0.001) compared to community hospitals. Patients treated at high-volume hospitals were more likely to receive timely orchidopexy and orchiectomy (all OR>1, p<0.05). Pediatric (OR 1.67, CI 1.53–1.84, p<0.001) and general surgeons (OR 1.89, CI 1.58–2.26, p<0.001) were more likely to operate in <18 months compared to pediatric urologists for orchidopexy, but only pediatric surgeons were more likely to do so for orchiectomy (OR 1.95, CI 1.00–3.79, p=0.05). The odds of timely surgery declined in recent years (orchidopexy: OR 0.99, CI 0.97–1.00, p=0.039; orchiectomy: OR 0.88, CI 0.81–0.95, p=0.001).

Conclusions: In this study, less than one-third of UDT surgeries in Canada occurred within the recommended 18-month period. Higher-volume, teaching institutions, and pediatric and general surgeons were more likely to perform orchidopexy in <18 months. Higher-volume institutions and pediatric surgeons were more likely to perform orchiectomy in <18 months. UDT patients were less likely to receive surgery within 18 months over time, indicating that access to operative treatment is worsening in Canada.

Acknowledgements: Funded by the UBC Department of Urologic Sciences (PM007341). This project has been previously presented at the Society of Pediatric Urology 2021 Fall Congress; however, new analyses have been conducted and results were revised.

MP 11.2. Table 1. Baseline characteristics of (A) orchidopexy, and (B) orchiectomy cases performed in Canada

(A)

Variable	<18 months (n=5051)	≥18 months (n=12896)	Overall (n=17947)	% cases done <18 months	p
Hospital type					
Teaching children's hospital	3511 (70.8%)	8059 (64.5%)	11570 (66.3%)	30.35%	<0.001
Teaching Non-children's hospital	984 (19.8%)	1954 (15.7%)	2938 (16.8%)	33.49%	
Community non-children's hospital	467 (9.4%)	2472 (19.8%)	2939 (16.8%)	15.89%	
Missing	89 (1.8%)	411 (3.2%)	500 (2.8%)		
Annual case volume (by quartiles)					
<46 cases	676 (13.4%)	3216 (24.9%)	3892 (21.7%)	17.37%	<0.001
46-135 cases	1431 (28.3%)	3173 (24.6%)	4604 (25.7%)	31.08%	
135-284 cases	1616 (32.0%)	2913 (22.6%)	4529 (25.2%)	35.68%	
≥284 cases	1328 (26.3%)	3594 (27.9%)	4922 (27.4%)	26.98%	
Surgeon type					
Pediatric urologist	2214 (43.8%)	5709 (44.3%)	7923 (44.1%)	27.94%	<0.001
Urologist	1171 (23.2%)	4396 (34.1%)	5567 (31.0%)	21.03%	
Pediatric surgeon	1271 (25.2%)	1954 (15.2%)	3225 (18.0%)	39.41%	
General surgeon	356 (7.0%)	787 (6.1%)	1143 (6.4%)	31.15%	
Other Provider	39 (0.8%)	50 (0.4%)	89 (0.5%)	43.82%	
Distance from hospital (by quartiles)					
<8 km	1223 (24.7%)	3130 (25.1%)	4353 (25.0%)	28.10%	0.859
8-17 km	1191 (24.1%)	3012 (24.2%)	4203 (24.1%)	28.34%	
17-50 km	1294 (26.1%)	3274 (26.3%)	4568 (26.2%)	28.33%	
≥50 km	1241 (25.1%)	3052 (24.5%)	4293 (24.6%)	28.91%	
Missing	102 (2.0%)	428 (3.3%)	530 (3.0%)		

*Data from Quebec was not available.

MP 11.2. Table 1 (cont'd). Baseline characteristics of (A) orchidopexy, and (B) orchiectomy cases performed in Canada

(A) (cont'd)

Diagnosis					
Undescended unilateral	4053 (80.2%)	9118 (70.7%)	13171 (73.4%)	30.77%	<0.001
Undescended bilateral	998 (19.8%)	3778 (29.3%)	4776 (26.6%)	20.90%	
Intraabdominal testis					
Yes	476 (9.4%)	504 (3.9%)	980 (5.5%)	48.57%	<0.001
No	4575 (90.6%)	12392 (96.1%)	16967 (94.5%)	26.96%	
Province*					
Newfoundland	63 (1.2%)	179 (1.4%)	242 (1.3%)	26.03%	<0.001
Prince Edward Island	0 (0.0%)	7 (0.1%)	7 (0.0%)	0.00%	
Nova Scotia	149 (2.9%)	290 (2.2%)	439 (2.4%)	33.94%	
New Brunswick	35 (0.7%)	151 (1.2%)	186 (1.0%)	18.82%	
Ontario	2098 (41.5%)	5493 (42.6%)	7591 (42.3%)	27.64%	
Manitoba	273 (5.4%)	479 (3.7%)	752 (4.2%)	36.30%	
Saskatchewan	208 (4.1%)	450 (3.5%)	658 (3.7%)	31.61%	
Alberta	1650 (32.7%)	4170 (32.3%)	5820 (32.4%)	28.35%	
British Columbia	571 (11.3%)	1668 (12.9%)	2239 (12.5%)	25.50%	
Other	4 (0.1%)	9 (0.1%)	13 (0.1%)	30.77%	
Year					
2010	488 (9.7%)	1237 (9.6%)	1725 (9.6%)	28.29%	0.801
2011	465 (9.2%)	1267 (9.8%)	1732 (9.7%)	26.85%	
2012	541 (10.7%)	1353 (10.5%)	1894 (10.6%)	28.56%	
2013	523 (10.4%)	1357 (10.5%)	1880 (10.5%)	27.82%	
2014	539 (10.7%)	1437 (11.1%)	1976 (11.0%)	27.28%	
2015	623 (12.3%)	1546 (12.0%)	2169 (12.1%)	28.72%	
2016	633 (12.5%)	1523 (11.8%)	2156 (12.0%)	29.36%	
2017	628 (12.4%)	1587 (12.3%)	2215 (12.3%)	28.35%	
2018	611 (12.1%)	1589 (12.3%)	2200 (12.3%)	27.77%	

*Data from Quebec was not available.

