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1

Narcotic Use after Robotic Urologic Surgery - Are We Overprescribing?

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Introduction: Overprescription of narcotic pain medications in the post-operative setting has been identified as a significant contributor to our nationwide opioid crisis. In this study, we sought to quantify the level of narcotic overprescription after minimally invasive urologic surgery by assessing narcotic prescription and utilization patterns, and identifying potential risk factors for higher post-operative narcotic use.

Materials & Methods: We prospectively recorded pain pill usage, including narcotics, acetaminophen, and ibuprofen, following robotic radical prostatectomy (RP) and robotic partial nephrectomy (PN) at two academic institutions. At discharge, patients were encouraged to use non-narcotics for first-line pain control, and narcotics for breakthrough pain. All patients completed a pain pill log documenting the daily quantity of pills taken of each analgesic type. At the first post-operative visit, our clinic staff verified patient-reported narcotic utilization by physically counting the remaining narcotic pills. We also recorded potential risk factors for increased narcotic usage -- including age, gender, pre-existing comorbidities, depression, prior narcotic use, and alcohol consumption – and used multivariable logistic regression to evaluate the association of these factors with higher narcotic utilization.

Results: 94 RP and 35 PN patients completed their pain pill logs and were included in this study (see table). Most were prescribed 20 to 30 pills of oxycodone 5 mg. 10-15% of patients did not fill their narcotic prescription. For RP patients, 83% of narcotic pills that were filled were unused. PN patients used a higher proportion of their filled narcotic pills, but 66% of pills were unused. If all patients had filled their prescriptions, 2067 (85%) and 647 (70%) of pills after RP and PN, respectively, would have been left unused.
An average of 3.9 and 7.9 narcotic pills per patient were used, with a mean usage duration of 1.9 and 3.7 days after RP and PN, respectively. 43-51% used zero narcotic pills postoperatively.
Only 16/129 (12.4%) of patients required ≥ 15 narcotic pills. On multivariable analysis, we did not identify any significant predictors of taking > 15 narcotic pills after RP. After PN, younger age (OR 0.62, 95% CI 0.32-0.86, p = 0.046), higher Charlson comorbidity score (OR 7.13, 95% CI 1.83-94.7, p = 0.03), and a higher number of narcotic pills prescribed (OR 1.90, 95% CI 1.22-6.90, p = 0.045) were associated with taking ≥ 15 narcotic pills post-operatively.

Conclusions: Narcotic overprescription is common after robotic urologic surgery. The majority of patients following RP and PN require minimal or no narcotics following discharge when first-line use of non-narcotic medications are encouraged. In this small study of 129 patients, more than 2,200 excess, unused narcotic pills were filled. Clinicians should prescribe fewer routine postoperative narcotics, encourage patients to first use non-narcotic pain regimens, and educate patients on proper disposal of excess narcotics. Subsequent studies will evaluate strategies to modify narcotic prescription routines and curb overprescription.

Table: Pain pill usage after robotic urologic surgery

	Radical Prostatectomy n = 94	Partial Nephrectomy n = 35
Male sex	94 (100%)	23 (65.7%)
Mean age (years)	62.7 (range 46-85)	46.2 (28-80)
Mean BMI	28 (range 19-41)	29.5 (19-44)
Mean Charlson score (age-adjusted)	4.8 (2-7)	3.6 (0-8)
Narcotic Use		
Total narcotic pills prescribed	2420	922
# unused prescribed pills (%)	2067.5 (85.4%)	648 (70.3%)
Prescriptions filled (%)	80 (85%)	28 (80%)
# unused filled narcotic pills (%)	1722.5 (83%)	528 (65.6%)
Mean narcotic pills prescribed	26.7 (range 20-30)	27.1 (range 0-60)
# of patients using post op narcotics (%)	47 (50%)	19 (54.3%)
# Narcotics pills used (%)	0 pills: 48 (51.1%) < 10 pills: 32 (34.0%) 10-20 pills: 10 (10.6%) ≥ 20 pills: 4 (4.3%)	0 pills: 15 (42.9%) < 10 pills: 10 (28.6%) 10-20 pills: 4 (11.4%) ≥ 20 pills: 6 (17.1%)
Mean pills used/patient	3.9 (range 0-37)	7.9 (range 0-38)
Mean days of narcotic use/patient	1.9 (range 0-11)	3.7 (range 0-18)
Ibuprofen Use		
# of patients using Ibuprofen (%)	56 (62.8%)	20 (57.1%)
Mean ibuprofen pills used/patient	7.8 (range 0-45)	7.2 (range 0-32)
Mean days of ibuprofen pills use/patient	3.3 (range 0-13)	4.4 (0-17)
Acetaminophen Use		
# of patients using acetaminophen (%)	67 (71.3%)	22 (88%)
Mean acetaminophen pills used/patient	11.3 (range 0-46)	24.2 (1-122)
Mean days of acetaminophen used/patient	3.7 (range 0-11)	8.5 (0-42)

2

Long-term Oncologic Comparison of Radiofrequency Ablation to Partial Nephrectomy for T1 Renal Cell Carcinoma using Propensity Score Analysis

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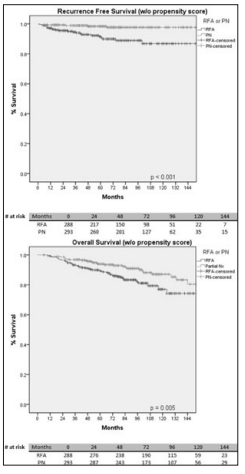
Introduction: Radiofrequency ablation (RFA) of clinical T1 (cT1) renal cell carcinoma (RCC) is a well-established option. Comparisons to partial nephrectomy (PN) in similar patients are infrequently reported due to significant differences in age and comorbidities. Our objective is to compare oncologic outcomes after RFA to those for PN for treatment of sporadic, cT1 RCC in a large cohort with strict exclusion criteria using propensity score analysis to reduce the effect of confounding variables.

Materials & Methods: All patients (n = 1,255) who underwent RFA or PN at a single institution between 1998-2014 were retrospectively reviewed. Only solitary cT1 lesions, proven as RCC on pre-RFA biopsy or surgical pathology, were included. Exclusion criteria were prior RCC, RCC-associated genetic syndrome, > 1 lesion, metastasis at presentation, follow-up < 6 months, and/or metachronous tumor development. Residual disease after RFA was defined as enhancement on initial post-RFA imaging. Local recurrence was defined as enhancement after initially negative post-procedure imaging, and was carefully discriminated from metachronous tumor development. A propensity score was calculated using a binary logistic regression including age, Charlson score, and location (R.E.N.A.L. score). Patients were stratified and compared by quintiles of the propensity score. Recurrence-free (RFS), metastasis-free (MFS) and overall survivals (OS) were estimated using the Kaplan-Meier method before and after stratification. The log-rank test was used to assess differences in survival and was pooled to assess significance across quintiles.

Results: 288 RFA and 293 PN patients were included. Only age, Charlson score, and location (R.E.N.A.L. score) were significantly different between groups with no significant difference in clinical stage or total R.E.N.A.L. score. Median oncologic follow-up was 53 months after RFA versus 65 months after PN. RFA patients experienced 23 recurrences, 13 metastases, and 54 deaths while PN patients experienced 6 recurrences, 7 metastases, and 30 deaths during follow-up. RFA patients had significantly worse RFS (p < 0.001) and OS (p = 0.005) than PN patients by Kaplan-Meier estimates while metastasis-free survival (MFS) was not significantly different (p = 0.081). After stratifying by propensity score, there remained a significant difference in RFS (p = 0.042) but not in OS (p = 0.713) or MFS (p = 0.845).

Conclusions: Our data suggest more local recurrence after RFA in proven cT1 RCC after adjusting for factors related to treatment selection. This difference does not clearly translate to a greater risk for metastatic progression or, importantly, overall survival. This analysis supports that PN is the gold standard in healthy surgical candidates, but RFA is a reasonable option in those who are of greater surgical risk.



Baseline Characteristics and Pathology

Factor	RFA (n = 288)	PN (n = 293)	p value
Age, mean (median; IQR)	70.10 (70.50, 64-77)	57.98 (58, 49.96-67)	<0.001
Sex, no (%)			
Male	189 (65.6%)	200 (68.3%)	0.500
Female	99 (34.4%)	93 (31.7%)	
BMI, mean (median; IQR)	30.07 (28.75, 25.68-33.10) (n = 246)	29.34 (28.50, 25.68-32.08) (n = 270)	0.187
Charlson score, mean (median; IQR)	2.31 (2, 1-3)	0.98 (0, 0-2)	<0.001
Solitary kidney, no (%)	1 (0.3%)	6 (2%)	0.060
Side, no (%)			
Left	124 (43.1%)	145 (49.5%)	0.120
Right	164 (56.9%)	148 (50.5 %)	
Clinical stage, no (%)			
T1a	245 (85.1%)	252 (86.0%)	0.748
T1b	43 (14.9%)	41 (14.0%)	
Pre-op size on CT, cm, mean (median; IQR)	2.87 (2.75, 2.00-3.50)	2.80 (2.50, 2.00-3.50)	0.432
R.E.N.A.L. Score, mean (median; IQR)	6.63 (6, 5-8)	6.83 (7, 5-8)	0.197
R, no (%)			
R <= 4	245 (85.1%)	251 (85.7%)	0.753
R > 4, < 7	42 (14.6%)	42 (14.3%)	
R >= 7	1 (0.3%)	0 (0%)	
R, mm, mean (median; IQR)	28.68 (27.50, 20-35)	27.78 (26, 18-35)	0.352
E, no (%)			
>= 50 % exophytic	162 (56.3%)	142 (48.5%)	0.166
< 50 % exophytic	67 (23.3%)	78 (26.6%)	
Completely endophytic	59 (20.5%)	73 (24.9%)	
N, no (%)			
N >= 7	114 (39.6%)	106 (36.2%)	0.697
N < 7, >4	49 (17.0%)	52 (17.7%)	
N <= 4	125 (43.4%)	135 (46.1%)	
N, mm, mean (median; IQR)	5.35 (4.45, 0-9)	5.89 (5, 0-10)	0.254
A, no (%)			
Anterior	121 (42.0%)	130 (44.4%)	0.276
Posterior	128 (44.4%)	113 (38.6%)	
Middle	39 (13.5%)	50 (17.1%)	
L, no (%)			
Mass entirely above upper or below lower polar line	146 (50.7%)	157 (53.6%)	
Mass crosses polar line	54 (18.8%)	31 (10.6%)	0.018
>50% of mass across polar line OR crosses axial midline OR entirely between polar lines	88 (30.6%)	105 (35.8%)	
Pathology, no (%)			
RCC NOS	33 (11.5%)	9 (3.1%)	-
Clear Cell	179 (62.2%)	181 (61.8%)	
Papillary	66 (22.9%)	74 (25.3%)	
Chromophobe	10 (3.5%)	26 (8.9%)	
RCC mixed	0 (0%)	3 (1.0%)	
Grade, no (%)			
NOS	163 (56.6%)	19 (6.5%)	-
Low	111 (38.5%)	226 (77.1%)	
High	14 (4.86%)	48 (16.4%)	
Oncology specific follow-up time, months, mean (median; IQR)	58.70 (53, 26-84)	69.97 (65, 42-89)	0.001

RFA = radiofrequency ablation; PN = partial nephrectomy; NOS = not otherwise specified

3

Utility of microRNA to Predict Bladder Recurrence after Nephroureterectomy for Upper Tract Urothelial Carcinoma

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Introduction: Upper tract urothelial carcinoma (UTUC) is a rare but aggressive urologic malignancy. Nephroureterectomy (NU) can be curative for organ confined disease. However, 30-50% of patients will develop intravesical recurrence, which is associated with higher cancer specific and overall mortality. Bladder surveillance is costly and time consuming. Single dose intravesical therapy at the time of NU decreases bladder recurrences but has potential toxicity so targeting those at highest risk would be useful. MicroRNA (miRNA) are biomarkers with potential to differentiate behavior of cancers. Identification of miRNA associated with intravesical recurrence could improve screening and treatment algorithms after NU. We sought to identify miRNA associated with intravesical recurrence after NU for UTUC.

Materials & Methods: Total RNA was extracted from formalin-fixed, paraffin-embedded NU samples from 2005 to 2013 under a multi-institutional IRB-approved study. Patients were excluded if they had history of or synchronous diagnosis of bladder cancer. Samples were categorized as either having a bladder recurrence after NU or not having a bladder recurrence within 12 months of NU. Samples from each group were profiled via miRNA RT-qPCR array.

Results: Eleven samples from the recurrence group and 13 from the no-recurrence group underwent array analysis. Demographics and baseline characteristics were similar between groups. Array analysis of 752 miRNA identified 11 miRNA with ≥2 fold differential expression between the recurrence and no-recurrence groups. A combination of two miRNA predicted recurrence with a sensitivity of 82% and a specificity of 85%, for an AUC=0.846. Several of the miRNA we identified have been previously implicated in other types of cancer. One of the top performing miRNA had a strong association with median overall survival ($p < 0.001$).

Conclusions: MiRNA expression profiles are able to differentiate patients with or without subsequent intravesical urothelial cancer recurrence after NU for UTUC. This study is among the first to identify molecular biomarkers that correlate with intravesical recurrence after NU. This miRNA profile needs to be validated in a larger cohort. Patients with this miRNA profile may merit receipt of single dose intravesical therapy, and/or shorter screening cystoscopy intervals after NU.

5

A National Study of Risk-aligned Bladder Cancer Surveillance - Recommended but Rarely Practiced

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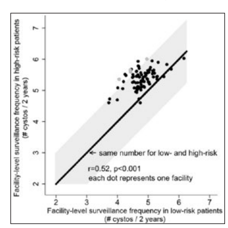
Introduction: Guidelines for surveillance of patients with non-muscle invasive bladder cancer (NMIBC) recommend aligning surveillance frequency with underlying cancer risk. We sought to assess the extent to which such risk-aligned surveillance is practiced within Department of Veterans Affairs (VA) facilities by classifying surveillance patterns for low- versus high-risk patients with NMIBC.

Materials & Methods: Using national Department of Veterans Affairs administrative data, we identified patients with NMIBC newly diagnosed 2005-2011 with follow-up through 2014. Low-risk (i.e., low grade Ta) or high-risk (i.e., high grade Ta/T1 or carcinoma in situ) cancer was assessed using pathology data extracted via a validated natural language processing algorithm. Procedural codes were used to identify all subsequent surveillance cystoscopies. Using multi-level modeling, we estimated the adjusted frequency of surveillance cystoscopy for low- and high-risk patients within and across facilities. Models were adjusted for age, comorbidity, and year of diagnosis. We compared surveillance frequency for low- versus high-risk patients within each facility and examined the correlation of surveillance frequencies for low- versus high-risk patients across facilities.

Results: We identified 1,278 low-risk and 2,115 high-risk patients across 85 facilities. The mean adjusted number of surveillance cystoscopies per patient over 2 years following diagnosis ranged across facilities from 3.7 to 6.2 (mean 4.8) for low-risk patients and from 4.6 to 6.0 (mean 5.4) for high-risk patients. Within facilities, cystoscopy frequency for high-risk patients only slightly exceeded that for low-risk patients (mean 0.6 cystoscopies over 2 years, range 0.2 fewer to 1.3 more, Figure). At most facilities (70 of 85), cystoscopy was performed at a comparable frequency for high- and low-risk patients, differing by less than one cystoscopy over 2 years (shaded area in Figure). The difference in surveillance frequency among high- versus low-risk patients was statistically significant at only four facilities (green dots in Figure). Across all facilities, surveillance frequencies for low- versus high-risk patients were moderately strongly correlated ($r = 0.52$, $p < 0.001$).

Conclusion: Patients with NMIBC undergo cystoscopic surveillance at comparable frequency, regardless of risk. This finding highlights the need to understand barriers to risk-aligned surveillance, with the goal of making it easier for providers to deliver it in routine practice.



4

Factors Associated with Readmissions after Radical Cystectomy

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Introduction: Radical cystectomy (RC) is the standard of care treatment for muscle-invasive bladder cancer. This major surgical procedure is associated with a high readmission risk. Here we sought to identify demographic, clinical and perioperative factors that are associated with readmission after RC.

Materials & Methods: We retrospectively reviewed our bladder cancer database to identify patients who were diagnosed with primary bladder cancer and treated with RC from January 1, 2007 through September 30 2017. A series of univariate analyses (Chi square or Wilcoxon signed rank test, as appropriate) identified demographic, clinical, and operative factors that were significantly associated with 30 day and 90 day readmission after RC, respectively. A p value of < .05 was then used as the cut off for inclusion in multivariate logistic regression.

Results: A total of 283 patients (232 men, 51 women) had RC at our institution during the study period. The median (IQR) age was 69 (62.0, 76.0) and median (IQR) BMI was 27.1 (24.2, 30.2). Most (69.6%) had robotic surgery, 19.4% had open and 11.0% converted to open. Readmission rates at 30 and 90 days were 31.6% and 39.2% respectively. Table 1 presents associations between demographic, clinical, and operative factors and 30 day and 90 day readmissions. Females were more likely to be readmitted at both time points (p = .01 and .03 for 30 and 90 day readmissions, respectively). Similar results were observed for those with longer operative times (p = .018 and .016, for 30 and 90 day readmissions, respectively). Patients who were readmitted at both time points were more likely to have been in the ICU (p = .047 and .001 for 30 and 90 day readmissions, respectively). Logistic regression (Table 2) indicated that male gender, smoking status, OR time and ICU were significantly associated with readmission. ICU stay and operative time were both associated with increased risk of readmission at 90 days.

Conclusions: Readmission following RC remains a major concern. In this study we identify risk factors associated with readmissions following RC. Quality improvement projects can be aimed toward targeting these risk factors in order to reduce the readmission risk.

Table 1. Factors associated with 30 and 90 day readmission after radical cystectomy

	30 day readmission			90 day readmission		
Factor	**Yes (N= 90)**	**No (N=193)**	***p***	**Yes (N=112)**	**No (N=171)**	***p***
Gender (n, % male)	66 (73.3)	166 (86.0)	**.01**	83 (73.9(	147 (86.0)	**.031**
Age (median, IQR)	69.9 (62.8,76.0)	69.0 (61.0,76.0)	.73	70 (63,76)	68 (61,75)	.508
BMI (median, IQR)	26.6 (10.8,31.7)	30 (33.6,29.9)	.067	27.31 (24.7,30.8)	27.05 (23.64,30.19)	.283
Smoking status (n,%)			**.046**			**.025**
Never	27 (30)	35 (18.6)		31 (27.7)	31 (18.7)	
Former	51 (56.7)	111 (59.0)		67 (59.8)	95 (57.2)	
Current	12 (13.3)	42 (22.3)		14 (12.5)	40 (24.1)	
ASA classification (median, IQR)	3 (2,3)	3 (2,3)	.927	3 (2,3)	3 (2,3)	.385
Any prior surgery (n, %)	26 (28.9)	53 (27.5)	.803	32 (28.6)	47 (27.5)	.842
AJCC Stage (n,%)			.096			.091
In-situ or Stage 1	31 (34.4)	51 (26.4)		42 (24.6)	40 (35.7)	
Stage 2	27 (30.0)	45 (23.3)		43 (25.1)	29 (25.9)	
Stage 3	14 (15.6)	53 (27.5)		48 (28.1)	19 (17.0)	
Stage 4	18 (20.0)	44 (22.8)		38 (22.2)	24 (21.4)	
Positive surgical margin (n,%)	6 (6.7)	26 (13.5)	.092	11 (9.8)	21 (12.3)	.523
Creatinine (median, IQR)	.90 (.70, 1.10)	.95 (.80, 1.20)	.079	.90 (.70, 1.10)	.95 (.8, 1.2)	.219
Hemoglobin (median, IQR)	9.7 (9.1, 11.1)	10.3 (9.3, 11.4)	.108	9.8 (9.1, 11.0)	1.6 (9.4, 11.4)	.061
Hematocrit (median, IQR)	30.0 (27.8,33.6)	31.0 (28.0,34.0)	.375	30.5 (28.0, 33.6)	31.0 (28.0, 34.1)	.390
Neoadjuvant treatment (n, %)	26 (28.9)	50 (26.2)	.633	29 (25.9)	47 (27.8)	.723
Surgery type (n,%)			**.044**			.094
Robotic	71 (78.9)	141 (73.1)		89 (79.5)	123 (71.9)	
Open	11 (12.1)	44 (22.8)		15 (13.4)	40 (23.4)	
Converted	8 (8.9)	8 (4.1)		8 (7.1)	8 (4.7)	
Diversion (n,%)			.21			.195
Ileal loop	59 (67.8)	150 (78.9)		76 (70.4)	133 (78.7)	
Indiana pouch	6 (6.9)	10 (5.3)		6 (5.6)	10 (5.9)	
Neobladder	22 (25.3)	30 (15.8)		26 (24.1)	26 (15.4)	
Operative time, minutes (median, IQR)	449.5 (367.25, 550.0)	413.5 (360.25, 491.0)	**.015**	445.50 (366.75, 547.0)	416 (352.75, 650)	**.046**
Blood loss (median, IQR)	400 (293,602)	310 (300, 700)	.710	400 (300,700)	400 (250,650)	.941
ICU stay (n, %)	20 (22.2)	23 (13.0)	**.047**	29 (25.9)	16 (9.4)	**.001**
LOS, days (median, IQR)	7 (6, 10)	7 (6, 10)	.450	7 (6, 10)	7 (6,10)	.51
Discharge to SNF (n, %)	32 (34.8)	60 (65.3)	.455	41 (36.6)	51 (29.8)	.234
Positive node (n, %)	16 (17.8)	41 (21.2)	.195	22 (19.6)	35 (20.5)	.806
Any transfusion	37 (41.1)	72 (37.3)	.54	45 (40.2)	64 (37.4)	.642
Any in-hospital complication	55 (61.1)	124 (64.2)	.61	71 (63.4)	108 (63.2)	.97

Note: Chi square used to analyze categorical variables; Wilcoxon rank sum used to analyze continuous variables. BMI, body mass index; ASA, American Society of Anesthesiologists; IQR, interquartile range; ICU, intensive care unit; LOS, length of stay; SNF, skilled nursing facility. BMI, Creatinine n=282; Hematocrit, n=275; Hemoglobin, n=209; Operative time, n=272.

Table 2. Logistic Regression for 30 day and 90 day Readmission

Predicting 30 day Readmissions					95% C.I.	
Factor	**ß**	**df**	**p**	**OR**	**Lower**	**Upper**
Male gender	.790	1	**.020**	2.20	1.13	4.28
Ever smoked	-.560	1	.080	.571	.30	1.07
Surgery type (using Conversions as reference group)		2	.174			
Robotic	-.808	1	.136	.446	.15	1.29
Open	-1.17	1	.061	.312	.09	1.06
ICU stay	.500	1	.156	1.649	.87	3.29
Operative time (per minute longer)	.107	1	**.050**	1.113	1.00	1.24

Predicting 90 day Readmissions					95% C.I.	
Factor	**ß**	**df**	**p**	**OR**	**Lower**	**Upper**
Male gender	.659	1	**.050**	1.933	1.00	3.74
Current smoker	-.719	1	**.039**	.482	.241	.965
ICU stay	1.07	1	**.002**	2.941	1.48	5.84
Operative time (per minute longer)	.109	1	**.037**	1.11	1.01	1.24

6

Complications and Survival of Primary Cystectomy, Primary Cystectomy with History of Pelvic or Abdominal Radiation and Salvage Cystectomy after Trimodality Therapy

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Introduction: Trimodal therapy (TMT) involving transurethral resection of bladder tumor, external beam radiation and chemotherapy has become an acceptable option for treatment of muscle invasive bladder cancer. Salvage cystectomy is reserved for those patients who fail bladder preservation by TMT. We compared complications and survival outcomes between primary cystectomy (PC), salvage cystectomy (SC) and primary cystectomy with prior history of abdominal or pelvic radiotherapy (PC+XRT).

Materials & Methods: Two hundred and seventy-five patients were identified and retrospectively reviewed who underwent radical cystectomy at Massachusetts General Hospital for clinical cT1-T4 disease between 2003 to 2013. Patients who underwent radical cystectomy for benign or clinical cT0, cTa, or cTis disease were excluded. Patients were grouped as having PC with or without neoadjuvant chemotherapy, SC, or PC+XRT. Early complications (≤ 90 days) and late complications (> 90 days) were compared between surgical groups by organ system and Clavien-Dindo classification. Disease-specific survival (DSS) and overall survival (OS) were evaluated between surgical groups using the Kaplan-Meier method.

Results: The incidence of any early complication for PC, SC and PC+XRT were 60.1%, 76.1% and 61%, respectively (p = 0.36). Early respiratory, infectious and neurological complications were more common in SC than in PC or PC+XRT (respiratory: 19.0%, 5.0%, 14%, respectively; p = 0.01) (infectious: 38.1%, 17.1%, 7%, respectively; p = 0.02) (neurological: 23.81%, 5.5%, 0%, respectively; p = 0.007). The rate of early significant complications as defined by Clavien-Dindo grades 3-5 was 27.7% for PC, 33.3 % for SC and 21.4% for PC+XRT (p = 0.6). Late complications are more common in SC compared to PC and PC+XRT (57.1%, 21.3%, 36%, respectively, p = 0.002). Higher incidence of late infectious, gastrointestinal and genitourinary complications was seen in SC compared to PC and PC+XRT (Infectious 23.8%, 7.4 %, 11%, respectively; p = 0.03) (gastrointestinal 23.8%, 4.1%, 14%, respectively; p = 0.001) (genitourinary 24%, 7.8%, 1%; p = 0.03). The rate of significant late complications graded Clavien-Dindo 3-5 was 52.3% for SC, 2.6% for PC and 35.7 % for PC+XRT (p = 0.008). DSS at 5 years after surgery was 63.8% for SC, 63% for PC and 61.1 for PC+XRT (p = 0.9). OS at 5 years after surgery was 29% for SC, 47.8% for PC and 45.5% for PC+XRT (p = 0.8).

Conclusions: SC is associated with higher incidence of any and significant late complications. SC was associated with higher incidence of early respiratory, infectious and neurological complications; and late infectious, gastrointestinal and genitourinary complications. SC after TMT does not represent a delay in treatment since DSS and OS from the time of surgery are similar between the 3 groups.

Fig 2- Kaplan Meier plots for rates of late complications of Primary Cystectomy, Salvage Cystectomy and Primary Cystectomy with PMH of abdominal/pelvic XRT

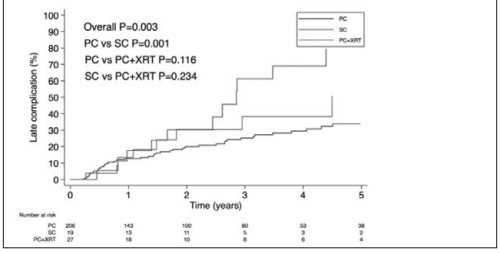

Table 2 – Incidence of early complications by organ system

Early Complications (≤90 Days)	Primary Cystectomy	Salvage Cystectomy after TMT	Primary Cystectomy with PMH of XRT	P Value
Any early complication (≤ 90 Days)	60.10%	76.10%	61%	0.36
Metabolic	11.57%	19.05%	7%	0.4
Hematologic	17.59%	28.57%	17.86%	0.4
Cardiac	9.72%	19.05%	18%	0.16
Respiratory	5.09%	19.05%	14%	0.01
Infectious	17.13%	38.10%	7%	0.02
Gastrointestinal	21.30%	23.81%	14%	0.64
Neurological	5.56%	23.81%	0%	0.007
Vascular	8.33%	10%	7%	0.9
Genitourinary	4.63%	10%	0%	0.2
Other	5.56%	10%	7%	0.5

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Intravesical Docetaxel for the Management of High-Risk Non-Muscle Invasive Bladder Cancer (NMIBC) Following Failed BCG Therapy

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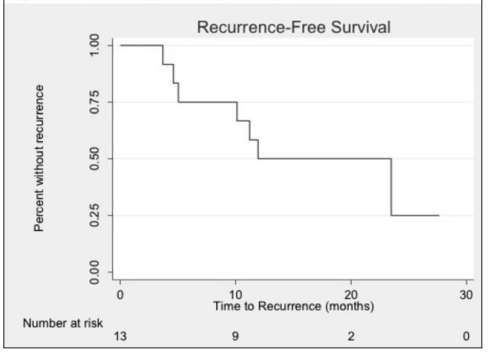
Introduction: There are limited bladder-preserving therapeutic options for patients with high-risk non-muscle invasive bladder cancer (NMIBC) after failed intravesical bacille Calmette-Guérin (BCG) therapy. Salvage intravesical docetaxel therapy was originally described in 2006 but has not been validated outside of the original institution. In this study, we present the first external report on the oncologic outcomes of salvage intravesical docetaxel.

Materials & Methods: We identified 13 patients with high-risk NMIBC previously treated with one or more courses of intravesical BCG who received salvage intravesical docetaxel. Recurrence-free survival (RFS) was estimated using Kaplan-Meier method. Associations of clinicopathologic features with RFS were evaluated using univariable Cox regression.

Results: Median age at pre-docetaxel recurrence was 75 (66, 78) years, and 46% of patients were male. 92% of patients had a prior diagnosis of high grade T1 disease, 39% had a prior diagnosis of CIS, and 46% had received 2 or more prior courses of BCG. Only 1 (8%) patient experienced docetaxel-related toxicity. Nine (69%) patients had a complete response at initial post-docetaxel cystoscopy. During a median follow-up of 12.0 (IQR 5.0, 18.1) months, a total of 7 (54%) patients developed recurrence (Figure). Median time to recurrence was 10.1 (IQR 4.6, 12.0) months. Estimated RFS at 6-, 12-, 18-, and 24-months was 75%, 50%, 50%, and 25%. Three (23%) patients ultimately underwent cystectomy. On univariable analysis, multiple courses of induction BCG was associated with decreased RFS, although did not reach statistical significance (HR 4.69, p = 0.08).

Conclusions: In this first external validation study, intravesical docetaxel was associated with a 69% initial response rate and 50% RFS at 18-months among patients with high-risk NMIBC after failed BCG therapy.

Figure: Recurrence-free survival (RFS) for entire cohort



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Impact of Tumor, Treatment and Access on Outcomes in Bladder Cancer: Can Equal Access Overcome Race-based Differences in Survival?

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Introduction: As with many cancers, there are well-known race-based differences in bladder cancer outcomes, however the optimum strategies to reduce these disparities are not known. We therefore designed a study to assess the relative contribution of tumor, treatment and access-related factors on race-based differences in survival for men and women with bladder cancer.

Materials & Methods: We performed a retrospective, registry based observational study within the National Cancer Database from 2004-2015. Participants included men and women, aged 18 or older, of Black or White race diagnosed with clinically localized or locally advanced muscle invasive bladder cancer. The main outcome was patient race. Using a previously described approach, we assessed the impact of tumor, access and treatment related factors on racial differences in overall survival by fitting propensity score models to which we sequentially added (A) demographics and comorbidities (B) tumor characteristics (C) treatment variables and (D) access to care related variables. We calculated the relative hazard of death of Black and White patients after each weighting procedure. The change in excess mortality was used to infer the contribution of that set of variables on the excess risk of mortality.

Results: We identified 44,577 patients with clinically localized invasive bladder cancer of Black or White race. The median follow up was 77 months. After balancing for demographics and comorbidities, Black race was associated with a significant adverse effect on overall survival (hazard ratio 1.18, 95% CI 1.12 - 1.25; $p < 0.001$). After weighting by tumor characteristics, the excess relative risk was reduced from 18% to 16%, and after adding treatment this was reduced to 10%. After adding access variables, the difference in survival was not significant. Overall, access-related variables explained 40% (95% CI 22.9-57.0%) of the excess risk of death among Black patients, followed by treatment factors which explained 34.5% (95% CI 22.2-46.9). The individual contribution of biological tumor characteristics was not statistically significant (See Table).

Conclusions: There are persistent racial differences in overall survival for bladder cancer, which are largely explained by disparities in access to care, and to a lesser extent by disparities in treatment. Black-white differences in assessed tumor biologic characteristics explained little of the difference in overall survival.

