

# Upper Urinary Tract Transitional Cell Carcinoma and Lymph Node Involvement: Pre and Post Operative Outcomes

Brittney R Henderson, Young Son, Mark Quiring, Scott Serpico, Edward Wu, Emma Troyer, Ryan Moriarty, Thomas Mueller & Gordan Brown

## INTRODUCTION

 Upper urinary tract transitional cell carcinomas (UUT-TCC) comprise any malignancy arising from the renal pelvis to distal ureter. These cancers account for approximately 5-10% of all urothelial tumors. Two-thirds of cases are invasive with an estimated 5-year survival rate less than 50%. Pathologic staging, invasion into local structures, and lymph node involvement influence the overall survival rate. Lymph node dissection (LND) is associated with higher overall survival rates in UUT-TCC patients, likely by decreasing regional lymph node metastasis. Current literature suggests that removing eight to ten regional lymph nodes may improve survival. The outcomes of upper urinary tract malignancies (UTM) have significantly improved, however, no standard guidelines exist regarding the role of LND in UUT-TCC.

## **Objective**

•This analysis aims to investigate the impact of LND on outcomes in patients diagnosed with UUT-TCC.

# METHOD

 The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) is a Health Insurance Portability and Accountability Act (HIPAA) compliant data file containing patient cases from 706 participating hospital institutions. A total of 14,186 patients who underwent nephrectomy and nephroureterectomy were initially evaluated. Inclusion criteria included a postoperative diagnosis of UTM (n=923). The cohort was subgrouped to patients with LND. The groups were defined for patients with lymph node positive (LNP) (n=48) and lymph node negative (LNN) (n=255) on pathological staging. Patients without lymph nodes evaluated or unknown status were excluded. The two groups were then compared. Pearson's Chi-square test was performed for categorical variables, and t-test analysis for continuous variables. A univariate and multivariate analysis was performed with significant variables from the basic statistical analysis to predict independent factors. A Random forest model was also used. Statistical analysis was accepted at p<0.05.

**Table 1.** Patient Demographics and Post-Operative Outcomes and Variables, Lymph Node Positive vs Lymph Node Positive Patients

	Total Cohort		Lymph Node Positive		Lymph Node Negative		
	n = 303		n = 48 (15.8%)		n = 255 (84.2%)		
Patient Characteristics							
Mean Patient Age (SD)	70.12	10.32	70.22	13.45	70.10	9.68	P = 0.6
Height (in.) (SD)	66.82	4.01	65.96	4.00	66.98	4.00	P = 0.1
Weight (lbs.) (SD)	178.81	41.44	167.63	37.52	180.93	41.87	P = 0.0
Male Gender (%)	190	62.71%	25	52.08%	<b>16</b> 5	64.71%	P = 0.2
Non-Caucasian Race (%)	87	28.71%	10	20.83%	77	30.20%	P = 0.2
Ethnicity Hispanic (%)	8	2.64%	0	0.00%	8	3.14%	P = 0.3
Past Medical History /Co-morbidities							
Current Smoker (Within one year) (%)	51	16.83%	4	8.33%	47	18.43%	P = 0.1
Inpatient (%)	291	96.04%	48	100.00%	243	95.29%	P = 0.2
Transfer Status (Not Transferred - Admitted	301	99.34%	48	100.00%	253	99.22%	P = 1.0
from Home) (%)	301	JJ.J470	70	100.0070	233	33.2270	1 – 1.0
Functional Health Status Prior to Surgery	301	99.34%	48	100.00%	253	99.22%	P = 1.0
(Independent) (%)	301	33.3470	10	100.0070	233	33.2270	1 - 1.0
Prior Pelvic Surgery (%)	144	47.52%	25	52.08%	119	46.67%	P = 0.5
Prior Pelvic Radiation (%)	11	3.63%	1	2.08%	10	3.92%	P = 1.0
Chemo Within 90 days (%)	39	12.87%	7	14.58%	32	12.55%	P = 0.8
Perioperative Antibiotic Use (<72 hours) (%)	284	93.73%	47	97.92%	237	92.94%	P = 0.3
Mean Estimated Probability of Mortality (SD)	0.009	0.017	0.010	0.013	0.009	0.018	P = 0.5
Mean Estimated Probability of Morbidity (SD)	0.123	0.046	0.127	0.043	0.122	0.047	P = 0.4
Diabetes with Insulin Dependency (%)	24	7.92%	3	6.25%	21	8.24%	P = 0.7
Diabetes with Oral Agents (%)	50	16.50%	5	10.42%	45	17.65%	P = 0.3
Severe COPD (%)	20	6.60%	2	4.17%	18	7.06%	P = 0.7
HTN Requiring Meds (%)	179	59.08%	27	56.25%	152	59.61%	P = 0.7
Steroid Use for Chronic Conditions (%)	10	3.30%	3	6.25%	7	2.75%	P = 0.1
Dyspnea (%)	24	7.92%	2	4.17%	22	8.63%	P = 0.3
Malignancy Stage							
TO (%)	13	4.30%	0	0.00%	13	5.10%	P = 0.2
T1 (T1a, T1b, T1c) (%)	92	30.40%	1	2.10%	91	35.70%	P < 0.0
T2 (T2a, T2b, T2c) (%)	38	12.50%	2	4.20%	36	14.10%	P = 0.0
T3 (T3a, T3b, T3c) (%)	126	41.60%	34	70.80%	92	36.10%	P < 0.0
T4 (%)	20	6.60%	11	22.90%	9	3.50%	P < 0.0
M0 (%)	147	48.50%	21	43.80%	126	49.40%	P = 0.5
M1 (%)	7	2.30%	4	8.30%	3	1.20%	P = 0.0
ASA Classification							
Class 1 (%)	1	0.30%	0	0.00%	1	0.40%	P = 1.0
Class 2 (%)	78	25.70%	11	22.90%	67	26.30%	P = 0.7
Class 3 (%)	202	66.70%	35	72.90%	167	65.50%	P = 0.4
Class 4 (%)	22	7.30%	2	4.20%	20	7.80%	P = 0.5
Operative Approach							
Planned Laparoscopic/Robotic (%)	200	66.01%	24	50.00%	176	69.02%	P = 0.0
Planned Open (%)	46	15.18%	13	27.08%	33	12.94%	P = 0.0
Unplanned Conversion to Open (%)	5	1.65%	0	0.00%	5	1.96%	P = 1.0
Outcome Variables		_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		3,00,0		_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	, _,,
Mean Operative Time (SD)	237.50	82.92	236.83	91.34	237.63	81.43	P = 0.9
Mean Length of Stay (SD)	4.31	4.91	5.06	4.18	4.16	5.03	P = 0.3
Mean Days from Operation to Discharge (SD)	3.93	3.72	4.58	3.18	3.80	3.80	P = 0.1
Mean Number of Nodes Evaluated (SD)	6.09	6.43	6.42	5.92	6.02	6.53	P = 0.6
Readmission (%)	22	7.26%	2	4.17%	20	7.84%	P = 0.5
Post Operative Complications	LL	7.2070		7.17/0	20	7.07/0	1 - 0.5
Blood Transfusion (%)	31	10.23%	6	12.50%	25	9.80%	P = 0.6
Urinary Tract Infection (%)	21	6.93%	2	4.17%	19	7.45%	P = 0.5
•							
Discharge to Home (%)	284	93.73%	43	89.58%	241	94.51%	P = 0.1
Prolonged Postop NPO or NGT Use (%)	16	5.28%	4	8.33%	12	4.71%	P = 0.2
Unplanned Reoperation Related to Principal	8	2.64%	1	2.08%	7	2.75%	P = 1.0
Procedure (%)	2	0.00%	0	0.000/	2	0.700/	D 4.0
Mortality (%)	2	0.66%	0	0.00%	2	0.78%	P = 1.0