MP 11.2. Table 1 (cont'd). Baseline characteristics of (A) orchidopexy, and (B) orchiectomy cases performed in Canada

(B)

Variable	<18 months (n=135)	≥18 months (n=1127)	Overall (n=1262)	% cases done <18 months	p
Hospital type					
Teaching children's hospital	68 (53.1%)	192 (18.7%)	260 (22.5%)	26.15%	<0.001
Teaching non-children's hospital	36 (28.1%)	327 (31.9%)	363 (31.5%)	9.92%	
Community non-children's hospital	24 (18.8%)	507 (49.4%)	531 (46.0%)	4.52%	
Missing	7 (5.2%)	101 (9.0%)	108 (8.6%)		
Annual case volume (by quartiles)					
<46 cases	46 (34.1%)	859 (76.2%)	905 (71.7%)	5.08%	<0.001
46–135 cases	51 (37.8%)	172 (15.3%)	223 (17.7%)	22.87%	
135–284 cases	32 (23.7%)	85 (7.5%)	117 (9.3%)	27.35%	
≥284 cases	6 (4.4%)	11 (1.0%)	17 (1.3%)	35.29%	
Surgeon type					
Pediatric urologist	43 (31.9%)	126 (11.2%)	169 (13.4%)	25.44%	<0.001
Urologist	47 (34.8%)	740 (65.7%)	787 (62.4%)	5.97%	
Pediatric surgeon	29 (21.5%)	45 (4.0%)	74 (5.9%)	39.19%	
General surgeon	15 (11.1%)	213 (18.9%)	228 (18.1%)	6.58%	
Other provider	1 (0.7%)	3 (0.3%)	4 (0.3%)	25.00%	
Distance from hospital (by quartiles)					
<8 km	26 (20.3%)	405 (38.9%)	431 (36.8%)	6.03%	<0.001
8–17 km	27 (21.1%)	203 (19.5%)	230 (19.7%)	11.74%	
17–50 km	39 (30.5%)	208 (20.0%)	247 (21.1%)	15.79%	
≥50 km	36 (28.1%)	226 (21.7%)	262 (22.4%)	13.74%	
Missing	7 (5.2%)	85 (7.5%)	92 (7.3%)		

*Data from Quebec was not available.

MP 11.2. Table 1 (cont'd). Baseline characteristics of (A) orchidopexy, and (B) orchiectomy cases performed in Canada

(B) (cont'd)					
Diagnosis					
Undescended unilateral	133 (98.5%)	1096 (97.2%)	1229 (97.4%)	10.82%	0.569
Undescended bilateral	2 (1.5%)	31 (2.8%)	33 (2.6%)	6.06%	
Intraabdominal testis					
Yes	32 (23.7%)	303 (26.9%)	335 (26.5%)	9.55%	0.491
No	103 (76.3%)	824 (73.1%)	927 (73.5%)	11.11%	
Province*					
Newfoundland	4 (3.0%)	25 (2.2%)	29 (2.3%)	13.79%	0.0885
Prince Edward Island	0 (0.0%)	1 (0.1%)	1 (0.1%)	0.00%	
Nova Scotia	4 (3.0%)	41 (3.6%)	45 (3.6%)	8.89%	
New Brunswick	1 (0.7%)	34 (3.0%)	35 (2.8%)	2.86%	
Ontario	68 (50.4%)	554 (49.2%)	622 (49.3%)	10.93%	
Manitoba	7 (5.2%)	77 (6.8%)	84 (6.7%)	8.33%	
Saskatchewan	20 (14.8%)	74 (6.6%)	94 (7.4%)	21.28%	
Alberta	13 (9.6%)	122 (10.8%)	135 (10.7%)	9.63%	
British Columbia	18 (13.3%)	198 (17.6%)	216 (17.1%)	8.33%	
Other	0 (0.0%)	1 (0.1%)	1 (0.1%)	0.00%	
Year					
2010	23 (17.0%)	140 (12.4%)	163 (12.9%)	14.11%	0.297
2011	20 (14.8%)	148 (13.1%)	168 (13.3%)	11.90%	
2012	20 (14.8%)	129 (11.4%)	149 (11.8%)	13.42%	
2013	9 (6.7%)	130 (11.5%)	139 (11.0%)	6.47%	
2014	16 (11.9%)	97 (8.6%)	113 (9.0%)	14.16%	
2015	14 (10.4%)	128 (11.4%)	142 (11.3%)	9.86%	
2016	11 (8.1%)	129 (11.4%)	140 (11.1%)	7.86%	
2017	10 (7.4%)	104 (9.2%)	114 (9.0%)	8.77%	
2018	12 (8.9%)	122 (10.8%)	134 (10.6%)	8.96%	

*Data from Quebec was not available.

MP 11.2. Table 2. Multivariable logistic regression for factors associated with completion of surgery before 18 months of age for (A) orchidopexy; and (B) orchiectomy cases performed in Canada

	A: Orchidopexy			B: Orchiectomy		
Variable	OR	95% CI	P-value	OR	95% CI	p
Hospital type	–	–	–	–	–	–
Community non-children's hospital	–	–	–	–	–	–
Teaching children's hospital	1.52	1.29, 1.79	<0.001	1.35	0.56, 3.18	0.5
Teaching non-children's hospital	2.21	1.87, 2.61	<0.001	1.24	0.60, 2.50	0.6
Annual case volume (by quartiles)	–	–	–	–	–	–
<46 cases	–	–	–	–	–	–
46–135 cases	1.73	1.51, 1.98	<0.001	4.39	2.34, 8.16	<0.001
135–284 cases	2.6	2.22, 3.06	<0.001	4.86	2.13, 11.2	<0.001
≥284 cases	2.4	1.91, 3.02	<0.001	7.1	1.72, 28.6	0.006
Surgeon type	–	–	–	–	–	–
Pediatric urologist	–	–	–	–	–	–
Urologist	1.03	0.93, 1.15	0.5	0.54	0.25, 1.16	0.12
Pediatric surgeon	1.67	1.53, 1.84	<0.001	1.95	1.00, 3.79	0.05
General surgeon	1.89	1.58, 2.26	<0.001	0.65	0.24, 1.68	0.4
Other provider	1.77	1.14, 2.75	0.011	2.85	0.12, 31.4	0.4
Distance from hospital (by quartiles)	–	–	–	–	–	–
<8 km	–	–	–	–	–	–
8–17 km	0.91	0.82, 1.01	0.069	1.65	0.87, 3.13	0.12
17–50 km	0.91	0.83, 1.01	0.073	2.42	1.34, 4.42	0.004
≥50 km	0.84	0.76, 0.93	<0.001	1.42	0.79, 2.57	0.2
Diagnosis	–	–	–	–	–	–
Undescended bilateral	–	–	–	–	–	–
Undescended unilateral	1.63	1.49, 1.78	<0.001	1.48	0.39, 9.87	0.6
Intraabdominal testis	–	–	–	–	–	–
No	–	–	–	–	–	–
Yes	2.3	2.01, 2.64	<0.001	0.94	0.57, 1.51	0.8