Table: Hazard Ratios and Explainable Excess Risk for Overall Survival (Black v. White) After Four Sequential Propensity Score Balancing Procedures

	Balancing Procedure A - Demographics, Health status	Balancing Procedure B - Demographics, Health status - Tumor characteristics	Balancing Procedure C - Demographics, Health status - Tumor characteristics - Treatment characteristics	Balancing Procedure D - Demographics, Health status - Tumor characteristics - Treatment characteristics - Health Care Access
IPTW-adjusted hazard ratio (B/W)	1.18 (95% CI: 1.12 – 1.25)	1.16 (95% CI: 1.10- 1.22)	1.10 (95% CI: 1.04-1.16)	1.03 (95% CI: 0.94-1.11)
Excess relative risk, % (B/W)	12 (95% CI: 12-25)	16 (95% CI: 10 - 22)	10 (95% CI: 4 - 16	3 (95% CI: -6 – 11)
Total explainable excess risk, %	-	10.8 (95% CI: -1.3 – 22.6)*	45.2 (95% CI: 22.3 – 58.1)	85.1 (95% CI: 64 – 105%)
Individual contribution of explainable excess risk, %	-	10.8 (95% CI: -1.3 – 22.6)*	34.5 (95% CI: 22.2 – 46.9)	40.0 (95% CI: 22.9 – 57.0%)

*No significant contribution to explainable excess risk.

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Urine Testing for Prostate Cancer Screening: Outcomes Data from a Massachusetts Suburban Community Setting for the DLX1/HOXC6 mRNA Urine Test

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Introduction: For years prostate cancer (PCa) screening has been criticized for its inaccuracy resulting in over biopsy. Newer commercially available urine and blood tests have been approved that further quantify patients as low or high risk for having the disease. Urinary DLX1 and HOXC6 mRNA are highly express in the setting of prostate cancer and have been shown to be predictive of higher grade PCa[1]. The validation population for this test from the Netherlands reported a 98% negative predictive value. We looked at patients who were tested with the commercially available DLX1/HOXC6 mRNA urine test[2] and then subsequently underwent standard prostate biopsy to assess accuracy of this tests screening results in the Massachusetts community setting.

Materials & Methods: This is a retrospective study of 271 patients from April 2016 to March 2018 from a single large practice urology group who had the DLX1/HOXC6 mRNA urine test. All patients that were tested with the DLX1/HOXC6 mRNA urine test and subsequently underwent transrectal ultrasound guided prostate biopsy for suspicion of prostate cancer were included in this analysis. Patients were grouped according to urine test results, Very Low Risk (VLR) group and Higher Risk Group (i.e. any report that was not VLR). The groups were assessed for differences in age at biopsy, PSA, prostate size, PSA density, PHI, and PHI density. Analyses of the urine test for sensitivity, specificity, positive predictive value and negative predictive value were undertaken for both biopsy results of PCa and significant PCa.

Results: Of 271 patients, 59 underwent prostate biopsy. Of the 59 biopsied patients, there were 18 patients in the VLR Group and 41 patients in the Higher Risk Group. There were no statistical differences between the groups in prostate size (61.0g vs. 70.7g, $p = 0.34$), PSA density (0.10 vs. 0.17), PHI (33.9 vs. 45.4), or PHI density (0.55 vs. 1.06). There were statistical differences in age at biopsy (64.0 vs. 69.5, $p = 0.0098$) and PSA (5.52 vs. 9.01, $p = 0.0008$). In diagnosing PCa, we found a sensitivity of 74.2%, specificity of 35.7%, positive predictive value of 56.1%, and a negative predictive value of 55.6%. In diagnosing significant PCa, we found a sensitivity of 79.2%, specificity of 37.1%, positive predictive value of 46.3% and a negative predictive value of 72.2%.

Conclusions: These results of DLX1/HOXC6 mRNA urine testing in the community setting are in line with other commercially available prostate cancer screening tests in regards to sensitivity, specificity, positive predictive value and negative predictive value. This was a small cohort and further studies with larger cohorts should be undertaken.

1. Van Neste L, Hendriks R, Dijkstra S et al. Detection of High-grade Prostate Cancer Using a Urinary Molecular Biomarker-Based Risk Score. Eur Urol 2016;70:740-748.
2. SelectMDx urine test. MDxHealth Irvine, CA

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Impact of Multi-Morbidity on Clinician Estimates of Life Expectancy among Men with Urological Cancers: A Pilot Assessment

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Introduction: Estimates of life expectancy and competing causes of death are critical in decision making for patients with urologic cancers. Tools that weigh multiple comorbidities appear to improve the accuracy of life expectancy estimates relative to estimates based on a patient's age. However, less is known about the perception of individual competing risks, or how multiple risks are integrated. Therefore, we aimed to assess the accuracy of clinicians' estimations of life expectancy in the setting of multi-morbidity.

Materials & Methods: Under IRB approval we prospectively collected data from urology clinicians using a third party web survey (Survey Monkey). Participants were asked to estimate the life expectancy of each patient in 10 vignettes that varied by patient age and presence of comorbidity. We invited all attending physician urologists, fellows, residents, physician assistants and advanced practice registered nurses to participate by email. Responses were compared to a comorbidity-adjusted life expectancy calculator. Differences between life expectancy estimations were compared using two sided t-tests.

Results: Of 83 participants who were invited to participate, we received 31 responses. Overall, the difference in clinician estimation of life expectancy from the standard life expectancy calculator ranged from -10.14 years to +2.06 years (median -1.17 years, IQR 3.18 years). Providers underestimated life expectancy in cases of low or medium comorbidity status (mean -5.67 years, $p < 0.0001$). Providers also underestimated life expectancy in both patients under 75 years old (mean -3.31 years, $p < 0.0001$) and over 75 years old (mean -1.12 years, $p = 0.0053$). When stratifying data based on provider level (attending vs. other), there was no statistically significant difference in estimation of life expectancy with regards to age or level of comorbidity.

Conclusions: In a pilot study from a single institution, providers tended to underestimate life expectancy for patients with urologic cancers in the setting of multiple low or medium risk comorbidities. There were no significant differences in risk estimation based on provider level or degree. Further study is warranted to explore how individual medical comorbidities are perceived during decision-making.

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A Single-institution Series of Botulinum Toxin Injection for Refractory Neurogenic Bladder in Children

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Introduction: When neurogenic bladder (NGB) dysfunction is refractory to antimuscarinic medication, botulinum toxin (Botox) injections may be a reasonable alternative to improving bladder function. We aimed to describe our institution's experience using Botox in children with NGB, including changes in urodynamic (UDS) parameters and success rates.

Materials & Methods: Children receiving Botox for refractory NGB, between 2008-2015, were identified from surgical records. Patient characteristics and UDS parameters (capacity, detrusor overactivity [DO], and maximum detrusor pressure [Pdet]) were collected via retrospective chart review. Botox success was defined as improvement of incontinence, DO, capacity or maximum Pdet at capacity. Among those who improved, the number of additional injections and the duration between each was collected.

Results: Of the 27 patients who received Botox, a majority was female (59%), with a median age of 16 (IQR 10, 19) at first injection. Spinal dysraphism was the most common etiology (81%) compared to transverse myelitis (7%), dysfunctional voiding (7%) and spinal cord injury (4%). Eight (30%) had a successful response from Botox. There was no significant difference in age or sex for successful response to Botox. There was improvement in capacity by a median of 24% compared to group without success from Botox (median 20% increase) After the first injection, there was a mean improvement in Pdet by 1.9% for all patients. The 8 who experienced success had a mean improvement in Pdet by 30% compared to the failure group; the latter 19 patients had an increase in Pdet of 6.9% after first injection. Prior to Botox therapy, 13 patients (48.1%) had DO (5 in success group and 8 in failure group) and 22 (81.5%), experienced incontinence (5 in success group, 17 in failure group). Of the patients who experienced success with Botox, all had resolution of DO and 80% had improvement of incontinence. Of those who failed Botox, only 50% had resolution of DO and none had improvement in incontinence. Those with success received a median of 4 (range 2-5) additional injections over a 3.9-year median follow up. The duration of effect extended with each Botox administration with a median incremental increase of two months per injection (range 0-5.5). Of the 19 where Botox was unsuccessful, 11 were further maintained on CIC and anticholinergic therapy while 8 underwent (or are scheduled for) bladder augmentation.

Conclusions: Botox was successful in 30% of children with refractory NGB. When successful, there was improvement in compliance, DO and incontinence, as well as a modest incremental increase in effect duration. Botox is a less invasive surgery for a subset of children with NGB than other management options and should be considered before undertaking more involved procedures.

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Predictors of Renal Compromise in the Young Spina Bifida Population

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Introduction: Long-term renal function preservation in the spina bifida population is one of the primary goals of pediatric urologists and nephrologists caring for patients with this condition. There are inherent limitations in assessing renal function in this unique demographic. Use of creatinine (Cr) to estimate glomerular filtration rate (GFR), the standard marker for renal function, is limited due to decreased lean body mass in this population. Moreover, little data exists elucidating which parameters increase the risk of renal deterioration over time. We therefore sought to identify these risk factors.

Materials & Methods: A retrospective review was performed of all patients between birth and 30 years of age with the diagnosis of "spina bifida" who were treated at our institution. Five parameters were used to screen for renal compromise, including (1) a sustained increase in serum creatinine of 0.2 mg/dL over two subsequent lab draws, (2) hypertension, (3) a size discrepancy of > 1 cm between renal units on renal ultrasound (US), (4) presence of renal scarring or cortical thinning on US, and (5) significant proteinuria (100+ protein on at least 2 consecutive spot urine samples or elevated urine protein/Cr ratio defined as a sustained increase of 0.2 g/g over two subsequent samples). If at least one of these criteria were met, the patient was determined to have evidence of renal compromise. We then examined a variety of other patient factors to determine which were significantly correlated with renal compromise.

Results: There was a total of 140 patients initially identified; 55 were excluded due to a diagnosis of spina bifida occulta, and an additional 14 were excluded because they received their urologic care elsewhere, leaving a total of 71 patients. Of the 71 patients, 27 had at least one marker of renal compromise (38%). These patients had a higher rate of obesity (42% vs. 30%, p = 0.3075), were more likely to have had a history of recurrent febrile urinary tract infections (UTI) [37% vs. 13%, p = 0.022], were more likely to exhibit hydronephrosis on US (15% vs. 4%, p = 0.1890), were more likely to have vesicoureteral reflux (VUR) demonstrated on either voiding cystourethrogram (VCUG) or a fluoro-urodynamic study (f-UDS) [22% vs. 9%, p = 0.1643], and were more likely to have elevated bladder pressures (greater than or equal to 30 cm water) on f-UDS (43% vs. 23%, p = 0.1478). Additionally, four of the patients with renal compromise had a solitary kidney, versus none of the patients with no markers of renal compromise.

Conclusions: In the young spina bifida population, the prevalence of obesity, recurrent febrile UTI, hydronephrosis, VUR and elevated bladder pressures are higher among patients who go on to develop renal compromise. These specific parameters should be assessed regularly, and treatable markers of renal dysfunction such as proteinuria and blood pressure elevation should be screened for in these patients in order to preserve long-term renal function.

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Delayed Return of Ejaculatory Function in Adolescent Males Treated with RPLND and Adjuvant Therapy for Paratesticular Rhabdomyosarcoma

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Introduction: Due to the rarity of the disease and evolving treatment strategies, adverse events related to ejaculatory function following the management of paratesticular rhabdomyosarcoma (ptRMS) with multi-modal therapy in adolescents are rarely discussed. We sought to analyze the effect of nerve-sparing retroperitoneal lymph node dissection (NS-RPLND), chemotherapy, and radiotherapy on ejaculatory function in adolescent males and potential for delayed recovery of function after cessation of all therapies.

Materials & Methods: A single-institution retrospective case report was performed. Patient's with ptRMS who underwent surgical resection followed by multi-modal therapy with the side-effect of delayed return of ejaculatory function were assessed. Ejaculatory function was determined via patient interview during follow-up visits over a > 2 year period. Two adolescent males, ages 15 and 17 at the time of diagnosis were reviewed. Each underwent radical orchiectomy followed by NS-RPLND and adjuvant chemotherapy with vincristine, actinomycin and cyclophosphamide. One of the two patients also underwent adjuvant pelvic radiation. We sought to assess the effects of each aspect of multi-modal therapy on the observed side-effect.

Results: Two patients with ptRMS who underwent multi-modal therapy with initial loss of antegrade ejaculation after NS-RPLND had spontaneous return of ejaculatory function first reported 18 months from the initial diagnosis and 1 year from completion of all adjuvant therapy. Nerve sparing RPLND (NS-RPLND) is a well described technique with a high success rate particularly for low stage germ cell tumors (GCT). However, ptRMS requires postoperative adjuvant therapy (chemotherapy +/- radiotherapy) that differs significantly from GCT treatment algorithms. NS-RPLND has been shown to have high rates of preservation of post-operative ejaculatory function. While chemotherapy may have neurotoxic effects, autonomic toxicity appears to be uncommon. Likewise, there are few reports of abdominal and pelvic radiation leading to acute neurotoxicity. Any radiation effect on ejaculation reported in the adult population appears to be long-term. The cumulative effect of multi-modal therapy on ejaculatory function is somewhat difficult to assess, however may contribute to a temporary loss of normal ejaculatory function in adolescent males.

Conclusions: Ejaculatory function outcomes after NS-RPLND for ptRMS is poorly reported. We observed an extended loss of antegrade ejaculatory function after bilateral NS-RPLND and adjuvant chemotherapy +/- radiotherapy. Both cases had a delayed spontaneous return of ejaculatory function after resolution of the side effects of the adjuvant therapy. Physicians treating ptRMS should be aware that after NS-RPLND, ejaculatory function may still return after the completion of adjuvant therapy if initially lost. Validated questionnaires at time of follow-up may be helpful to capture specific areas of dysfunction as they occur.

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The Use of Recombinant Factor VIIa (NovoSeven®) for Unexplained Bleeding after Genital Surgery

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Introduction: Bleeding is a common risk factor for pediatric penile surgery. Diffuse, significant bleeding, uncontrollable with traditional measures, including electrocautery, compression, and surgical hemostatic agents, is rare, and can be difficult to manage. We present two patients successfully treated with off-label use of recombinant Factor VIIa (rFVIIa, NovoSeven®).

Materials & Methods: We review the history, hospital course, and subsequent workup of two different patients with uncontrolled, diffuse bleeding during and/or after elective penile surgery, who were successfully treated with off-label use of rFVIIa.

Results: Patient A is a six-month old with a mid-shaft hypospadias. Intra-operative generalized bleeding was uncontrolled with electrocautery, pressure, or surgical hemostatic agents. Pediatric Hematology recommended sending lab work to measure plasma concentration of coagulation factors and platelet function, and the patient was given vitamin K and rFVIIa. The bleeding was controlled, and the hypospadias repair was completed. The patient was discharged home the next day. Despite further hematologic testing, no specific coagulopathy was found.
Patient B is a three-year old presenting for circumcision for phimosis. He returned to the operating room on post-operative day (POD) one for diffuse penile bleeding, which was surgically controlled. He re-presented with excessive bleeding on POD#6, requiring repeat operation. Pediatric Hematology was again consulted, and the patient was treated with rFVIIa and one unit of packed red blood cells for an intra-operative hemoglobin of 6.8, with appropriate response. He was discharged home the next day, and was ultimately diagnosed with Hemoglobin A (Factor VIII deficiency).
Both cases were notable for abnormal, diffuse oozing, not from a focal arterial or venous source. Due to the acute and intractable nature of the bleed, and lack of known coagulopathy risk factors by history, pediatric hematology recommended labwork and off-label use of rFVIIa. Both parents were counseled on thrombus risk with NovoSeven® prior to administration.

Conclusions: As Factor VII is an early initiating factor in the coagulation cascade, rFVIIa should be considered when faced with excessive surgical bleeding of unknown cause. In these patients, we felt the benefit of hemostasis outweighed the risk of thrombosis. Although this complication is rare, we believe our experience with rFVIIa may be useful to other urologic surgeons confronted with unexplained and uncontrollable bleeding in the acute setting.

15

Use of Induction and Maintenance Intravesical BCG in a Pediatric Patient with High-grade, Non-muscle Invasive Bladder Cancer

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Introduction: Urothelial carcinoma of the bladder is extremely rare in the pediatric population with the majority of cases being solitary, low-grade tumors. Given the rarity of disease, there are currently no guidelines for the management of pediatric bladder malignancies or prior cases in the literature discussing the use of intravesical BCG in instances of high-grade disease. Here we discuss novel use of intravesical BCG in a pediatric patient with evaluation of treatment efficacy and side-effects.

Materials & Methods: A single-institution retrospective case report was performed. We evaluated a single female patient, 10 years of age, who was referred to the urology clinic with gross hematuria and found to have high-grade, non-muscle invasive bladder cancer on transurethral resection of bladder tumor. The patient subsequently underwent instillation of induction and maintenance BCG. Patient and disease characteristics, treatment, and adverse effects were reported. The outcome of interest was the role of intravesical BCG in the management of the pediatric patient for reduction of disease recurrence and progression, feasibility of therapy, and therapy associated side effects.

Results: One patient, age 10 years old, was diagnosed with high-grade T1 urothelial carcinoma on transurethral resection of bladder tumor. She underwent induction BCG based on adult protocols. The patient had no disease recurrence after induction course and was therefore continued on maintenance BCG. She has now completed 1.5 years of maintenance therapy without recurrence of disease and with minimal local side effects from therapy.

Conclusions: Current AUA guidelines in adults recommend induction BCG in newly diagnosed CIS, high-grade T1 or high-risk Ta urothelial carcinoma with the goal of reduction in disease progression and recurrence. Drug manufactory recommendations however state that the safety and efficacy in the pediatric population is unknown. Given similar disease pathophysiology in adult and pediatric patients, it is felt that the beneficial effects of BCG would be equivalent in pediatric patients. Here we demonstrate that intravesical BCG is technically feasible using the same treatment protocol as is used in the adult population with good efficacy and minimal side effects. Given lack of prior reports and a single patient being reviewed, the overall safety and efficacy in all pediatric patients cannot be determined.

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Gender Equivalence in Prevalence of Nephrolithiasis Among Working and Reproductive-Aged U.S. Adults

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Introduction: Although urolithiasis affects both sexes, conventional teaching has proposed that men are up to 3x more likely to suffer from kidney stones. Clinical practice, however, refutes such disparity particularly among working-aged adults. Small studies have also suggested erosion of such a gender gap. As stone disease has been shown to increase work absenteeism, the significant financial burden this may impose warrants further evaluation of the epidemiology of stone disease in working and reproductive-aged adults. We therefore sought to examine the relationship between gender and stone prevalence among U.S. adults < 50 years of age.

Materials & Methods: We analyzed the nationally representative cohort of U.S. adults from the 2007-2012 National Health and Nutrition Examination Surveys. Weighted proportions and multivariate logistic regression of the cohort and pertinent subgroups were assessed to determine prevalence and odds of nephrolithiasis.

Results: The complete NHANES cohort of 17,658 subjects -- weighted to represent the full nationwide U.S. population of 218,828,951 adults -- was 48.1% male and 51.9% female. Focused upon our cohort of 8,888 adults weighted to represent 123,976,786 subjects (49.3% male and 50.7% female) less than 50 years old, there was no difference in stone prevalence (6.3% male and 6.4% female, respectively, p = 0.85).
On unadjusted logistic regression of those under the age of 50, men were no more likely than women to report history of stones (OR 0.98, p = 0.85). Multivariate logistic regression adjusting for diabetes, obesity, ethnicity, age, as well as water, sodium, and protein intake, confirmed there was no difference in stone prevalence between men and women (OR 1.1, p = 0.51).

Conclusion: Among working and reproductive-aged U.S. adults less than 50 years of age, the much-touted gender disparity in stone prevalence is not present. Prior assessments of gender-based prevalence of stones may have failed to specifically assess this economically critical demographic, or there may in fact be a change in epidemiology. Recognition that women are equally as likely as men to form stones in this demographic suggests the need for continued efforts to better elucidate the pathophysiology of stones in women.

*Max J, Willscher Award Eligible

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Perioperative Outcomes of Ureteroscopic Laser Lithotripsy with a Single-Use Disposable Ureteroscope

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Introduction: Ureteroscopic laser lithotripsy is commonly utilized for surgical stone management. While reusable flexible ureteroscopes (RU) are commonly used, they are criticized for their limited durability which results in unpredictable performance and the requirement of costly repairs. As such, single-use disposable ureteroscopes (DU) present an attractive alternative that may eliminate the costs and delays associated with RU damage. Additionally, DU may have superior deflection, even in the presence of a laser fiber, allowing enhanced maneuverability during ureteroscopic laser lithotripsy. As such, we seek to compare perioperative outcomes of ureteroscopic laser lithotripsy with use of DU compared to RU.

Materials & Methods: We identified 203 adult patients who underwent ureteroscopy with laser lithotripsy and/or stone extraction over an 11-month period (3/2017 - 2/2018). Cases were excluded if a semi-rigid ureteroscope was used or if bilateral ureteroscopy was performed. All procedures were performed by a single fellowship trained Endourologist. DU procedures utilized the LithoVue single-use disposable digital ureteroscope (Boston Scientific, USA), while RU procedures utilized the Flex2s fiber optic reusable ureteroscope (Karl Storz, Germany). Electronic medical records were reviewed to record procedural and clinical outcomes including operative time, complication rates and unplanned visit rates. Patients were considered stone free if no residual stone (0mm) was noted follow up imaging (CT or ultrasound). Patients were grouped by flexible ureteroscope type and compared across groups. Comparison and hypothesis testing were performed using two-tailed t-tests, Pearsons's Chi-squared, Fisher's exact and Kruskall-Wallis tests.

Results: 97 cases met inclusion criteria, and of these 24 (24.7%) cases utilized DU. Patients in the DU group had a higher median stone burden (15.5 mm vs. 9 mm, $p < 0.01$), and more frequently had ASA score ≥ 3 (50.0% vs. 24.7%, p = 0.02) (Table). Overall, the median operative time was 24 minutes, and 47% of cases treated a lower pole stone. Patients in the DU group had a longer median operative time (34 min vs. 23 min, $p < 0.01$). 74 patients had follow-up imaging available which revealed an overall strict stone free rate of 32.4% and a clinical stone free rate of 54.1%. DU group had lower stone free rates (15.8% vs. 32.8%, p = 0.09), and higher median residual stone burden (8 mm vs. 5 mm, p = 0.22). Similar rates of unplanned postoperative encounters were noted in both groups (Table).

Conclusions: In this cohort, DU was used in cases with a median stone burden of 15 mm. While lower stone free rates and larger residual stone burden were noted among the DU group, this likely due to the increased complexity of DU cases. Further studies are warranted to compare outcomes of DU and RU in complex cases, using more homogenous treatment arms. Secondarily, overall stone free rates were lower than reported data which may be due to the strict criteria utilized at our institution to classify a patient "stone-free." As our data matures, we will report on the stone free classification using intraoperative vs. radiographic reporting.

Table 1: Patient characteristics and perioperative outcomes by ureteroscope type.

	Total (N=97)	Reusable Ureteroscope (n=73, 75.3%)	Disposable Ureteroscope (n=24, 24.7%)	p-value[a]
Median Age, years (IQR)	59.1 (49.8, 67.9)	58.1 (49.7, 66.3)	64.0 (49.9, 68.4)	0.26[b]
Gender – male, n (%)	57 (58.8)	41 (56.2)	16 (66.7)	0.37
ASA class ≥3, n (%)	30 (30.9)	18 (24.7)	12 (50.0)	0.02
Laterality- Left, n (%)	50 (51.6)	38 (52.1)	12 (50.0)	0.86
Median Procedure time (minutes) (IQR)	27 (19, 34)	23 (18, 32)	34 (29, 38)	<0.01[b]
Median total Stone burden (mm) (IQR)	10 (7.3, 15)	9 (7, 12)	15.5 (11.5, 21.5)	<0.01[b]
Lower Pole Stone treated, n (%)	47 (48.5)	32 (43.8)	15 (62.5)	0.11
Follow up imaging	74 (76.3)	55 (75.3)	19 (79.2)	0.70
Stone free rate, n(%)	24 (32.4)	21 (38.2)	3 (15.8)	0.09[c]
Median residual stone burden (mm) (IQR)	7 (4,10)	5 (3,10)	8 (6.5, 11)	0.22[b]
Unplanned Encounter	17 (18.7)	12 (17.4)	5 (22.7)	0.58

[a] Pearson's Chi - Squared unless otherwise specified

[b] Kruskal-Wallis Test

[c] Fishers Exact Test

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Evaluating the Rising Use of Ureteroscopy in New England among Medicare Beneficiaries
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Introduction: For decades, extracorporeal shockwave lithotripsy has been the leading treatment method for nephrolithiasis. However, advancement in ureteroscopy and laser lithotripsy has allowed for alternative minimally-invasive approaches to treating stone disease. The rise in rates of ureteroscopy has led to a concomitant decrease in shockwave lithotripsy. The purpose of this project is to examine how rates of ureteroscopy in Medicare beneficiaries differ throughout New England and to determine how uptake of ureteroscopy in New England compares to changes nationally.

Materials & Methods: Administrative data from the Centers for Medicare and Medicaid Services (CMS) were used to identify cases of instances of shockwave lithotripsy (CPT 50590) and ureteroscopy (CPT 52352, 52353, 52356) for stone disease for the years 2006, 2009, and 2014. Rates were constructed by hospital referral regions in CT, MA, ME, NH, RI, and VT using the population of Medicare beneficiaries with known nephrolithiasis as the denominator (ICD9 592.0). Rates are presented for each year with adjustment for age, sex, and race. For 2014, the national rates of shockwave lithotripsy and ureteroscopy were used to calculate the expected number of cases in each hospital referral region. The ratio of observed to expected cases is presented geographically.

Results: From 2006 to 2014, the national rate of ureteroscopy rose from 17 to 27 per 1,000 among Medicare beneficiaries with stones, while the rate of shockwave lithotripsy fell from 59 to 45 per 1,000. During this time period, rates for ureteroscopy increased in all hospital referral regions (that were able to be calculated) with the largest absolute increase from 13 to 39 per 1,000 occurring in Portland, ME. Also during this time period, rates of shockwave lithotripsy declined in all hospital referral regions with the largest decrease from 67 to 18 per 1,000 occurring in Lebanon, NH. In 2014, the hospital referral regions in ME, NH, and VT had more ureteroscopies than predicted by national estimates, while hospital referral regions in CT and RI had fewer.

Conclusions: Management of nephrolithiasis is changing in the United States with increased use of ureteroscopy supplanting shockwave lithotripsy. While trends in New England generally show that the use of ureteroscopy among Medicare beneficiaries is rising in most hospital referral regions, uptake varies regionally with accelerated uptake of ureteroscopy in northern New England states. Further work is needed to determine the contribution of access and practice patterns on patient outcomes.

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Association Between Nutritional Habits and Nephrolithiasis Among U.S. Adults
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Introduction: Certain nutritional and eating habits, such as fast-food consumption and organic food purchases, may be related to the development of nephrolithiasis. Such associations have not been well investigated to-date.

Materials & Methods: Data, weighted to the U.S. population, was abstracted from the National Health and Nutrition Examination Survey (NHANES) for individuals ages 20 to 59 between 2007 and 2010. Descriptive statistics and multiple logistic regression were used to assess the relationship between fast-food consumption and organic food purchases in the last 30 days with nephrolithiasis. Adjustment was performed using age, race, gender, and Body Mass index (BMI).

Results: The weighted national prevalence of nephrolithiasis between age 20 and 59 was 7.3% of a population of over 247.2 million. 51% of the weighted database was female. The average age was 40 years old and the mean BMI was 28.6. A lower prevalence of nephrolithiasis was observed among individuals who bought organic food in the last 30 days compared to those who did not (2.5% vs. 4.8%, $p = 0.02$). After adjustment, individuals who purchased organic food had 23% decreased odds of developing nephrolithiasis compared to those who did not (OR 0.77, 95% CI 0.59-0.99; $p = 0.04$). Nephrolithiasis did not significantly differ among individuals who ate 3 or more fast-food/pizza meals a week compared to those who did not (2.3% vs. 4.9%, $p = 0.7$). However, after adjustment, eating 3 or more fast-food/pizza meals a week was associated with increased odds of nephrolithiasis (OR 1.19, 95% CI 1.00-1.40; $p = 0.05$). Among those uninsured, eating 3 or more fast-food/pizza meals a week was associated with significantly increased odds of nephrolithiasis (OR 1.68, 95% CI 1.18-2.41; $p < 0.01$). Among those insured, purchasing organic food in the last 30 days was negatively associated with nephrolithiasis (OR 0.72, 95% CI 0.55-0.95; $p = 0.02$).

Conclusions: We demonstrate that certain nutritional and eating habits may be associated with nephrolithiasis. Specifically, eating three or more fast-food/pizza meals a week may increase an individual's odds of developing nephrolithiasis, while eating organic food may decrease the odds. Individuals who are more conscientious about their eating habits or have access to healthier diets may be less likely to develop nephrolithiasis. In this analysis, the association between fast food and nephrolithiasis was most pronounced among those uninsured, demonstrating the potential importance of targeting interventions to this high-risk group. Further investigation is warranted to determine whether certain diet recommendations can reduce risk of nephrolithiasis.

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Effect of Seasonal Variation on the Incidence of Urolithiasis at an Urban Academic Medical Center
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Introduction: Interest in the effect of seasonality and temperature on the incidence of symptomatic urolithiasis has increased in recent years. To date, most studies have overwhelmingly demonstrated a positive correlation between incidence of urolithiasis and warmer times of year or higher ambient temperatures. Due to unique factors within our patient population, we suspect that the incidence of symptomatic urolithiasis may not follow this commonly observed trend. Our institution is a not-for-profit 487-bed academic medical center serving a diverse patient population, many of whom are from the Caribbean and Latin America. We sought to determine whether season, month, and/or average monthly temperature had any effect on symptomatic urolithiasis.

Materials & Methods: All ureteroscopies performed at our institution for stone disease between July 1st 2016 and June 30th, 2017 were reviewed. Demographic data, including race and ethnicity, as well as stone characteristics were extracted. Average monthly temperature in Boston was obtained from the National Oceanic and Atmospheric Administration records.

Results: 275 ureteroscopies were performed for stone disease between July 1st, 2016 and June 30th, 2017. 51.3% were male, average patient age was 49.2 ± 15.3 years and average BMI was 29.2 ± 6.69. By race, 37.5% were white, 29.1% black/African-American, 4.4% Asian, 3.3% Hispanic/Latino, and 25.5% were unknown/unreported. Most patients had multiple stones (62.1%), located intrarenally (40.7%) and the average diameter measured 7.61 ± 4.56 mm. Stone type was predominantly calcium oxalate (78.8%). The highest average monthly temperature occurred during August 2016 (76.4ºF) and the lowest in March 2017 (34.0ºF). There was significant variation in the incidence of ureteroscopies by month $\chi^2(11) = 21.68$, $p = .027$), with the greatest percentage of ureteroscopies occurring in November (12.7%) and the smallest percentage occurring in May and July (5.1%). The incidence of ureteroscopies did not vary by season [$\chi^2(3) = 1.09$, $p = 0.78$] or by average monthly temperature [$r(10) = -.35$, $p = .27$].

Conclusions: Although there was no clear relationship between the incidence of ureteroscopy and season or average monthly temperature, interestingly, we found that a large volume of ureteroscopies were performed in cooler months and a smaller number in warmer months. This is in contrast to previously published trends and warrants further examination.

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Regional Variation in Rate of SWL Utilization among Patients with Nephrolithiasis
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Introduction: Nephrolithiasis is rising in prevalence and continues to pose an increasing financial burden on society. Common management options for stones include watchful waiting, percutaneous stone removal, ureteroscopy and shockwave lithotripsy (SWL), with the latter two comprising the majority of interventions for stones in the US. When multiple treatment options exist, effective care is heralded by equal utilization rates in disparate locations. Conversely, if variation is identified, this may be secondary to unwarranted variation, potentially driven by either supply-sensitive or preference-sensitive care. Responsible healthcare spending dictates identification of variation in surgical utilization as a first step in unravelling and then addressing underlying sources of potentially unwarranted variation. Variation in the utilization of SWL has been suspected but not comprehensively evaluated in the United States.

Materials & Methods: Utilizing the full 100% Medicare dataset from the year 2014, we identified all patients with the diagnosis of a renal stone within the previously defined and validated 306 hospital referral regions (HRR's) of the US. Among beneficiaries with the diagnosis of a renal stone, we then assessed the rate of any type of surgical management of the stone, and then specifically the rate of use of SWL, both on a national level and by HRR. Both crude rates and rates adjusted by age, sex and race were generated.

Results: In 2014 there were a total of 806,652 included Medicare beneficiaries with a diagnosis of a renal stone. Nationally, the rate of any surgical intervention was 71.34/1000. The HRR with the lowest rate of surgical intervention was 31.67/1000 while that with the highest was 131.02/1000, representing an approximately 4-fold variation in the rate of all surgical management.
For SWL, the national rate of utilization was 45.48/1000 patients with kidney stones. The HRR with the lowest rate of SWL utilization was 9.24/1000 while that with the highest was 105.80/1000, representing a greater than 11-fold variation in SWL utilization among those with stones.