Table 2. Univariate and Multivariate Analysis of Lymph Node Positive Patients

	Univariate An	alysis	Multivariate Analysis		
	OR (95% CI)	P value	OR (95% CI)	P value	
Weight (lbs.)	0.99 (0.98-1.00)	0.042	0.99 (0.98-1.00)	0.058	
Operative Approach					
Planned Open	Referent		Referent		
Planned Laparoscopic/Robotic	0.35 (0.16-0.76)	0.007	0.37 (0.14-0.93)	0.033	
T Malignancy Stage					
T1 (T1a, T1b, T1c)	Referent		Referent		
T2 (T2a, T2b, T2c)	5.06 (0.47-111)	0.191	5.35 (0.49-118)	0.180	
T3 (T3a, T3b, T3c)	33.6 (7.02-604)	<0.001	35.5 (7.29-642)	<0.001	
T4	111 (18.6-2157)	<0.001	94.5 (15.0-1874)	<0.001	
M Malignancy Stage					
M1	7.64 (1.63-39.9)	0.009	2.29 (0.37-16.1)	0.369	

**Table 3.** Patient Demographics and Post-Operative Outcomes and Variables, Patients with >8 Lymph Nodes Dissected vs ≤8 Lymph Nodes Dissected

Height (in.) (SD)   66.82	Mean Patient Age (SD) Height (in.) (SD) Weight (lbs.) (SD) Male Gender (%) Non-Caucasian Race (%) Ethnicity Hispanic (%) Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	70.12 66.82 178.81 190 87 8 51 291 144 11 39	10.32 4.01 41.44 62.71% 28.71% 2.64% 16.83% 96.04% 47.52%	68.93 66.47 174.39 43 24 2	10.39 3.68 39.23 62.32% 34.78% 2.90%	70.46 66.93 180.13 147 63 6	10.30 4.10 42.06 62.82% 26.92% 2.56%	P = 0.483 P = 0.384 P = 0.293 P = 1.000 P = 0.264 P = 1.000
Patient Characteristics	Mean Patient Age (SD) Height (in.) (SD) Weight (lbs.) (SD) Male Gender (%) Non-Caucasian Race (%) Ethnicity Hispanic (%) Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	66.82 178.81 190 87 8 51 291 144 11 39	4.01 41.44 62.71% 28.71% 2.64% 16.83% 96.04% 47.52%	68.93 66.47 174.39 43 24 2	10.39 3.68 39.23 62.32% 34.78% 2.90%	70.46 66.93 180.13 147 63 6	10.30 4.10 42.06 62.82% 26.92% 2.56%	P = 0.384 P = 0.297 P = 1.000 P = 0.264
Mean Patient Age (SD)	Mean Patient Age (SD) Height (in.) (SD) Weight (lbs.) (SD) Male Gender (%) Non-Caucasian Race (%) Ethnicity Hispanic (%) Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	66.82 178.81 190 87 8 51 291 144 11 39	4.01 41.44 62.71% 28.71% 2.64% 16.83% 96.04% 47.52%	66.47 174.39 43 24 2 10 68	3.68 39.23 62.32% 34.78% 2.90%	66.93 180.13 147 63 6	4.10 42.06 62.82% 26.92% 2.56%	P = 0.384 P = 0.297 P = 1.000 P = 0.264
Height (fin.) (SI)	Height (in.) (SD) Weight (lbs.) (SD) Male Gender (%) Non-Caucasian Race (%) Ethnicity Hispanic (%) Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	66.82 178.81 190 87 8 51 291 144 11 39	4.01 41.44 62.71% 28.71% 2.64% 16.83% 96.04% 47.52%	66.47 174.39 43 24 2 10 68	3.68 39.23 62.32% 34.78% 2.90%	66.93 180.13 147 63 6	4.10 42.06 62.82% 26.92% 2.56%	P = 0.384 P = 0.297 P = 1.000 P = 0.264
Weight (bs.) (5)   178.81	Weight (lbs.) (SD)  Male Gender (%)  Non-Caucasian Race (%)  Ethnicity Hispanic (%)  Past Medical History / Co-morbidities  Current Smoker (Within one year) (%)  Inpatient (%)  Prior Pelvic Surgery (%)  Prior Pelvic Radiation (%)  Chemo Within 90 days (%)  Perioperative Antibiotic Use (<72 hours) (%)	178.81 190 87 8 51 291 144 11 39	41.44 62.71% 28.71% 2.64% 16.83% 96.04% 47.52%	174.39 43 24 2 10 68	39.23 62.32% 34.78% 2.90%	180.13 147 63 6	42.06 62.82% 26.92% 2.56%	P = 0.29 P = 1.00 P = 0.26
Male Gender (%) Non-Caucasian Race (%) Non-Caucasian Race (%) Ethnicity Hispanic (%) Refreshibity Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Inpatient (%) Inpatient (%) Refreshibity Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Inpatient (%) Refreshibity Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Refreshibity Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Refreshibity Co-morbidities Refreshibity Co-morbidity Co-morbidities Refreshibity Co-morbi	Male Gender (%) Non-Caucasian Race (%) Ethnicity Hispanic (%) Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	190 87 8 51 291 144 11 39	62.71% 28.71% 2.64% 16.83% 96.04% 47.52%	43 24 2 10 68	62.32% 34.78% 2.90% 14.49%	147 63 6	62.82% 26.92% 2.56%	P = 1.00 P = 0.26