MP 11.2. Table 2 (cont'd). Multivariable logistic regression for factors associated with completion of surgery before 18 months of age for (A) orchidopexy; and (B) orchiectomy cases performed in Canada

	A: Orchidopexy			B: Orchiectomy		
Variable	OR	95% CI	P-value	OR	95% CI	p
Province	–	–	–	–	–	–
British Columbia	–	–	–	–	–	–
Newfoundland	1.03	0.67, 1.54	>0.9	3.73	0.52, 16.4	0.12
Prince Edward Island	0	–	>0.9	0	–	>0.9
Nova Scotia	2.54	1.98, 3.24	<0.001	1.68	0.41, 5.70	0.4
New Brunswick	1.32	0.83, 2.02	0.2	1.07	0.06, 6.11	>0.9
Ontario	1.47	1.31, 1.66	<0.001	1.45	0.76, 2.87	0.3
Manitoba	1.86	1.51, 2.29	<0.001	0.81	0.26, 2.34	0.7
Saskatchewan	1.56	1.25, 1.95	<0.001	7.13	2.93, 17.9	<0.001
Alberta	1.21	1.03, 1.42	0.02	1.34	0.51, 3.43	0.5
Other	2.42	0.65, 7.57	0.15	0	–	>0.9
Year (2010–2018)	0.99	0.97, 1.00	0.039	0.88	0.81, 0.95	0.001

MP 11.3

Does marginalization status and distance from the hospital impact the timing of pediatric pyeloplasty in a universal access to care system

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Introduction: Prior research in the U.S. suggests that marginalized populations tend to undergo pyeloplasty earlier, likely reflecting concerns about the challenges of reliable followup care in this population. This study assessed the effect of sociodemographic marginalization and geographic distance on the timing of pyeloplasty in a universal, single-payer healthcare system.

Methods: We performed a single-center, retrospective study on children undergoing pyeloplasty from 2008–2019. We assessed the impact of marginalization indices (with the Ontario Marginalization Index [ON-Marg]) and geographic distance on the timing of pyeloplasty, preoperative ultrasound findings, and renogram features. Unadjusted analysis and Cox proportional regression were performed to determine the effect of marginalization and geography on the timing of pyeloplasty.

Results: Among 503 patients who underwent pyeloplasty, median age at surgery was 16 months. Median preoperative anteroposterior diameter (APD) was 22 mm and split renal function on renogram was 43%. There was no significant effect of marginalization indices on age at surgery. Patients living >50 km from the hospital had a later age at surgery than those living <10 km (p=0.04); however, there was no significant difference in preoperative APD or split function by marginalization index or geographic distance. Adjusted analyses revealed no significant associations between ON-Marg variables or geographic distance with age at surgery.

Conclusions: In a universal healthcare system, marginalization status and geographic distance were not associated with the timing of pyeloplasty. These results contrast with literature from other settings and suggest that access to care can mitigate disparities in pediatric urologic care.

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MP 11.4

Impact of surgery in children with congenital anomalies of the kidney and urinary tract

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Introduction: Congenital anomalies of kidney and urinary tract (CAKUT) affect 3–7/1000 newborns, causing chronic kidney disease (CKD) and end-stage renal disease (ESRD) in children. While clinical factors are studied, demographic and geographic variations, care access, and surgical outcomes remain understudied, especially regarding CKD/ESRD progression. We aimed to assess the development of CKD or ESRD in pediatric patients with CAKUT following surgical intervention over 20 years.

Methods: This retrospective cohort study analyzed data from a single tertiary referral children's hospital in Vancouver, Canada, spanning from 2000–2022. Children aged 0–18 years diagnosed with CAKUT who underwent surgical intervention at our center were included. The Canadian Index of Multiple Deprivation (CIMD), a comprehensive method to assess patients' ethnocultural composition, situational vulnerability, economic dependency, and residential instability, was included to measure demographic and socioeconomic variations in this cohort. A Cox proportional hazards model was applied to assess associations between potential risk factors and the time from surgery to the development of CKD or ESRD.

Results: In 799 pediatric patients with surgically managed CAKUT, 190 (24%) developed CKD/ESRD. Several factors were significantly associated with the development of CKD/ESRD. Nephrology involvement was associated with an over two-fold increased likelihood of KD/ESRD diagnosis (HR 2.22, 95% CI 1.57–3.15, p<0.0001). Endoscopic surgical technique showed a 39% lower likelihood of CKD/ESRD development compared to open surgery (HR 0.61, 95% CI 0.41–0.89, p=0.01). CIMD and time from primary diagnosis, as well as the

MP 11.4. Table 1

Variable		Hazard Ratio (HR)	95% CI		p-value
CIMD composite score (1-5)		1.13	0.95	1.36	0.1752
Time from Primary Dx to Surgery		1.00	1.00	1.00	0.1929
	No (ref.)	1.00			
Nephrology Involvement	Yes	2.22	1.57	3.15	<.0001
	Male (ref.)	1.00			
Sex	Female	1.39	1.01	1.92	0.0458
	Transgender	Unable to estimate			
	Unilateral (ref.)	1.00			
Laterality	Bilateral	1.27	0.88	1.83	0.2067
	Anterior/Posterior urethral valve,Urethral strictures/stenosis/atresia vs. Vesicoureteral reflux (ref.)	1.00			
	Duplicated collecting system	0.41	0.13	1.30	0.1303
Diagnosis Category - Israel	Hypoplasia/Dysplasia	1.97	0.42	9.20	0.3875
	Multicystic dysplastic kidney	1.35	0.35	5.21	0.6651
	Other	0.89	0.29	2.75	0.8445
	UPJO and UVJO	0.62	0.21	1.87	0.3940
	Vesicoureteral reflux	0.79	0.27	2.32	0.6639
Number of Diagnosis		1.09	0.88	1.34	0.4450
	Other/None (ref.)	1.00			
Indication	clinical only	1.35	0.97	1.87	0.0713
	radiographical only	1.49	0.86	2.58	0.1602
	Open (ref.)	1.00			
Surgical Technique	Minimally invasive (laparoscopic or robot-assisted laparoscopic)	1.03	0.52	2.02	0.9422
	Endoscopic (e.g., cystoscopy)	0.61	0.41	0.89	0.0107

laterality and number of diagnoses to surgery, did not show any association with the development of CKD/ESRD (Table 1).