Conclusions: In this all-inclusive population of Medicare beneficiaries with a diagnosis of a renal stone, there is dramatic variation in the rate of SWL utilization. Although this may reflect overutilization of SWL in some centers and underutilization in others, these findings clearly suggest that the probability of having SWL as opposed to any other management option for a stone may depend heavily upon the hospital to which one is referred. Whether this is due to supply-sensitive factors, including the availability of a lithotripter or number of urologists on staff, or preference-sensitive factors, including the physician's preferred treatment, warrants further investigation. Future efforts to standardize treatment algorithms and develop shared decision making models may reduce unwarranted variation in the care of patients with kidney stones.

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First Time, Real World Experience with the UroLift Device Closely Mimics the LIFT Trial Data: a Single Surgeon Experience

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Introduction: The prostatic urethral lift (PUL) therapy for moderate BPH has been evaluated through the L.I.F.T. study and has shown continued robust results. As physicians weigh economic factors with potential patient benefit, it is important to know that these results are generalizable to surgeons who were not a part of the original trial and who practice in a "real world" setting.

Materials & Methods: At a single surgical center, 29 men who had an AUA IPSS > 12, with prostate volume 19-80cc, with no cystoscopic evidence of significant median lobe involvement underwent the UroLift procedure by a single surgeon, using between 2 and 7 loads per procedure. All patients had the procedure performed under LMA general anesthesia. A representative from the device company was present at all procedures. Their AUASI, quality of life scores (QoL) and post void residual (PVR) were evaluated preoperatively, at 2 weeks and 2 months postoperatively. These results were compared to the published LIFT data with a student t test.

Results: The prostatic urethral lift reduced AUA symptom index scores, improved QoL, and reduced post void residuals at both the two week and two month mark. These changes were similar and not statistically different than the LIFT trial at similar time points.

Conclusions: The L.I.F.T. trial, a multicenter randomized control trial, showed robust improvements in AUA SIS, and QoL for patients with the use of the prostatic urethral lift therapy. This result seems to be generalizable to individual surgeons who are new to the technique. This study lends evidence to the prostatic urethral lift becoming a useful tool in the armamentarium of BPH surgeons.

Table 1:

		Home Institution			LIFT			
		N (paired)	Baseline	Change	N (paired)	Baseline	Change	p value comparison
AUASS	2 weeks	29	21.7+/- 5.9	-11.0 +/- 8.5	138	22.2 +/- 5.5	-4.3 +/-7.6	0.695
	2-3 months	20	21.7+/- 5.9	-12.7 +/- 10.1	139	22.2 +/- 5.5	-11.1 +/- 7.7	0.939
QoL	2 weeks	28	4.8 +/-1.0	-3.0 +/- 2.2	139	4.6 +/- 1.1	-1 +/- 1.7	0.611
	2-3 months	19	4.8 +/-1.0	-2.9 +/-2.1	139	4.6 +/- 1.1	-2.2 +/- 1.8	0.896
PVR	2 weeks	27	89 +/- 76	-43 +/-67	NA	NA	NA	NA
	2-3 months	16	89 +/- 76	-29 +/-64	136	85.1 +/- 68.6	-9 +/- 85.7	0.937

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Analyzing the Cost-Effectiveness of Six Therapies for Treating Lower Urinary Tract Symptoms Due to Benign Prostatic Hyperplasia

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Introduction: To conduct a cost-effectiveness analysis from payers' perspectives of six treatments for lower urinary tract symptoms (LUTS) due to benign prostatic hypertrophy (BPH) and to examine these modalities in the marketplace for the best use of healthcare funds and quality of life benefits for patients.

Materials & Methods: The economic analysis was conducted with a Markov model to compare combination drug therapy (ComboRx), minimally invasive procedures (MITs) - water vapor thermal therapy (Rezūm), conductive RF thermal therapy (Prostiva) and prostatic urethral lift (UroLift), and invasive surgical procedures - photovaporization of prostate (Greenlight PVP) and transurethral resection of the prostate (TURP). Effects were assessed based on the average changes in the International Prostate Symptom Score (IPSS) with treatment effects modeled using a common IPSS baseline score. Adverse events and retreatment rates were estimated from medical literature. Starting with each therapy, patients' transitions to more intensive therapies when symptoms returned were simulated in 6 month cycles over 2 years. Incremental cost-effectiveness ratios (ICERs) were calculated for pairs of treatments; uncertainty in ICERs estimated with probabilistic sensitivity analyses.

Results: ComboRx was least effective and provided one-third of the symptom relief achieved with MITs. UroLift was similar in effectiveness to Prostiva and Rezūm but costs more than twice as much. The cheaper MITs were about $900 more expensive than ComboRx generic drugs over 2 years. TURP and PVP, typically reserved for treatment of more severe LUTS, provided slightly greater relief of LUTS than MITs at about twice the cost over 2 years.

Conclusions: The analysis evaluated the costs and symptom relief of six treatment options in the continuum of care from a common baseline of LUTS severity. Identification of treatments for LUTS/BPH that demonstrate cost-effectiveness and provide appreciable symptom relief is paramount as reimbursement for patient care moves from volume-based services to value-based services.

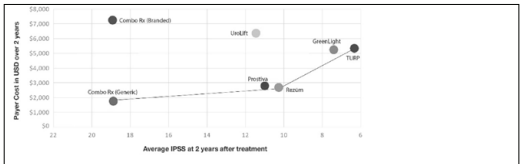

Figure. Therapies along the line represent the most efficient treatments, i.e. those with greater symptom relief for the money spent.

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Comparing Physician Retention in State of Training by Subspecialty Surgical Field and Sex

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Introduction: Newly trained physicians will be an increasingly valuable resource in the setting of forecasted physician workforce shortages. This is particularly relevant for the field of urology, where the workforce shortage is anticipated to be compounded by both the aging demographic of current practicing urologists as well as that of the general population and its associated urologic disease burden. Policy designed to improve retention of newly trained physicians should be prioritized as graduate medical education represents a significant financial commitment at the federal, state and community level. However, there is a paucity of data specifically evaluating urology trainees and retention in state of training.
This study examines the current trends in retention of newly trained physicians, focusing on urology trainees compared to other surgical subspecialties and all medical fields overall, sub-analyzed by sex. We hypothesized that the in-state retention of urologic trainees would be less compared to all fields overall but similar to other competitive surgical subspecialties and similar across gender.

Materials & Methods: Data on specialty, sex, state of residency training and current state of practice were obtained from the Association of American Medical Colleges' Report on Residents from 2006 to 2016. The in-state retention of urology trainees was compared to other surgical subspecialties as well as the overall rate of retention for trainees in all fields. Statistical analysis consisted of chi-square testing; significance was set at $p < 0.05$.

Results: Between 2006-2016, a total of 237,176 GME graduates were identified by the AAMC's Report on Residents and retention in state of training was compared by specialty and sex. Comparative analysis demonstrated that surgical subspecialties tended to have lower rates of trainee retention in state of residency compared to all fields, p-values < 0.0001 (Table 1). Overall, plastic surgery, ophthalmology and urology demonstrated the lowest rates of in-state retention. When analyzed by sex, men in neurosurgery (35.7%), plastic surgery (36.2%), ophthalmology (36.9%), and urology (41.6%) were least likely to practice in the same state of training (Table 1). Women in plastic surgery (39.6%) and urology (40.9%) were also less likely to practice in the same state of training when compared to all fields overall (Table 1).

Conclusions: This study demonstrates that newly trained urologists are among the most likely to transition from their state of training, even when compared with other similar subspecialty surgical fields. Additional research should evaluate post-training migration trends of surgical subspecialists to understand motivating factors and the transition behavior of trainees. Given the significant financial investment required for resident training, this information may aid sponsoring institutions to train and retain the needed workforce.

Table 1: Chi-Square Analysis of Trainee Retention in Urology v Other Surgical Subspecialties v All Fields

Specialty	In State (%)	Out of State (%)	P-value*
Neurosurgery			
- Men	5 (35.7)	9 (64.3)	< 0.0001
- Women	0	0	n/a
OB/GYN			
- Men	1019 (46.4)	1179 (53.6)	< 0.0001
- Women	4593 (54.5)	3837 (45.4)	< 0.0001
Ophthalmology			
- Men	836 (36.9)	1427 (63.1)	< 0.0001
- Women	727 (44.0)	927 (56.0)	< 0.0001
Orthopedics			
- Men	1158 (42.2)	1587 (57.8)	< 0.0001
- Women	132 (42.6)	178 (57.4)	< 0.0001
Otolaryngology			
- Men	623 (40.4)	920 (59.6)	< 0.0001
- Women	308 (48.1)	332 (51.9)	< 0.0001
Plastic Surgery			
- Men	317 (36.2)	558 (63.8)	< 0.0001
- Women	108 (39.6)	165 (60.4)	< 0.0001
General Surgery			
- Men	2078 (49.6)	2110 (50.4)	< 0.0001
- Women	1075 (53.0)	955 (47.0)	< 0.0001
Urology			
- Men	744 (41.6)	1043 (58.4)	< 0.0001
- Women	168 (40.9)	243 (59.1)	< 0.0001
All Fields			
- Men	64554 (51)	62094 (49)	n/a
- Women	64792 (59)	45736 (41)	n/a

* p-value significance set at < 0.05

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Overuse of Cystoscopic Surveillance Among Patients with Low-risk Non-muscle-Invasive Bladder Cancer - A National Study of Patient, Provider, and Facility Characteristics

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Introduction: Since 2005, multiple panels have recommended no more than 3 cystoscopies in the first two years after diagnosis for patients with low-risk non-muscle-invasive bladder cancer (NMIBC). We hypothesized that despite these recommendations many patients receive too much cystoscopic surveillance. We sought to understand the extent of overuse and to examine patient, provider, and facility characteristics contributing to it, potentially identifying targets for improvement.

Materials & Methods: Integrating administrative and pathology data extracted via a validated natural language processing algorithm, we included patients newly diagnosed with low-risk (i.e., low-grade Ta) NMIBC within the national Department of Veterans Affairs (VA) Corporate Data Warehouse (CDW) from years 2005 to 2011. Patients were followed until cancer recurrence, death, date of last VA encounter, or for 2 years after diagnosis. Procedure codes were used to enumerate the number of cystoscopy procedures during follow-up. Based on guideline recommendations and length of follow-up, overuse of cystoscopic surveillance was defined as > 1 cystoscopy if followed less than 1 year, > 2 cystoscopies if followed 1 to less than 2 years, or > 3 cystoscopies if followed for 2 years after diagnosis. We obtained patient (age, sex, race, year of diagnosis, number of comorbidities, household income, rural residence) and provider (age, gender, attending vs. resident vs. advanced practice provider) characteristics from CDW. Facility characteristics (size, complexity, number of urologists, rurality) were from VA operational data (Veterans Health Administration Support Service Center). We identified patient, provider, and facility characteristics associated with overuse using multivariable generalized estimating equations.

Results: We identified 1,206 patients with low-risk bladder cancer (mean age 76; 99% male; 85% white; 15% with 0 comorbidities, 47% with 1 to 2, and 38% with 3 or more). We found overuse of cystoscopy among 75% of patients (905 of 1,206). This included 226 (81%) of 280 patients followed less than 1 year, 194 (85%) of 227 patients followed 1 to less than 2 years, and 485 (69%) of 699 patients followed for 2 years. Across all patients in the cohort, 4,805 cystoscopy procedures were performed although only 2,831 would have been recommended. Of 14 patient, provider, and facility characteristics assessed, few were associated with overuse of cystoscopy: earlier year of diagnosis (2005-2006 vs. 2011), white race vs. other/missing, 1 to 2 comorbidities, and attending provider vs. resident (Figure).

Conclusions: Overuse of cystoscopy among patients with low-risk NMIBC in our cohort was common, raising concerns about the cost and quality of bladder cancer surveillance. However, we found few patient and provider factors associated with overuse. The association of earlier year of diagnosis with overuse suggests lack of knowledge of surveillance recommendations as a potential cause of overuse. Further qualitative research is needed to confirm this hypothesis and to identify other determinants of overuse not captured in administrative data.

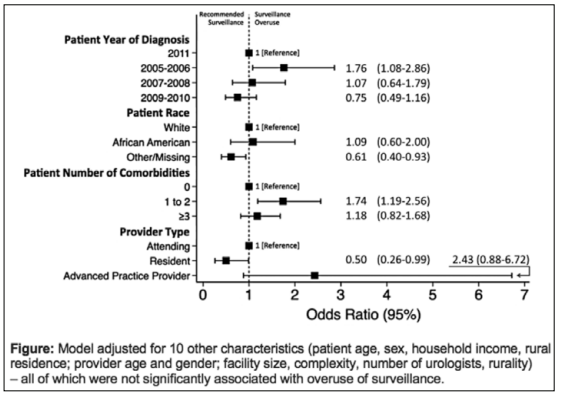

Figure: Model adjusted for 10 other characteristics (patient age, sex, household income, rural residence; provider age and gender; facility size, complexity, number of urologists, rurality) – all of which were not significantly associated with overuse of surveillance.

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Operating Room Efficiency Improves with Increasing Staff Experience and Structured Pre-operative Briefing

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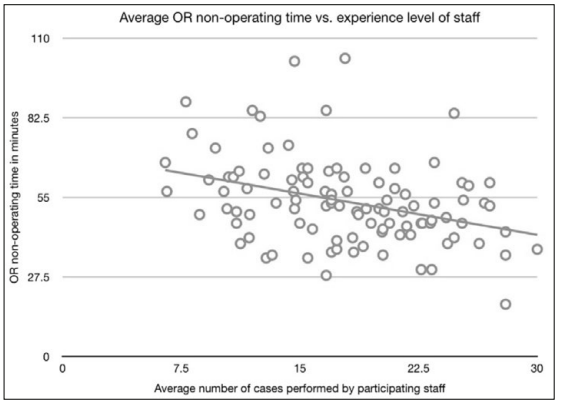
Introduction: Surgical procedures can vary greatly in complexity and equipment needs. Compared to other endoscopic procedures, for example, percutaneous nephrolithotomy (PCNL) requires a much larger and more varied set of equipment, which presents unique challenges to the surgeons and OR staff. This can lead to more time in the OR spent not performing the actual procedure, but rather setting up equipment, positioning the patient, and other non-operative tasks. Our study used this procedure to examine whether OR time was more efficiently used when staff was formally briefed on the upcoming case, and when a more experienced OR team was present.

Materials & Methods: Beginning in December 2016, OR staff were included on a briefing email sent the night before each PCNL detailing the surgical plan, anticipated equipment needs, and any other challenges likely to arise during the case. An Epic report was generated containing time in room, time of actual procedure, and OR staff present for all PCNLs performed during a 2-year period spanning this intervention. Non-operating time (NOT) was defined as the difference between the duration of time in the room and the duration of the procedure itself. The level of experience amongst the staff for any given case was determined by averaging the number of PCNLs each staff member had participated in during the examined time period. Statistical analysis was performed with IBM SPSS Statistics version 23.

Results: During the examined time period, 104 PCNLs were performed. Prior to the regular briefing email, average NOT was 58.6 minutes, which decreased to 49.5 minutes afterwards ($p < 0.01$). Plotting NOT per average number of cases performed by staff revealed a significant negative association, with increasing OR staff experience leading to shorter NOT ($r = -0.35$, $p < 0.01$).

Conclusions: Initiating regular pre-op communication with OR staff modestly but significantly reduces time in the room relative to the procedure itself. Crucially, more experienced OR teams were associated with significantly less time in the operating room spent not performing the procedure itself. Though our analysis only included one type of procedure, these findings demonstrate that efficiency is demonstrably improved with better communication and more experienced staff, which is potentially generalizable to any complex surgical procedure. Simple interventions, such as a briefing email, should be combined with careful attention to OR staff experience to maximize OR efficiency and patient safety.



27

Convective Water Vapor Thermal Therapy: 3-Year Durable Outcomes of a Randomized Controlled Study for Treatment of Lower Urinary Tract Symptoms due to Benign Prostatic Hyperplasia

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Introduction: Convective water vapor thermal therapy is a unique minimally invasive procedure for rapid ablation of prostate obstructive tissue including the median lobe and hyperplastic central zone tissue. We report 3-year outcomes of a randomized, controlled trial for treatment of moderate to severe lower urinary tract symptoms (LUTS) due to benign prostatic hyperplasia (BPH).

Materials & Methods: 197 men ≥ 50 years old with International Prostate Symptom Score (IPSS) ≥ 13, maximum flow rate (Qmax) ≤ 15 mL/s and prostate volume 30-80 cc, enrolled in 15 centers were randomized 2:1 to thermal therapy with Rezūm System (136) or control (61). Control procedure was rigid cystoscopy with simulated active treatment sound. The total number of treatments in each lobe of the prostate was determined by the length of the prostatic urethra; it can be customized to the configuration of the gland including the median lobe/enlarged central zone. The primary endpoint compared IPSS reductions at 3 months after unblinding; evaluations continued annually for 3 years.

Results: Mean IPSS improvement by 3 months after thermal therapy was -11.2 vs. -4.3 points for control ($p < 0.0001$), remaining durable with 50% improvements from baseline throughout 3 years ($p < 0.001$). Commensurate 50% improvements in quality of life and Qmax were sustained over 3 years ($p < 0.0001$). Ablation of the median lobe in 30/135 subjects resulted in significantly decreased PVR. At 36 months PVR decrease was 61% of the mean baseline vs. 18% for subjects without a treated median lobe ($p = 0.0109$). No late related adverse events occurred; no de novo erectile dysfunction was reported. The surgical retreatment rate was 4.4% (6/135), primarily due to failure to initially treat the median lobe in 4/135 (3%) subjects.

Conclusions: The 3-years results indicate that convective water vapor thermal therapy achieves rapid and durable relief of LUTS, quality of life and flow rates and preservation of sexual function. This office or ambulatory outpatient procedure requires minimal anesthesia; subjects experience minimal transient perioperative side effects. The thermal therapy warrants positioning as a procedure for LUTS relief, both as an initial therapy versus medications and as an alternative to transurethral surgery for selected patients.

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Transurethral Thulium Laser Prostatectomy in the Outpatient Setting: Benefits and Outcomes at a Single Center in the United States

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Introduction: Thulium laser prostatectomy is a versatile laser that allows for vaporization, vapo-enucleation and enucleation and morcellation of benign prostatic hyperplasia (BPH). In an effort to seek out procedures to avoid inpatient hospitalization while maintaining superior hemostasis, this study details the ongoing experience utilizing thulium laser vaporization in the outpatient setting.

Materials & Methods: A retrospective chart review of patients who underwent thulium laser vapo-enucleation between 2014 and 2018 was performed. AUA symptom scores, PSA reduction, duration of catheterization, and postoperative complications were analyzed. All procedures were performed by a single surgeon at a single institution utilizing 150 watt and later a 200 watt laser for surgery.

Results: 128 patients were included in the analysis. 11 patients were anticoagulated and 9 patients had concurrent cystolithalopaxies performed. 25 patients had repeat procedures from prior TURPs or green light laser prostatectomies. Of the primary cases, the mean prostate size was 56 gm (range 15-167 gm). 121 (95%) patients were able to be discharged as outpatients the day of surgery. The mean preoperative AUA symptom scores, generally on maximal medical therapy, were 19.1 and 16.8 for primary and repeat, respectively. The mean AUA symptom scores were significantly reduced to 6.1 and 8.2 ($p < 0.005$ for both), respectively, at 3-month follow-up (128 pts) and further reduced to 5.1 and 6.0 ($p < 0.005$ for both), respectively, at 12-month follow-up (71 pts) and 6.0 ($p < 0.0001$) at 24 months (37 pts). For primary patients, the mean preoperative PSA was 4.1 ng/mL (range 0.2-37.0) and the postoperative PSA was 1.5 ng/mL (63.4% reduction; range 0.1-10.3). Ejaculatory function was preserved in 65 patients (57.8%) and worsening erectile function occurred with 12 patients (10.2%). Transient short-term stress incontinence occurred in 5 patients and resolved in all. 2 patients required a repeat resection and 1 patient had a bladder neck contracture. 57 patients (46.2%) required two or fewer days of postop catheterization, with a mean of 2.8 days (range 0-14 days). 20 patients (15.6%) experienced problematic postoperative hematuria after discharge, of which 7/11 anticoagulated patients passed significant clots requiring catheterization. 5/117 of patients overall (4.3%) went into clot retention requiring delayed admission and continuous bladder irrigation.

Conclusions: Our experience suggests that thulium laser vaporization of the prostate is a safe, effective and durable alternative for the treatment of BPH with results comparable to published traditional inpatient electrosurgical methods. Our analysis suggest that effective laser therapy offers an advantage by greatly reducing the need for hospitalization without compromising efficacy of traditional electrosurgical methods.

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Aquablation for BPH - Subgroup Examination

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Introduction: High pressure water jet-based prostate resection, for the treatment of lower urinary tract symptoms due to benign prostatic hyperplasia, may provide much needed reproducible outcomes for patients suffering from BPH related LUTS. The hypothesis that BPH surgery standardized with robotic execution may have a more pronounced benefit in certain subgroups such as subjects with more challenging anatomies (e.g., large prostates, large middle lobes) and subjects with moderate BPH has not yet been determined.

Materials & Methods: We conducted prespecified and exploratory subgroup analyses from a double-blind, multicenter prospective randomized controlled trial comparing transurethral resection of the prostate using either standard electrocautery (TURP) or robotic waterjet (Aquablation) to determine whether certain baseline factors predicted more marked responses after Aquablation as compared to TURP. The primary efficacy endpoint was reduction in International Prostate Symptom Score (IPSS) at 6 months. The primary safety endpoint was the occurrence of Clavien-Dindo persistent grade 1 or Grade 2 or higher operative complications.

Results: For men with larger prostates 50-80 g, mean IPSS reduction was 4 points larger after Aquablation compared to TURP ($p = .0099$), a larger difference than the overall result (1.8 points, $p = .1347$). Similarly, the primary safety endpoint difference (20% vs. 46% [26% difference, $p = .0082$]) was larger for men with large prostate compared to the overall result (26% vs. 42% [16% difference, $p = .0149$]). Postoperative anejaculation was also less common after Aquablation compared to TURP in sexually active men with large prostates (2% vs. 41%, $p = .0001$) vs. the overall results (10% vs. 36%, $p = .0003$) Exploratory analysis showed larger IPSS changes after Aquablation in men with enlarged middle lobes, men with severe middle lobe obstruction, men with a low baseline Qmax, and men with elevated (> 100) post-void residual.

Conclusions: In patients with moderate-to-severe LUTS due to BPH and larger, more complex prostates, Aquablation was associated with both superior symptom score improvements and a superior safety profile, with a significantly lower rate of postoperative anejaculation. The standardized, robotically executed, surgical approach with Aquablation may overcome the increased outcome variability in more complex anatomy that result in superior symptom score reduction.

30

Long Term Outcomes of Expectant Management in Patients with Incomplete Bladder Emptying & Chronic Urinary Retention

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Introduction: Large volume incomplete bladder emptying/chronic urinary retention (CUR) has been associated with many complications, including acute retention, renal failure, infections and stones. The American Urological Association recently defined CUR and recommended a treatment algorithm based on a variety of factors. In this report, we evaluated the relationship between chronically elevated post-void residual (PVR) volumes and adverse outcomes during long-term follow-up.

Materials & Methods: Between 2002 and 2016, non-neurogenic patients who had PVR volumes > 300 mL by bladder ultrasound or catheterization on two or more separate occasions at least six months apart were included. We followed this cohort over time and recorded complications including upper and lower urinary tract infection (UTI), acute retention (AUR), urosepsis, stones, hydronephrosis, and acute and chronic renal failure. The cohort was then divided in 2 groups based on baseline PVR cutoffs (300-450 mL and > 450 mL) and complications were compared and analyzed. Finally, we correlated predisposing factors and complications.

Results: There were 28 male patients with a mean age of 74 who met inclusion criteria and were followed for a mean of 65 months (Range: 6-198 months); 26 had benign prostatic hyperplasia (BPH) with a median prostate size of 55 cc (IQR: 35-86), and 24 were receiving medical therapy. Other patient and UDS characteristics are show in Table 1. Baseline median PVR corresponded to 468 mL (IQR: 395-828), follow-up median PVR was 508 mL (IQR: 322-714) and last visit median PVR was 508 mL (IQR: 300-850). During follow-up, 16 patients (57%) had at least 1 complication with acute urinary retention being the most common occurring in 13 patients with 18 episodes. The other complications were rare and presented in less than 15%. No patients had worsened renal insufficiency with the mean final recorded creatinine being 1.1. No statistically significant difference was found for any studied complication between the 2 different PVR cut-offs. Patients with prostate size ≥ 100 cc had significantly higher total number of AUR episodes (P value: 0.02) and symptomatic UTIs (P value: 0.03). There was also a strong positive correlation ($r= 0.7$, $P < 0.001$) between prostate size and total number of AUR episodes.

Conclusions: While the presence of CUR could predispose to episodes of acute retention, other complications are infrequent. Additionally, prostate size may play a role in increasing some complications. Certain patients can be safely followed for at least 5 years without renal deterioration and low risk of other complications.

	PVR 300-450ml	PVR > 450ml	P value	Total patients
Patients (n)	14	14		28
Mean baseline PVR (ml) ± SE	377 ± 52	962 ± 509	0.0002	669 ± 463
Mean follow-up PVR (ml) ± SE	517 ± 233	736 ± 688	0.2	627 ± 516
Mean age ± SE	74.7 ± 12.5	73.7 ± 14.1	0.8	74.2 ± 13.1
Mean prostate size (cc) ± SE	58 ± 27	81 ± 70	0.2	69 ± 49
Urodynamic parameters (mean ± SE)				
Qmax (ml/s)	5.1 ± 4.4	5 ± 5.1	0.9	5.0 ± 4.6
Voided volume (ml)	112 ± 105.8	111.7 ± 150	0.9	114.7 ± 125.3
Bladder capacity (cc)	320.3 ± 63	451.5 ± 168.9	0.1	385.9 ± 139.5
Mean episodes of AUR ± SE	0.2 ± 0.4	1 ± 1.3	0.06	0.6 ± 1.0
Mean creatinine (mg/dl) ± SE	1.1 ± 0.3	1.0 ± 0.3	0.3	1.1 ± 0.3

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How Robust are the Results of Urologic Studies? Applying the P-value Fragility Index to Urologic Studies

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Introduction: In the urologic literature, the publishability of a study and the weight attached to study findings too often hinges on attaining the threshold "statistically significant" p value of less than 0.05. Unfortunately, this reliance on and often misapplication of frequentist statistical principles promotes overconfidence in the results of studies. Often, the occurrence or non-occurrence of only a few events can switch a finding from "statistically significant" to not, or vice versa. A tool to measure this number, entitled the "fragility index" or FI, is a valuable addition to interpreting the robustness of p values and by extension the findings of studies. It is defined as the hypothetical number of events needed to change to non-events for a p value to become insignificant ($p > 0.05$). Herein, we applied the concept of the fragility index to studies published in the urologic literature.

Materials & Methods: All issues of five major urologic journals from the last 3 years were examined for studies including two groups with count data. Information from each study including manuscript descriptors, statistical methodology, and numbers of events/non-events in each of the two groups were extracted. Using a custom Python script, the fragility index was then calculated for each study comparison.

Results: A total of 4,086 unique studies comprising 4,364 unique comparisons were extracted from the literature, of which 768 had count data. Of these, 732 comparisons reported significant p values ($p < 0.05$), and fragility index was able to be calculated for 715. Of these studies, 89 (12.4%) had a FI of 1; 193 (27.0%) had FI 2-5; 78 (10.9%) had FI 6-10; 81 (11.3%) had FI 11-20; and 274 (38.3%) had FI greater than 20. The median number of patients in the included comparisons was 347 (IQR 139-1,081). Studies in the lower half of enrollment (fewer than 347 patients) had FI < 10 in 77% of studies (n = 275/357). Studies in the upper half of enrollment (at least 347 patients) had FI < 10 in 24% of studies (n = 85/358).

Conclusions: Despite a high average number of enrolled patients, roughly 40% of urologic studies would not have conventionally statistically significant results if only a few events (5 or fewer) had not occurred. The statistical results, and "significance" of these results, should be tempered by an understanding of the limits of the p value and frequentist statistics, and that these studies may be difficult to replicate. Care must be taken in interpreting the results of studies in urology, particularly prior to altering clinical practice. The fragility index can be applied to aid in interpreting the robustness of urologic studies and confidence in their results.

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Concurrent Urologic Surgeries Increase the Risk of Infection: A National Database Study

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Introduction: Surgical infections are a vexing problem that put significant strain on our healthcare system. There have been multiple studies looking at infection rates after various solo urologic surgeries. We sought to examine the rates of postoperative infection when endoscopic surgery is performed concurrently with another type of urologic surgery using a large national database.

Materials & Methods: The Premier Hospital Database (2003-2015) was queried using International Classification of Diseases (ICD-9) procedural codes (CPT) codes for urologic procedures split into 7 categories: endoscopic, urethral, scrotal, testes, penile, implants, spermatic cord/vas. Endoscopic procedures were run against the other 6 categories of urologic surgery. Infection rates were evaluated divided into subcategories of soft tissue infection (STI), sepsis, clostridium difficile (C. diff), urinary tract infection (UTI), pneumonia, and other infections. We assessed for a relationship between the type of concurrent procedure and infection, adjusting for patient and hospital characteristics.

Results: A total of 487,725 patients were identified to have undergone endoscopic procedures, 2.7% of which also underwent a concurrent urologic procedure (n = 13,546). The most common concurrent procedure was urethral (86%), followed by penile procedures (8%), scrotal and implant procedures (2% each), and seminal vesicle/vas procedures (1%). Concurrent urologic surgery was associated with Caucasian race (75%, $p < 0.001$), male gender (79%, $p < 0.001$), marriage (62%, $p < 0.001$), Charleston Comorbidity Index 0-1 (63.5%, $p < 0.001$), Medicare payor (62%, $p = 0.046$), non-teaching hospitals (68%, $p < 0.001$), smaller hospitals ($p < 0.001$), and being in the Midwest region ($p < 0.001$). Accounting for patient/hospital factors, urethral and penile procedures were strongly associated with increased rates of overall infections and UTIs, while scrotal procedures were strongly associated with STI and implant procedures were strongly associated with other infections not specifically characterized (all $p < 0.0001$) (Table 1).

Conclusions: Concurrent urologic surgery is uncommon but associated with increased infection rates. Further studies are needed to better delineate how we can tailor our clinical practices and antibiotic choice to better prevent these infections.

Procedure	Odds of Any Infection (95% CI)	Odds of STI (95% CI)	Odds of Sepsis (95% CI)	Odds of C. diff (95% CI)	Odds of UTI (95% CI)	Odds of pneumonia (95% CI)	Odds of other infection (95% CI)
Urethral	2.03*** (1.93-2.14)	1.44* (1.09-1.91)	0.79 (0.6-1.038)	1.25 (0.64-2.43)	2.12*** (2.02-2.24)	1.11 (0.85-1.44)	1.3* (1.12-1.5)
Scrotal	1.33 (0.93-1.91)	6.09*** (2.7-13.71)	1.74 (0.56-5.45)	5.07 (0.7-36.47)	1.07 (0.71-1.63)	0.69 (0.1 4.93)	1.86 (0.88-3.94)
Testicular	0.87 (0.11-6.67)	NA	NA	NA	1.05 (0.14-8.03)	NA	NA
Penile	1.58*** (1.32-1.9)	1.64 (0.73-3.67)	2.31* (1.36-3.92)	2.7 (0.67-10.92)	1.43*** (1.17-1.75)	2.47* (1.42-4.28)	1.87*** (1.27-2.77)
Implant	1.53* (1.04-2.24)	5.14 (1.64-16.11)*	NA	9.31* (1.3-66.89)	1.37 (0.9-2.07)	1.28 (0.18-9.13)	3.44*** (1.76-6.73)
Spermatic & Vas	0.54 (0.2-1.49)	NA	NA		0.63 (0.23-1.72)		

***p<0.0001, **p<0.001, *p<0.05
Controlled for patient characteristics (gender, age, race, marital status, payer, Charleston Comorbidity Index) and hospital characteristics (teaching, urban vs. rural, bed number, region)

P1

The Intrinsic Nervous System of the Ureter

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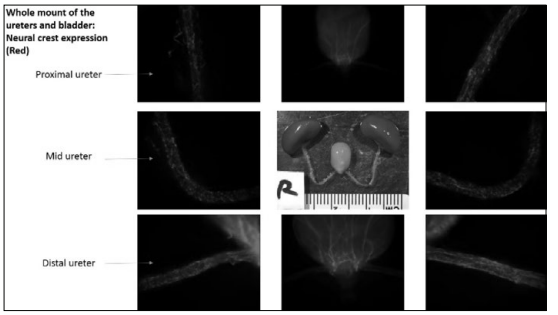
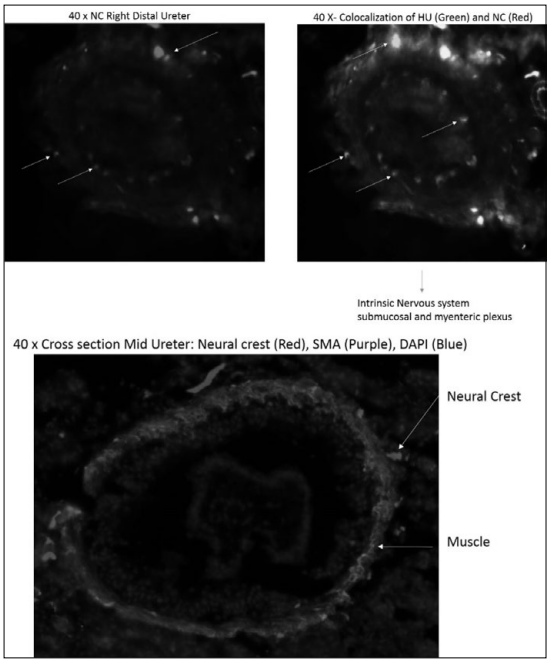
Introduction: The Autonomic Nervous System of the ureter has been described as an extrinsic component arriving from celiac, aortorenal and mesenteric ganglia. The Interstitial cells of Cajal (ICC) have been reported to be present in the renal pelvis and proximal ureter, where they regulate ureteral peristalsis. We hypothesized that the ureter has as intrinsic, neural crest-derived nervous system along its entire length.