Non Caucasian Race (%) 87 28.71% 24 34.78% 63 26.92% P=0.0 25th Historian (%) 8 2.64% 2 2.90% 6 2.56% P=1.0 25th Medical History / Co-morbidities	Non-Caucasian Race (%) Ethnicity Hispanic (%) Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	87 8 51 291 144 11 39	28.71% 2.64% 16.83% 96.04% 47.52%	24 2 10 68	34.78% 2.90% 14.49%	63 <b>6</b>	26.92% 2.5 <b>6%</b>	P = 0.26
Part Medical History (Co-morbidities   16	Past Medical History /Co-morbidities Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	8 51 291 144 11 39	2.64% 16.83% 96.04% 47.52%	2 10 68	2.90% 14.49%	6	2.56%	
Past Medical History   Co-morbiolities   Current Smoker (Within one year)   (%)   Inpatient   (%)   291   96,64%   68   98,55%   223   95,30%   P = 0.3	Past Medical History / Co-morbidities  Current Smoker (Within one year) (%)  Inpatient (%)  Prior Pelvic Surgery (%)  Prior Pelvic Radiation (%)  Chemo Within 90 days (%)  Perioperative Antibiotic Use (<72 hours) (%)	51 291 1 <b>44</b> 11 39	16.83% 96.04% 47.52%	1 <b>0</b> 68	14.49%			P = 1.00
Current Smoker (Within one year)	Current Smoker (Within one year) (%) Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	291 <b>144</b> 11 39	96.04% <b>47.52%</b>	68		41	17 530/	
Inpatient	Inpatient (%) Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	291 <b>144</b> 11 39	96.04% <b>47.52%</b>	68		41	47 570/	
Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (*72 hours) (%) Perioperative Antibiotic Use (*72 hours) (%) Mean Estimated Probability of Mortality (\$D) Mean Estimated Probability of Mortality (\$D) Diabetes with Insulin Dependency (%) Diabetes with Insulin Dependency (%) Diabetes with Oral Agents (%) Congestive Heart Failure (%) Congestive Heart Failure (%) Severe COPD (%) Severe COPD (%) Severe COPD (%) Prior Pelvic Registry (%) Prior Pelvic Registry (%) Prior Registry (%) Prio	Prior Pelvic Surgery (%) Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	144 11 39	47.52%		00 550/			
Prior Pelvic Radiation (%) Cheem Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%) Perioperative Antibiotic Use (<72 hours) (%) Perioperative Antibiotic Use (<72 hours) (%) Mean Estimated Probability of Mortality (\$D) Mean Estimated Probability of Mortality (\$D) Mean Estimated Probability of Mortality (\$D) Diabetes with Insulin Dependency (%) Diabetes with Oral Algents (%) Diabetes with Insulin Dependency (%) Diabetes with Insulin Depend	Prior Pelvic Radiation (%) Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	11 39		25	30.33%	223	95.30%	P = 0.30
Chemo Within 90 days [%] 39 12.87% 51 11 15.94% 28 11.97% P = 0.5 Perioperative Antibiotic Use (<72 hours) [%] 284 93.73% 65 94.20% 219 93.59% P = 1.0 Mean Estimated Probability of Mortality (SD) 0.009 0.017 0.009 0.011 0.010 0.018 P = 0.5 Mean Estimated Probability of Mortality (SD) 0.22 0.046 0.115 0.042 0.125 0.047 P = 0.0 Diabetes with Insulin Dependency (%) 24 7.92% 4 5.80% 20 8.55% P = 0.0 Diabetes with Insulin Dependency (%) 24 7.92% 4 5.80% 20 8.55% P = 0.0 Diabetes with Oral Agents (%) 24 7.92% 4 5.80% 20 8.55% P = 0.0 Diabetes with Oral Agents (%) 3 0.99% 0 0.00% 3 1.28% P = 1.0 Congestive Heart Failure (%) 3 0.99% 0 0.00% 3 1.28% P = 0.2 HTM Requiring Meds (%) 179 59.08% 39 56.52% 140 59.83% P = 0.7 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 9 3.85% P = 0.4 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 1 1.45% 1 1.45% 1 1.45% P = 0.0 Diabetes of Chronic Conditions (%) 10 3.30% 1 1.45% 1	Chemo Within 90 days (%) Perioperative Antibiotic Use (<72 hours) (%)	39	3.63%		50.72%	109	46.58%	P = 0.63
Perioperative Antibiotic Use (<72 hours) (%)   0.009   0.017   0.009   0.011   0.010   0.018   P = 0.5	Perioperative Antibiotic Use (<72 hours) (%)			3	4.35%	8	3.42%	P = 0.71