Conclusions: This study demonstrated that a significant proportion of patients with CAKUT developed CKD/ESRD even after surgical intervention, regardless of their primary CAKUT diagnosis. Demographic and socioeconomic factors did not affect the outcome. These findings highlight the importance of regular and long-term surveillance, early identification, and targeted management strategies for CAKUT patients, even after surgical intervention.

MP 11.5

Quantitative vesicoureteral reflux severity assessment: Towards clinical prediction with more objective metrics for infection and renal scarring

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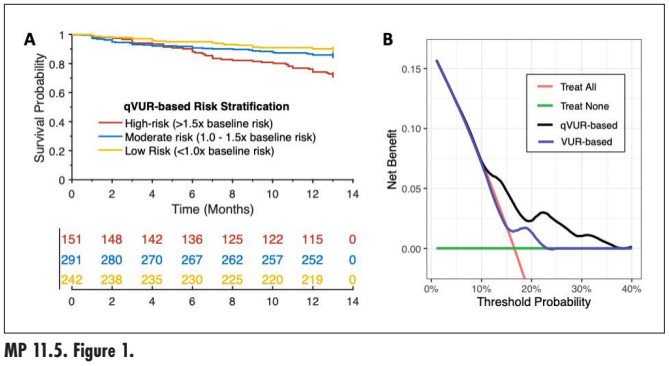
Introduction: Vesicoureteral reflux (VUR) is a common urologic disorder in children. To date, VUR severity is assessed by grading, and contemporary models have been developed to predict breakthrough UTI (bUTI) and renal scarring in VUR. Here, we report on the utility of quantitative VUR (qVUR) metrics to predict clinical outcomes and compare this to traditional grading.

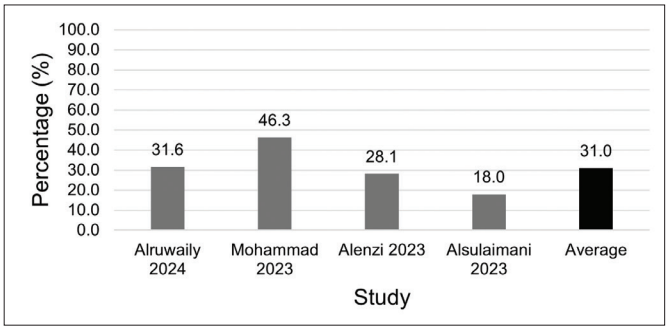
Methods: Four pediatric centers were queried for clinical information and voiding cystourethrogram (VCUG) data in children with VUR. The primary outcome was bUTI; the secondary outcome was renal scarring. Eligible participants had primary VUR with >14 months of followup on prophylactic antibiotics and no surgical interventions. Each VCUG was graded for severity and by qVUR features, including ureteral tortuosity and dilatation. Cox regression was used to determine the risk of bUTI, and logistic regression was used to assess renal scarring. Hazard ratios (HR) with confidence intervals are reported, and the model was assessed for baseline clinical risk, VUR-based, and qVUR-based models.

Results: Overall, 684 children were included, of which 109 (16%) experienced a bUTI within the study period. Age >12 months (HR 0.64, 0.44–0.93) and male sex (HR 0.60, 0.41–0.89) were associated with decreased risk of bUTI. High-grade VUR was associated with an increased risk of bUTI (HR 1.48, 1.01–2.15). Ureteral dilation was associated with an increased risk of bUTI (HR 1.58–1.73), while ureteral tortuosity was not significantly associated with bUTI risk. Together, the qVUR-based model performed with a c-index of 0.64, compared to 0.57 for VUR-based models. The qVUR-based model stratified patients (Figure 1), and high-risk patients were at significantly elevated risk (HR 2.17, 1.45–3.23). Among 130 children with radionuclide scans, 72 (55%) had renal scars. The addition of qVUR features improved AUROC when added to clinical-only models (0.84 vs. 0.75).

Conclusions: These findings suggest that personalized bUTI risk is associated with VUR severity, which can be forecasted with modest model performance. qVUR measures remain clinically significant and offer an objective metric to prognosticate patients with VUR.



MP 11.5. Figure 1.



MP 11.6. Figure 1. Correct identification of the critical time frame for testicular salvage.

MP 11.6

Pediatric testicular torsion: Patient and caregiver knowledge and awareness

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Introduction: Pediatric testicular torsion (PTT) is a surgical emergency requiring prompt presentation, as delay in intervention may lead to testicular loss. In the PTT care pathway, delay before presentation to the emergency department is the strongest determining factor for testicular salvage. Although multifactorial, delay in presentation may be prolonged due to the lack of awareness of patients and their caregivers on the severity of PTT and the implications of delay. Understanding patient and caregiver knowledge and understanding of PTT will aid in better designing and delivering educational initiatives to reduce pre-hospital delay and improve testicular salvage rate.

Methods: A systematic review was performed on all English-language literature reporting on pediatric and caregiver PTT knowledge. Additionally, a review was conducted on all PTT-based educational initiatives. Both qualitative and quantitative studies were reviewed, analyzed, and compiled.

Results: A total of 2773 articles were reviewed, with 21 studies included for further analysis. Eleven studies focused on caregiver perspectives of PTT, five studies examined patient perspectives, and eight studies focused on educational initiatives for PTT. Patient and caregiver knowledge of PTT was very low, with knowledge gaps identified in the areas of: PTT definition, symptoms, and critical time frame for testicular salvage (Figure 1). There was a paucity of educational initiatives, despite an expressed need and desire by caregivers for more teaching and public awareness of PTT. School-based educational initiatives were well-received among the pediatric population and their caregivers, with social media-based initiatives showing promise.

Conclusions: Knowledge of PTT is poor among pediatric patients and caregivers. This lack of knowledge and awareness may contribute to delayed presentation. Educational initiatives, although sparce, have been shown to improve PTT awareness and knowledge. Results from this study can be used to optimize PTT educational efforts.