Materials & Methods: We tested our hypothesis by isolating kidney, ureters and bladder of 3 week-old transgenic mice in which the expression of Rosa 26 tdtomato red fluorescent protein is expressed in the neural crest cell (NCC) lineage (Wnt-Cre, Rosa Tdtomato). Whole mount images were taken. The ureter was divided into 3 segments (proximal, mid, distal). Immunofluorescence with Hu (neuronal antibody) was used to colocalize neural crest cells with neurons. Smooth muscle antibody (SMA) was used to identify the relation of the neural crest cells relative to the layers of the ureteral wall.

Results: NCCs were present along the ureter and bladder (Figure 1). These cells colocalize with Hu+ ureteral neurons in all segments of the ureter (Figure 2), in both the submucosal and muscular compartments (Figure 3).

Conclusions: The autonomic nervous system of the ureter includes an intrinsic component that originates from the neural crest. These cells are present along the entire length of the ureter, are patterned in two concentric layers, and differentiate into Hu-expressing neurons.





P2

microRNA Profiles in Stage I Clear Cell Renal Cell Carcinoma Predicts Progression to Metastatic Disease

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Introduction: Despite surgical intervention, patients with small localized clear cell renal cell carcinoma (ccRCC) can still develop metastatic disease. MicroRNAs (miRNA) are small non-coding RNAs regulating gene expression that have shown to be early oncologic diagnostic biomarkers and potential therapeutic targets. Recent research has focused on a subset of miRNA, termed metastamirs, that are thought to play a role in various steps of tumor metastasis. This investigation sought to identify miRNA profiles of small, pathologically confirmed ccRCC tumors that could predict metachronous metastatic disease.

Materials & Methods: Samples of pathologic stage 1 ccRCC tumors (< 5 cm) from two institutions were studied in two stages: initial miRNA screening, followed by a validation study. All specimens were secondarily reviewed by a single pathologist to confirm their characteristics and patient data was collected in a retrospective manner after IRB approval. For the screening phase 752 miRNA were evaluated on each sample to identify those with differential expression between tumors that did (n = 10) or did not (n = 10) progress to metachronous metastatic disease. In the second phase, 54 additional samples from two institutions (29 non-progressors, 25 with progression to metachronous metastasis) were utilized in a validation analysis. This analysis investigated 20 miRNA in each specimen to determine if a miRNA panel could differentiate an aggressive natural history.

Results: In the screening analysis, 27 miRNA were found to be significantly differentially expressed ($p < 0.05$, FDR < 0.1) between the groups. In the validation phase, 14 of the 20 miRNA examined were confirmed to have differential expression. Two of these miRNA biomarkers, miR-140-3p and miR-26a-5p, were found to differentiate between localized and progressive disease showing a sensitivity of 80% and 64%, specificity of 79.3% and 86.2%, respectively. MiR-10a-5p, -10b-5p, and -21-5p were also significantly differentially expressed between groups, and supports previous ccRCC investigations regarding miRNA phenotypes and oncologic aggressiveness.

Conclusions: This investigation identified miRNA biomarkers among ccRCC samples that may differentiate between localized tumors and those that progress to metastatic disease in this group of stage I tumors. The miRNA profiles determined in this study have the potential to identify patients with small renal masses who are likely to have progressive ccRCC.

P3

Analysis of Urinary Extracellular Vesicles in Stone Formers Reveals Potential Target Proteins in the Formation of Nephrolithiasis

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Introduction: Nephrolithiasis (NL) prevalence has increased 6 times in the last decade and is a tremendous burden on the healthcare system. The exact molecular pathophysiology of NL is unclear. Analysis of molecular components of kidney cells may help delineate the pathophysiology of NL. Extracellular vesicles (EV) are found in urine and contain peptides and other molecules. We studied urinary EV in various risk stone-formers in order to assess any differences in protein expression between non-, low- and high-risk (HR) stone formers.

Materials & Methods: Urine samples were collected from patients in our kidney stone center. Urine samples were classified as normal, low risk (LR) and HR stone formers. LR stone formers were patients with 1 stone episode and no recurrence. HR was defined as patients with stone burden > 1 cm, bilateral stone disease, or those with presentation at 18 years or younger. EV from urine samples were isolated and urine proteomes for each group were characterized using spectral counting mass spectrometry. Relative abundancy protein analysis for each of the groups was compared to analyze and difference in protein expression.

Results: 6 of 30 urines were available for analysis at the time of this report. Of these, 2 were from normal, 2 from LR and 2 from HR stone formers. A total of 1232 unique peptides were isolated and quantified in study samples. Comparative analysis revealed that 22 of these proteins have increased over 25 fold in stone formers compared to healthy individuals. Figure 1 shows these 22 most upregulated peptides (> 25 fold) and the 22 peptides that were most downregulated (> 34 fold) in HR and LR patients compared to the healthy samples.

Conclusions: A relative change in protein abundancy was observed in the cohort analysis. We demonstrate that proteins isolated from the EV of our population express proteins related to NL and the inflammatory response associated with NL. Additionally, we postulate that certain proteins (e.g Osteopontin) may be associated with mineralization and crystal formation and may be involved in kidney stone formation. The latter may serve as a target for further research to identify their exact pathophysiology of NL. A larger analysis is currently being conducted to validate the results.

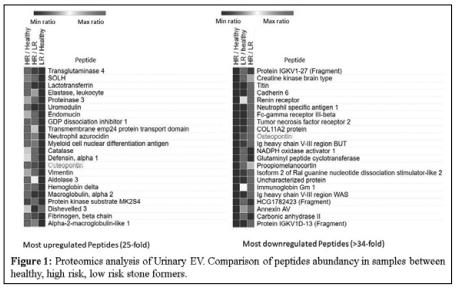

Figure 1: Proteomics analysis of Urinary EV. Comparison of peptides abundancy in samples between healthy, high risk, low risk stone formers.

P4

MicroRNA Expression Profiles in Biopsy Specimens of Upper Tract Urothelial Carcinoma as a Reflection of Tumor Grade and Stage: a Tool for Clinical Decision Making

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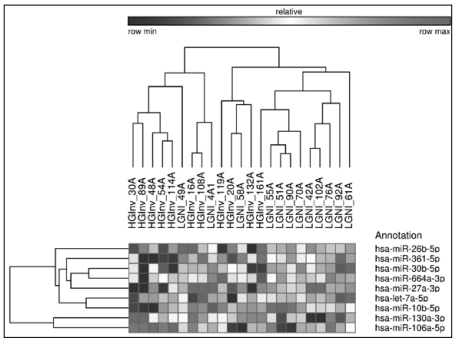
Introduction: The current methodology for grading and staging upper tract urothelial carcinoma (UTUC) has inherent limitations due to insufficient tissue sampling during endoscopic biopsy. While grading is possible, staging is rarely accurate. Better understanding of tumor biology would enable practitioners to proactively risk stratify treatment strategies accordingly, potentially avoiding aggressive, extirpative procedures on less aggressive, superficial tumors. A previous study at our institution demonstrated that microRNAs (miRNAs) - small, non-coding RNA molecules that modify gene expression - are differentially expressed in radical nephroureterectomy (RNU) in a pattern that correlates with grade and stage. While this serves as a novel adjunct in understanding tumor biology after a radical surgery, it might be more clinically meaningful in the ureteroscopic biopsy setting. This would enable prediction of grade and stage prior to an aggressive resection and would help select patients for kidney-sparing procedures. We aimed to identify miRNA expression profiles in UTUC biopsy specimens predictive of histopathologic findings of the final RNU specimen.

Materials & Methods: Total RNA was extracted from formalin-fixed, paraffin-embedded UTUC biopsy samples from 2005 to 2016 under an IRB-approved study. Twenty-three unique biopsy samples from low-grade, non-invasive lesions and high-grade, invasive RNU pathologies were selected and profiled via miRNA RT-qPCR array for 752 unique miRNA. Validation of differentially expressed miRNA was performed with a second cohort of UTUC biopsy specimens from two institutions.

Results: Array analysis identified 26 miRNA differentially expressed between the low and high-grade tumors ($p < 0.05$ and FDR < 0.1). Of these, four were up-regulated and 22 were down-regulated in the high-grade, invasive tumors. Down-regulated miRNA included four members of the miR-200 family and three members of the let-7 family. Notably, these are known to be associated with muscle-invasive urothelial carcinoma of the bladder. Twenty of these miRNA were previously identified as differentially expressed in our investigation of RNU specimens. Hierarchical clustering analysis resulted in two groupings with samples aligning with the corresponding RNU pathology ($p = 0.029$). A selection of miRNA was further validated by qRT-PCR on individual samples confirming differential expression within tumor grade and stage.

Conclusions: We identified distinct miRNA expression profiles of UTUC biopsies that differentiate low-grade, non-invasive tumors from high-grade, invasive lesions. This may enable practitioners to risk stratify treatment strategies to more appropriately match the tumor biology.



P5

Androgenic to Estrogenic Switch in the Prostate Gland of Overweight Patients

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Introduction: The steroid 5-α reductase type 2 (SRD5A2) is critical for prostatic development and growth. Strategies to block SRD5A2 using 5-alpha reductase inhibitors (5ARI) remain a mainstay in the treatment of benign prostatic hyperplasia (BPH). However, one-third of men are resistant to 5ARI therapies. We previously showed that body mass index (BMI) correlates with increased SRD5A2 gene promoter methylation and decreased protein expression in men with symptomatic BPH. We have demonstrated that there is an "androgenic to estrogenic switch" when SRD5A2 is absent in the prostate gland. Here we wished to identify whether BMI is associated with the androgenic to estrogenic switch in human prostate tissue.

Materials & Methods: Prostate specimens were collected from 35 patients who underwent transurethral resection of the prostate for symptomatic BPH at Massachusetts General Hospital. Medical records were reviewed to retrospectively collect clinical and pathological data. Patients were categorized by BMI as lean (less than 25 kg/m^2), and overweight (25 kg/m^2 or greater). Use and duration of alpha-blockers and/or 5ARIs was assessed. Methylation of SRD5A2 promoter was assessed using Methylated CpG Island Recovery Assay (MIRA). Prostatic levels of testosterone, dihydrotestosterone and estradiol were measured by HPLC-MS.

Results: We found that BMI was significantly correlated with methylation of SRD5A2 gene promoter ($p < 0.05$) and absence of SRD5A2 protein expression. Higher BMI was associated with higher prostatic estradiol levels ($p < 0.05$). IIEF-5 score, International Index of Erectile Function Questionnaire score, was negatively associated with BMI ($p < 0.05$). Treatment with 5ARIs dramatically increased the level of prostate testosterone levels and testosterone/estradiol ratio in the prostate specimens ($p < 0.01$, $p = 0.01$, respectively), and decreased the level of dihydrotestosterone ($p < 0.05$).

Conclusions: Our study demonstrates for the first time that there is an androgenic to estrogenic switch in the prostate glands of overweight patients. Associated with body weight, somatic epigenetic silencing of SRD5A2 changes the prostatic hormonal milieu, and may modulate prostatic homeostasis and growth. Targeting the estrogenic signaling may serve as an effective treatment strategy in subset of patients with increased BMI.

P7

Synthetic TGF-β1/Smad Oligodeoxynucleotide Attenuated Renal Fibrosis via Regulation of both Epithelial and Endothelial Mesenchymal Transition (EMT/Endomt) in Unilateral Ureteral Obstruction

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Introduction: Kidney interstitial fibrosis is common process of kidney disease leading to end-stage of renal failure irrespective of etiology. Excessive accumulation of extracellular matrix (ECM) produced by myofibroblasts is an important characteristic in kidney fibrosis. Recent studies have demonstrated that epithelial and endothelial cells become myofibroblasts by epithelial-mesenchymal transition (EMT) and endothelial-mesenchymal transition (EndoMT). TGF-β1/Smad signaling plays a crucial role in EMT and EndoMT. TGF-β1/Smad oligodeoxynucleotide (ODN) is a synthetic short DNA containing complementary sequence for Smad transcription factor and TGF-β1 mRNA. This study investigated whether both EMT and EndoMT processes are involved in kidney fibrosis and to examine the anti-fibrotic effect of synthetic TGF-β1/Smad ODN on kidney fibrosis via regulation of both EMT and EndoMT.

Materials & Methods: To examine the anti-fibrotic effect of synthetic TGF-β1/Smad ODN, we performed histological staining, western blotting and immunofluorescence to evaluate renal interstitial fibrosis.

Results: The results showed that UUO induced accumulation of collagen and raised kidney tubular atrophy. However, synthetic ODN for TGF-β1/Smad significantly suppressed UUO-induced fibrosis via attenuated EMT and EndoMT processes. As shown Western blot and immunofluorescence data, the epithelial and endothelial markers were recovered in TGF-β1/Smad ODN-treated mice compared with UUO mice. In addition, the expressions of mesenchymal markers such as α-SMA and FSP-1 were reduced in ODN-treated mice compare with UUO mice.

Conclusions: These results demonstrated that administration of synthetic TGF-β1/Smad ODN attenuates kidney fibrosis via inhibiting both EMT and EndoMT processes. This research proposes the possibility of synthetic ODN as a new effective therapeutic tool for kidney fibrosis.

Keywords: Kidney fibrosis, TGF-β1/Smad oligodeoxynucleotide, EMT, EndoMT, UUO

P6

Preclinical Study of Intraprostatic Ethanol Injection via a Microporous Needle: Correlation of Injected Volume and Lesion Size

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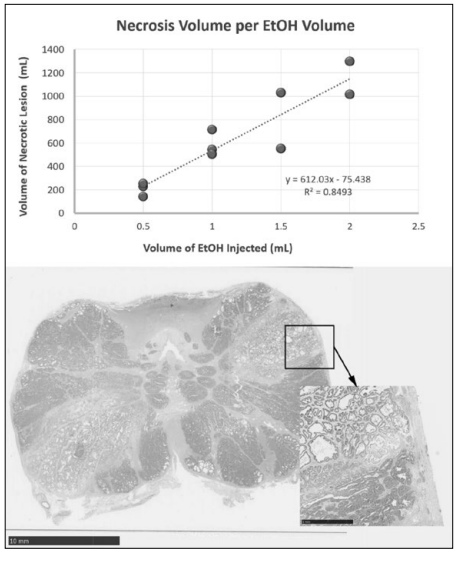
Introduction: Prostate cancer (PCa) remains the most commonly diagnosed cancer and is the second leading cause of cancer death in men. Currently, treatment options for localized PCa lesions are limited to techniques involving periprostatic tissue damage causing significant adverse effects. With the guidance of novel imaging techniques, intraprostatic injection has potential to fill this gap as a minimally-invasive PCa therapy. We previously documented that intraprostatic anhydrous ethanol (EtOH) injection through a 1 cm microporous needle, ablated tissue, offered improved diffusion characteristics, and decreased backflow along the needle track when compared to a traditional needle. The objective of this study is to assess the properties of intraprostatic injection by calculating the lesion volumes, comparing lesion volumes with injection volumes, and generating precise 3D reconstructions of the prostate with the corresponding lesions.

Materials & Methods: Seven canine prostates were exposed by laparotomy and each prostate received EtOH injections of differing volumes into the right and left lobes. A 1 cm microporous needle was used to inject 0.5, 1.0, 1.5, or 2.0 mL of EtOH at a rate of 0.25 mL/min. Prostates were removed two hours post injection. 3 m sections of prostatic tissue spaced 4 mm apart were processed with H&E for histological analysis. Stereo Investigator was used to outline the prostates and corresponding lesions. Cavalieri Estimator calculated the volume of the lesions and generated 3D representations of the prostate and lesions.

Results: Intraprostatic injections yielded oval lesions that were fully contained within the prostatic psueudocapsule. EtOH diffused throughout the glandular tissue and smooth muscle, resulting in glandular dilation, shrinkage of cell nuclei, and loss of visible nucleoli. The pseudocapsule remained intact and showed no sign of EtOH-mediated destruction. Injections of 0.5, 1.0, 1.5, and 2.0 mL yielded average lesion volumes of 208, 588, 791, and 1158 mm^3, respectively. A regression analysis of the volume-necrosis relationship showed an R^2 of 0.8493.

Conclusions: In this study, we successfully injected seven canine prostates with EtOH and confirmed that intraprostatic injection with a micropourous needle ablates prostate tissue by inducing coagulative necrosis without backflow of EtOH along the needle track. Histological analysis of the prostates confirmed injections were confined to the prostate with no leakage of EtOH outside the prostatic pseudocapsule. Volume analysis confirmed that tissue ablation occurred in a reliably dose-dependent manner, highlighting the customizable nature of intraprostatic EtOH injection as a safe, reproducible, and cost-effective potential new PCa treatment method.



P8

Identification of the Core Methylated CpG Regions Responsible for Silencing of steroid-5-alpha-reductase 2 (SRD5A2) in Human Prostate

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Introduction: 5-alpha reductase type 2 (SRD5A2), an enzyme that is critical for prostatic development and growth, is utilized as an inhibitory target by finasteride for patients with bladder outlet obstruction (BOO) secondary to benign prostatic hyperplaisa (BPH). However, we have found that many aging benign prostate tissues do not express the enzyme. We have demonstrated that hypermethylation affects expression of SRD5A2 gene and that DNA methylation of SRD5A2 gene is regulated by DNMT1 in human BPH tissues. Here we define the methylation pattern and identify specific core CpG dinucleotides that account for absence of SRD5A2 expression in human adult prostate tissues when methylated.

Materials & Methods: Sixteen prostate samples from patients who were treated by transurethral resection of prostate (TURP) for BOO secondary to BPH were used. In order to perform methylation profiling of this gene, the regulatory regions from the Ensembl Regulatory Built and the CpG islands based on the CpG islands identified by the UCSC Genome Browser are the focus of the in silico design. These designs cover the regulatory components that include 2 CpG islands, 1 CTCF binding site and one open chromatin region in the SRD5A2 promoter regulatory region. The initial assessment resulted in a total of 14 in silico designs that cover the CpG sites. Process of testing: DNA samples were processed for direct bisulfite modification using EZ DNA Methylation Direct Kit, then performed gradient PCR, followed by capillary electrophoresis of the PCR products using the QIAxcel Advanced System. Libraries were prepared using the KAPA Library Preparation Kit, followed by library molecules purification, quantification, and sequencing. Finally, FASTQ files were aligned to the local reference database using open-source Bismark Bisulfite Read Mapper with the Bowtie2 alignment algorithm. Methylation levels were calculated in Bismark by dividing the number of methylated reads by the total number of reads.

Results: Eight samples had high SRD5A2 expression and eight samples had low SRD5A2 expression confirmed by immunohistochemistry. With deep CpG dinucleotide methylation analysis we found the highest percentage of methylation in the regions -813 (CpG#-60) to -630 (CpG#-45) and -266 (CpG#-29) to -26 (CpG#-6) of SRD5A2 low-expressing BPH tissues compared with SRD5A2 high-expressing tissues. The CpG dinucleotides that most notably differentiated between expressing and non-expressing SRD5A2 prostate tissues were located at nucleotide -813 (CpG#-60), -630 (CpG#-45), -266 (CpG#-29), -165 (CpG#-21), -160 (CpG#-20), -158 (CpG#-19), -47 (CpG#-7), and -26 (CpG# -6). These CpG hotspots can be divided into two broad regions: nucleotide -813 to -630 and segment -266 to -26.

Conclusions: SRD5A2 low-expression samples showed significantly higher methylation patterns than SRD5A2 high-expression samples. Methylation of two specific regions on the promoter (-813 to -630 and -266 to -26) most notably determine expression of SRD5A2. The specific CpG dinucleotides that are methylated will enable us to evaluate mechanisms and patterns of SRD5A2 promoter methylation to study the functional significance of SRD5A2 methylation, and will enable the first effort to decipher molecular mechanisms accounting for unresponsiveness to the SRD5A2 inhibitors for management of BPH.

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P9

Effects of Isoliquiritigenin (ISL) and [6]-Gingerol on Invasive Bladder Cancer

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Introduction: It is estimated that nearly 80,000 cases of bladder cancer will be diagnosed in the United States in 2017. Treatment for invasive bladder cancer, an advanced stage of this disease, often requires the removal of the entire bladder in a complicated surgery and/or treatments that exert undesirable side effects on the patient. This project addresses the potential of ISL (Isoliquiritigenin), which comes from licorice, and [6]-Gingerol, which is derived from ginger, to inhibit bladder cancer metastasis, thereby reducing the adverse effects posed by other treatments as well as the need for bladder removal and further addresses potential molecular mechanisms that may underlie the effects observed. There is currently very limited literature on the role of both compounds in the context of bladder cancer.

Materials & Methods: ISL and [6]-Gingerol were used to treat UMUC3 and T24, two invasive bladder cancer cell lines, upon which the effects of these compounds were observed and analyzed through an MTT assay, which measures cell proliferation, and migration assays, which reveal cellular migration rates. Differential gene and protein expression were then analyzed in only ISL-treated cells with a real-time PCR array, assessing the expression levels of genes that have been implicated in invasive bladder cancer. Subsequently, relative protein levels were measured by Western Blot analysis. Differential lncRNA expression was measured in ISL-treated cells using a real-time PCR array, which measured lncRNA expression levels of genes implicated in cancer. Finally, potential pathways and proteins linked to ISL-based effects were investigated through literature searches.

Results: The MTT and migration assays revealed that proliferation and migration both decreased in the licorice- and ginger-treated cells. Additionally, changes in cell morphology observed through microscopy, of the treated cells compared to controls, demonstrated that treated cells exhibited signs of blebbing (formation of vesicles), a process that has been shown to precede apoptosis. Moreover, the PCR and Western Blot revealed that specific genes and proteins that have been implicated in bladder cancer, namely ACTA2, EZH2, MMP-2, and MMP-9, were downregulated following treatment with ISL. The real-time lncRNA assay, in conjunction with a literature search, revealed that changes in the expression of several lncRNA, including RP11-363E7.4, BCAR4, FOXP4-AS1, and NEAT1, may contribute to the anti-invasive effects produced in the ISL-treated cells, since these lncRNAs have been implicated in cancer-causing processes.

Conclusions: There is sufficient evidence to conclude that ISL and [6]-Gingerol have the potential to decrease characteristics associated with bladder cancer metastasis, and that key genes and lncRNAs such as ACTA2, EZH2, FOXP4-AS1, and NEAT1 may play a role in producing the effects observed in the ISL-treated cells. Further research may lead to the identification of novel treatment targets, new therapeutics and improvements in patient morbidity and mortality.

P10

Robotic Dismembered Pyeloplasty Surgical Simulation using a 3D-printed Silicone-based Model: Development, Face Validation, and Crowdsourced Learning Outcomes Assessment

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Introduction: Ureteropelvic junction obstruction (UPJO) is an uncommonly encountered pathology and training residents to perform robotic dismembered pyeloplasty poses unique challenges. We describe the development and face validation of a robotic-assisted pyeloplasty simulation using a 3-dimensional (3D) printed silicone-based model of UPJO for surgical training. In addition, we demonstrate the use of a crowdsourced platform to objectively assess surgical performance and learning outcomes.

Materials & Methods: The organs (kidney, renal pelvis, and ureter) were created using 3D modeling software and printed using a silicone-based material (Lazarus 3D, LLC, Houston, TX, USA). The model was secured in a laparoscopic box trainer and the da Vinci robotic system (Intuitive Surgical Inc., Sunnyvale, CA, USA) was docked. 6 residents and one faculty member assessed our skills module. Participants independently performed a robotic-assisted right dismembered pyeloplasty using 3-0 prolene on a RB-1 needle, on two separate occasions. Face validity was demonstrated on a 5-point Likert scale. Crowd-Sourced Assessment of Technical Skills (C-SATS Inc., Seattle, WA, USA) scored surgical performance using the Global Evaluative Assessment of Robotic Skills (GEARS) criteria, based on video review of a standardized segment of each simulation.

Results: The dry-laboratory model consists of a kidney, a dilated renal pelvis and ureter with an obstructed ureteropelvic junction. All participants were able to complete the robotic-assisted dismembered pyeloplasty simulation twice with fully patent anastomoses. Average total time to complete the initial procedure was 52 ± 13 minutes (range 38-75). 43% of participants were able to improve the speed of their anastomosis on the second attempt. During initial validation, participants rated (out of 5) 4.1 ± 0.4 for the overall feel of the model, 3.7 ± 0.5 for realism, 4.7 ± 0.5 for usability, 4.9 ± 0.4 for suturability, and 4.3 ± 0.5 for aesthetics. 57% of participants reported feeling very or extremely confident that they could perform a complete anastomosis at the end of the study, compared to 29% prior to the simulations. All participants felt that this simulation was a useful addition to their surgical training.

Conclusions: Using 3D-printed silicone-based models, participants were able to perform a complete robotic-assisted dismembered pyeloplasty for training and skills acquisition. The model's usability, realism, suturability, and resultant improvement in participant confidence show promise as an educational tool for skills acquisition of infrequently encountered pathology.

P11

Anti-fibrotic Effects of Bee Venom and its Major Component Melittin in an Animal Model of Unilateral Ureteral Obstruction

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Introduction: Progressive renal fibrosis is the final common pathway for all kidney diseases leading to chronic renal failure. Purified bee venom (BV) and its major component melittin (Mel) has been widely used as a traditional medicine for various diseases. It has multiple effects including antibacterial, antiviral, and anti-inflammatory activities in various cell types. Many studies have examined the biological and pharmacological activities of BV and Mel. However, the precise mechanism of BV and Mel in ameliorating the renal fibrosis is not fully understood.

Material & Methods: To investigate the therapeutic effects of BV and Mel against unilateral ureteral obstruction (UUO)-induced renal fibrosis, BV and Mel was given intraperitoneally after ureteral ligation. At 7 days after UUO surgery, the kidney tissues were collected for protein analysis and histologic examination.

Results: Histological observation revealed that UUO induced a considerable increase in the number of infiltrated inflammatory cells. However, BV and Mel treatment markedly reduced these reactions compared with untreated UUO mice. The expression levels of TNF-α and IL-1β were significantly reduced in BV and Mel treated mice compared with UUO mice. In addition, treatment with BV and Mel significantly inhibited TGF-β1 and fibronectin expression in UUO mice. Moreover, the expression of α-SMA was markedly withdrawn after treatment with BV and Mel.

Conclusion: These findings suggest that BV and Mel attenuates renal fibrosis and reduces inflammatory responses by suppression of multiple growth factor-mediated pro-fibrotic genes. In conclusion, BV and Mel may be a useful therapeutic agent for the prevention of fibrosis that characterizes progression of chronic kidney disease.

Keywords: Bee Venom, Melittin, Renal Fibrosis, Inflammation, UUO

P12

Lichen Sclerosus of the Urethra, Penile Skin and Vulva: 3 Distinct Disease Processes

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Introduction: Lichen Sclerosus (LS) is a chronic, inflammatory skin condition that affects men and women with predilection for the genital regions. Despite identical pathologic diagnostic criteria, the clinical course of LS in men and women differs. The disease in men is heterogeneous, as 30% who present with genital LS will develop urethral stricture disease (USD). Prior research has aided in characterization of vulvar LS but no large-scale studies have focused on LS of the male urethra or genital skin. Our hypothesis is that male LS is distinct from female LS. We sought to compare protein expression in pathologically confirmed male urethral, male genital, and female LS samples.

Materials & Methods: Tissue samples were collected at a single institution from male genital skin, urethral strictures and female genital skin with confirmed LS. Chart review was performed to extract clinical and demographic data. In-house pathologists reviewed paraffin slides to identify areas of interest that appeared pathognomonic for LS. A tissue microarray (TMA) was created with cores from each sample. Markers of inflammation, cell cycle disruption, oxidative stress, hormone receptor, and viral infection were selected and immunohistochemistry was performed on the TMA. Stains were evaluated semiquantitatively or qualitatively, as appropriate. Data were compared by Kruskal-Wallis or Fisher's exact test with significance of alpha = 0.05.

Results: Core samples were analyzed from 58 men with LS USD, 19 men with genital LS and 6 women with genital LS. Female LS samples stained more for p53 compared to male LS USD. Only male LS showed loss of cyclin D1 presence and only male genital LS showed loss of GH2AX expression. Block-like p16 staining, which is associated with high-risk HPV, was seen only in the male LS USD and genital skin LS samples. Thirty-seven percent of male LS USD and 27% of male genital skin LS stained positively for EBV versus none of the female LS samples. LS USD from males expressed significantly higher levels of VEGF compared with female LS ($p < 0.001$) and male skin LS ($p < 0.01$). Approximately half of male LS samples had loss of androgen receptor expression. There was no difference in staining for markers of inflammation.

Conclusions: Immunohistochemistry staining demonstrates differences in the pathophysiology of male genital LS, LS USD, and female genital LS suggesting that they may be distinct disease processes. Our results indicate that there may be alteration of cell cycle regulation in LS USD and more significant oxidative stress in male LS. EBV and block-like p16 stains show that there may be an infectious precursor to the formation of male LS. Larger cohorts and further study are needed to fully elucidate the pathophysiology of LS.

P14

Evaluation of Urine Bacterial DNA Isolation Protocols for Sequencing Analysis of the Urinary Microbiome

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Introduction: The influence of the human bacterial microbiome on a myriad of diseases has been recently elucidated, but limited data are available regarding its role in genitourinary pathophysiology. Research into the urinary microbiome is limited in part by technical challenges and ease of contamination. If a better understanding of the urinary microbiome and its relationship to genitourinary diseases is to be gained, optimization of analytic techniques and practices needs to be undertaken. This pilot study sought to compare preanalytical treatment of urine and currently available DNA isolation kits in the analysis of the urinary microbiome.

Materials & Methods: Clean catch urine samples were obtained from patients under an IRB approved study. Treatment of the urine was divided into two groups: storage at -80°C or fresh urine. Samples were sterilized by centrifugation and ultrafiltration and then spiked with either a known microbial standard (Zymo Research) or a control solution (phosphate buffer saline). Three different commercially available DNA isolation kits (Zymo Research, MoBio, and Qiagen) were used to extract DNA from samples. Twenty-two samples were analyzed by 16S rRNA PCR/Illumina MiSeq gene sequencing in order to ascertain the best isolation method. Gene sequencing allowed for identification and determination of relative abundance of bacterial genera amongst the groups as compared to the known microbial standard.

Results: Weighted UniFrac analysis of sample beta diversity demonstrated different kits have an effect on observed microbiome ($p = 0.064$), and frozen samples are not as consistent as fresh samples ($p = 0.023$). Determination of genera amongst samples revealed a disproportionately elevated relative abundance of staphylococcus species. The alpha diversity analysis to determine a measurement of microbial richness and evenness within a sample showed that a modified version of the Qiagen protocol was most closely consistent with the known microbial standard.

Conclusions: This study found that the specific DNA isolation kit as well as the pre-analysis treatment of the sample had an impact on the observed microbiome. The inherent low bacterial DNA biomass of urine samples proves to be a challenging feature of urinary microbiome analysis. Risk of sample contamination at any point in the process, from sample collection to final product, demands scrutiny in interpretation of low biomass samples. Future research involving the urinary microbiome should seek to minimize pre-analysis sample treatment differences between specimens. If using a commercially available bacterial DNA isolation kit, researchers should utilize a protocol such as the Qiagen kit with modifications that most closely represents a known microbial standard, especially given the setting of the technically challenging urine sample.