Mean Estimated Probability of Mortality (SD)         0.009         0.011         0.010         0.018         P = 0.5           Mean Estimated Probability of Mortality (SD)         0.123         0.046         0.115         0.042         0.125         0.047         P = 0.0           Diabetes with Insulin Dependency (%)         24         7.92%         4         5.80%         20         8.55%         P = 0.0           Congestive Hacter failure (%)         3         0.99%         0         0.00%         3         1.28%         P = 1.0           Severe COPD (%)         20         6.60%         2         2.90%         18         7.69%         P = 0.0           HTN Requiring Meds (%)         3179         59.08%         39         56.52%         140         59.83%         P = 0.0           Malignancy Stage         1         1         0.33%         0         0.00%         1         0.43%         P = 1.0           Malignancy Stage         71 (Ta, Tib, Tic) (%)         78         25.74%         21         30.43%         57         24.36%         P = 0.0           Ta (78a, Ta), Ta), Ta), Ta), Ta)         78         25.74%         21         30.43%         57         24.36%         P = 0.0           Ta (78a, Ta), Ta		284	12.87%	11	15.94%	28	11.97%	P = 0.50
Mean Estimated Probability of Mortality (SD)   0.012			93.73%	65	94.20%	219	93.59%	P = 1.00
Mean Estimated Probability of Morbidity (SD)   0.123		0.009						P = 0.58
Diabetes with Insulin Dependency (%)								P = 0.08
Diabetes with Oral Agents (%) Congestive Heart Failure (%) Severe COPD (%) Congestive Heart Failure (%) Severe COPD (%) Congestive Heart Failure (%) Severe COPD (%) Congestive Heart Failure (%) Congestive Complications Congestive Congestiv								
Congestive Heart Failure (%) Severe COPD (%) Severe COPD (%) 170 (%) 171 (Tria, Trib, Trib.) (%) 172 (T2a, T2b, T2c) (%) 174 (%) 175 (T2a, T2b, T2c) (%) 174 (%) 175 (T2a, T2b, T2c) (%) 175 (T2a, T2b, T2c) (%) 176 (T2a, T2b, T2c) (%) 176 (T2a, T2b, T2c) (%) 177 (T2a, T2b, T2c) (%) 178 (T2a, T2b, T2c) (%) 179 (T2a, T2b, T2c) (%) 170 (								
Severe COPD (%)								
HTN Requiring Meds (%) Steroid Use for Chronic Conditions (%) Dyspnea (%)  Dyspnea (%)  All 1,45% 9 3,85% P = 0.7  Dyspnea (%)  T0 (%)  T1 (T1a, T1b, T1c) (%) T2 (T2a, T2b, T2c) (%) T3 (T3a, T3b, T3c) (%) T4 (%) T4 (%) T4 (%) T5 (T3a, T3b, T3c) (%) T4 (%) T6 (%) T6 (%) T6 (%) T6 (%) T7 (T2a, T2b, T2c) (%) T6 (%) T7 (T3a, T3b, T3c) (%) T6 (%) T7 (T2a, T2b, T2c) (%) T6 (%) T7 (T2a, T2b, T2c) (%) T6 (%) T7 (T2a, T2b, T2c) (%) T6 (%) T6 (%) T7 (T3a, T3b, T3c) (%) T6 (%) T7 (T3a, T3b, T3c) (%) T6 (%) T7 (T3a, T3b, T3c) (%) T7 (%) T8 (T3a, T3b, T3c) (%) T9 (%) T9 (%) T9 (%) T9 (%) T1 (T3a, T3b, T3c) (%) T1 (T3a, T3b, T3c) (%) T2 (T2a, T2b, T2c) (%) T4 (%) T6 (T3a, T3b, T3c) (%) T6 (%) T6 (T3a, T3b, T3c) (%) T6 (%) T6 (T3a, T3b, T3c) (%) T6 (T3a, T3b, T3c) (%) T6 (T3a, T3b, T3c) (%) T7 (T2a, T2b, T2c) (%) T7 (T2a, T2c) (%)	-							
Steroid Use for Chronic Conditions (%)								
Dyspnea   %   24   7.92%   5   7.25%   19   8.12%   P = 1.0								
Malignancy Stage    TO (%)	Steroid Use for Chronic Conditions (%)	10	3.30%	1	1.45%	9	3.85%	P = 0.46
TO (%) 1 0.33% 0 0.00% 1 0.43% P = 1.0 T1 (T1a, T1b, T1c) (%) 78 25.74% 21 30.43% 57 24.36% P = 0.3 T1 (T1a, T1b, T1c) (%) 78 25.74% 21 30.43% 57 24.36% P = 0.3 T1c (T2a, T2b, T2c) (%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 T3 (T3a, T3b, T3c) (%) 22 7.26% 5 7.25% 17 7.26% P = 1.0 M(%) 78 25.74% 21 30.43% 57 24.36% P = 1.0 M(%) 78 25.74% 21 30.43% 57 24.36% P = 0.3 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 1.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 1.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 0.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 0.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 0.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 0.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% P = 0.0 M(%) 202 66.07% 41 52.4 M(%) 29 12.39% 1 = 0.2 M(%) 202 66.07% 41 52.4	Dyspnea (%)	24	7.92%	5	7.25%	19	8.12%	P = 1.00