MP 11.7

Retrospective analysis of age, laser type, access sheath use, stone number, size, and composition on clearance rates of lower pole stones in pediatrics: Outcomes of institutional laser lithotripsy

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Introduction: Lower calyces are a common location of pediatric urolithiasis and are considered the most challenging site to manage due to anatomical complexities, especially in children. Our study evaluated factors associated with laser lithotripsy and clearance of lower calyceal stones.

Methods: We evaluated pediatric patients with lower calyceal stones who underwent retrograde intrarenal surgery with laser lithotripsy between January 2015 and December 2024 at a tertiary pediatric institution. We assessed the association of age, laser type, use of access sheath, stone characteristics, and number of laser procedures required for stone clearance of lower calyceal stones. Statistical analysis was performed with Chi-squared test.

Results: This study included 40 pediatric cases of lower calyceal urolithiasis with a mean age of 10.8±5 years. Our results showed that 21 of 40 cases (52.5%) achieved clearance. Factors including age, type of laser, use of access sheath, number of stones, and stone composition were significantly associated with stone clearance (p=0.04, 0.004, 0.012, 0.036, and 0.004, respectively). Among various age groups, adolescent children older than 12 years and those 8–12 years had the highest clearance rate of 66.7% and 45.5%, respectively. Thulium laser compared to older holmium laser exhibited superiority in clearing stones (77.8% vs. 31.8%). Use of access sheath improved stone clearance outcomes (71.4% vs. 31.6%). Variety in stone types had different impacts on the likelihood of clearance, with mixed calcium and cystine stones being the easiest to break. Additionally, single stones were more likely to clear than multiple stones. Stone size was not significantly associated with stone clearance, but larger stones likely require more procedures to render patients stone-free (Table1).

Conclusions: Lower calyceal stones remain a significant challenge in pediatric urolithiasis. This study identifies significant associations between various factors and outcome of lower lobe stones.

MP 11.8

Evaluating the accuracy of a natural language processing model on answering pediatric urology questions and adherence to international guidelines

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Introduction: Natural language processing models (LPM) are increasingly being used for medical information. ChatGPT, a LPM, has demonstrated success, albeit its use in pediatric urology is limited. Additionally, ChatGPT's ability to answer urologic questions using national guidelines as a standard is lacking, thus the concordance with guideline recommendations is unexplored. This study investigates ChatGPT's ability to answer pediatric urologic questions compared to the Canadian Urological Association (CUA) guidelines. The concordance between ChatGPT's answers with the American Urological Association (AUA) and European Association of Urology guidelines (EAU) is explored secondarily.

Methods: A list of common urologic questions was developed across six areas: phimosis, cryptorchidism, acute scrotum, hypospadias, vesicoureteral reflux, and urinary stone disease. For each area, a list of questions was developed and administered individually into ChatGPT V4. Responses were assessed by pediatric urologists/residents for appropriateness, accuracy, and repeatability using Likert scores (0–3: 0=completely incorrect, 3=comprehensive). Responses were assessed separately against CUA, AUA, and EAU guidelines. Descriptive statistics and comparative analysis were performed.

Results: A total of 27 questions were generated and assessed. ChatGPT performed best in the domain of phimosis (mean ± SD: 2.73±0.29) and urinary stone disease (2.17±0.68) when compared to CUA guidelines. The domains of vesicoureteral reflux (1.75±0.80) and hypospadias (1.88±0.37) had the poorest accuracy. ChatGPT generated responses most aligned with the CUA (2.00±0.60) and EAU (2.01±0.50) guidelines and performed worse when evaluated against the AUA guidelines (1.92±0.47, p<0.05).

Conclusions: ChatGPT performed well when answering common urologic questions, with average scores being rated "correct but inadequate." The domains of phimosis and urinary stone disease were most accurately answered, which likely reflects the frequency of these pediatric conditions. ChatGPT generated answers most aligned with CUA and EAU recommendations, which may be due to regional LPM bias.

MP 11.7. Table 1. Factors affecting stone clearance

	Total	No	Yes	p
Age (months)				
0–36	4	3 (75%)	1 (25%)	0.4
37–60	4	4 (100%)	0 (0%)	
61–96	3	0 (0%)	3 (100%)	
97–144	11	6 (54.5%)	5 (45.5%)	
>144	18	6 (33.3%)	12 (66.7%)	
Laser type				
Holmium	22	15 (68.2%)	7 (31.8%)	0.004
Thulium	18	4 (22.2%)	14 (77.8%)	
Access sheath				
No	19	13 (68.4%)	6 (31.6%)	0.012
Yes	21	6 (28.6%)	15 (71.4%)	
Stone count				
Single	15	3 (20%)	12 (80%)	0.007
Multiple	25	16 (64%)	9 (36%)	
Stone size (cm)				
0–0.5	1	1 (100%)	0 (0%)	0.79
0.51–1.00	19	7 (36.8%)	12 (63.2%)	
1.01–1.5	7	4 (57.1%)	3 (42.9%)	
1.51–2.00	6	3 (50%)	3 (50%)	
2.01–2.5	2	1 (50%)	1 (50%)	
>2.5	3	1 (33.3%)	2 (66.7%)	
Stone composition				
Calcium oxalate	7	6 (85.7%)	1 (14.3%)	0.036
Calcium phosphate	5	4 (80%)	1 (20%)	
Mixed calcium	13	3 (23.1%)	10 (76.9%)	
Cystine	3	2 (66.7%)	1 (33.3%)	
Others	1	1 (100%)	0 (0%)	

MP 11.9

Pneumovesicoscopic diverticulectomy and ureteral reimplantation: A safe and effective minimally invasive technique

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Introduction: Pneumovesicoscopy, a technique involving bladder insufflation with carbon dioxide, enables a magnified intravesical view for complex procedures. This study aimed to evaluate the feasibility, safety, and short-term outcomes of pneumovesicoscopic diverticulectomy combined with ureteral reimplantation.

Methods: This retrospective study evaluated the short-term outcomes of pneumovesicoscopic diverticulectomy combined with ureteral reimplantation performed between 2018 and 2024. The minimally invasive technique involved three 5 mm trocars (for 30-degree scope) and two 3 mm trocars for working instruments, with carbon dioxide insufflation. Bladder diverticulectomy, bladder wall reconstruction, and ureteral reimplantation was performed using the cross-trigonal or modified Glenn-Anderson technique.