P13

Metabolomic Evaluation of MRI-US Fusion Biopsies Differentiates Malignant from Benign

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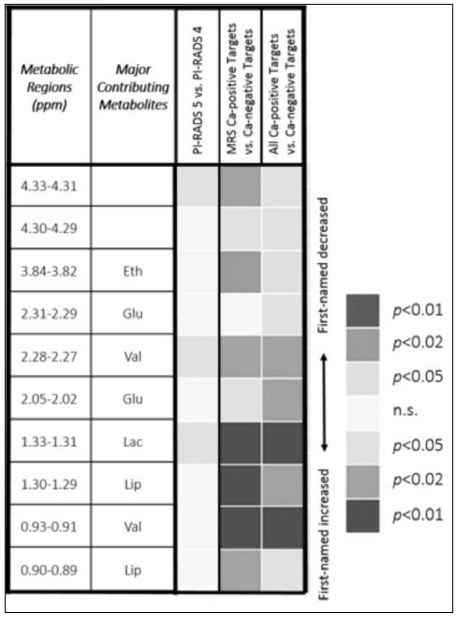
Introduction: Multiparametric MRI (mpMRI) has improved detection of prostate cancer (PCa), however, inaccuracies remain. Our prior work with ex vivo magnetic resonance spectroscopy (MRS) demonstrated metabolomic field differences in PCa and benign prostate tissue. This study uses ex vivo MRS to study mpMRI/ultrasound fusion targeted biopsies to identify metabolomic markers of disease.

Materials & Methods: Subjects having fusion biopsy were eligible for the study. ≥ 3 targeted cores were taken, followed by standard 12 core template biopsy. Patient matched target and nontarget cores (n = 54 patients) underwent high resolution magic angle spinning MRS on a Bruker 600MHz spectrometer. Spectra were processed and transformed into statistical matrices using a MatLab program. Principal component (PC) analysis was performed with all identified metabolic spectral regions (n = 33). Following MRS, all biopsy cores underwent standard histopathology.

Results: 59% of fusion targets were positive for PCa. Higher PIRADS scores resulted in greater likelihood of detecting PCa. Patient matched target and nontarget samples were compared with Wilcoxon tests. Among the 33 metabolic spectral regions, ten regions differentiated between all paired samples with statistical significance. The Figure demonstrates a heatmap of metabolic regions measured in targeted cores. Although there were minor differences between cores from PIRADS 4 & 5 lesions, the majority of metabolic regions were similar. The second data column in the heatmap demonstrates significant differences between the analyzed (MRS) cores that were PCa-positive vs. cores that were benign. The third data column shows that similar differences remain present even when the analyzed target core is benign, but other cores from that MRI target are PCa-positive. These findings support the presence of metabolomic fields in PCa tissue.

Conclusions: We demonstrate metabolic differences in tissue obtained from mpMRI lesions as compared with mpMRI normal regions. Metabolic differences are also seen in mpMRI lesions with biopsies demonstrating cancer as compared with those lesions from which all biopsies were benign. Continued investigation of metabolic differences in mpMRI lesions may help translate ex vivo MRS to novel in vivo MRS biomarkers and thus improve the discrimination of PCa from normal with imaging.



P15

The State of PSA screening in Male to Female Transgender Patients

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Introduction: There are over one million transgender (TG) persons in the United States. As this population grows, more TG patients will seek urologic care for prostate cancer (PCA) screening. However, the effects of hormonal manipulation used by many TG patients on the natural progression of prostate cancer and its implication on screening tests remains unclear. Prostate specific antigen (PSA) levels are lower in those on hormonal therapy, but data evaluating the normal PSA range for these patients are limited. Current recommendations for PCA screening are not tailored for TG patients making appropriate prescreening counseling regarding PSA critical in this population. As such, we sought to describe prescreening PSA counseling (PPC) rates amongst MtF-TG patients and non-TG patients using the 2016 Behavioral Risk Factor Surveillance System (BRFSS).

Materials & Methods: We analyzed complex survey data from the 2016 BRFSS. Only respondents ages 40-79 who completed both the "Prostate Cancer Screening" and "Sexual Orientation and Gender Identity" modules were included. Respondent characteristics analyzed included education level, income level, relationship status, age, and race. Baseline characteristics were summarized using weighted percentages, and compared using Pearson chi-square test. The association of PPC with MtF-TG status was evaluated using logistic regression, adjusted for respondent features.

Results: A total of 59,148 respondents were included, corresponding to a weighted estimate of 35 million people. Of these, 0.4% identified as MtF-TG. MtF-TG respondents were more likely to report a lower education level ($p < 0.01$), and lower income level ($p < 0.01$); no other statistically significant differences were noted between groups. Overall, 57.3% of respondents reported undergoing PPC. Counseling rates were lower amongst MtF-TG respondents when compared to the non-TG group, though this did not reach statistical significance (47.4% vs. 57.3%, $p = 0.36$). Multivariable analysis adjusting for the previously mentioned respondent features demonstrated no statistically significant association with MtF-TG status and PPC (OR 0.65 $p = 0.38$). A higher income level, higher education level, and increased age were all associated with increased odds of PPC.

Conclusions: In this survey, PPC was less frequently reported among MtF-TG respondents than in the non-TG group, though this difference did not reach statistical significance. Further data is needed to help tailor PSA screening for MtF-TG patients, but until then quality prescreening counseling regarding PSA is essential when treating members of this population.

TABLE 1. Characteristics of respondents over age 40 who had serum PSA level drawn, by transgender status.

	Overall (n = 59,148)	Identifies as Transgender – Male to Female(n–173)	Does not Identify as Transgender (n–58,975)	P
	Weighted%	Weighted% (n)	Weighted% (n)	
PSA Counseling	57.3%	47.4%	57.3%	0.36
Race White Black Other	67.3% 9.9% 22.7%	47.0% 14.7% 38.2%	67.4% 9.9% 22.7%	0.19
Education Level HS or less Some College College graduate	43.1% 28.0% 28.9%	70.8% 20.6% 8.6%	43.0% 28.0% 29.0%	0.01
Income level (USD) <50,000 50-75,000 > 75,000	43.3% 15.6% 41.0%	73.1% 11.3% 15.6%	43.4% 15.6% 41.1%	< 0.01
AUA Age Group· 40-54 years 55-69 years 70-79 years	44.1% 41.5% 14.3%	30.4% 60.0% 9.6%	44.2% 41.5% 14.4%	0.07
In a relationship	69.3%	63.8%	69.3%	0.52

TABLE 2. Unadjusted and Adjusted Odds Ratio of having a PSA counseling according to transgender status Education Level, Race, Income Level, Marital Status, Age, Diabetes status and BMI.

	Underwent PSA Counseling	P	Underwent PSA Counseling	P
	Unadjusted OR (95%CI)		Adjusted OR (95%CI)	
Male to Female transgender ·	0.67 (0.28, 1.59)	0.37	0.65 (0.25, 1.70)	0.38
Race White Black Other	-- 1.14 (1.00, 1.29)	-- 0.04	-- 1.67 (1.44, 1.93)	-- < 0.01 < 0.01
	0.57 (0.52, 0.63)	< 0.01	0.82 (0.73, 0.92)	
Education Level HS or Lower Some College College or Higher	-- 1.57 (1.44, 1.71) 2.05 (1.90, 2.21)	-- < 0.01 < 0.01	-- 1.36 (1.23, 1.50) 1.66 (1.50, 1.82)	-- < 0.01 < 0.01
Income level (USD) < 50,000 50-75,000 > 75,000	-- 1.48 (1.34, 1.65) 1.63 (1.51, 1.76)	-- < 0.01 < 0.01	-- 1.39 (1.23, 1.56) 1.60 (1.44, 1.78)	-- < 0.01 < 0.01
AUA Age Group 40-54 years 55-69 years 70+ years	-- 3.74 (3.46, 4.03) 5.30 (4.73, 5.95)	-- < 0.01 < 0.01	-- 4.03 (3.70, 4.38) 5.97 (5.24, 6.80)	-- < 0.01 < 0.01
In Relationship	1.57 (1.46 1.69)	< 0.01	1.34 (1.22, 1.46)	< 0.01

· Reference group = Non-transgender

[a]Reference group = Non-transgender

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Robotic Sacrocolpopexy for the Management of Pelvic Organ Prolapse: An Update on Quality of Life Outcomes

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Introduction: Robotic-assisted laparoscopic sacrocolpopexy (RALS) is a widely-used surgical treatment for pelvic organ prolapse (POP). Our aim was to investigate the longer-term surgical and quality of life (QOL) outcomes in our updated cohort.

Materials & Methods: A retrospective cohort study of women undergoing RALS with and without concomitant robotic-assisted laparoscopic hysterectomy, urethral sling, and rectocele repair was performed. Scores from the Pelvic Floor Distress Inventory (PFDI-20) and Pelvic Floor Impact Questionnaire (PFIQ-7) surveys were used to evaluate QOL outcomes. Clinical improvement was defined by a decrease in a patient's PFDI-20 and PFIQ-7 post-operative score by at least 70%.

Results: A total of 205 patients from November 2010 to June 2015 were included in our review with a mean follow-up time of 23 months. Complete pre- and post-operative survey data were available in 180 patients. Clinical improvement was seen in 62.6% by the PFIQ-7 and in 64% by the PFDI-20 survey. We analyzed patient demographics, history, and pre-operative physical exam in those that reached clinical improvement. Younger patient age (OR 0.92, $p = 0.011$) and a higher pre-operative AUA Quality of Life score (OR 1.42, $p = 0.46$) were associated with clinical improvement. Within the PFQI-7, 35.6% of patients saw clinical improvement within the bowel category, compared to the bladder category (54.1%, $p < 0.001$) and the prolapse category (45.6%, $p = 0.053$). Similarly, within the PFDI-20, 45.5% of patients saw clinical improvement within the CRADI-8, compared to the UDI-6 (56.7%, $p = 0.035$) and the POPDI-6 (62.6%, $p < 0.001$). Of the patients who had a concomitant rectocele repair, 46.3% reached clinical improvement in their CRADI-8 score and 51% saw clinical improvement in the bowel portion of the PDFI-20.

Conclusions: This is the largest series to analyze pre- and post-operative PFIQ-7 and PFDI-20 scores. Most patients undergoing RALS saw clinical improvement based on the PFDI-20 and PFIQ-7 following RALS. However, there were significantly fewer patients reached our clinical improvement definition within the portions of the surveys that focus on bowel symptoms and functions compared to the portions of the surveys that ask about symptoms related to urination and prolapse. Of those that had a concomitant rectocele repair, approximately half reached clinical improvement their bowel symptoms. This information can be helpful when counseling patients pre-operatively regarding expectations of improving pre-existing bowel symptoms after RALS.

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Postoperative Penile Prosthesis Pain: Is it Worse in Diabetic Patients?

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Introduction: Inflatable penile prosthesis (IPP) surgery is an effective, safe and satisfactory treatment option for medication-refractory erectile dysfunction. Postoperative complications include infection, mechanical failure, erosion, and pain. Current literature suggests the need for a better approach to postoperative pain management after IPP surgery. Furthermore, targeted pain management strategies for diabetic patients have been suggested in the non-urologic literature, as several clinical studies have demonstrated that postoperative pain is different in diabetic and non-diabetic patients. The purpose of this study is to determine if there is a difference in postoperative pain after IPP placement in diabetics.

Materials & Methods: This is a single-institution retrospective review of 173 primary penoscrotal three-piece IPP prosthesis cases performed between 2014 and 2017. The main outcome measure was the number of 30-day postoperative emergency room and unplanned clinic visits specifically for significant pain. T-test was used for mean assessment and chi-square analysis was used for proportion assessment. P values < 0.05 were considered statistically significant. The top HgbA1C quartile (with values greater than or equal to 8) was compared to the other HgbA1C quartiles, for a total of 30 (23%) and 98 (77%) patients, respectively.

Results: Diabetes was present in 92 (54.4%) patients and 96% of these had HgbA1C greater than 8. Significant postoperative pain was more common in patients with HgbA1C greater than 8 (41% versus 13%, $p = 0.047$) and resulted in more unplanned 30-day post-operative emergency room and/or clinic visits (27% versus 11%, $p = 0.042$). Patients with HgbA1C greater than 8 with significant postoperative pain were more likely to be managed with a combination of opiates and gabapentin (30% versus 14%, $p = 0.05$). There were no statistical differences in age in diabetics and non-diabetics (mean 59 versus 61, $p = 0.193$). Hispanic and African-American patients represented 87% of the poorly controlled diabetics compared to only 13% of white patients ($p < 0.001$). Poorly controlled diabetics had more medical comorbidities ($p < 0.001$). There were no differences in intra- or postoperative surgical complications in either group.

Conclusions: Significant pain after IPP surgery was statistically higher in diabetics with HgbA1C greater than 8, which resulted in more unplanned 30-day post-operative emergency room and/or clinic visits. Approximately 90% of diabetics with HgbA1C greater than 8 were African-American and Hispanic patients. Patients with significant postoperative pain were managed with a combination of opioids and gabapentin. Future studies are required to optimize pain management in diabetics following IPP placement.

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Virtue Sling is Ineffective as Salvage for Failed AdVance Sling in Treating Male Stress Urinary Incontinence

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Introduction: Male stress urinary incontinence (SUI) post-radical prostatectomy (RP) and post-transurethral resection of the prostate (TURP) remains a significant source of morbidity. While Artificial Urinary Sphincter (AUS) remains the gold standard for surgical management, the Male Sling was developed as an attractive treatment option for mild to moderate SUI. There are currently two slings on the North American market. The retroluminal transobturator device (AdVance) provides continence by moving the proximal urethra proximal into the pelvis. The quadratic sling (Virtue) provides both proximal urethra relocation as well as perineal urethral compression. The goal of this study was to investigate if Virtue sling could be used as a salvage treatment for AdVance sling failure.

Materials & Methods: Using CPT codes (53440, 53442) we identified all male patients undergoing urethral sling placement between 1/2011 and 10/2017. We excluded patients who had surgical intervention for SUI prior to receiving a sling. Surgical success was defined as post operative use of ≤ 1 pad per day. Statistics were completed using Stata (StataCorp).

Results: We identified 48 patients who had urethral sling placement at our institution during the study period. Patient age ranged from 56 to 90, average 72. Causes of SUI included RP (N = 43), TURP (N = 4), and neurogenic bladder (N = 1). Primary intervention was quad-arm Virtue sling (Coloplast US) (N = 41) or bi-arm AdVance sling (Boston Scientific) (N = 7). 0/7 (0%) of the AdVance sling patients achieved success versus 27/41 (65.9%) of the Virtue sling patients (p = .001, Chi Square). 11 patients underwent salvage therapy to correct for persistent SUI. 0/4 (0%) achieved success with sling conversion from AdVance to Virtue sling, 3/4 (75%) with conversion to AUS, 2/2 (100%) with urinary diversion, and 0/1 (0%) with coaptite injection. A single patient failed sling conversion (AdVance to Virtue) but had successful salvage with AUS placement.

Conclusions: While conversion from AdVance to Virtue sling was technically feasible, none of the patients who were converted had meaningful improvement in their SUI. If a patient fails a male urethral sling, a different modality of incontinence surgery should be discussed as salvage therapy.

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Resident Simulation Training Courses (Cadaver Lab): An Assessment Survey

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Introduction: Penile prosthesis is an effective and safe treatment option for male erectile dysfunction which is associated with high satisfaction rates. Constraints on surgical resident training (work hour mandates and shorter training programs) and insufficient urologic prosthetic urologists in residency academic programs may limit the acquisition of certain surgical skills. As a result, training courses are being conducted to augment the resident penile prosthetic surgery learning experience. Here, we sought to assess if there is a knowledge and self-reported confidence improvement as a result of the simulation training course.

Materials & Methods: As part of the 2017 Society of Urologic Prosthetic Surgeons and the Sexual Medicine Society of North America meeting, 31 residents participated in penile prosthesis lectures and simulation. They filled out surveys before and after this experience. The surveys consisted of 15 multiple choice questions to assess overall knowledge and self-confidence about penile prosthesis surgery. The cadaver knowledge assessment included multiple choice questions with one correct answer. The confidence assessment included a Likert scale to rate self-confidence.

Results: Of the 31 residents (average age 30, median of 28 years old), 7 (22.6%) were female and 24 were male (77.4%). The majority of residents were in their fourth and fifth years of residency (41.9% and 38.7%, respectively). Prior implant experience was assessed by the number of penile prosthesis cases performed before the training course. Residents were grouped into less than 10 cases (35.5%), between 10 and 20 cases (45.2%), and greater than 20 cases (19.4%). The overall survey score mean improvement from before the training to after was statistically significant (68.8 ± 13.4 vs. 74.2 ± 13.0, $p < 0.05$). The mean self-reported confidence level was statistically higher after the simulation experience (3.9 vs. 2.8, p-value < 0.001).

Conclusions: Surgical simulation can augment resident surgical training by both increasing resident knowledge and confidence. Limitations of this study include small sample size and data based on survey questions. Studies investigating the efficacy of surgical simulation are still needed.

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Emerging Data Regarding Fungal Infections of Inflatable Penile Prostheses

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Introduction: Fungal infections of inflatable penile prostheses (IPPs) are inadequately understood in the literature. We reviewed our multi-institution database of IPP infections to examine for common patient and surgical factors related to IPP fungal infection.

Materials & Methods: This is a retrospective IRB-approved analysis of 213 patients at 25 institutions who underwent salvage procedure or device explant between 2001 and 2016. Patient data were compiled after extensive review of operative reports, nursing operative data, intraoperative wound cultures, perioperative antibiotics, inpatient notes, consult notes, and follow-up visits. Twenty patients with fungal infections were identified and additional information was requested.

Results: Fourteen patients underwent primary IPP implantation, the other 6 had previously undergone an average of 1.5 IPP-related surgeries (range 1-3, median 1). Average age at implantation was 58 (range 31-72, median 60). Thirteen of the 20 fungal infection patients were diabetic (65%), the rest were not. Of the diabetic patients mean HgbA1c was 8.7 (range 6.5-13.3, median 8.3). Mean BMI for all patients was 30.9 kg/m^2 (range 23.7-45 kg/m^2, median 31 kg/m^2). Mean BMI for diabetic patients was 31.8 kg/m^2 (range 24.1-45 kg/m^2, median 32 kg/m^2). Ninety percent of implants were placed with IV antibiotics consistent with current AUA guidelines. In seven of these cases, fungi and bacteria were found in culture together. Eight devices were explanted, 8 underwent malleable implant salvage (MIST), and 4 were salvaged in the classic Mulcahy technique. Of the 8 patients who underwent explant, 5 later had successful reimplantation with either a malleable prosthesis or an inflatable prosthesis. The other three remain without an implant at last follow-up. Two of the 20 fungal infection patients were incontinent at IPP implantation. One of these patients underwent simultaneous Virtue sling implantation. No patient had concomitant immunosuppressive disease aside from DM at IPP implantation. No patient had evidence of recent antibiotic exposures prior to IPP implantation.

Conclusions: To our knowledge these data represent the first in-depth exploration of IPP patients presenting with fungal infections. Approximately two-thirds of the patients were diabetic, suggesting that additional prophylaxis may be appropriate for diabetic patients. Further investigation is needed to confirm our results.

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Pre-Operative Urodynamic Evaluation in Female Medicare Patients Undergoing a Stress Urinary Incontinence Procedure: Rates Before and After the Value Trial

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Introduction: The American Urologic Association/Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (AUA/SUFU) Guideline outlines the evaluation and treatment of stress urinary incontinence (SUI) and state that urodynamic (UDS) testing may be omitted in healthy females who have not undergone a prior SUI procedure. This recommendation is largely based on the data reported in the seminal Value of Urodynamic Evaluation (ValUE) trial. We sought to investigate the rates of UDS testing in those undergoing a SUI procedure before and after the ValUE trial publication.

Materials & Methods: Using The Dartmouth Institute Atlas Rate Generator exploring a 100% Medicare claims data, we identified females with a diagnosis of SUI by ICD-9 codes and a CPT code for either urethral bulking or urethral sling procedure, within 306 hospital referral regions (HRR). We then identified the proportion of those who also had a CPT code for UDS within one year prior to their SUI procedure.

Results: Complete 2011 and 2013 data was available for 151 of the 306 HHRs. The national percentage of pre-operative UDS evaluation was 53% (16020/30131) in 2011, compared to 55% (11,772/21579) in 2013, after the publication of the ValUE trial (p = 0.157). In 2011, the highest percentage of UDS testing in was performed in Monroe, LA at 81% (48/59) and the lowest in Jonesboro, AR at 22% (14/64). In 2013, the highest percentage of UDS testing was performed in Longview, TX at 88% (43/49) and the lowest in Springfield, MO at 22% (22/99). Only 40% (61/151) of HHRs decreased their use of UDS, while 52% (79/151) increased UDS rates, and 8% (11/151) HHRs stayed the same.

Conclusions: There is significant regional variation in utilization of UDS in those undergoing a SUI procedure. Nationally, the overall rates of UDS, diagnostic testing did not change significantly after the publication of the ValUE trial. When evaluating at the HRR level, a larger proportion of HRRs demonstrated increased or unchanged rates between 2011 and 2013. Further research is needed to investigate the differences in UDS testing after the distribution of the SUI AUA/SUFU guidelines as well the rates of UDS testing in populations other than Medicare beneficiaries.

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The Use of Flurbiprofen in Treatment of Pyospermia

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Introduction: Pyospermia, the presence of an elevated number of seminal white blood cells, is associated with poor semen parameters and diminished fertility. Pyospermia, defined as > 0.9 million leukocytes/mL, is present in up to 23% of men being evaluated for infertility and may reflect an inflammatory process. While limited evidence supports therapeutic efficacy with COX-2 selective non-steroidal anti-inflammatory agents, the risk of cardiac adverse events limits general usage. We sought to examine the role of flurbiprofen, a generic non-selective non-steroidal anti-inflammatory agent, in treating asymptomatic pyospermia.

Materials & Methods: We performed a single-institution retrospective analysis of patients with asymptomatic pyospermia treated with flurbiprofen in a male infertility clinic. Exclusion criteria included urine testing and/or physical examination concerning for active urogenital infection. Patients were prescribed flurbiprofen 100mg twice daily for two weeks, and a repeat semen analysis was performed upon completion of the course. We identified 15 patients with adequate follow-up. No patients received concurrent antibiotics. Paired T-test was used for statistical analysis.

Results: The mean age in our series was 36 years (24-42), with a mean BMI of 27 (20-37). Median time from initial diagnosis of pyospermia to administration of flurbiprofen was 27 days, with a median time of 25 days to post-treatment semen analysis. Of the 15 patients, 13 showed an improvement in pyospermia after treatment (86.7%), with a mean improvement of 4.7 million leukocytes/mL (0.8-19.6). The remaining 2 men showed no change in semen leukocyte count. This result was statistically significant, with a p-value of 0.0046 (SD 4.92; 95% CI 2.20-7.19) (Table 1).

Conclusions: Flurbiprofen is a viable treatment option for asymptomatic pyospermia. Further research is needed to see how this treatment could affect fertility outcomes.

N	WBC	motility	pH	round	count	agg.	normal	prog.	velocity	viscosity	volume	Diff.
	Pre-NSAID											in
	Post-NSAID											WBC
1	3.2	51	8.5	4	64	0	1	54	59	normal	1.9	
	0.4	*59*	*8*	*3.5*	*76*	*0*	*1*	*50*	*67*	*normal*	*1.8*	2.8
2	9.2	64	8	10	25	0	4	57	73	normal	3.4	
	6	*60*	*8*	*6.1*	*21*	*0*	*1*	*62*	*71*	*normal*	*2.4*	3.2
3	19.6	23	8	38	3	0	0	/	/	normal	2.9	
	0	*40*	*8*	*1.3*	*2*	*0*	*1*	/	/	*normal*	*2.7*	19.6
4	2.8	72	8	15	62	0	3	45	79	normal	1.5	
	1.2	*69*	*8*	*1.7*	*57*	*0*	*3*	*48*	*87*	*normal*	*1.7*	1.6
5	4	85	8	4.5	99	0	3	50	75	normal	2.6	
	3.2	*43*	*8.5*	*4.7*	*48*	*0*	*3*	*56*	*62*	*mod.*	*2*	0.8
6	5.2	62	8	6.3	49	0	0	49	71	normal	1.1	
	0	*65*	*8.5*	*1.4*	*73*	*0*	*1*	*52*	*65*	*normal*	*1.8*	5.2
7	2.4	71	8	2.9	21	0	1	49	89	normal	2.4	
	0.8	*48*	*8.5*	*1.7*	*29*	*0*	*4*	*57*	*71*	*normal*	*3.3*	1.6
8	2.4	24	8	3	24	0	2	68	50	normal	1.8	
	2.4	*21*	*9*	*3.5*	*20*	*0*	*2*	*59*	*44*	*normal*	*0.5*	0
9	10.4	22	8.5	10.8	29	0	1	43	66	mod.	1.8	
	2	*34*	*9*	*2.8*	*6.4*	*0*	*2*	*45*	*74*	*slight*	*1.5*	8.4
10	3.2	74	8.5	3.7	133	0	6	/	/	normal	1.2	
	0	*78*	*8*	*3.3*	*123*	*0*	*6*	/	/	*normal*	*1.5*	3.2
11	3.2	18	8.5	5.5	22	1+	0	40	88	normal	3.2	
	3.2	*29*	*8.5*	*7.4*	*34*	*tail*	*3*	*46*	*65*	*normal*	*2*	0
12	9.6	82	8	11.7	61	0	2	55	83	normal	2.5	
	1.2	*77*	*8*	*1.9*	*49*	*0*	*3*	*59*	*82*	*normal*	*2*	8.4
13	7.6	88	8	7.8	110	0	4	/	/	normal	0.9	
	1.2	*94*	*8*	*3.8*	*103*	*0*	*5*	/	/	*normal*	*0.6*	6.4
14	4.8	24	8	6.2	21	0	2	57	62	normal	3.9	
	0	*21*	*8*	*2*	*20*	*0*	*3*	*60*	*52*	*normal*	*2.5*	4.8
15	8	55	8	8.4	1.3	0	1	/	/	normal	1.5	
	3.6	*15*	*6.5*	*3.7*	*0.1*	*0*	*2*	/	/	*normal*	*2.3*	4.4

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Voiding Dysfunction and Risk Factors for Complications in Multiple Sclerosis

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Introduction: Multiple sclerosis (MS) is a progressive demyelinating disease affecting the central nervous system which is frequently related to voiding dysfunction and a wide range of urinary complications. However, urodynamic (UDS) changes in this population and other potential risk factors predisposing individuals with MS to develop complications is largely unknown. Therefore, in this observational study, we described the frequency of urologic complications in a cohort of MS patients, reported changes in UDS and aimed to identify characteristics that increase their odds to develop adverse outcomes.

Materials & Methods: After IRB approval, patients diagnosed with MS who had been followed regularly by urology with serial UDS were analyzed. Other characteristics including lower urinary tract symptoms (LUTS), expanded disability status score (EDSS), complications, creatinine and imaging were recorded at each visit. Univariable and Multivariable logistic regression were performed for independent variables.

Results: The study cohort included 107 MS patients with a mean age at diagnosis of 37. Patients were followed by Urology for a mean of 97 months (Table 1). At baseline, 73% had Relapse-Remitting (RR) subtype; mean EDSS was 3.2. LUTS were present in all participants during first visit; the most common complaints were: Incontinence (72%) and urgency (71%). The 2 most frequent UDS patterns were Detrusor Overactivity (DO) + Dyssynergia (DSD) and DO alone in 32% and 20% respectively (Table 2). During follow-up, MS progressed in 39% and EDSS progressed to a mean of 5.6, with 54% of the cohort developing ≥ 1 complication. The most common complication was lower urinary tract infections (UTI). Complicated UTIs, bladder or kidney stones, and persistent hydronephrosis were rare and presented in less than 10%. There were no cases of chronic renal failure secondary to MS during follow-up. After multivariable analysis, EDSS > 6.0 (OR 7.2, 95% CI 2.8-18; P value < 0.001) and EDSS progression > 2.5 (OR 4.8, 95% CI 2.0-11.7; P value < 0.001) were significantly associated with increased odds for overall urologic complications. Bladder capacity significantly decreased during follow-up but was not related to complications after analyses. No other UDS parameter or changes in voiding function reached statistical significance.

Conclusions: While LUTS and changes in voiding function are frequent and difficult to control, these were not related to adverse outcomes in our study population. Furthermore, serious complications like upper tract deterioration were rare in this cohort. Complications in MS approximated the overall worsening status of the primary neurologic disease process and resultant increase in total disability.

Source of funding: None
Conflicts of interests: None

Table 1: Baseline patient characteristics and complications frequency

Age at Diagnosis ± SE	37.1 ± 11.4
Sex (%)	
-Female	80
-Male	20
Initial MS subtype (%)	
-Relapse/Remitting	73
-Primary Progressive	5
-Secondary Progressive	22
Baseline EDSS ± SE	3.2 ± 1.5
MS subtype progression (%)	
-Yes	61
-No	39
Follow-up EDSS ± SE	5.6 ± 2.0
Complications (%)	
-Lower UTI	58
-Pyelonephritis	7
-Urosepsis	7
-Kidney stones	7
-Bladder stones	6
-Acute renal failure	6
-Persistent hydronephrosis	1
-Chronic renal failure	0
Total years of follow-up ± SE	97 ± 49.4

Table 2: UDS changes during follow-up

	Baseline UDS	Follow-up UDS	
Detrusor (%)			
-Normal	14	14	
-DO	21	17	
-DSD	19	31	
-Detrusor Underactivity (DU)	9	5	
-DO + DSD	32	29	
-DU + DSD	5	4	
			P value (Paired T-test)
Bladder Capacity	304.4 ml	254.5 ml	0.02
Pdet.Qmax	35.3 cmH2O	27.7 cmH20	0.1
Qmax	10.1 ml/s	7.7 ml/s	0.1
PVR	147.2 ml	137 ml	0.2
Voided Volume	158.8 ml	169 ml	0.1

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Trends in Penile Prosthesis Implantation and Predictors of Removal

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Introduction: Implantation of penile prosthesis is a definitive treatment option for erectile dysfunction and Peyronie's disease. The two most common complications leading to prosthesis removal are mechanical and infectious. In this study, we examine the trends in implantation of malleable and inflatable penile prosthesis in the United States as well as cost of prosthesis removal. We also examine the factors predicting removal stratified by indication.

Materials & Methods: The patient population was from the Premier Perspective Database between 2003-2015 and consisted of a weighted estimate of 5085 implants performed at over 700 U.S. hospitals. Among these weighted implants, we compared the proportion of inflatable vs. malleable prosthetic placements by year. We then compared the cohort of penile prosthesis removals to the cohort of penile prosthesis implants who were never explanted. Cost analysis was performed between prosthesis explants due to infectious versus mechanical complication. Multivariate analysis was performed on covariates which predicted prosthesis removal, stratified by indication for removal.

Results: Between 2003-2015 we observed a stable trend in the proportion of inflatable vs. malleable implants. The proportion of malleable implants ranged from 0.97%-19.52% and inflatable implants from 80.48%-99.03%. There was a weighted estimate of 3317 total explants. 1930 explants (49.27%) were due to infectious complications, 771 explants (28.97%) were due to mechanical complications, and the remainder due to unknown indications. Median hospital cost for all explants was $11,237. The median cost of an explant due to infection was not significantly different from removal due to mechanical complication ($11,657 vs. $8,481, p = 0.10). On multivariate analysis, predictors of removal due to infectious complications included Charlson Comorbidity Index (CCI) ≥ 2, teaching status of the hospital, low surgeon volume, uncomplicated diabetes, complicated diabetes, and HIV status. Predictors of removal due to mechanical complications included CCI ≥ 2, teaching status of the hospital, and uncomplicated diabetes. Predictors of removal for all explants as a group included CCI ≥ 2, teaching status of the hospital, low surgeon volume, uncomplicated diabetes, complicated diabetes, HIV status. Other factors examined that did not reach statistical significance included race, marital status, insurance, hospital bedsize, rural versus urban hospital, low versus high volume hospital, and chronic steroid use (Table 1).

Conclusions: This is a large nationwide based study demonstrating the stable trend in the proportion of inflatable vs. malleable implants over the last 13 years. We also identified predictors of prosthesis removal which are valuable to patient counseling. Even though causality for any of the predictors cannot be substantiated, it provides insight on factors which may impact rates of penile prosthesis removal.

Table 1. Comparison of cohorts of penile prosthesis explants to control group of never-explanted patients.