T1 (T1a, T1b, T1c) (%) 78 25.74% 21 30.43% 57 24.36% P = 0.3 T2 (T2a, T2b, T2c) (%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 T3 (T3a, T3b, T3c) (%) 22 7.26% 5 7.25% 17 7.26% P = 1.0 M0 (%) 78 25.74% 21 30.43% 57 24.36% P = 1.0 M0 (%) 78 25.74% 21 30.43% 57 24.36% P = 0.3 M1 (%) 202 66.67% 43 62.32% 159 67.95% P = 0.4 ASA Classification    Class 1 (%) 13 4.29% 2 2.754% 73 31.20% P = 0.6 Class 3 (%) 92 30.36% 19 27.54% 73 31.20% P = 0.6 Class 3 (%) 92 30.36% 19 27.54% 73 31.20% P = 0.6 Class 3 (%) 126 41.58% 30 43.48% 96 41.03% P = 0.6 Class 4 (%) 126 41.58% 30 43.48% 96 41.03% P = 0.8 M1 (%) M1 (%) M20	Malignancy Stage							
T2 (T2a, T2b, T2c) (%) T3 (T3a, T3b, T3c) (%) T4 (%) T4 (%) M0 (%) T8 25.74% T9 (10, 30, 33% T1 (10, 33) T1 (10, 33) T1 (10, 33) T2 (10, 33) T3 (10, 33) T3 (10, 33) T4 (10, 33) T5 (10, 34) T5 (10, 3	TO (%)	1	0.33%	0	0.00%	1	0.43%	P = 1.00
T3 (T3a, T3b, T3c) (%) T4 (%) T4 (%) M0 (%) M0 (%) M1 (%) M1 (%) M20 (%) M1 (%) M20 (%) M20 (%) M3 (%) M4.58 M3 (%) M4.58 M3 (%) M4.58 M4 (%)	T1 (T1a, T1b, T1c) (%)	78	25.74%	21	30.43%	57	24.36%	P = 0.39
T3 (T3a, T3b, T3c) (%) T4 (%) T4 (%) T8 25.74% T8 (20 0.00% T8 25.74% T8 (21 0.03% T9 24.36% T9 -1.00 MO (%) T8 25.74% T8 (21 0.03% T9 27.54% T9 10.00% T9 20 66.67% T9 20 7.54% T9 21.00,43% T9 27.54% T9 31.00% T9 27.54%	T2 (T2a, T2b, T2c) (%)	202	66.67%	43	62.32%	159	67.95%	P = 0.46
T4 (%) M0 (%) 78 25.74% 21 30.43% 57 24.36% P = 1.0.43% P = 1.0.43% M1 (%) 78 25.74% 21 30.43% 57 24.36% P = 0.3* M1 (%) 202 66.67% 43 62.32% 159 67.95% P = 0.4* ASA Classification    Class 1 (%) 13 4.29% 2 2.90% 11 4.70% P = 0.7* Class 2 (%) 92 30.36% 19 27.54% 73 31.20% P = 0.6* Class 3 (%) 38 12.54% 9 13.04% 29 12.39% P = 1.0* Class 4 (%) 126 41.58% 30 43.48% 96 41.03% P = 0.6* Class 4 (%) 126 41.58% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.58% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.58% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 29 12.399% P = 0.0* Class 4 (%) 126 41.518% 17 24.64% 12.518 1	T3 (T3a, T3b, T3c) (%)	22	7.26%	5	7.25%	17	7.26%	P = 1.00
M0 (%) M1 (%)  Class 1 (%) Class 2 (%) M2	, , , , , , , , , , , , , , , , , , , ,							
ASA Classification  Class 1 (%)								
ASA Classification  Class 1 (%)								
Class 1 (%) Class 2 (%) 92 30.36% 19 27.54% 73 31.20% P = 0.76 Class 3 (%) 38 12.54% 9 13.04% 29 12.39% P = 1.06 Class 3 (%) 126 41.58% 30 43.48% 96 41.03% P = 0.8 Class 4 (%) 126 41.58% 30 43.48% 96 41.03% P = 0.8 Class 4 (%) 126 41.58% 17 24.64% 29 12.39% P = 0.0 Class 4 (%) 126 41.58% 17 24.64% 29 12.39% P = 0.0 Class 4 (%) 159 67.95% P = 0.2 Class 4 (%) 159 67.25% P		202	00.0770	73	02.3270	133	07.5570	1 - 0.40
Class 2 (%) Class 3 (%) Class 3 (%) Class 4 (%) Class		12	4.200/	2	2.00%	11	4.700/	D _ 0.7E
Class 3 (%) Class 4 (%) Class 5 (%) Class 6 (%) Class 6 (%) Class 6 (%) Class 7 (%) Class	· · ·							
Class 4 (%)   126								
Planned Laparoscopic/Robotic (%)   200   66.01%   41   59.42%   159   67.95%   P = 0.2								
Planned Laparoscopic/Robotic (%)   Planned Open (%)   A6   15.18%   17   24.64%   29   12.39%   P = 0.02	Class 4 (%)	126	41.58%	30	43.48%	96	41.03%	P = 0.82
Planned Open (%)   46   15.18%   17   24.64%   29   12.39%   P = 0.0	Operative Approach							