Results: A total of six patients, all males age 18–180 months and weighing 13–34 kg, with three left-sided, two right-sided, and one bilateral diverticulum. The diverticulum was associated with ureterovesical junction obstruction in four cases (five diverticulum) and two cases had high-grade vesicoureteral reflux (without diverticulum). The mean operative time was 195 minutes, with no conversions to open surgery and minimal complications (urinary retention in one patient, bladder hematoma in another). The average bladder catheter duration and hospital stay were 3.3 days and 4.2 days, respectively. Postoperative imaging demonstrated resolution of hydronephrosis and complete disappearance of the diverticulum.

Conclusions: Pneumovesicoscopic diverticulectomy with concomitant ureteral reimplantation and bladder wall reconstruction demonstrates feasibility, safety, and excellent short-term outcomes. This minimally invasive approach offers several advantages, including a low complication rate and rapid recovery.

MP 11.10

Enhancing surgical outcomes and accelerating learning curves in open pyeloplasty: The impact of surgical mentorship on junior academic surgeons

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Introduction: Surgeons performing pediatric open pyeloplasty may initially lack confidence in their skills during early cases post-training, as this procedure is particularly challenging for junior academic surgeons. Surgical mentorship for early-career surgeons has been proposed as a strategy to accelerate skill development and improve surgical outcomes. This study aimed to evaluate the impact of surgical mentorship on case outcomes and the learning curves of early-career surgeons.

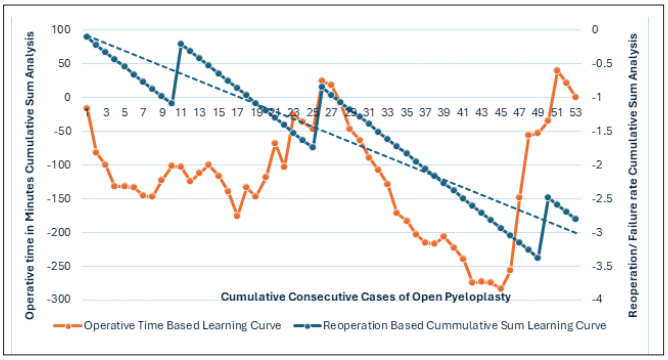
Methods: Using an institutionally maintained prospective case log by EPIC electronic health record system, we reviewed all initial open pyeloplasty cases consecutively performed by an index junior academic surgeon (MC) with the mentorship of a senior surgeon (AJL) from April 2020 to May 2023. Data collected included case characteristics, operative times, followup durations, and surgical complications within a two-year postoperative period (Table 1). A cumulative sum (CUSUM) analysis was employed to identify peaks, plateaus, and trends for complications (defined as Clavien–Dindo classification ≥3b) and operative time.

Results: A total of 54 open pyeloplasty cases performed under surgical mentorship were analyzed and categorized into three phases using CUSUM analysis. The mean age of patients was 15.49 (27.02) months and the average operative time was 141.26±34.49 minutes, with a decreasing trend observed across phases. Complication rates requiring redo pyeloplasty or dilatation (Clavien-Dindo classification ≥3b) accounted for 5.5% of cases. The average followup duration was 21.63±14.14 months. Based on CUSUM analysis (Figure 1), the junior surgeon achieved the competency-proficiency phase around the 11th to 26th case, demonstrating consistent technical skill development, reduced operative times, and satisfactory outcomes under mentorship. In the later phase (50th case), when the surgeon handled more complex cases while increasing trainee involvement, a slight increase in operative time was noted.

Conclusions: This analysis demonstrates that surgical mentorship provides opportunity and facilitates the early development of technical proficiency in pediatric open pyeloplasty for junior academic surgeons, enabling them to achieve comparable learning curves and outcomes early in their careers. These findings suggest that mentorship supports satisfactory surgical outcomes even during the initial stages of the learning curve.

MP 11.10. Table 1. Case characteristics, operative time, followup duration, and complication rates

	Overall (n=54)	Phase 1 (n=11)	Phase 2 (n=15)	Phase 3 (n= 8)
Categorical, n (%)				
Sex (male)	43 (79.6%)	9 (81.8%)	9 (60%)	25 (89.3%)
Laterality (left)	33 (61.1%)	5 (45.5%)	10 (66.7%)	18 (64.3%)
Redo pyeloplasty or dilatations	3 (5.5%)	1 (9%)	1 (6.7%)	1 (3.6%)
Continuous, mean (SD)				
Age at surgery, months	15.49 (27.02)	20.29 (37.55)	18.29 (20.68)	12.49 (24.88)
OR time, minutes	141.26 (34.49)	132.3 (23.43)	150.2 (36.35)	140 (35.9)
Followup, months	21.63 (14.14)	14.26 (17.04)	27.22 (14.65)	21.53 (10.88)



MP 11.10. Figure 1. Phases in the CUSUM analysis reflect slope changes in the cumulative sum curve. The orange line shows operative time trends, and the blue line highlights outcome deviations, indicating improvement to competency (phase 1), stability to proficiency (phase 2), or decline failure rate/adjustment with case mix (phase 3).

MP 11.11

Efficacy of laser lithotripsy in pediatric urolithiasis across different anatomical locations: A retrospective analysis

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Introduction: Pediatric urolithiasis poses substantial challenges due to the heterogeneity in the anatomical locations and the inherent delicacy of the structures. This study aimed to assess the efficacy of laser lithotripsy, a prevalent treatment modality, focusing on achieving stone-free rates and minimizing the requirement for further surgical procedures.

Methods: In this retrospective study, we analyzed medical records from a tertiary pediatric hospital for patients undergoing laser lithotripsy from January 2015 to December 2024. Data were classified by stone location, number of laser lithotripsy procedures, and final stone-free status. The Chi-squared test assessed the relationships between stone location and eventual stone-free status.

Results: This study included 164 pediatric urinary stone cases with a mean age of 10.4 years (SD 5.4), and a mean stone size of 1.33 cm (SD 0.72). Our findings revealed notable variations in treatment success across different anatomical regions. The overall stone clearance rate was 73.8%, with the highest success observed in stones located in the bladder (96.4%) and distal ureter (96.2%). The lower pole, on the other hand, exhibited the lowest clearance rate, with only 52.5% of patients becoming stone-free (Table 1). Our results also, indicated that the majority of stones can be cleared with a single laser procedure, while pelvis stones (23.1%) require multiple surgeries to render stone-free (Table 2).
Conclusions: Our findings indicate that stones located in the lower pole are least likely to eventually become cleared, demonstrating a high likelihood of persistence and necessitating multiple subsequent interventions. This highlights the need for more comprehensive investigations to improve lower pole stones management.