Parameter	n (%)					Group 1 vs. Control		Group 2 vs. Control		Group 3 vs. Control	
	Control: Never explanted	Group 1: explanted - infection	Group 2: explanted mechanical	Group 3: explanted-All		Adjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Total	5085	1930 (49.27)	771 (28.97)	3317 (100)							
Age (year), mean ± SD	66 ± 8	71 ± 11	74 ± 10	72 ± 11							
Race											
White	3183 (62.6)	1214 (62.9)	555 (71.96)	2130 (64.21)		Reference		Reference		Reference	
Black	734 (14.43)	289 (14.99)	44 (5.69)	459 (13.83)		1.05 (0.63-1.75)	0.8592	0.32 (0.13-0.82)	0.0179	1.14 (0.72-1.82)	0.5713
Hispanic/Other	1168 (22.97)	426 (22.08)	172 (22.33)	729 (21.97)		1.1 (0.64-1.87)	0.74	0.74 (0.36-1.52)	0.4094	1.03 (0.67-1.6)	0.8855
Marital Status											
Married	3077 (60.71)	1027 (53.21)	357 (46.28)	1712 (51.71)		Reference		Reference		Reference	
Single or other	1991 (39.29)	903 (46.77)	414 (53.72)	1615 (48.69)		1.18 (0.8-1.66)	0.43976	1.32 (0.68-2.56)	0.4046	1.27 (0.93-1.74)	0.1277
Charlson Comorbidity Index											
0	2384 (51.43)	600 (34.39)	152 (23.66)	922 (31.56)		Reference		Reference		Reference	
1	1379 (29.75)	592 (22.47)	113 (17.7)	674 (23.06)		1.67 (0.67-1.71)	0.7944	1.04 (0.52-2.08)	0.9042	1.14 (0.77-1.67)	0.5181
>= 2	871 (18.79)	733 (43.15)	375 (58.64)	1326 (45.38)		2.64 (1.67-4.17)	<.0001	5.93 (2.87-12.27)	<.0001	2.94 (1.98-4.37)	<.0001
Insurance											
Medicare/Medicaid	3352 (65.92)	1537 (79.64)	687 (89.11)	2716 (81.88)		Reference		Reference		Reference	
Other	1733 (34.08)	393 (20.36)	84 (10.89)	601 (18.12)		1.23 (0.71-2.11)	0.4564	1 (0.45-2.22)	0.9991	1.16 (0.75-1.81)	0.5098
Hospital Bedsize											
< 300	1410 (27.73)	581 (30.08)	245 (31.75)	1031 (31.08)		Reference		Reference		Reference	
300-499	2285 (44.94)	834 (43.19)	318 (41.24)	1398 (40.94)		1.21 (0.73-2.02)	0.4624	1.47 (0.67-3.24)	0.3352	1.17 (0.79-1.81)	0.4845
> 500	1390 (27.34)	516 (26.72)	208 (27.01)	929 (27.99)	1.32 (0.67-2.61)	0.425	2.55 (1.1-5.92)	0.0294	1.49 (0.83-2.67)	0.1813	
Teaching Status											
No	3430 (67.61)	1482 (76.79)	625 (81.1)	2556 (77.06)	Reference		Reference		Reference		
Yes	1647 (32.39)	448 (23.22)	146 (18.9)	761 (22.94)	0.54 (0.32-0.92)	0.0224	0.43 (0.2-0.92)	0.0305	0.61 (0.39-0.96)	0.0317	
Location											
Urban	4878 (95.93)	1868 (96.79)	748 (96.94)	3221 (97.11)	Reference		Reference		Reference		
Rural	206 (4.06)	62 (3.23)	24 (3.06)	97 (2.92)	0.82 (0.37-1.86)	0.6362	0.75 (0.19-2.92)	0.6748	0.68 (0.33-1.42)	0.3065	
Annual hospital volume (no. of cases)											
Low (< 7)	4394 (86.41)	1782 (92.33)	722 (93.66)	3109 (93.73)	Reference		Reference		Reference		
High (> 7)	691 (13.58)	147 (7.64)	49 (6.34)	209 (6.29)	0.64 (0.27-1.52)	0.3109	0.57 (0.11-1.22)	0.1021	0.56 (0.23-1.36)	0.198	
Annual surgeon volume (no. of cases)											
Low (< 5)	4552 (89.52)	1874 (97.1)	750 (97.2)	3236 (97.56)	Reference		Reference		Reference		
High (> 5)	533 (10.49)	56 (2.9)	22 (2.8)	82 (2.46)	0.23 (0.09-0.6)	0.0028	0.63 (0.22-1.79)	0.3803	0.28 (0.14-0.59)	0.0009	
Diabetes mellitus											
No	4361 (94.09)	1510 (86.53)	569 (88.91)	2516 (86.11)	Reference		Reference		Reference		
Uncomplicated	68 (1.04)	58 (3.34)	21 (3.29)	126 (4.51)	6.21 (1.28-30.02)	0.0234	5.5 (1.76-17.18)	0.0035	7.42 (1.93-28.56)	0.0057	
Complicated	225 (4.86)	177 (10.13)	50 (7.8)	280 (9.6)	2.35 (1.24-4.45)	0.0086	2.57 (0.97-6.81)	0.0569	2.14 (1.2-3.8)	0.0097	
HIV											
No	5082 (99.94)	1922 (99.59)	771 (100)	3310 (99.79)	Reference		Reference		Reference		
Yes	3 (0.05)	8 (0.4)	0 (0)	8 (0.23)	19.99 (3.25-122.93)	0.0013	NA	NA	15.98 (2.86-89.48)	0.0017	
Long-term steroid use											
No	5080 (99.9)	1912 (99.07)	771 (100)	3299 (99.46)	Reference		Reference		Reference		
Yes	5 (0.1)	18 (0.93)	0 (0)	18 (0.54)	NA	NA	NA	NA	9.71 (0.21-448.72)	0.2444	

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Closed Suction Drain Outputs at 12 and 24 Hours after Virginal Three-Piece Inflatable Penile Prosthesis Surgery

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Introduction: There is no consensus on the use of closed suction drains after inflatable penile prosthesis (IPP) surgery. Proponents of drain usage suggest that drains decrease hematoma formation, scrotal swelling and postoperative pain. Opponents cite concerns of drain fracture and increased infection rates given the presence of an additional foreign body. No increased infectious complications have been reported with the use of closed suction drainage and early removal of scrotal drains has been advocated to decrease theoretical risk of infection. In the non-urologic literature, drain output has been found to be greatest during the first 12 hours following surgery. To our knowledge, no reports of temporal drain output exist in the current IPP literature. As a result, we explored our rates of closed suction drain output at 12 and 24 hours after IPP surgery.

Materials & Methods: We performed a single-institution retrospective review of closed suction drain outputs in primary three-piece IPP cases performed between 2014 and 2017 by a single surgeon. All patients underwent intraoperative placement of a 10 French Jackson Pratt (JP) closed-suction drain in the scrotum. Patients also underwent postoperative compressive dressing using a 4-inch Kerlix TM dressing roll applied to the penile shaft and scrotum in the standard Mummy Wrap fashion. All devices were left fully inflated until drain removal on postoperative day 1. The main outcomes evaluated were the drain outputs at 12 and 24 hours postoperatively. Secondary end points were 30-day postoperative hematoma formation and IPP infections.

Results: 169 IPPs were placed during the study period, of which 165 (98%) had drain outputs recorded at both 12 and 24 hours. The total 24-hour postoperative drain output ranged from 30 to 570 mL (median 132.5 mL, mean 163.5). The mean JP output rate in the first 12 hours postoperatively was 11.0 mL/hour. The mean JP output rate in the second 12-hour period postoperatively was 2.5 mL/hour. No 30-day hematoma formation or infectious complications were noted in this cohort.

Conclusions: Despite intraoperative and postoperative advancements in IPP surgery, including small corporotomies, compressive dressing usage and postoperative device inflation, there appears to be significant drain output in the first 24 hours postoperatively in our cohort. Based on our data, we advocate for the use of closed suction drains for at least 12 hours postoperatively as this was when outputs were highest (4.4 times higher than in the second 12 hours). Additionally, in our study, the use of JP drains was not associated with any infectious complications or hematoma formation. Randomized prospective studies evaluating drain placement versus no drainage are still required to further elucidate the value and risks of drain placement.

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Multicenter Investigation on the Influence of Climate in Penile Prosthesis Infection

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Introduction: Studies in other fields have documented a relationship between temperature and surgical site infection. We reviewed our multi-institution database of inflatable penile prosthesis infections to examine the relationship between inflatable penile prosthesis (IPP) infection,culture positivity, time of year, climate, temperature, humidity, and organisms responsible for infection.

Materials & Methods: This is a retrospective IRB-approved analysis of 213 patients at 25 institutions who underwent salvage procedure or device explant between 2001 and 2016. Patient data were compiled after extensive review of operative reports, nursing operative data, intraoperative wound cultures, perioperative antibiotics, inpatient notes, consult notes, and follow-up visits. Climate data were compiled from monthly norms based on location, as well as specific data regarding temperature, dew point, and humidity from dates of surgery. Rigorous statistical analysis was performed.

Results: Infected implants performed in the summer or fall were 2.7 times more likely to grow Gram-positive bacteria compared to implants performed in spring (p = 0.005). 139 infections occurred at average daily temperatures greater than 55 degrees F, compared to 72 infections at less than 55 degrees F. The incidence rate ratio for this trend was 1.93, with a p-value of < 0.001. 40% more implants would have to be performed at temperatures less than or equal to 55 degrees F than were performed at greater than 55 degrees F for this difference not to be significant. Infections were more likely to occur in devices placed in spring months (61), although the small sample size and lack of a denominator precluded statistical significance. This was consistent across geographic location, including in the Southern hemisphere. Assuming that a similar number of implants are performed in every quarter, the incidence rate ratio for this trend is 1.49, with a p-value of 0.05. Infections occurred most frequently in IPPs placed in June (24). Fewer infections occurred in IPPs placed in winter months (39), with the lowest number occurring in March (11). There were 58 infections in summer months and 55 in fall months.

Conclusions: To our knowledge these data represent the first exploration of the relationship between temperature and infection in prosthetic urology. Gram-positive infections are nearly 3 times as likely in the summer or fall. Temperature correlates with rates of IPP infection. Infections occur less often in winter months and more often in spring months in our series. Further investigation is needed to confirm our results.

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Evaluation of Urethral Stricture Tissue Protein Expression Profiles as Predictors of Stricture Recurrence

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Introduction: Urethroplasty is a well supported and efficacious treatment option for male urethral stricture disease. Despite appropriate operative technique, there is a risk of stricture recurrence following urethroplasty that is extremely difficult to predict. Utilizing urethral tissue samples of patients undergoing urethroplasty, we sought to determine both predictors of stricture recurrence and potential protein expression profiles that differentiate patients who develop recurrent disease.

Materials & Methods: Urethral tissue samples from patients undergoing urethroplasty for stricture disease at a single institution were collected. A tissue microarray was created with cores from each sample and immunohistochemical analysis was performed for markers of inflammation, infection, cell cycle disruption, hormone receptor expression, and angiogenesis/oxidative stress. Additionally, patient demographic, stricture characteristics, and clinical follow up data was collected. Data were compared using statistical R software with significant of alpha = 0.05.

Results: A total of 81 subjects were included in this study. Mean stricture length was 6.6 cm. Fifty-eight patients (72%) had pathologically confirmed lichen sclerosus. Patients who had a stricture recurrence were significantly more likely to have a history of smoking ($p = 0.017$) and higher BMI (34.3 vs. 31.3, $p = 0.0036$). Strictures that recurred demonstrated significantly higher levels of VEGF ($p < 0.001$). Expression of all other proteins did not discriminate those who would progress to recurrence from those who would not.

Conclusions: Urethral stricture recurrence after urethroplasty is more likely among those with higher BMI and history of smoking. To our knowledge, this is the first study to demonstrate that VEGF expression is higher in patients with stricture recurrence. This suggests the importance of ensuring repairs have adequate blood supply to heal properly. Further investigation of the biochemical properties of recurrent urethral strictures is vital to improve patient selection, counseling, and potentially improve treatment.

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Epidemiology of Penile Fractures in the Emergency Room Setting in the United States

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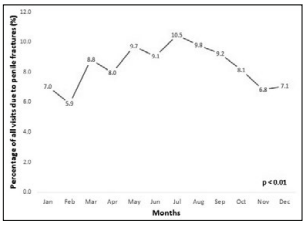
Introduction: The epidemiology of penile fractures in the emergency room setting is not well described. This study aims to examine the epidemiology, evaluation, management and use of financial resources in patients presenting with penile fractures (PF) to the emergency departments (ED) nationwide in the United States (US).

Materials & Methods: ED visits with a primary diagnosis of PF (based on ICD-9 codes) between 2010 and 2014 were abstracted from the Nationwide Emergency Department Sample (NEDS) (Healthcare Cost and Utilization Project, the U.S. most comprehensive source of hospital care data).

Results: Between 2010 and 2014 a weighted estimate of 8,135 visits to the ED for PF was recorded in the US, which represents a national incidence of 1.02 per 100,000 male subjects per year (+/- 0.068 SE). No meaningful trends in incidence were observed over the 5-year study period. The incidence of ED visits increased by 31.6% during the summer months compared to the winter months ($p < 0.01$) and presentations during weekends (36.4%) was also overrepresented ($p < 0.01$). The region of the US with most visits was the South (40.7%) and patients were most likely to present to a trauma hospital (63.1%, $p < 0.01$). Urethral injury was diagnosed in 8.05% of patients with penile fractures. Mean age of patients with concurrent urethral injury was found to be significantly greater than patients without urethral injury (37.8 vs. 39.3 years, $p < 0.01$). In patients with PF, 60% were treated and discharged from the ED, and 28.1% were admitted as an inpatient, and 10.4% resulted in patients being transferred to other institutions for further management. Notably, 63.7% of patients with urethral injury were admitted, whereas only 25.8% of patients without urethral injury were admitted. Approximately 36% of patients with PF had no form of medical insurance, and 30.7% had a low income causing a substantial impact on those patients affected. Costs of stay in the ED averaged $6,121, for those patients admitted the mean length of stay was 1.3 days and the inpatient hospital charges for admitted patients averaged $21,913. Cystoscopy or retrograde urethrogram was performed on 25.8% of all patients and in 39.4% of those with urethral injury.

Conclusions: This is the largest study of ED visits for PF in the literature to date. These injuries are relatively uncommon, but occurred at higher incidence than previously suggested in the literature and have a significant impact on healthcare resources. PF are more common in the summer months and weekends. Concomitant urethral injury occurred in less than 10% of cases, but urethral evaluation took place approximately in a quarter of patients. Urethral injuries were associated with longer hospital stay and higher hospital cost.



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Perioperative Outcomes of Male One-Stage Urethroplasty; Outcomes from a National Prospective Database

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Introduction: There are few surgeons who perform a large number of male one-stage urethroplasties. Thus, the majority of the studies evaluating this specific surgery are retrospective and/or single-institution studies. We sought to assess the patient and perioperative characteristics of male one-stage urethroplasty using a large multi-institutional prospectively collected database.

Materials & Methods: The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) Participant User Files (2007-2013) was queried using Current Procedural Terminology (CPT) codes for one-stage urethroplasty (53410, 53415, 53431). Medical comorbidities, length of stay (LOS), operative time (pOT), 30-day complications (including infectious, thromboembolic, renal, cardiac, pulmonary, and neurologic events), and need for blood transfusion, re-intubation, or reoperation were analyzed.

Results: Four hundred eighty male patients having undergone single stage urethroplasty were identified, with a median age of 48 years at the time of surgery (18-85). Median body mass index (BMI) was 29 (17-65) and median ASA score was 2 (1-3). The median procedure length was 167 minutes (65-507 minutes), and the median length of stay was 1 day (0-17). Twenty-nine patients developed post-operative complications within 30 days of surgery (6.0%): 13 urinary tract infections (UTIs), 3 superficial wound infections, 4 deep wound infections, 3 wound dehiscences, 1 post-operative pneumonia, 1 deep vein thrombosis, 2 myocardial infarctions, and 2 cases of sepsis. Two patients required blood transfusions, and 2 different patients required reoperation. There were no 30-day mortalities.

Conclusions: To our knowledge, our study represents the largest multi-institutional cohort of male patients having undergone single-stage urethroplasty. The patients in this study were relatively healthy and most patients were discharged within 24 hours. UTIs and wound infections/dehiscences were the most common 30-day complications recorded. While the rate of more severe complications was low, they did occur on occasion. Thus, patients should be counseled that while one-stage urethroplasty is an overall safe procedure with very few perioperative complications, infectious complications are the most likely complication to occur. Also, as with any surgery with a lengthy operative time, post-operative thromoembolic, pulmonary, and cardiac complications are possible.

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Risk of Post-Operative Venous Thromboembolism in Urethroplasty

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Introduction: The prevention of venous thromboembolism (VTE) and reducing its significant morbidity and mortality is of utmost importance for the urologic surgeon, and has been an initiative across multiple surgical specialties and organizations including the American Urological Association (AUA), the Centers for Medicine and Medicinal Services, and the Joint Commission on Accreditation of Health Care Organizations. The European Association of Urology (EAU) has recently published the first urologic specific guideline on thromboprophylaxis for VTE, but there was insufficient data to provide a recommendation on chemoprophylaxis to prevent VTE with regards to urethroplasty. The aim of this study is to provide urethroplasty procedure specific data on the risk of VTE and postoperative bleeding in patients undergoing urethroplasty.

Materials & Methods: We retrospectively analyzed a prospectively maintained, multi-institutional database of 10 institutions. Patient demographics, co-morbid conditions, operative characteristics, occurrence of post-operative VTE (deep venous thrombosis or pulmonary embolism), and prevalence of post-operative bleeding complications were analyzed. Comparisons between groups were performed using standard Chi-squared and t-tests where appropriate.

Results: A total of 2,991 urethroplasties were reviewed over a period from 2006-2017. A diagnosis of VTE was found in 9 (0.3%) of cases. Patients who had a post-operative VTE were significantly more likely to have higher BMI (36.1 vs. 29.8, $p = 0.0064$) and higher time in lithotomy position (302.2 vs. 186.8, $p = 0.0014$). Patients in the VTE group were also more likely to have coronary artery disease (RR 4.2, $p = 0.1737$) and have a history of malignancy (RR 4.1, $p = 0.0463$). Those patients without DVT had a higher rate of post-operative hematomas (RR 3.3, $p = 0.4083$).

Conclusions: This is the largest study to date evaluating the risk of VTE in patients undergoing urethroplasty. Patients with high BMI, extended time in lithotomy position, and history of malignancy are at greater risk for development of a DVT after urethroplasty. However, the risk of VTE in the majority of patients undergoing urethroplasty is very low and thus patients may not require chemoprophylaxis for VTE prevention.

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Predictors of Hospital Transfer for Patients Presenting with Penile Fractures in Emergency Departments in the United States

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Introduction: Penile fracture (PF) is a medical emergency that requires prompt surgical management. There is currently no study in the literature that assesses the characteristics of those patients with PF presenting to the emergency room that are transferred to another hospital for further care. In this study, we examine the patient and ED attributes associated with an increased likelihood of being transferred to another institution for further management.

Materials & Methods: ED visits with a primary diagnosis of PF between 2010 and 2014 were abstracted from the Nationwide Emergency Department Sample (NEDS) (Healthcare Cost and Utilization Project, the U.S. most comprehensive source of hospital care data). Univariable and multivariable analyses were performed of patient and hospital characteristics of those patients transferred with PF.

Results: Between 2010 and 2014 we identified a weighted estimate of 8,135 visits to the emergency department for PF in the US. Although, the majority of the patients were treated in the presenting hospital (87.4 %), 10.4% (an estimated 848 visits) resulted in a patient transfers to other institutions. Approximately 36.9% of patients presented initially to a non-teaching/non-trauma hospital and 8.05% had an associated urethral injury. On multivariable analyses independent predictors of transfer to another institution included type of insurance (Medicaid vs. Private OR 1.70, $p < 0.001$), hospital location (rural vs. urban teaching hospital OR 5.91, $p < 0.001$), ZIP code income (very low vs. very high OR 2.68, $p < 0.001$), emergency department volume (very low vs. very high OR 1.84, $p < 0.006$), level of trauma center (Level 1 & 2 vs. Level 3 & non-trauma OR 5.32, $p < 0.001$), country region (Northeast/South vs. West/Midwest (OR 1.56, $p < 0.038$), and day of the week (weekend vs. weekday) (OR 1.54, $p < 0.001$).

Conclusions: To our knowledge, this study is the first to investigate the predictors of hospital transfer for patients presenting with PF to the ER in the US. Approximately 10 percent of patients are transferred to other institutions for further care. Predictors of transfer to another hospital included type of insurance, hospital location/teaching status, ZIP code income, emergency department volume, level of trauma center, country region, and day of the week.

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"Shreddin' the Gnar": An Analysis of Winter Sport Related Renal Trauma

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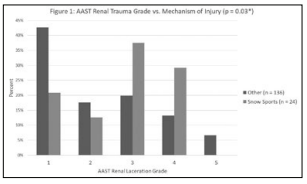
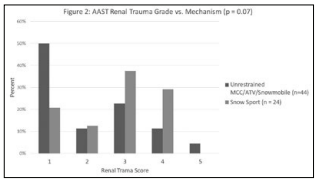
Introduction: Skiing and snowboarding (SS) continue to increase in popularity. Although most enjoy these activities safely, personal protective equipment is typically restricted solely to helmets, raising the question as to whether these activities could result in renal trauma severity equivalent to that of more dramatic and more commonly encountered mechanisms including motor vehicle, ATV, and motorcycle collisions. We sought to describe the spectrum of injury associated with SS and compare with other sources of blunt renal trauma.

Materials & Methods: A retrospective chart review was performed on all patients presenting with renal trauma at our institution between January 2008 and October 2016. Patients < 18 years were excluded. Demographics, renal trauma grade (1-5), and type of intervention (observation, embolization, or nephrectomy) if any were determined. Renal trauma grade was determined using computed tomography images based on the American Association for the Surgery of Trauma (AAST) classification. Differences in demographics, renal laceration score, and intervention were compared between groups using t-test and chi squared analysis.

Results: We identified 160 patients with renal trauma with average age 32 years (+/- 17years), 2.5% female (4/160). Of these 160, 15% (24/160) suffered renal trauma due to SS. 80% (19/24) were due to snowboarding. Patients undergoing renal trauma secondary to SS were more likely to be younger 27 yrs (+/-9) vs. 37 yrs. (+/-17) [$p < 0.001$]. The SS cohort demonstrated a significantly higher proportion of higher grade renal injuries, $p = 0.03$ (figure 1), however, there was no difference in intervention rates between groups (8% vs. 9%, $p = 0.83$). SS (24/68) had an similar risk of renal trauma severity compared to the unrestrained high speed trauma mechanisms (Motorcycle/ATV/snowmobile)(44/68), $p = 0.07$ (figure 2).

Conclusions: Adult renal trauma secondary to SS occurred in a younger, predominately male cohort with higher renal injury severity as compared to all blunt motorized injury mechanisms. This severity of renal trauma is in accord with its mechanism of potentially high speed blunt trauma without protective equipment, and was therefore similar to that seen with unrestrained recreational vehicular collisions. Those participating in SS may underestimate the associated risk of severe renal injury, and these data may be useful to urologists counseling patients inquiring about these risks.





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Pathophysiology of Lichen Sclerosus Urethral Strictures: The Role of Inflammation and Viral Infection

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Introduction: Urethral stricture disease (USD) affects approximately 0.6-0.9% of susceptible populations. Lichen sclerosus (LS) is a chronic, inflammatory condition that is the presumed etiology in 14-29% of USD cases. Strictures due to LS are clinically distinct, behave more aggressively and are more likely to fail urethral reconstruction compared to non-LS strictures. The underlying pathophysiology of LS USD remains poorly understood, and to our knowledge no large-scale molecular studies have been performed on LS USD. To help elucidate the pathophysiology of LS USD we compared the protein expression of LS vs. non-LS urethral strictures.

Materials & Methods: Tissue samples were collected from patients undergoing urethroplasty for USD and healthy controls. Clinical and demographic data was obtained from chart review. Paraffin slides were reviewed by in-house pathologists to identify areas of interest that appeared pathognomonic for LS. A tissue microarray (TMA) was created with cores from each sample and immunohistochemistry was performed for markers of inflammation, cell cycle disruption, oxidative stress, hormone receptor, and viral infection. Stains were evaluated semiquantitatively or qualitatively, as appropriate. Data were compared by Kruskal-Wallis or Fisher's exact test with significance of alpha = 0.05.

Results: The cohort analyzed consisted of 58 men with LS USD, 23 men with non-LS USD, and 7 healthy controls. LS USD expressed significantly higher levers of CD8 and CCL4 than non-LS USD, both markers of inflammatory cell recruitment ($p < 0.01$). TNF-alpha was only expressed in LS USD. Block-like p16 staining is associated with high-risk HPV infection and was only expressed in the LS USD tissues. LS USD was also significantly more likely to stain positively for latent Epstein-Barr Virus ($p = 0.02$). There was no difference in markers of cell cycle disruption or oxidative stress and loss of androgen receptor expression was found in about half of all strictures.

Conclusions: To our knowledge, this is the first study to identify the molecular characteristics underlying the pathophysiology of LS USD. LS USD differs significantly from non-LS USD. Multiple markers indicate higher levels of inflammation in LS USD. The presence of EBV and block-like p16, which is associated with high-risk HPV infection, suggest there may be an infectious precursor to some LS urethral strictures. Expansion to a larger cohort of samples as well as analysis of biomarkers in different stages of LS (acute and chronic) are needed to help describe the molecular pathway of the disease.

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Perioperative Outcomes of Enterocystoplasty in Adults

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Introduction: Enterocystoplasty has been used to treat neurogenic bladder in both children and adults. While this procedure has been well-studied in children, the literature for adult patients is lacking. In this study, we examined the perioperative outcomes of adult enterocystoplasty.

Materials & Methods: The American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) Participant User Files (2007-2012) was queried using Current Procedural Terminology (CPT) codes for bladder augmentation (51960). Medical comorbidities, length of stay (LOS), operative time (OT), 30-day complications (including infectious, thromboembolic, renal, cardiac, pulmonary, and neurologic events), and need for blood transfusion, re-intubation, or reoperation were analyzed. Prolonged OT and LOS were defined as an operating time and a hospital length-of-stay of 75th percentile or greater, respectively (pOT = 6.6 hours and pLOS = 8 days).

Results: 42 patients having undergone enterocystoplasty were identified, with a median age at time of surgery of 47 years (17-73). Of these patients, 23 were female (54.7%), 12 were either paraplegic or quadraplegic (28.6%), and 13 were dependent upon caretakers to accomplish activities of daily living (ADLs) (30.9%). Nine patients underwent concurrent ileovesicostomy creation (21.4%). Median OT was 5.2 hours (310 minutes) and median LOS was 7 days. Nine patients developed post-operative complications within 30 days (21.4%), two of whom developed multiple complications (4.8%). Complications included superficial skin infections (4, 9.5%), organ space infections (1, 2.4%), sepsis (2, 4.8%), urosepsis (4, 9.5%), DVT (1, 2.4%), and PE (1, 2.4%). Three patients required blood transfusion (7.1%), and 3 required re-operation (7.1%). There were no 30-day postoperative mortalities. On univariate analysis, superficial skin infection was found to be associated with prolonged OT (0.0196) and dependence upon a caretaker (p=0.0451). No other significant associations were found.

Conclusions: Enterocystoplasty is a generally safe procedure, with no perioperative mortalities and few patients requiring reoperation or blood transfusions. This operation appears to be equally safe in patients with functional limitations, and concurrent ileovesicostomy was not associated with futher complications. Every effort should be made to decrease operative time to avoid the formation of superficial wound infections, and optimal wound care should be established in patients dependent upon a caretaker.

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Epidemiology of Genito-Urinary Foreign Bodies in the Emergency Room Setting in the United States and its Association with Mental Health Disorders

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Introduction: The epidemiology of genito-urinary foreign bodies has never been examined before in the literature. This study aims to examine the epidemiology, presentation, management, use of financial resources and socio-economic factors in patients presenting with genito-urinary foreign bodies to the emergency departments (ED) nationwide in the United States (US). We further examine the association with mental disorders.

Materials & Methods: ED visits with a primary diagnosis of a genito-urinary foreign body (based on ICD-9 codes) between 2010 and 2014 were abstracted from the Nationwide Emergency Department Sample (NEDS) database (Healthcare Cost and Utilization Project, the U.S. most comprehensive source of hospital care data).

Results: Between 2010 and 2014 a weighted estimate of 120,223 visits to the ED with a genito-urinary foreign body were recorded in the US, which represents a national incidence of 7.6 (+/- 0.2 SE) ED visits per 100,000 persons. No meaningful trends in incidence were observed over the 5-year study period. Male patients (11,526) represented only 9.5% of the cohort, with the most common location being the vulva/vagina (87.5%) followed by urethral/bladder (6.77%), penis (4.17%) and GU tract NOS (1.08%). A total of 5,628 ED visits (4.68%) resulted in admission to the hospital. Male patients were more likely to be admitted to the hospital as compared to female patients (24.8% vs. 2.1%, $p < 0.001$). The majority of the patients were between the ages of 18-44 yrs (75.8%), with a mean age of 30.28 yrs. Mean age of presentation varied by location (vulva/vaginal 29.1 yrs vs. penile 37.6 yrs vs. urethra/bladder 42.6 yrs, $p < 0.001$). The region of the US with most visits was the South (39.6%), followed by the Midwest 22.6%. Approximately 32.4% of pts had a low income and 25.5% had no form of medical insurance, causing a substantial impact on those patients affected. Costs of stay in the ED averaged $3,769, for those patients admitted the mean length of stay was 2.6 days and the inpatient hospital charges for admitted patients averaged $16,932, however, those with penile or urethra/bladder foreign bodies stayed longer (avg 3.5 days) and incurred a much higher hospital charge (avg $30,071) ($p < 0.001$). Urethral/bladder and penile foreign bodies had a significant association with mental health disorders as compared to vulvar/vaginal foreign bodies (35.6% vs. 6.1%, $p < 0.001$). Mood disorders were more common (27.5%) followed by schizophrenia/psychotic disorders (21.7%) in those patients with mental disorders.

Conclusions: This is the sole study in the literature to date that examines the epidemiology of genito-urinary foreign bodies. These presentations are relatively uncommon but occur at a higher incidence than expected and have a significant impact on healthcare resources. The majority of patients were young females with vulvar/vaginal foreign bodies. Penile and urethral/bladder foreign bodies occurred in slightly older patients and were associated with longer hospital stays and higher hospital costs. Co-morbid mental health disorders were more common in patients with urethral/bladder and penile foreign bodies. Mood disorders and schizophrenia/psychotic disorders were the most common co-morbid mental disorders.

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Endoscopic Treatments Prior to Urethroplasty: Trends in Management of Urethral Stricture Disease

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Introduction: Endoscopic treatment of urethral stricture disease (USD) with either direct vision internal urethrotomy (DVIU) or dilation continues to be the most common treatment of USD despite its poor success. AUA guidelines regarding the management of male USD were published in 2016, advocating a consideration of urethroplasty in patients with 1 prior failed endoscopic treatment. The aim of our study is to determine if the number of endoscopic treatments of USD prior to urethroplasty has decreased since the implementation of the AUA guideline.

Materials & Methods: We performed a retrospective review of a prospectively maintained, multi-institutional urethral stricture database of geographically diverse institutions. Patient demographics, endoscopic treatments prior to urethroplasty, operative characteristics, and peri-operative interventions were analyzed. Either DVIU or urethral dilation were considered to be endoscopic treatment. To determine if pre-urethroplasty endoscopic treatment patterns changed after the AUA guideline, the number of endoscopic treatments prior to urethroplasty were recorded and grouped into pre-2016 and 2016-current cohorts. Statistics were performed with Chi-square tests and t-tests where appropriate.

Results: A total of 2,964 urethroplasties were reviewed that had sufficient data for analysis. Overall average number of endoscopic treatments prior to urethroplasty for the entire cohort was 1.97 (SD = 1.75). There was a significant difference in the average endoscopic pre-urethroplasty treatments between the pre-2016 and 2016-current cohorts (2.3 vs. 1.6, $p < 0.0001$). Endoscopic treatment prior to urethroplasty is less common in patients undergoing posterior urethral reconstruction ($p < 0.0001$).

Conclusions: To our knowledge, this is the first study to demonstrate a decrease in the number of endoscopic treatments of USD prior to urethroplasty since development of the AUA stricture guideline. This change may be a direct response to recommendations in the 2016 AUA guideline on male USD, due to the continued presence of regional urethroplasty experts for referral, or part of an unrelated change in practice patterns amongst urologists. Further research is needed to determine if there will be a continued trend in the declining use of endoscopic treatment and elucidate the barriers to earlier urethroplasty in patients with USD.