Unplanned Conversion to Open (%) Outcome Variables  Mean Operative Time (SD) Mean Length of Stay (SD) Mean Days from Operation to Discharge (SD) Mean Number of Nodes Evaluated (SD) Readmission (%)  Post Operative Complications  Urinary Leak/Fistula (%) Ureteral Obstruction (%) Sepsis (%)  Blood Transfusion (%) Sepsis (%)  Lurinary Tract Infection (%) Acute Renal Failure (%) Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%) Superficial SSI (%)  Superficial SSI (%)  Discording Table 1.65%  1 1.45% 1 1.45% 4 1.71% P = 1.00 1.45% 1 0.43% P = 0.01 1.45% 1 0.43% P = 0.05 1.65% 1 1.45% 1 0.43% 1 0.43% P = 0.05 1.65% 1 1.45% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.43% 1 0.4	Planned Laparoscopic/Robotic (%)	200	66.01%	41	59.42%	159	67.95%	P = 0.24
Outcome Variables           Mean Operative Time (SD) Mean Length of Stay (SD)         237.50         82.92         236.23         78.54         237.88         84.32         P = 0.8           Mean Days from Operation to Discharge (SD) Mean Number of Nodes Evaluated (SD) Readmission (%)         3.93         3.72         4.43         4.33         3.78         3.51         P = 0.2           Post Operative Complications         6.09         6.43         15.64         6.93         3.27         2.14         P < 0.0	Planned Open (%)	46	15.18%	17	24.64%	29	12.39%	P = 0.02
Mean Operative Time (SD) Mean Length of Stay (SD)       237.50       82.92       236.23       78.54       237.88       84.32       P = 0.8         Mean Days from Operation to Discharge (SD) Mean Number of Nodes Evaluated (SD) Readmission (%)       3.93       3.72       4.43       4.33       3.78       3.51       P = 0.2         Post Operative Complications       0.09       6.43       15.64       6.93       3.27       2.14       P < 0.0	Unplanned Conversion to Open (%)	5	1.65%	1	1.45%	4	1.71%	P = 1.00
Mean Operative Time (SD) Mean Length of Stay (SD)       237.50       82.92       236.23       78.54       237.88       84.32       P = 0.8         Mean Days from Operation to Discharge (SD) Mean Number of Nodes Evaluated (SD) Readmission (%)       3.93       3.72       4.43       4.33       3.78       3.51       P = 0.2         Post Operative Complications       0.09       6.43       15.64       6.93       3.27       2.14       P < 0.0								
Mean Length of Stay (SD)       4.31       4.91       4.62       4.42       4.21       5.05       P = 0.5         Mean Days from Operation to Discharge (SD)       3.93       3.72       4.43       4.33       3.78       3.51       P = 0.2         Mean Number of Nodes Evaluated (SD)       6.09       6.43       15.64       6.93       3.27       2.14       P < 0.0		237.50	82.92	236.23	78.54	237.88	84.32	P = 0.88
Mean Days from Operation to Discharge (SD)       3.93       3.72       4.43       4.33       3.78       3.51       P = 0.2         Mean Number of Nodes Evaluated (SD)       6.09       6.43       15.64       6.93       3.27       2.14       P < 0.0								P = 0.51
Mean Number of Nodes Evaluated (SD) Readmission (%)       6.09       6.43       15.64       6.93       3.27       2.14       P < 0.0         Post Operative Complications	, , ,							
Readmission (%)   22   7.26%   6   8.70%   16   6.84%   P = 0.75								
Post Operative Complications  Urinary Leak/Fistula (%)	` '							
Urinary Leak/Fistula (%) Ureteral Obstruction (%) Blood Transfusion (%) Sepsis (%) Urinary Tract Infection (%) Acute Renal Failure (%) Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%) Superficial SSI (%)  Superficial SSI (%)  Urinary Leak/Fistula (%) 5 1.32% 3 4.35% 1 0.43% P = 0.0 1.45% 4 1.71% P = 1.0 1.45% 4 1.71% P = 1.0 1.45% 4 1.71% P = 1.0 1.45% 1 0.43% P = 0.1 1.45% 1 0.43% P = 0.0 1.026% P = 1.00 0.00% 2 0.85% P = 1.00 0.00% 2 0.85% P = 1.00 0.55% 1 1.470% P = 0.55% 1 1.470% P = 0.55% 1 1.45% 1 0.43% P = 0.0 1.026% P = 0.00% 1 1.45% 1 0.43% P = 0.00% Superficial SSI (%) Superficial SSI (	` '	22	7.26%	Ь	8.70%	16	0.84%	P = 0.79