MP 11.11. Table 1. Stone-free status by location

Location	NO n=43 (%)	Yes n=121 (%)
Upper calyx	2 (28.6%)	5 (71.4%)
Lower pole	19 (47.5%)	21 (52.5%)
Pelvis	18 (31.6%)	39 (68.4%)
Proximal ureter	2 (33.3%)	4 (66.7%)
Distal ureter	1 (3.8%)	25 (96.2%)
Bladder	1 (3.6%)	27 (96.4%)

MP 11.11. Table 2. Distribution of the number of laser procedures for stone-free status across locations

Location	No. of laser procedure	Count
Upper calyx	1	5 (100.0%)
Lower pole	1	19 (90.5%)
	2	2 (9.5%)
Pelvis	1	30 (76.9%)
	2	5 (12.8%)
	3	4 (10.3%)
Proximal ureter	1	4 (100.0%)
Distal ureter	1	21 (84.0%)
	2	4 (16.0%)
Bladder	1	25 (92.6%)
	2	1 (3.7%)
	3	1 (3.7%)

MP 11.12
Early creatinine dynamics in boys with posterior urethral valve are associated with long-term renal function

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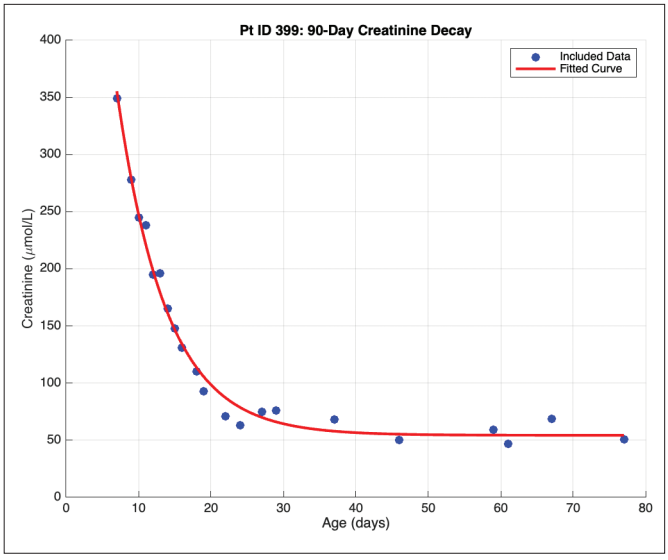
Introduction: Neonatal serum creatinine is closely monitored in boys with posterior urethral valves (PUV), where nadir creatinine is a key predictor of long-term renal outcomes. Creatinine typically declines after urinary decompression; we assessed whether this decay predicts one-, three-, and five-year kidney function.
Methods: We retrospectively identified boys (2002–2024) with PUV at our institution. An exponential decay model, y=Ae^(-bx) + C, was fit to creatinine from the first 90 days. Patients with poor fits (R2<0.70) were excluded. One-, three-, and five-year creatinine values were evaluated as outcome measures. The area under the curve (AUC) was derived from integrating the decay function. We compared the predictive performance of model parameters vs. nadir creatinine using the C-index.
Results: Ninety-nine patients met the inclusion criteria; data at one, three, and five years were available for 79 (80%) patients, 48 (49%) patients, and 35 (35%) patients, respectively. Figure 1 demonstrates a representative exponential decay fit. Median serum creatinine was 30 µmol/L (IQR 25–41) at one year, 36 µmol/L (31–53) at three years, and 43 µmol/L (38–64) at five years. On multivariable regression, the horizontal asymptote (C) was associated with five-year creatinine (OR 3.46, 95% CI 1.87, 6.40, p<0.001); the scaling factor (A) and decay rate (B) were not significant. Nadir creatinine alone was associated with five-year creatinine (OR 10.66, 95% CI 5.00, 22.72, p<0.001) and showed consistently higher C-indices than AUC in predicting creatinine at one year (0.87 vs. 0.74), three years (0.83 vs. 0.80), and five years (0.76 vs. 0.73).
Conclusions: Although exponential decay parameters were associated with long-term kidney function in boys with PUV, nadir creatinine was superior in prediction. Study limitations include retrospective design, limited data, and lack of inclusion of further risk factors. This study does contribute that decay parameters may be meaningful for future prediction in this population, while corroborating the importance of nadir creatinine.



MP 11.12. Figure 1. Creatinine plot.

MP 11.13

Twenty-year retrospective analysis of open vs. laparoscopic dismembered pyeloplasty and trends in perioperative pain management at a single institution

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Introduction: Laparoscopic pyeloplasty (LP) is increasingly used as a minimally invasive alternative to open pyeloplasty (OP) for treating ureteropelvic junction obstruction (UPJO);[1,2] however, it remains controversial which approach is preferred in the pediatric population.[3,4] This study compares outcomes of OP vs. LP over 20 years at a single institution, while also analyzing trends in perioperative pain management during this period.

Methods: All patients aged 0–18 years who underwent dismembered pyeloplasty (DP) from 2003–2023 were included in this study. Baseline data included age, sex, laterality, and surgical approach. Outcomes assessed were perioperative pain management strategies, length of stay, operative time, and change in anteroposterior diameter (APD) of the renal pelvis. Statistical analyses were conducted using SPSS version 29.

Results: A total of 68 procedures were analyzed, with 24 (35%) performed laparoscopically and 44 (65%) openly. Patient demographics are displayed in Table 1. Success and complication rates were similar between LP and OP. Laparoscopic pyeloplasty had significantly longer operative times (245±45 vs. 150±42 minutes, p<0.001) but shorter hospital stays (2±1.1 vs. 3.8±1.2 days, p<0.001) compared to OP. Continuous opioid infusion was required in 82% of OP patients vs. 8% of LP patients (p<0.001). From 2003–2023, there was a significant reduction in opioid infusions (p<0.001) and increased dexamethasone use (p=0.009), although no significant changes were noted for the number of oral/IV bolus opioid doses, ketorolac, or regional blocks. Reduction in APD was significantly greater after LP than OP (66.9±25.1% vs. 27.3±78.4%, p=0.002).