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Genitourinary Complications Associated with Transcatheter Aortic Valve Replacement

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Introduction: The use of Transcatheter Aortic-Valve Replacement (TAVR) has quickly gained traction as a mainstay approach in the treatment of symptomatic aortic stenosis in patients who are considered an intermediate or high risk for standard aortic valve replacement. Due to the rapid adoption of this procedure, the associated adverse complications have not been fully described. While originally TAVR was performed strictly under general anesthesia, conscious sedation has become more commonplace. There is growing evidence to suggest that TAVR is often associated with genitourinary (GU) complications. The purpose of this study is to examine GU complications in patients undergoing TAVR and to identify a potential relationship with GU risk factors and anesthesia method.

Materials & Methods: Patients having undergone TAVR were identified from a pre-existing IRB-approved database at Hartford Hospital. Clinical risk factors including type of anesthesia, urethral catheter placement, length of stay, and prior GU history were gleaned from the medical records. Adverse outcomes including hematuria, urinary retention, and the need for GU intervention were recorded. To test for significant differences we employed the Pearson's chi-square (when cell counts were sufficient) or Fisher's exact test (for cells with counts smaller than 5), using a significance level of $\alpha < 0.05$. The Mann-Whitney Ranked Sum test was used for non-normally distributed data.

Results: 201 patients were identified who underwent TAVR at Hartford Hospital between 2012 and 2017. 69.2% of these patients had a urethral catheter placed for the procedure and 36.1% had a GU risk factor, with benign prostatic hyperplasia (BPH) being the most common. The overall GU complication rate was 13.4% with a significantly greater proportion of these complications occurring in men versus women (20.4% vs. 5.4%, $p < 0.002$). The most common GU complications were hematuria and urinary retention. BPH was a statistically significant predictor of GU complication with 38.5% of men with BPH suffering from GU complication compared to 10.1% of those without BPH ($p < 0.0004$) Those who received conscious sedation as opposed to general anesthesia had a significantly lower GU complication rate (7.6% vs. 17.2%, $p = 0.05$). While patients who had a catheter placed for their procedure had a lower GU complication rate, this did not reach statistical significance ($p = 0.063$). Mean length of stay was significantly lower in those without a GU complication.

Conclusions: History of BPH, male gender, and use of general anesthesia are significantly associated with GU complications in the post-operative period following TAVR. Knowledge of these risk factors may aid cardiology providers in risk stratifying patients who qualify for TAVR while suggesting a change in practice for those who commonly use general anesthesia for TAVR.

Table 1 – Patient Characteristics

	N (%)
Number of Patients	201
Male	108 (53.7)
Mean age	82.8
General anesthesia	123 (61.2)
Conscious sedation	78 (38.8)
Preoperatively foley placement	139 (69.2)
Mean length of stay (days)	5.2
Genitourinary risk factor	79 (39.3)
BPH	39 (19.4)
Prior urologic procedure	13 (6.5)
History of 5-alpha reductase use	9 (4.5)
History of hematuria	8 (4.0)
History of urinary retention	6 (3.0)
History of ADT	4 (2.0)

Table 2 – Genitourinary Complications and Risk Factors

	N (%)	p
Genitourinary complications	27 (13.4)	
Hematuria	11 (40.7)	
Urinary retention	11 (40.7)	
UTI	8 (30.0)	
Gender		0.002
Male (% of all males)	22 (20.4)	
Female (% of all females)	5 (5.4)	
Type of anesthesia		0.05
General anesthesia	21 (17.2)	
Conscious sedation	6 (7.6)	
Foley for procedure		0.063
Foley	22 (16.1)	
No Foley	5 (6.5)	
Hx of BPH (Males only)		0.0004
Hx of BPH	15 (38.5)	
No Hx of BPH	7 (10.1)	
Mean length of stay in days [st.dev]		.001
Genitourinary complication	8.07 [6.7]	
No genitourinary complication	4.82 [4.1]	

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Positive Surgical Margins Following Robotic Prostatectomy: Should Location be Considered in Planning Further Treatment?

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Introduction: Following prostatectomy for prostate cancer, the importance of the location of a positive surgical margin (PSM) as a guide to further disease management is not well understood. Here we evaluated the degree to which location of PSM following radical prostatectomy for prostate cancer was associated with recurrence (surgical failure).

Materials & Methods: We performed a retrospective review of a prospectively maintained database of patients who underwent a robotic-assisted laparoscopic radical prostatectomy (RALP) between January 2004 to December 2016 to identify those who had a PSM on final pathology. Margins were categorized based upon location. Those described in only one region (i.e., apical, posterior, anterior, base, lateral, mid) were categorized as "pure"; those described as occurring across regions (e.g., posterior-lateral and posterior-mid) were placed into "mixed" categories. Multiple PSM in different regions (e.g., apex and base) were excluded from the mixed category. Patients with margins in each location were compared to all others on surgical failure (SF; defined as PSA ≥ 0.2 ng/ml), salvage treatment after a pattern of rising PSA not reaching 0.2, or persistent disease (never below .2). To evaluate time to recurrence and account for any difference in opportunity to recur (follow-up time), a Kaplan Meier (KM) analysis was conducted on each of the comparisons. After Bonferroni correction, a p value of .005 was considered significant for each test.

Results: Of 3950 patients who underwent RALP, 880 (22.3%) had a PSM. Post-operative PSA was available for 833 men comprising the analytic dataset. Median follow-up was 41 months. Of the 833 men included in the analysis, SF occurred in 22.7% of patients overall. The pure apical and mixed apical groups were less likely to have SF than the comparison groups ($p < .001$ and $p = .004$, respectively); the mixed anterior group was also less likely to experience SF but this did not reach the corrected significance level established above. KM indicated that patients with pure or mixed apical margins had significantly longer time to failure (Table 1).

Conclusions: PSM at any location involving the apex was associated with more positive outcomes relative to other locations. Location of PCM should be considered when planning treatment after RALP.

Table 1: Recurrence (Surgical Failure) by Location of Positive Margin

Region	N	N (%) Surgical Failure	P value	Kaplan Meier Cumulative Failure Free Proportion (1yr/2yrs/5 yrs)	P value
Anterior only	33	4 (12.1)	.139	95.7/ 90.0/ 90.0	.133
All others	800	185 (23.1)		89.2/ 83.4/ 70.5	
Anterior Mixed	54	6 (11.1)	.036	94.2/ 89.1/ 89.1	.076
All others	779	183 (23.5)		89.1/ 83.3/ 70.3	
Apical only	255	38 (14.9)	<.001	92.2/ 86.4/ 80.8	.003
All others	578	151 (26.1)		88.2/ 82.4/ 67.5	
Apical Mixed	307	53 (17.3)	.004	91.1/ 84.3/ 75.8	.040
All others	526	136 (25.9)		88.4/ 83.2/ 69.0	
Base only	105	25(23.8)	.769	86.0/ 81.2/ 73.8	.906
All others	728	164 (22.5)		89.9/ 84.0/ 71.0	
Base Mixed	135	32 (23.7)	.758	84.2/ 80.4/ 73.0	.940
All others	698	157 (22.5)		90.4/ 84.3/ 71.0	
Posterior only	139	32 (23.0)	.918	92.7/ 86.9/ 68.5	.820
All others	694	157 (22.6)		88.8/ 83.0/ 71.9	
Lateral only	9	1 (11.1)	.692	Only 1 event > 5 yr	.223
All others	824	188 (22.8)		89.3/ 83.5/ 71.0	
Mid only	9	2 (22.2)	1.000	88.9/ 88.9/ 59.3	.693
All others	824	187 (22.7)		89.4/ 83.6/ 71.4	
Mid –Posterior-Lateral Mixed	221	56 (25.3)	.272	93.6/ 87.6/ 68.8	.600
All others	612	133 (21.7)		87.9/ 82.2/ 72.5	

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Thirty Day Readmissions After Radical Cystectomy: Does the Hospital Make a Difference?

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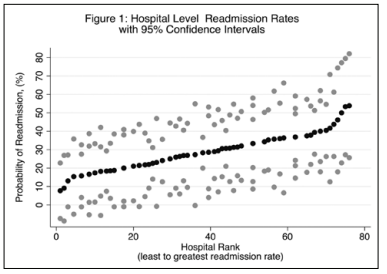
Introduction: Hospitals are increasingly being held responsible for their readmissions rates. Some have questioned this, citing the large role of factors beyond the control of most hospitals. We designed a study to estimate the contribution of individual hospitals on the patient-level probability of readmission after radical cystectomy— a typical, complex cancer surgery.

Materials & Methods: We utilized the Nationwide Readmissions Database (NRD), which is a large, nationally representative database designed for analysis of national readmissions rates including all payers and the uninsured. We identified all individuals who underwent radical cystectomy within the NRD during the first 11 months of 2014, survey weights were employed to generate national level estimates. The main outcome was readmission to any hospital within 30 days following an admission for radical cystectomy. Using a multilevel mixed effects model, we estimated the influence of hospital and clinical variables on patients' probability of readmission. A hospital-level random effects term was used to estimate the contribution of each hospital to their patients' probability of readmission.

Results: We identified a weighted sample of 6,808 individuals who received radical cystectomy at 341 hospitals in the United States. The 30-day readmission rate was 29.7% (95% CI 28.0-31.4). In our adjusted model, female sex and comorbidity score were associated with increased likelihood of readmission, however hospital characteristics such as bed size and surgical volume were not. Individual hospitals did not meaningfully contribute to the model for readmission (pseudo R-squared < 0.01%).

Conclusions: After adjusting for patient level characteristics, the hospital where surgery was performed did not meaningfully add to a model predicting patient-level probability of readmission. Our findings underscore the potential limitations of using 30-day post-discharge readmissions as a hospital metric.

*Max J, Willscher Award Eligible



Pseudo-R^2 for Contribution of Patient Characteristics, Hospital Characteristics, and the Individual Hospital Effect on Readmissions Rates

	Adjusted R-square	Percent of Variance Explained by Component of Model
Overall Model		
	0.071	7.1%
Patient Characteristics		
- Age - Sex - Comorbidity Score - Insurance Status - Income	0.018	1.8%
Hospital Characteristics		
- Ownership - Bed Size - Caseload	0.0008	0.08%
Index Hospitalization		
- Length of Stay - Costs - Surgical Approach - Month of Surgery	0.050	5.0%
Individual Hospital Effects		
(hospital-level random effects only)	<0.00001	<0.001%

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Effect of Biopsy Orientation on Prostate Cancer Detection Rates Using a Modified MRI-Fusion Biopsy Template

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Introduction: The relative utility of axial (A) vs. sagittal (S) orientation of cores obtained through MRI fusion biopsy in the detection of clinically significant prostate cancer is a question of debate. Here, we sought to determine whether the two planes differ in the detection of 1) any cancer and 2) clinically significant cancer (CSC; defined as grade group 2 and above).

Materials & Methods: We retrospectively reviewed our prostate biopsy database to identify patients who had MRI-guided fusion biopsies from July 2016 to September 2017. We used a modified MRI fusion biopsy template in which 2 cores were taken in each of the A and S dimensions for one or more regions of interest (ROI) identified by the MRI; in addition, 12 cores were taken using traditional ultrasound guidance ("random" cores). We compared tumor detection rates for any cancer and for CSC for: A vs. S cores, A and S cores each vs. combined results and for MRI combined vs. random. For men with 2 ROIs, comparisons were made for each region and for a combined result. These comparisons were evaluated using the McNemar test. Differences between men with 1 or 2 ROIs were tested using chi-square tests of proportion. A p value of 0.05 was used to indicate significance for all tests.

Results: Biopsies for 268 men met inclusion criteria; 167 were positive and 101 were negative for any cancer. The median (IQR) age, PSA, and prostate volume was 64.5 years (53, 69), 5.81 ns/ml (4.3, 8.6), and 55 cc (40, 85). S cores were more likely than A cores to detect any cancer (35% vs. 31%; p = .065); no differences were observed for CSC (15.3% vs. 14.9%). The combination of S and A was significantly better than either alone, with S and A cores missing 4.5% (p<.001), 9.0% (p < .001) of any cancers and 3.0% (p = .008), 3.4% (p = .004) of CSC, respectively. Random cores detected any cancer more often than MRI (60.8% vs. 39.6%, p<.001), but this was not true for CSC (p = .154). The detection rate for any cancer by A cores was significantly better among men with 2 ROIs vs. 1 ROI (41.6% vs. 27.4%, p = .035); no other associations were observed between detection rates, ROI and biopsy orientation.

Conclusions: Detection of both any cancer and CSC was better using a combination of A and S cores than it was using either plane alone, supporting the use of this modified template. This pattern was the only statistically significant finding related to CSC. S alone detected more cancer (but not more CSC) than A alone, but not when the MRI identified multiple ROIs. Cancer detection rates for MRI guided vs. random cores at this institution continue to be contrary to most published reports.

P20

Does the Number of Lymph Nodes Resected During Radical Cystectomy for Squamous Cell Carcinoma Really Matter?

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Introduction: Radical cystectomy is the gold standard treatment for muscle invasive bladder cancer of both conventional and variant histologies. While greater extent of nodal dissection during cystectomy has been associated with increased survival for conventional urothelial carcinoma, the impact of nodal dissection for squamous cell carcinoma has not been described. If a greater lymph node yield does not improve survival, an extended lymph node dissection during cystectomy could be potentially be avoided.

Materials & Methods: The National Cancer Database was queried for muscle invasive, non-metastatic, clinically node negative squamous cell carcinoma of the bladder undergoing radical cystectomy without perioperative chemoradiation. Only cases reporting number of lymph nodes retrieved and positive (including reporting 0 nodes retrieved) were included. Overall survival was estimated via the Kaplan-Meier method. Multivariate Cox proportional hazards methods were used to assess the effect of node dissection extent on overall survival. Multivariate logistic regression models were created to assess the effect of node dissection extent on 30- and 90-day mortality, 30-day readmission rates, and likelihood of positive lymph nodes.

Results: A total of 505 cases were eligible for inclusion, of which 83 (16.4%) had 0 nodes removed, 186 (36.8%) had 1-10 nodes removed, 230 (45.5%) had 11-19 nodes removed, and 6 (1.2%) had > 20 nodes removed. Five year survival for these groups was 35%, 35%, 50%, and 33%, respectively. Median overall survival via KM estimate was 37.4 months [95% CI 24.9-51.9 months]. Number of nodes removed at time of cystectomy did not significantly affect overall survival (HR 0.99, 95% CI 0.98-1.003, p = 0.16) when adjusted for clinical T stage, sex, and Charlson comorbidity index. When grouping node extent, removal of 11-19 nodes compared to 0 nodes may improve overall survival (HR 0.76, 95% CI 0.54-1.07, p = 0.11); removal of 1-10 or > 20 nodes did not impact survival. Node dissection did not affect 30- and 90-day mortality or 30-day readmission rates. In exploratory analysis, more extended lymph node dissection was significantly associated with likelihood of at least one positive lymph node (HR 1.03, 95% CI 1.01-1.05, p = 0.008).

Conclusions: Excision of a greater number of nodes during radical cystectomy for squamous cell carcinoma yields a higher likelihood of finding positive nodes, but it is unclear if this affects overall survival. Node dissection extent does not affect 30-day readmission rates. At present, there does not appear to be sufficient evidence to forego a lymph node dissection during cystectomy for squamous cell carcinoma.

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Predictors of Clinically Significant Prostate Cancer in Anterior Fibromuscular Stroma Lesions on Multi-Parametric Magnetic Resonance Imaging

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Introduction: Multi-parametric magnetic resonance imaging (mpMRI) has been demonstrated to improve prostate cancer detection in anatomical areas previously difficult to sample on sextant biopsy alone, including the anterior fibromuscular stroma (AFMS). We aimed to investigate clinical and imaging parameters that may assist in identifying patients with AFMS lesions harboring clinically-significant prostate cancer (csPCa).

Materials & Methods: We retrospectively queried our institutional mpMRI-ultrasound fusion biopsy database to identify patients with at least one region of interest (ROI) located in the AFMS on mpMRI who underwent fusion biopsy between March 2015 and December 2017 in the context of known or clinical suspicion of PCa. mpMRI findings were assessed, including prostate and ROI volumes, Prostate Imaging Reporting and Data System (PI-RADS) score, and location of the ROI (apex/midgland/base). Logistic regression and receiver operating characteristics curves with an area under the curve (AUC) were used to assess the ability of clinical and mpMRI characteristics to predict csPCa (Grade Group (GG) ≥ 2) in any core from a targeted biopsy of the ASMS lesion. Positive predictive value (PPV) for csPCa detection was also determined in each PI-RADS score.

Results: Of 756 men who underwent MRI-ultrasound fusion biopsy during the study period, 104 (13.7%) had at least one ROI in the AFMS. Of total 109 ROIs detected on mpMRI, 55 (50.4%) had csPCa and 18 (16.5%) showed perineural invasion on the biopsy of AFMS lesions. Detection of csPCa increased with the PI-RADS score (p < 0.001, Figure 1). The PPV for csPCa detection of PI-RADS ≤ 3, 4, and 5 was 10%, 34.3%, and 75.9%, respectively. On multivariable analysis, older age (OR 1.12, p = 0.008), higher PSA density (OR 2.38 per 0.1 increase in unit, p = 0.01), higher PI-RADS score (5 vs. 2-3, OR 10.48, p = 0.01), and apical vs. midgland location (OR 4.76, p = 0.02) were associated with an increased likelihood of csPCa in AFMS lesions (Table 1).

Conclusions: AFMS lesions were identified in a minority of men undergoing mpMRI-ultrasound fusion biopsy. However, the targeted biopsy revealed csPCa in more than half of these patients. In patients with AFMS lesions on mpMRI, age, PSA density, PI-RADS score, and apical location are predictors of csPCa.

Figure 1. Proportions of benign, GS 3+3, or clinically significant (GS≥3+4) prostate cancer on targeted biopsy of anterior fibromuscular stroma within each PI-RADS score

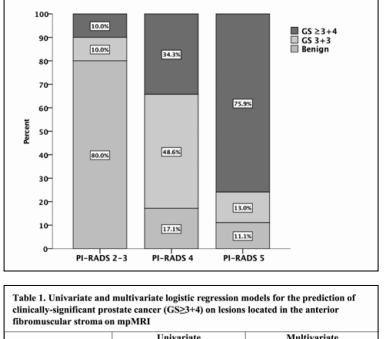

Table 1. Univariate and multivariate logistic regression models for the prediction of clinically-significant prostate cancer (GS≥3+4) on lesions located in the anterior fibromuscular stroma on mpMRI

	Univariate		Multivariate	
Variable	*OR (95% CI)*	*P value*	*OR (95% CI)*	*P value*
Age	1.09 (1.03-1.15)	0.002	1.12 (1.03-1.22)	**0.008**
African-American	1.66 (0.37-7.35)	0.50		
Abnormal DRE	1.32 (0.59-2.95)	0.49		
Biopsy status				
Biopsy-naive	1.00 (Ref)			
Prior negative biopsy	1.97 (0.77-5.08)	0.15		
Active surveillance	0.76 (0.30-1.92)	0.56		
Prostate volume	0.98 (0.97-1.00)	0.07		
PSA	1.16 (1.06-1.26)	0.001	0.97 (0.83-1.13)	0.72
PSA density	2.78 (1.66-4.66)	<0.001	2.38 (1.17-4.85)	**0.01**
ROI volume	1.04 (0.95-1.13)	0.32		
PI-RADS score				
2-3	1.00 (Ref)		1.00 (Ref)	
4	4.69 (0.93-23.7)	0.06	4.26 (0.67-27.05)	0.12
5	28.35 (5.79-138.98)	<0.001	10.48 (1.64-66.68)	**0.01**
ROI location				
Apex	1.00 (Ref)		1.00 (Ref)	
Midgland	0.38 (0.13-1.06)	0.06	0.21 (0.05-0.85)	**0.02**
Base	0.56 (0.16-1.92)	0.36	0.18 (0.03-1.11)	0.06
≥2 locations	3.69 (0.82-16.50)	0.08	0.97 (0.14-6.49)	0.97
ROI side				
Left	1.00 (Ref)			
Right	1.00 (0.39-2.52)	1.00		
Bilateral	1.05 (0.42-2.61)	0.90		

P21

Heterogeneity in Early Oncologic Outcomes after Radical Prostatectomy in Men with National Comprehensive Cancer Network (NCCN) Intermediate-Risk Prostate Cancer

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Introduction: The National Comprehensive Cancer Network (NCCN) risk classification scheme for prostate cancer encompasses several definitions and has been shown to contain significant heterogeneity. Because patients possessing a single intermediate-risk feature may be regarded as ineligible for active surveillance, we aimed to compare pathologic and early oncologic outcomes between those with low-risk and intermediate-risk features based on the number of criteria met.

Materials & Methods: We queried the National Cancer Database (NCDB) to identify men with NCCN low-risk (cT1-T2a, prostate-specific antigen [PSA] < 10 ng/mL, and Gleason score (GS) ≤ 6) and intermediate-risk prostate cancer diagnosed from 2010-2014 who were treated with radical prostatectomy. Patients with intermediate-risk disease were stratified based on a single factor: clinical stage (cT2b-T2c), PSA (10-20 ng/mL), GS 3+4, or GS 4+3 alone (Figure 1). The pathologic outcomes including any Gleason upgrade, and adverse pathology (primary Gleason 4 or ≥ T3 at radical prostatectomy), and receipt of adjuvant radiation therapy were compared between the low-risk and intermediate-risk groups. Odds ratios (OR) for pathologic outcomes and receipt of adjuvant radiation therapy were computed using logistic regression analyses.

Results: Of 181,847 patients treated with radical prostatectomy, we identified 30.7% and 37.1% with low-risk and intermediate-risk prostate cancer, respectively. Of 67,623 with intermediate-risk prostate cancer, 4,075 (6%) were due to clinical stage alone, 5,004 (7.4%) by PSA, 43,409 (64.2%) by GS 3+4, and 15,135 (22.4%) by GS 4+3 (Figure 1). Patients meeting intermediate-risk by clinical stage alone had similar risks of adverse pathology as low-risk patients (OR 1.03, 95%CI 0.94-1.13, p = 0.49, Table 1). In contrast, those meeting intermediate-risk by PSA alone had higher risks of adverse pathology compared with low-risk individuals (OR 2.20, 95%CI 2.05-2.36, p < 0.001, Table 1). Moreover, receipt of adjuvant radiation therapy was similar among low-risk and intermediate-risk patients by clinical stage alone (p = 0.62), and higher among patients meeting definitions by PSA alone (OR 2.99, 95%CI 2.43-3.69, p < 0.001, Table 1).

Conclusions: Based on national cancer registry data, early outcomes among men meeting the NCCN intermediate-risk definition for prostate cancer are heterogeneous. Intermediate-risk patients by clinical stage alone had similar rates of adverse pathology as did low-risk patients. Broadened eligibility for active surveillance should be considered to include those meeting favorable intermediate-risk definitions.

Figure 1. Definition of study cohort

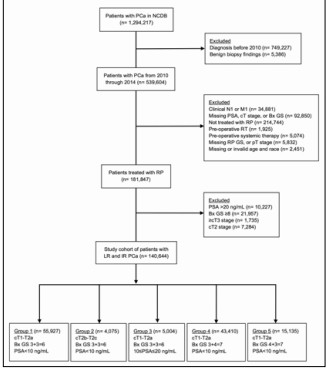

Table 1. Risk of upgrading, positive surgical margins, adverse pathology, non-organ confined disease, and receipt of adjuvant radiation therapy among the studied intermediate-risk categories compared with those classified as NCCN low-risk prostate cancer.

	OR	*95% CI*	*p value*
Upgrading			
Low risk	1	-	-
Clinical T2b-T2c	1.16	1.09-1.23	<0.001
PSA 10-20	1.47	1.39-1.56	<0.001
GS 3+4	0.23	0.23-0.24	<0.001
GS 4+3	0.14	0.13-0.15	<0.001
Positive surgical margins			
Low risk	1	-	-
Clinical T2b-T2c	1.12	1.03-1.22	0.006
PSA 10-20	1.54	1.44-1.66	<0.001
GS 3+4	1.34	1.30-1.38	<0.001
GS 4+3	1.57	1.50-1.64	<0.001
Adverse pathology			
Low risk	1	-	-
Clinical T2b-T2c	1.03	0.94-1.13	0.49
PSA 10-20	2.20	2.05-2.36	<0.001
GS 3+4	3.14	3.04-3.24	<0.001
GS 4+3	11.70	11.22-12.19	<0.001
Non-organ confined disease			
Low risk	1	-	-
Clinical T2b-T2c	0.87	0.78-0.98	0.02
PSA 10-20	2.10	1.94-2.27	<0.001
GS 3+4	2.69	2.59-2.79	<0.001
GS 4+3	4.53	4.33-4.73	<0.001
Adjuvant radiation therapy			
Low risk	1	-	-
Clinical T2b-T2c	1.09	0.76-1.54	0.62
PSA 10-20	2.99	2.43-3.69	<0.001
GS 3+4	1.88	1.66-2.13	<0.001
GS 4+3	4.16	3.64-4.75	<0.001

P22

Predictors of Urethrovesical Leak on Cystogram after Robotic Assisted Retropubic Prostatectomy

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Introduction: After robotic-assisted retropubic prostatectomy (RALP), some surgeons opt for routine cystograms postoperatively to assess for vesicourethral anastomotic leak. Currently, there are no widely accepted guidelines for obtaining post-prostatectomy cystograms. The present analysis aims to identify factors associated with leak and to lay the groundwork for a cost-effectiveness analyses of this post-operative exam.

Materials & Methods: Clinical information for all patients undergoing RALP by two fellowship-trained surgeons from a single center between March 2015 and July 2016 was retrospectively collected; all patients during this period routinely received a cystogram 1-2 weeks post-prostatectomy. Relevant data were extracted from electronic medical records; patients with incomplete records were excluded from analysis. A leak was defined as any extravasation of contrast on post-op cystogram. A failed cystogram was defined as not having the foley catheter removed within 1 day of post-op cystogram. Binary factors were compared between leak and non-leak groups using Chi-squared or Fisher's Exact test, continuous measures were compared using Student's t-test. A multivariate logistic regression was performed to identify factors associated with leak on cystogram.

Results: A total of 172 patients were included, of which 17 (9.9%) had a leak on cystogram, and 11 (6.4%) had their foley duration lengthened due to a failed cystogram. The included cohort had a median age of 61 (IQR 56-67) years and median BMI of 28.5 (IQR 26-29). With respect to Gleason score, the cohort comprised 16 (9%) 3+3, 91 (53%) 3+4, 35 (20%) 4+3, 17 (9.9%) 4+4, and 13 (7.6%) > 4+4 disease. Median PSA was 6.3 (IQR 4.7-9.1) ng/ml, and median prostate volume was 40 (IQR 30-50) cc. Intraoperatively, 24 (14%) of patients had a bladder neck reconstruction, and 28 (16%) had minimal or no nerve sparing. On univariate analysis, only higher gleason score was associated with leak on cystogram, with > 4+4 (5/13 leaks) and 4+4 (2/17 leaks) significantly more likely to leak than lower Gleason scores. There were no significant differences between leak and no-leak groups in average age, BMI, PSA, prostate volume, or operative time. There were no differences in rates of smoking status, CAD, CHF, diabetes, dyslipidemia, BPH, past abdominal or pelvic surgery, bladder neck reconstruction, nerve sparing, or positive margins. On multivariate analysis, only high Gleason score (> 4+4) and minimal nerve sparing were associated with greater odds of a leak and/or cystogram failure (Table 1).

Conclusions: The rate of leak and leak requiring prolonged foley drainage after prostatectomy is relatively low. Patients with higher Gleason scores and/or minimal nerve sparing may warrant cystograms. Further cost-effectiveness analysis is underway to establish recommendations regarding which patients warrant the additional expense of a cystogram after prostatectomy.

Multivariate Model for Factors Associated with Odds of Leak

Factor	OR	95% CI	p value
Age	0.95	0.85-1.07	0.41
BMI	1.08	0.91-1.27	0.36
DM	4.10	0.60-28.7	0.15
BPH	0.69	0.14-3.06	0.63
Prostate Volume	1.02	0.98-1.07	0.27
Gleason 3+4	5.22	0.35-423	0.34
Gleason 4+3	1.02	0.13-100	0.99
Gleason 4+4	12.9	0.37-1600	0.21
> Gleason 4+4	67.6	2.41-8225	0.035
Minimal Nerve Sparing	543	16-42567	0.001
< 50% unilateral nerve sparing	1.50	0.17-14.8	0.72
Bilateral Nerve Sparing	2.96	0.34-38	0.35
Positive Margins	1.82	0.36-8.6	0.45
Ever Smoker	0.33	0.06-1.54	0.18
Bladder Neck Reconstruction	4.33	0.64-31	0.13

P23

Outcomes of MR/Ultrasound Fusion-Guided Biopsy for Men with Low Risk Prostate Cancer on Active Surveillance

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Introduction: Multiparametric magnetic resonance imaging used in conjunction with ultrasound fusion biopsy (targeted biopsy, TB) results in the improved detection of clinically significant prostate cancer. We aim to evaluate the utility of TB in comparison to 12-core systematic biopsy (SB) in detecting clinically significant prostate cancer in men undergoing active surveillance.

Materials & Methods: We performed a retrospective analysis of 245 men undergoing active surveillance with both TB and SB performed. Clinically significant prostate cancer (csPCa) was defined as Gleason Score ≥ 3+4. PI-RADS version 2 was used to score ROI on a scale of 1-5 corresponding to suspicion that clinically significant prostate cancer was present and PI-RADS scores 2 and above were targeted on biopsy. We evaluated clinical and pathological factors associated with biopsy upgrade using multivariate logistic regression.

Results: CsPCa was detected in 104 men (42.4%) including 40 (38.5%) by TB only, 15 (14.4%) by SB only, and 49 (47.1%) by both. TB detected a significantly larger proportion of csPCA than SB (36.3% vs. 26.1%, p = 0.01). On multivariate analysis, older age, higher PSA density, higher PI-RADS score, and biopsy method were significant predictors in detection of csPCa (Table 1). Of the men with csPCa, 14.4% (15/104) was detected on systematic biopsy alone where targeted biopsy failed to detect csPCA. In this subset, younger age, larger prostate, and lower PI-RADS scores were significant predictors of detecting csPCa (Table 2).

Conclusions: Targeted biopsy detected a significant proportion of csPCA when compared to systematic biopsy in men undergoing active surveillance. However, targeted biopsy alone may be inadequate due to a proportion of significant cancers detected on systematic biopsy alone.

	Univariate		Multivariate	
Variable	*OR (95% CI)*	*P value*	*OR (95% CI)*	*P value*
Age	1.08 (1.04-1.13)	<0.001	1.10 (1.04-1.15)	**<0.001**
African-American	1.91 (0.77-4.72)	0.16		
Abnormal DRE	1.00 (0.53-1.88)	0.99		
PSA	1.11 (1.05-1.18)	<0.001	0.96 (0.88-1.05)	0.44
PSA density	2.18 (1.62-2.95)	<0.001	2.49 (1.57-3.95)	**<0.001**
Maximum PI-RADS				
2	1.00 (Ref)		1.00 (Ref)	
3	2.64 (0.65-10.73)	0.17	3.99 (0.72-22.15)	0.11
4	6.08 (1.71-21.51)	0.005	6.19 (1.32-29.01)	**0.02**
5	11.12 (3.07-40.31)	<0.001	10.52 (2.13-51.94)	**0.004**
Number of ROIs	1.10 (0.77-1.58)	0.57		
Lesion volume	1.00 (0.93-1.08)	0.92		
Biopsy method				
SB only	1.00 (Ref)		1.00 (Ref)	
TB only	5.55 (2.23-13.78)	<0.001	4.27 (1.57-11.64)	**0.004**
Both	0.78 (0.38-1.62)	0.51	0.35 (0.15-0.84)	**0.01**

Table 1: Multivariable-adjusted odds ratio for variables predicting detection of csPCa on either biopsy method among men on active surveillance.

	Univariate		Multivariate	
Variable	*OR (95% CI)*	*P value*	*OR (95% CI)*	*P value*
Age	0.92 (0.85-1.00)	0.050	0.89 (0.80-0.98)	**0.02**
African-American	3.68 (0.94-14.28)	0.059	3.60 (0.74-17.49)	0.11
Abnormal DRE	0.52 (0.10-2.54)	0.42		
PSA	0.97 (0.89-1.07)	0.62		
Prostate volume (per 5 mL increase)	1.12 (1.008-1.26)	0.03	1.17 (1.02-1.34)	**0.01**
PSA density	0.54 (0.28-1.04)	0.06		
Maximum PI-RADS				
2-3	1.00 (Ref)		1.00 (Ref)	
4	0.28 (0.07-1.13)	0.07	0.23 (0.05-1.05)	0.058
5	0.11 (0.02-0.57)	0.009	0.09 (0.01-0.54)	**0.008**
Number of ROIs	0.60 (0.23-1.52)	0.28		
Lesion volume	0.53 (0.21-1.37)	0.19		

Table 2: Multivariable-adjusted odds ratio for variables predicting detection of csPCa on systematic biopsy only among men on active surveillance.