Ureteral Obstruction (%) Blood Transfusion (%) Sepsis (%) 31 10.23% 7 10.14% 24 10.26% P = 1.00 Sepsis (%) 3 0.99% 2 2.90% 1 0.43% P = 0.11 Urinary Tract Infection (%) Acute Renal Failure (%) Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%) Surgical Site Infection (SSI)  Ureteral Obstruction (%) 31 10.23% 7 10.14% 24 10.26% P = 1.00 32 2.90% 1 0.43% P = 0.11 0.43% P = 0.12 0.66% 0 0.00% 2 0.85% P = 1.00 0.00% 2 0.85% P = 1.00 0.50% 1 1.45% 1 0.43% P = 0.50% 0.00% 5 2.14% P = 0.50%		4	4.2207	2	4.250/	4	0.420/	D 0.00
Blood Transfusion (%) Sepsis (%) Sepsis (%) 31 10.23% 7 10.14% 24 10.26% P = 1.00 Sepsis (%) 32 0.99% 2 2.90% 1 0.43% P = 0.10 Urinary Tract Infection (%) Acute Renal Failure (%) Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%) Surgical Site Infection (SSI) Superficial SSI (%) Sepsis (%) 31 10.23% 7 10.14% 24 10.26% P = 1.00 0.43% P = 0.10 0.43% P = 0.10 0.00% 2 0.85% P = 1.00 0.00% 2 0.85% P = 1.00 0.00% 2 0.85% P = 1.00 0.00% 2 0.85% P = 0.00 0.00% 5 0.85% P = 0.00 0.00% 5 0.00% P = 0.00 0.00% 5 0.00% P = 0.00	, , , , ,							
Sepsis (%)       3       0.99%       2       2.90%       1       0.43%       P = 0.12         Urinary Tract Infection (%)       21       6.93%       2       2.90%       19       8.12%       P = 0.12         Acute Renal Failure (%)       2       0.66%       0       0.00%       2       0.85%       P = 1.00         Discharge to Home (%)       284       93.73%       66       95.65%       218       93.16%       P = 0.55         Prolonged Postop NPO or NGT Use (%)       16       5.28%       5       7.25%       11       4.70%       P = 0.35         Mortality (%)       2       0.66%       1       1.45%       1       0.43%       P = 0.40         Surgical Site Infection (SSI)       5       1.65%       0       0.00%       5       2.14%       P = 0.55	` '							P = 1.00
Urinary Tract Infection (%)       21       6.93%       2       2.90%       19       8.12%       P = 0.18         Acute Renal Failure (%)       2       0.66%       0       0.00%       2       0.85%       P = 1.0         Discharge to Home (%)       284       93.73%       66       95.65%       218       93.16%       P = 0.5         Prolonged Postop NPO or NGT Use (%)       16       5.28%       5       7.25%       11       4.70%       P = 0.3         Mortality (%)       2       0.66%       1       1.45%       1       0.43%       P = 0.4         Surgical Site Infection (SSI)         Superficial SSI (%)       5       1.65%       0       0.00%       5       2.14%       P = 0.5	` '							P = 1.00
Acute Renal Failure (%) Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%)  Surgical Site Infection (SSI)  Acute Renal Failure (%) Discharge to Home (%) 284 93.73% 66 95.65% 218 93.16% P = 1.00 66 95.65% 11 4.70% P = 0.50 1.65% 0 0.00% 5 2.14% P = 0.50	Sepsis (%)	3	0.99%	2	2.90%	1	0.43%	P = 0.13
Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%)  Surgical Site Infection (SSI)  Discharge to Home (%) 284 93.73% 66 95.65% 218 93.16% P = 0.58 5 7.25% 11 4.70% P = 0.38 1 1.45% 1 0.43% P = 0.48 1 0.43% P = 0.58 1 0.00% 5 2.14% P = 0.58	Urinary Tract Infection (%)	21	6.93%	2	2.90%	19	8.12%	P = 0.18
Discharge to Home (%) Prolonged Postop NPO or NGT Use (%) Mortality (%)  Surgical Site Infection (SSI)  Discharge to Home (%) 284 93.73% 66 95.65% 218 93.16% P = 0.58 5 7.25% 11 4.70% P = 0.38 1 1.45% 1 0.43% P = 0.48 1 0.43% P = 0.58 1 0.00% 5 2.14% P = 0.58		2	0.66%	0	0.00%	2	0.85%	P = 1.00
Prolonged Postop NPO or NGT Use (%)								
Mortality (%) 2 0.66% 1 1.45% 1 0.43% P = 0.40    Surgical Site Infection (SSI)								
Surgical Site Infection (SSI)         Superficial SSI (%)         5         1.65%         0         0.00%         5         2.14%         P = 0.5%								
Superficial SSI (%) 5 1.65% 0 0.00% 5 2.14% P = 0.59		_	0.0070	1	1.70	1	0.43/0	1 - 0.40
		г	1.050/	0	0.000/	г	2 4 407	D 0.50
Organ Space SSI (%) 5 1.65% 2 2.90% 3 1.28% $P = 0.3$	·							P = 0.59 P = 0.32