Conclusions: Laparoscopic pyeloplasty offers shorter hospital stays, less opioid use, and greater APD reduction compared to OP, while maintaining similar success and complication rates. These results add to the growing body of evidence supporting LP as a viable option for pediatric UPJO treatment.

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MP 11.13. Table 1. Comparison of baseline characteristics for patients who underwent OP and LP

Characteristic	Open pyeloplasty (n=44)	Laparoscopic pyeloplasty (n=24)	p
Mean (SD)			
Age, months	64 (51)	100 (58)	0.005
Preoperative APD, mm	29.1 (14.2)	32.9 (15.9)	0.161
N (%)			
Sex, male	31 (70.5)	12 (50)	0.095
Side, left	28 (63.6)	13 (54.2)	0.446

MP 11.14

Quantitative voiding cystourethrogram features predict scarring on radionuclide imaging in patients with vesicoureteral reflux

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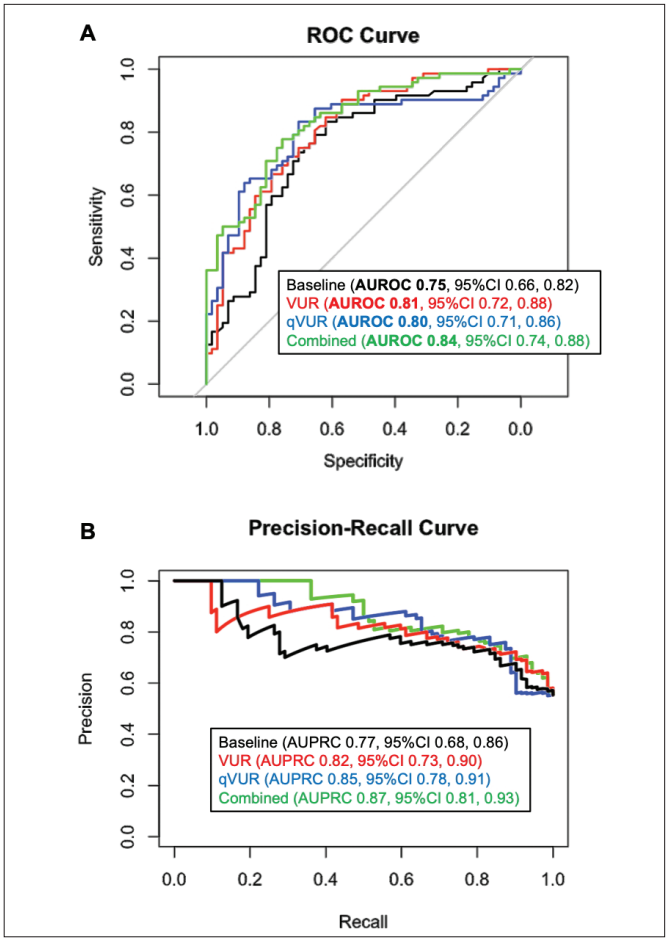
Introduction: Renal scarring is an indicator of decreased renal reserve in patients with vesicoureteral reflux (VUR), and its presence can influence long-term morbidity. This study aimed to evaluate the utility of quantitative features on voiding cystourethrogram (VCUG) to predict renal scarring.

Methods: We identified children with primary VUR who underwent a VCUG at first presentation and a nuclear renal scan within six months to assess for renal scarring at our institution from 2016–2019. Quantitative VUR features (qVUR) were extracted, including maximum ureteral width, proximal ureter width, distal ureter width, and ureteral tortuosity. Logistic regression models were developed to predict renal scarring using clinical features, VCUG indication, and VUR laterality (baseline model); the addition of VUR grade (grade model); the addition of qVUR (qVUR model); and the addition of both grade and qVUR (combined model). Performance was assessed with the bootstrapped area under the receiver operating characteristic (AUROC) and precision-recall curve (AUPRC).

Results: In total, 130 children (163 renal units) were included with median age at VCUG of 20 months (Table 1). Scarred and non-scarred groups differed significantly in age (47 vs. 7 months, p<0.001), high-grade reflux (54% vs. 29%, p=0.001), and



MP 11.14. Figure 1. (A) Bootstrapped receiver operating characteristic curves; and (B) precision-recall curves for logistic regression models predicting renal scarring in primary VUR patents.

recurrent UTI at presentation (57% vs. 26%, p<0.001). Model performance (Figure 1) was highest for the combined model (AUROC 0.84, AUPRC 0.87), followed by qVUR (AUROC 0.80, AUPRC 0.85) and grade (AUROC 0.81, AUPRC 0.82). While AUROC values for qVUR and grade models were comparable (p>0.05), qVUR demonstrated superior AUPRC compared to traditional grading alone.

Conclusions: Quantitative metrics enhanced model performance in predicting renal scarring. qVUR provides the additional benefit of objectivity in measurement compared to VUR grade, which incurs subjectivity. Our data highlights the need for heightened clinical suspicion in patients who are older at presentation or have ureteral dilation.

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MP 11.14. Table 1. Baseline clinical information and VCUG findings for VUR patients with DMSA renal scan

Test variable	Total cohort= 130 patients (163 renal units)	Non-scarred= 58 patients (84 renal units)	Scarred= 72 patients (79 renal units)	p
Age in months (IQR)	17.8 (57.5)	7.15 (27.9)	46.5 (56.1)	<0.001*
Male/Female	61/69	30/28	31/41	0.38
Single UTI n (%)	84 (64)	30 (52)	54 (75)	0.005*
Recurrent UTI n (%)	56 (43)	15 (26)	41 (57)	<0.001*
Hydronephrosis at presentation n (%)	34 (21)	15 (18)	19 (24)	0.34
Bilateral VUR n (%)	84 (64)	42 (72)	42 (58)	0.10
High grade VUR (IV & V) n (%)	68 (42)	25 (29)	43 (54)	0.001*
Ureteral tortuosity ratio (IQR)	1.07 (0.17)	1.07 (0.23)	1.07 (0.13)	0.83
Max ureteral width (IQR)	10.3 (8.55)	9.62 (9.08)	11.3 (10.5)	0.10
Proximal ureteral width (IQR)	6.47 (4.60)	5. 73 (4.15)	7.09 (5.46)	0.19
Distal ureteral width (IQR)	6.99 (5.35)	6.86 (5.43)	7.07 (5.35)	0.81

*Statistically significant.