**Table 4.** Univariate and Multivariate Analysis of Patients with >8 Lymph Nodes Dissected vs ≤8 Lymph Nodes Dissected

	Univariate An	alysis	Multivariate Analysis		
	OR (95% CI)	P value	OR (95% CI)	P value	
Past Medical History /Co-morbidities					
Currently on Dialysis (Pre-op)	6.96 (0.66-151)	0.116	7.74 (0.68-176)	0.096	
M Malignancy Stage					
M1	4.74 (1.02-24.5)	0.045	3.99 (0.74-23.1)	0.104	
Operative Approach					
Planned Open	Referent		Referent		
Planned Laparoscopic/Robotic	0.44 (0.22-0.89)	0.020	0.52 (0.25-1.09)	0.077	
Unplanned Conversion to Open	0.43 (0.02-3.18)	0.462	0.62 (0.03-4.99)	0.688	
Post Operative Complications					
Urinary Leak/Fistula	10.59 (1.33-216)	0.042	19.4 (2.02-476)	0.010	
Sepsis	6.96 (0.66-151)	0.116	23.6 (1.69-703)	0.020	
Urinary Tract Infection	0.34 (0.05-1.20)	0.151	0.21 (0.02-0.93)	0.038	
Pneumonia	2.61 (0.50-12.1)	0.216	1.72 (0.27-9.14)	0.539	

Significant p values in bold. COPD = Chronic obstructive pulmonary disease, HTN = Hypertension, ASA = American Society of Anesthesiologists

## RESULTS

- •The overall rate of lymph node involvement was 5.2% for 923 patients that underwent nephroureterectomy for UTM.
- •Among 303 patients with at least one lymph node evaluated, 48 (15.8%) were LNP.
- •On Chi-square and t-test analysis, the LNN group had higher pT1 staging and planned laparoscopy. The LNP group had higher pT3, pT4, and pM1 staging, and had more planned open procedures compared to the LNN group.
- •Postoperatively, there were no differences between the two groups including rate of lymphoceles or length of hospital stay (Table 1).
- •On multivariate analysis, pT3 (p=0.001) and pT4 (p<0.001) were associated with lymph node involvement.,
- The LNP group was less likely to be planned
- laparoscopic/robotic compared to the LNN group (p=0.03).
- •The previously statistically significant difference in weight, pT1 staging, and pM1 staging were statistically insignificant on multivariable regression analysis.
- •No significant findings in patient characteristics, comorbid conditions, or disease staging/classification when looking at patients who had >8 or ≤8 lymph nodes dissected.

### CONCLUSION

- Our study shows that pT3 and pT4 are independently associated with lymph node involvement.
- No differences in postoperative outcomes were seen on multivariable analysis including number of nodes evaluated, lymphocele occurrences, or length of hospital stay.
- Our data suggests that for patients with suspected pT3 or pT4 UUT-TCC, nephroureterectomy should be performed in conjunction with LND.

### REFERENCES

Jeldres C, Sun M, Isbarn H, et al. A population-based assessment of perioperative mortality after nephroureterectomy for upper-tract urothelial carcinoma. Urology. 2010;75:315–320.

for Upper Tract Urothelial Cancer. European Urology. Volume 60, Issue 4, 2011.

- 2. Soria, F., Shariat, S.F., Lerner, S.P. et al. Epidemiology, diagnosis, preoperative evaluation and prognostic assessment of upper-tract urothelial carcinoma (UTUC). World J Urol 35, 379–387 (2017).
- https://doi.org/10.1007/s00345-016-1928-x

  3. Cho KS, Choi HM, Koo K, et al. Clinical significance of lymph node dissection in patients with muscle-invasive upper urinary tract transitional cell carcinoma treated with nephroureterectomy. J Korean Med Sci. 2009
- upper urinary tract transitional cell carcinoma treated with nephroureterectomy. J Korean Med Sci. 2009
  Aug;24(4):674-8. doi: 10.3346/jkms.2009.24.4.674. Epub 2009 Jul 29. PMID: 19654951; PMCID: PMC2719212.

  4. Marco Roscigno, Maurizio Brausi, Axel Heidenreich, et al. Lymphadenectomy at the Time of Nephroureterectomy
- https://doi.org/10.1016/j.eururo.2011.07.009
   Marco Roscigno, Cesare Cozzarini, Roberto Bertini, et al. Prognostic Value of Lymph Node Dissection in Patients with Muscle-Invasive Transitional Cell Carcinoma of the Upper Urinary Tract. European Urology. Volume 53, Issue
- 4, 2008,
  6. Kondo T, Hara I, Takagi T, et al. Template-based lymphadenectomy in urothelial carcinoma of the renal pelvis: a prospective study. Int J Urol. 2014;21(5):453-459. doi:10.1111/iju.12417
- 7. Hakimi K, Carbonara U, Djaladat H, et al. Outcomes of Lymph Node Dissection in Nephroureterectomy in the Treatment of Upper Tract Urothelial Carcinoma: Analysis of the ROBUUST Registry. J Urology. 2022
- of the upper urinary tract. Cancer, 110: 1715-1722. <a href="https://doi.org/10.1002/cncr.22970">https://doi.org/10.1002/cncr.22970</a>
  9. Inokuchi J, Kuroiwa K, Nishiyama H, et al. (2018). Regional distribution of lymph node metastasis in upper urinary tract urothelial cancer, sub-analysis of large multi-institutional study (JCOG1110A). European Urology Supplements. 17. e1433-e1434. 10.1016/S1569-9056(18)31843-8.