P24

The Prognostic Impact of a Negative Confirmatory Biopsy in Men on Active Surveillance for Prostate Cancer

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Introduction: Active surveillance (AS) is increasingly used in managing low-risk and favorable intermediate-risk prostate cancer. To mitigate the risk of unsampled higher risk disease, most institutional AS protocols call for a confirmatory prostate biopsy within 12-18 months following initial diagnostic biopsy. Here, we investigate whether the results of confirmatory biopsy impact the outcomes of men on AS.

Materials & Methods: We retrospectively reviewed our institutional database of men enrolled in AS between 1997-2014 who underwent a confirmatory biopsy within 18 months of diagnosis and ≥ 3 biopsies overall. Thus, patients who progressed to treatment on the basis of their confirmatory biopsy were excluded. Biopsies containing prostate cancer were considered positive. Biopsies containing only benign prostatic tissue, prostatic intraepithelial neoplasia (PIN), or atypical small acinar proliferation (ASAP) were considered negative. Statistical analysis was conducted using the Kaplan-Meier method and Cox proportional hazards regression.

Results: Out of 974 patients in our cohort, 270 met inclusion criteria for this analysis, with a median follow up of 5.4 years. At diagnosis, median age was 64 years (IQR 59-69) and median PSA was 4.8 ng/mL (IQR 3.5-6.2). The vast majority of patients had Gleason ≤ 6 (98.1%) and clinical stage T1 (94%) disease. A total of 101 patients (37%) had a negative confirmatory biopsy (72 benign, 17 PIN, and 12 ASAP). Of the 270 patients, 28% progressed to treatment, with pathologic progression the most common reason (80%). Univariate predictors of progression to treatment included initial Gleason group, involvement of > 20% of any core on diagnostic biopsy, PSA density ≥ 0.15, and confirmatory biopsy status. In multivariate analysis, a negative confirmatory biopsy remained the strongest predictor of progression to treatment (HR 0.35 [95%CI 0.15-0.81], p = 0.1). Confirmatory biopsy status was not associated with risk of adverse pathology on RP, metastasis-free survival, disease-specific survival, or overall survival.

Conclusions: A negative confirmatory biopsy is associated with a significantly lower rate of subsequent progression to treatment among men on AS. This may serve as a useful tool for prognostication and help determine the intensity of interval biopsies for men on AS.

P25

10 Year Experience of Prostate Total and Partial Cryoablation

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Introduction: Cryoablation of the prostate is a well established treatment modality for prostate cancer. We present the 10 year experience of both total gland and partial gland ablation by a single surgeon.

Materials & Methods: A retrospective review was conducted of 27 patients who underwent partial or total prostate cryoablation between 2008 and 2018. Data on preoperative PSA, Pathology, IPSS, IIEF as well as post operative PSA, complications, and cancer control were collected. Follow up ranged from 1 month to 10 years.

Results: There were a total of 28 ablative procedures on 27 patients. Age ranged from 52 to 82 while the average was 68. There were 6 partial ablations which had an average age of 62. Average preop PSA was 12. Average prostate size was 46 grams for an average PSA density of 0.26. Nine patients had Gleason 6, twelve had Gleason 7, and six had Gleason 8, 9,or 10. Average post operative PSA was 443 in the PACU, 150 on POD1, and the nadir was one month at 1.6. There was one bladder neck contracture, one episode of renal failure requiring short term dialysis, four UTIs, and 13 post op retentions requiring the replacement of a foley. There were four post op biopsy confirmed prostate cancer recurrences. Four had XRT adjuvant therapy while one had a repeat cryoablation. There were three deaths during the 10 year period, one was prostate cancer specific while the other two were from lung cancer and AML. Five of the six partial prostate ablative patients had good sexual function after the procedure and one had a biopsy proven recurrence on the contralateral side.

Conclusions: Prostate cryoablation is safe and effective as a modality for prostate cancer treatment in a select population of patients. In addition, focal ablation is feasible and safe with preservation of erectile function. Although, the past literature suggests that cryoablation of the prostate can lead to better urinary symptoms, we have found that 46% of our patients had retention within the first month after treatment. This eventually resolved but patients should be counseled about the potential additional need for prostate medications or procedures for obstructive symptoms. More experience is needed in the area of focal ablative therapy for prostate cancer. The introduction of MRI fusion technology gives ablative techniques such as cryoablation a more targeted approach to treatment with less side effects and better quality of life.

P26

IMP3 Expression Predicts Metastatic-free Survival in Patients with High-risk Renal-cell Carcinoma

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Introduction: IMP3 staining is a useful prognostic marker in renal-cell carcinoma (RCC) because it correlates with the development of metastatic disease. The ability to risk-stratify patients with a high risk of tumor recurrence after surgical management is of particular interest given the emergence of effective adjuvant therapies. We sought to determine whether IMP3 expression is a predictor of disease-free survival in a cohort of patients treated surgically for stage III RCC.

Materials & Methods: Of the 294 patients at our institution who underwent either partial or radical nephrectomy for stage I-III RCC between November 2008 and September 2014, a total of 53 patients were identified to have locoregional, high-risk RCC (defined as stage III disease) at the time of surgery. Retrospective reviews of the medical records of these patients were conducted, with follow-up through January 2018. These records were used to determine pertinent information including gender, age, status of disease recurrence, time from surgery to metastasis, mortality, and IMP3 staining status. Overall survival and time-to-metastases analyses were conducted to assess whether IMP3 positivity correlated with the progression of disease in this high-risk subgroup.

Results: 53 patients with stage III RCC at the time of surgery were included in the study. Of these, the renal masses of 21 (39.6%) stained positive for IMP3 and 32 (60.4%) stained negative for IMP3. IMP3 positive staining correlated with reduced metastatic-free survival ($p = 0.011$) on multiple analytical models, but it did not correlate with overall survival ($p = 0.322$).

Conclusions: Identifying markers of aggressive disease is gaining importance in the era of targeted therapy. Specifically, the use of targeted adjuvant therapy could be useful in high risk IMP3 positive patients due to the increased risk of metastasis. IMP3 status therefore should be included in the risk-stratification of these patients when determining whether adjuvant treatment would be beneficial. Although overall survival did not correlate with IMP3 status in this subgroup of high risk patients, this was likely due to duration of follow-up, the presence of other comorbidities leading to mortality from other causes, and the size of the population. Additional studies can help identify not only which patients may benefit from targeted adjuvant therapy, but may also help guide the choice of therapy.

P27

Impact of Pathogen Colonization on Infection of the Urinary Tract after Radical Cystectomy

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Introduction: Urinary tract infection (UTI) is a common complication after radical cystectomy (RC) that can lead to readmission. The consequences of microbial colonization in RC patients is not well described. We explored the prevalence of colonization through surveillance cultures in a RC cohort and examined its impact on the risk of post-operative UTI. We hypothesized that colonized RC patients would have higher rates of UTI.

Materials & Methods: We queried an IRB-approved, institutional database of 134 RC patients managed with our Enhanced Recovery After Surgery (ERAS) protocol from 2015-2017. Inclusion criteria for study was receipt of surveillance urine culture prior to hospital discharge. Patients who received antimicrobials for infection prior to admission for RC were excluded. Perioperative antimicrobial prophylaxis included ceftriaxone and metronidazole for 24 hours and single-dose ciprofloxacin for stent removal. Patient demographics and pertinent clinical data were collected. Colonization was defined as isolation of yeast or bacteria on urine culture in an asymptomatic patient. UTI was defined as fever or localizing urinary symptoms with positive urine culture. Statistical analysis was performed using student's T-test, Mann-Whitney U and Fisher's exact test, as appropriate.

Results: Fifty-nine patients received surveillance cultures, of which 29% (n = 17) had robotic RC and 76% (n = 45) had an ileal conduit. Median age was 68 and 57% (n = 33) of patients were male. Colonization was present in 49% of patients (n = 29) and was not associated with age, diabetes, surgical approach or diversion type. Candida, enterococcus, and coagulase (-) staphylococcus were the most common isolates in 11, 7, and 5 patients, respectively. 17% of patients (n = 10) developed a UTI within 90 days and 30% (n = 18) developed a UTI within the follow-up period (median follow-up 7.4 months). Of the patients who developed UTI within 90 days, 4 of 10 were associated with stent removal, all were in patients who were not colonized, and all required readmission. Enterococcus, klebsiella, and pseudomonas were the most common pathogens in UTI. There was no statistically significant difference in the rate of UTI among those with negative surveillance cultures and colonized patients (36.7% vs. 24.1%, $p = 0.40$). Only 2 of 7 patients with colonization on surveillance culture and UTI had a UTI caused by the same organism.

Conclusions: Microbial colonization and UTI are common after radical cystectomy. However, colonization did not predict UTI in our cohort. Pre- hospital discharge surveillance cultures may have limited utility in predicting and preventing post-operative UTI in this population.

P28

Is Presence of a Urology Resident During Robotic Assisted Laparoscopic Radical Prostatectomy Detrimental to Outcomes?

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Introduction: Robotic procedures are an important component of resident training in urology but the impact of resident presence during procedures on outcomes is not known. We analyzed outcomes during and after robotic assisted laparoscopic radical prostatectomy (RALP) on the basis of resident presence or absence during the procedure.

Materials & Methods: We retrospectively reviewed a prospectively maintained database for RALP cases performed between 11/2007 and 12/2016 by a single surgeon on a specific weekday as it was his custom to work with a resident for the first case (R) and without residents (NR) later. Resident console time (i.e., the time that the attending spent instructing the residents) varied on the basis of year of training and skill set. We compared patient characteristics and outcomes for the two groups (R and NR). Outcomes included operative time (OT), robotic time (RT), estimated blood loss (EBL), complications, biochemical recurrence (BCR) (PSA ≥ .2), surgical failure (BCR or early salvage radiotherapy). Self-reported EPIC-26 questionnaires examined continence (no pads or 'occasional dripping' with 1 security pad/day) and potency (intercourse or erections that were firm enough for intercourse"). We also examined outcome variables on the basis of year of surgery (2007-2011 vs. 2012-2016) as residents have played increasingly greater roles in the procedures over time.

Results: A total of 460 cases (230 NR and 230 R) met inclusion criteria and were included in the analysis. Outcomes from RALP on the basis of R or NR are presented in Table 1. No statistically significant differences were found for any of the pre-operative patient variables, with the exception of higher grade disease ($p = 0.015$). Median follow-up was 30 and 33.5 months for NR and R, respectively ($p = 0.3$). Median OT was significantly longer for R vs. NR ($p < 0.001$) as was RT ($p < 0.001$). No statistically significant differences were observed for any other measure. For the R group, the median OT and median EBL were both significantly greater in the later years relative to the earlier years (2012-2016 vs. 2007-2011; Table 1). No differences were observed in the NR cases for these time periods.

Conclusions: These data suggest that resident console time results in longer operative times. However, the short and long term outcomes from RALP are not compromised.

Table 1: Outcomes from RALP on the basis of resident presence (R) or absence (NR)

Outcome*	NR	R	P value
Median age, years (IQR)	62 (57,66)	61 (56,66)	0.349
Median BMI (IQR)	28.1 (25.6, 30.97)	27.2 (25.5, 31.0)	0.820
Median highest pre-operative PSA (IQR)	5.60 (4.29, 7.18)	5.30 (4.00, 7.44)	0.367
Gleason 4+3 (grade group 3) or higher, %	36.7	25.9	**0.015**
Nerve sparing (bilateral), %	73.2	73.8	0.897
Median EBL, mL (IQR)	200 (100-300)	200 (100-350)	0.138
Median operative time, min (IQR)	156 (135,180)	200 (173,230)	**<0.001**
Median robotic time, min (IQR)	119 (103,140)	161 (137,186)	**<0.001**
Positive surgical margins, %	20.6	20.4	1.000
Median length of stay, days (IQR)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	0.332
Complications within 7 days, %	2.6	3.5	0.787
Complications within 30 days, %	7.8	8.5	0.718
Complications within 90 days, %	8.7	7.4	0.732
Clavien grade 3 or higher within 90 days, %	3.5	3.5	1.00
BCR, %	9.3	9.0	1.00
Surgical failure, %	12.0	10.4	0.653
Potent within 1 year post surgery, %	50.2	47.1	0.557
Continent within 1 year post surgery, %	91.5	91.2	1.00
Further analysis by years			
	2007-2011	2012-2016	2007-2011	2012-2016	
Median operative time, min (IQR)	160 (135,179)	155 (137,181)	185 (160,211)	215 (192,242)	.892 (NR); <.001 (R)
Median EBL, mL (IQR)	200 (100,300)	200 (100,300)	200 (100,300)	250 (106,400)	.672 (NR); .041 (R)

*Chi-square, t-test or Wilcoxon Ranked Sum used to analyze categorical, continuous variables meeting assumption of normality and continuous variables not meeting assumption of normality, respectively. IQR, interquartile range; PSA, prostate-specific antigen; BCR, biochemical recurrence; BMI, body mass index; EBL, excess blood loss

P29

Trends and Morbidity for Minimally Invasive Versus Open Cytoreductive Nephrectomy in the Management of Metastatic Renal Cell Carcinoma

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Introduction: Cytoreductive nephrectomy (CN) prior to systemic therapy for metastatic renal cell carcinoma (RCC) is recommended in patients with a surgically resectable primary tumor. Traditionally performed as open surgery, the advent of laparoscopic and robotic surgery provides a minimally invasive alternative to CN with a potential for accelerated recovery and earlier initiation of systemic therapy. We sought to compare the trends and morbidity of laparoscopic, robotic, and open CN for patients with metastatic RCC.

Materials & Methods: Using the Premier Hospital Database (Premier, Inc., Charlotte, NC), we identified 24,145 patients who underwent elective radical nephrectomy for metastatic RCC in the United States between 2003 and 2015. Comparative analysis between laparoscopic, robotic, and open CN was performed with propensity weighting on rates of 90-day complications, blood transfusion, intensive care unit (ICU) admission, prolonged length of stay (LOS), discharge destination, 90-day readmission, operative time, and direct hospital costs.

Results: Over the course of the study period, the rates of open CN decreased from 76.7% to 66.4%, laparoscopic CN decreased from 22.3% to 11.4%, and robotic CN increased from 0.6% to 22.1%. Compared to open CN, the laparoscopic approach was associated with a 30% decreased odds of 90-day major complications (OR 0.70, 95% CI 0.50-0.97, $p < 0.05$). Compared to open CN, both laparoscopic and robotic approaches were associated with significantly decreased odds of blood transfusion (OR 0.46 and 0.38, respectively), ICU admission (OR 0.57 and 0.48, respectively), and LOS (OR 0.50 and 0.35, respectively). Direct costs were lowest for laparoscopic CN.

Conclusions: Compared to open CN, minimally invasive CN is associated with decreased rates of blood transfusion, ICU admission, and LOS. Laparoscopic CN is additionally associated with decreased major complications and direct costs compared to open CN. When technically feasible, the utilization of minimally invasive CN, especially laparoscopic, may be associated with improved outcomes, decreased costs, and accelerated recovery prior to systemic therapy in patients with metastatic RCC.

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Investigating the Relationship between Socioeconomic Factors and Nephrolithiasis Prevalence

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Introduction: Socioeconomic factors, including type of health insurance, income, and level of education, may be associated with kidney stone formation. While some previous investigations have suggested a relationship between insurance status and kidney stone formation, to our knowledge such associations have not been made using a nationally representative cohort.

Materials & Methods: Data was abstracted from the National Health and Nutrition Examination Survey (NHANES) from 2007 to 2014, and was weighted to represent the United States population. The variables chosen were assessed for collinearity before analyzed. Using univariate and multivariable logistic regressions on STATA, we analyzed the odds of developing kidney stones among several socioeconomic factors.

Results: The weighted national prevalence of nephrolithiasis between ages 20 and 79 was 8.5% of a population of over 156.7 million. 51% of the population was women. The mean age was 45 years old and the mean body mass index (BMI) was 28.8. The prevalence of nephrolithiasis was higher among individuals who had state-assisted insurance compared to those with private insurance (6.3% vs. 1.8%, $p < 0.001$). On univariate regression analysis, having a college education was protective against stones compared to having less than a high-school degree (OR 0.78, 95% CI 0.63-0.97; $p = 0.03$). Income was also significantly associated with kidney stone prevalence. After adjusting for race, body mass index (BMI), gender, water intake, income, and education level through multivariable analysis, having private insurance was associated with lower odds of developing nephrolithiasis compared to having state-assisted insurance (OR 0.60, 95% CI 0.42-0.85; $p = 0.005$).

Conclusions: We demonstrate that certain socioeconomic variables, including health insurance, education level, and income are associated with nephrolithiasis. Individuals who have state-assisted insurance have increased odds of developing kidney stones. Further investigation is warranted so that these discrepancies among patients with nephrolithiasis may be reduced in the future.

P30

Clinical Utility of MR/Ultrasound Fusion-Guided Biopsy in Patients With PI-RADS 2 and 3 Lesions on Active Surveillance for Low Risk Prostate Cancer

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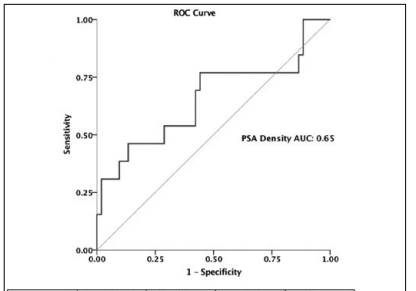
Introduction: Active surveillance has shown to a safe and effective management option for men with low-risk prostate cancer. Multiparametric magnetic resonance imaging (mpMRI) has demonstrated favorable performance in identifying occult high-grade cancers that would be missed on template biopsy alone. However, the utility of this approach in patients with low-suspicion lesions and otherwise low clinical risk is undefined.

Materials & Methods: We performed a retrospective analysis of 245 men undergoing active surveillance. Prostate Imaging Reporting and Data System (PI-RADS) version 2 was used to score regions of interest (ROI) on a scale of 1-5 corresponding to suspicion that clinically significant prostate cancer was present. PI-RADS scores 2 and above were targeted on biopsy. We identified 65 men (26.5%) whose highest suspicion lesion was PI-RADS 2 or 3. Clinically significant prostate cancer (csPCa) was defined as Gleason Score ≥ 3+4. We assessed the diagnostic accuracy of biopsy approaches using area under the receiver operator characteristic (ROC) curve and evaluated factors associated with csPCa in these patients using multivariate logistic regression.

Results: CsPCa was identified in 13 of 65 patients (20%). These included five (38.4%) by systematic biopsy alone, six (46.2%) by targeted alone, and two (15.4%) by both approaches. On univariate analysis, the only significant variable predicting the detection of csPCa in men with low risk imaging mpMRI characteristics was higher PSA density (PSAD) (OR per 0.1 unit = 2.18, 95% CI 1.14-4.16). A ROC curve of the logistic regression model of PSAD was performed (Figure 1). A PSAD cut-off of 0.1 resulted in a negative predictive value of 90%. When stratified by PI-RADS score with a PSAD cut-off of 0.1, a PI-RADS 2 score was associated with a sensitivity, specificity, PPV, and NPV of 66.6 %, 43.4%, 13.3%, and 90.9% respectively (AUC=0.55). A PI-RADS 3 score was associated with a sensitivity, specificity, PPV, and NPV of 80%, 58.6%, 40%, and 89.4% respectively (AUC = 0.7).

Conclusions: In men with clinical low-risk prostate cancer on active surveillance with PIRADS 2 and 3 lesions, there is a low risk of upgrade to csPCa. Integration of PSA density may be a useful adjunctive tool in identifying patients at highest risk for upgrade despite favorable imaging findings.



	Sensitivity	Specificity	PPV	NPV
PSAD 0.10	76.9%	51.9%	28.5%	90%

Figure 1. Receiver-operating characteristic curve of logistic regression model of PSA density predicting csPCa

	Univariate Analysis	
Variable	*OR (95% CI)*	*P value*
Age	1.05 (0.95-1.16)	0.26
African-American	1.36 (0.13-14.26)	0.79
Abnormal DRE	1.33 (0.23-7.53)	0.74
PSA	1.10 (0.96-1.26)	0.15
Prostate volume	0.97 (0.94-1.01)	0.19
PSA density (per 0.1 increase in unit)	2.18 (1.14-4.16)	**0.01**
Maximum PI-RADS		
2	1.00 (Ref)	
3	2.64 (0.65-10.73)	0.17
Number of ROIs	0.48 (0.10-2.17)	0.34
Lesion volume	0.95 (0.24-3.67)	0.94

Table 1: Logistic regression model for prediction of csPCa in men with low risk mpMRI characteristics on active surveillance. DRE – Digital Rectal Examination, PSA – Prostate Specific Antigen, ROI – Region of Interest

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Cystinuric Stone Conversion and Associations with Medical and Surgical Interventions
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Introduction: Although cystinurics are assumed to exclusively make cystine stones, conversion to non-cystine stones has been observed. Prior research suggested SWL may alter future stone composition. Additionally, urinary alkalization, a cornerstone of cystinuria medical management, may contribute to altered stone composition.
The incidence of and predictors for stone conversion among cystinurics are unknown. If such conversion occurs, it may alter management and thus would underscore the need for continued stone analyses.

Materials & Methods: We constructed a multi-institutional database of patients with cystinuria. We analyzed medications, stone analyses, 24-hour urinalyses, and prior interventions. We divided the patients into those who only formed cystine stones and those with other stone components and compared these two groups to identify factors associated with conversion.

Results: A total of 104 patients from 4 institutions were studied. There were 279 stone analyses and 417 stone procedures. Thirty-six (35%) patients converted to non-cystine components of which 77% were calcium phosphate. 15 (43%) converted more than once. K citrate medication was used in 38 (60%) of pure cystine stone patients, and in 24 (75%) of converters ($p = 0.1303$). Converters took K citrate for an average duration of 4.5 years. Surgically, 13 (12.4%) had at least one SWL (range 0-10) and 71 (67.6%) had at least one PCNL (range 0-9). When stratified based on pure cystine vs. converted stone, the average number of procedures was higher in the conversion group (5.9 vs. 3.5, $p = 0.0130$). There was a higher average SWL amount in the conversion group (0.97 vs. 0.07, $p = 0.0012$) but no difference in PCNL (1.8 vs. 1.8, $p = 0.9597$). On logistic regression, male gender (OR 3.2, p-value 0.0331) and number of SWL (OR 3.05, p-value 0.0229) were associated with increased likelihood of stone conversion.

Conclusions: Conversion to non-cystine stones may occur in over one third of cystinurics. This appears to be more common in men and is associated with prior SWL. Future research with larger cohorts is indicated to further characterize cystine stone conversion and guide best management options.

*Max J, Willscher Award Eligible

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The Value of Planned Renal Stone Clearance at Time of Ureteroscopy for Ureteral Stones: a Comparative Effectiveness Analysis
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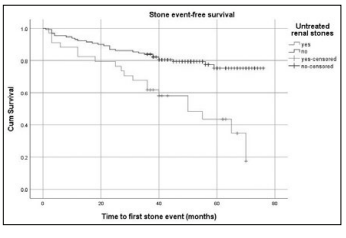
Introduction: During ureteroscopy for ureteral stones, ipsilateral 'coincidental' renal stones may be present. Best management foar these renal stones remains undefined. Although safety of concurrent intrarenal stone removal has been demonstrated, intrarenal clearance extends operative time. Some therefore intentionally leave these stones untreated whereas others routinely perform intra-renal stone clearance after treating the incident ureteral stone. This variation in management highlights the need for comparative effectiveness analysis of intrarenal stone clearance at the time of ureteroscopy for ureteral stones. We sought to characterize the comparative risk of future stone events in patients with and without planned treatment of asymptomatic ipsilateral renal stones.

Materials & Methods: We retrospectively reviewed patients with ureteral stones and simultaneous ipsilateral renal stones undergoing ureteroscopy between January 2011 and August 2014 with a minimum 36-month follow-up. Primary exposure was treated / untreated ipsilateral renal stones. Primary outcome was subsequent ipsilateral stone events including unplanned clinic or ER visit, stone passage, or surgical intervention. Statistical analysis was computed in SPSS©.

Results: Of 164 patients, 34 had intentionally untreated ipsilateral renal stones. 130 had planned full stone clearance. Of the full cohort, 47 (28.7%) experienced a subsequent ipsilateral stone event at any time out to a mean follow-up of 54.5 months. Stone events occurred after surgery for 19 and 28 patients in the untreated and treated groups, respectively. Stone events were more likely to occur in the untreated cohort (55.9% vs. 21.5%, $p < 0.0001$). Kaplan-Meier analysis demonstrated significantly improved stone event-free survival in planned renal stone clearance cohort (75.2% vs. 43.5% at 5 years, $p < 0.0001$).

Conclusions: Our findings confirm benefit to ipsilateral stone clearance. In those for whom renal stone clearance was attempted during initial ureteroscopy, there were fewer ipsilateral stone events and improved stone event-free survival. Planned removal of asymptomatic renal stones during ipsilateral ureteroscopy for ureteral stones may reduce future stone event morbidity.

Figure 1: Stone event-free survival for patients with untreated renal stones vs. patients with all stones treated.



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Non-obstructing Renal Stones and Their Effect on Stone-Related Quality of Life
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Introduction: Non-obstructing renal stones (NORS), while largely asymptomatic, have potential for causing future stone episodes. These may be either treatment naïve renal stones (TNS) or retained stone fragments (RSF) identified after surgical intervention. More frequent stone episodes and interventions have been associated with worse health related quality of life (HRQOL). HRQOL has become an increasingly important measure of treatment outcomes for the management of nephrolithiasis. We sought to evaluate if patients with the presence of known NORS experienced worse stone-related HRQOL.

Materials & Methods: Utilizing the previously validated Wisconsin Stone-QOL questionnaire (WISQOL), a kidney stone-specific instrument, we analyzed retrospective data from patients new to and established at a tertiary care center metabolic stone clinic. We compared HRQOL in the domains of social, emotional, and disease impact, and vitality between patients with TNS, RSF, and those without either at the time of WISQOL study enrollment using student t-test. Additionally, multivariate regression was used to assess for significance when adjusting for age, BMI, and number of stone events.

Results: 160 patients were included, of whom 82 had treatment naïve renal stones, 17 had retained stone fragments after intervention, 6 had both, and 55 had neither at time of study enrollment. There was no significant difference in total WISQOL scores for patients with TNS or RSF compared to patients with neither (105.3 vs. 107.5, $p = 0.61$). There was no significant differences in individual domain scores between the groups as well (all $p \geq 0.50$). When patients with TNS were compared to those with RSF, there was no significant difference in total WISQOL scores (104.5 vs. 105.5, $p = 0.88$). There was no significant differences in individual domain scores between patients with TNS and those with RSF (all $p \geq 0.36$). HRQOL remained similar on multivariate analysis.

Conclusions: Patients with TNS and RSF experience no significant difference in HRQOL compared to each other. Individuals with NORS also may not experience any worse HRQOL compared to those with history of nephrolithiasis who are stone free. These findings can be useful in counseling patients with known NORS and confirm that watchful waiting can be employed in this population without impairment in current stone-specific HRQOL.

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Failure of Electronic Stent Registry: Incidence of Retained Ureteral Stents and Implications for Prevention
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Introduction: Indwelling ureteral stent placement is procedure frequently performed to manage several urologic conditions. Unfortunately, not all stents are removed in a timely fashion and these retained ureteral stents are a source of increased resource utilization, preventable morbidity, and even mortality. Ureteral stent registries have been proposed and implemented to prevent unintended stent retention. However, despite their proven effectiveness, patients continue to suffer from stents which remain in place for far longer than intended. We assessed the incidence of retained ureteral stents despite implementation of an electronic stent registry and examine the root causes for registry failure despite appropriate implementation.

Materials & Methods: A ureteral stent registry was developed utilizing the secure web application Research Electronic Data Capture (REDCap). Patients are entered into the database using a combination of CPT codes for ureteral stent placement, removal, as well as surgeon, date, and indication. REDCap account managers provide a list of patients with clinician billed stent removals monthly. Patients are cross-referenced with stent registry entries to remove patients and complete their records. Retained stents prompted manual review of the entire stent registry. Confirmed cases of stent retention requiring intervention for removal were documented in the database and contacted for intervention.

Results: A total of 1278 records were entered into the REDcap database from 4/9/2015 to 1/31/18 consisting of 1124 complete records (placement and extraction verified) with 154 pending records (stent extraction pending). Three documented cases of retained ureteral stents requiring operative intervention to extract were identified; translating to a stent retention incidence of 0.24%. Root cause analysis of the failure of this registry to prevent retained stents revealed several reasons for registry failure. In one instance, a patient with bilateral ureteral stents was recorded appropriately in the registry; however, only one stent was removed at office cystoscopy. The forgotten stent was found on cystoscopic evaluation of presumed bladder stone > 1 year later and the fully encrusted stent required cystolitholapaxy and PCNL for removal. Two patients did not experience stent discomfort and forgot they were in place. They were only detected after manual review of the stent registry. Stents were removed cystoscopically in both cases.

Conclusions: Electronic ureteral stent registries are a validated, reliable method for decreasing the incidence of retained stents. Human error in removing only one of bilateral stents and suboptimal patient understanding of need for stent removal resulted in retained stents. Although electronic registries are known to decrease incidence of forgotten stents, inaccurate record maintenance and failure to monitor the registry still allow retained stents to occur. Systems can improve, but will remain limited by the potential for error imposed by those who build and maintain them. Stent registries therefore are not a panacea and require diligent, meticulous upkeep and manual inspection to guarantee accuracy. An automated system without an alert mechanism is not better than a manual entry registry which is not monitored and can lead to a false sense of security.

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Reduced Dose Computed Tomography for Urolithiasis: Stone Density and Composition
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Introduction: Computed tomography (CT) remains the gold standard in the diagnosis of urolithiasis but subjects patients to ionizing radiation. Multiple institutions have implemented reduced dose protocols with studies validating their sensitivity and specificity. Stone density measurements (Hounsfield units, HU) have been estimated to guide stone composition prediction and to guide treatment in standard dose CT (sCT) but not in reduced dose CT (RdCT). We aimed to compare HU in RdCT and sCT and determine if there is a correlation between stone composition.

Materials & Methods: 201 patients undergoing evaluation for renal colic were prospectively recruited into an IRB approved protocol, whereby each subject underwent a sCT (120 kV) followed immediately by a RdCT (80 or 100 kV). All scans were performed without contrast utilizing automated tube current modulation, 2.5 mm slice thickness, 0.5s rotation time, and a pitch of 1.375. RdCT protocol segregated patients by BMI (80 kV if < 30 kg/m^2 and 100 kV if > 30). All calculi < 5 mm were excluded to prevent volume averaging and distortion to HU measurements. The iliac bone cortex was utilized as an internal control. We also collected stone compositional analyses. Statistical analyses was performed with SPSS 24.0 using paired t-tests with an alpha value of 0.05. Values are displayed as mean ± standard deviation.

Results: There were 36 stones identified in 29 patients. The mean stone size was 7.7 mm (range 5.1-17). When the same calculi were evaluated with 120 kV versus 80 kV, the RdCT revealed a higher HU (n = 18, 1214 ± 520 vs. 1007 ± 307, p < 0.005). Statistical difference was not achieved when compared to 100 kV scans (n = 18, 962 ± 354 vs. 915 ± 299, p = 0.151) (figure 1). The percentage differences were 10.6 ± 21 and 1.4 ± 15 respectively. 41 stone analyses were reviewed in accordance to variable CT dosages. The stones' primary compositions were calcium oxalate dihydrate (4), calcium oxalate monohydrate (31), calcium phosphate (21), and uric acid (5). When stratified by CT kVp and stone composition, RdCTs trended toward wider density ranges than standard dose CT (figure 2).

Conclusions: Density measurements of urolithiasis in RdCT, achieved by voltage reduction, corresponds to a paradoxical increase in HU. While HU can be used as a predictor for stone composition, there can be a wide deviation in measured density, and this can be further magnified in the setting of dose reduction.

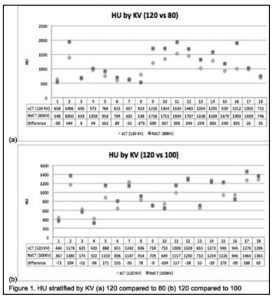

Figure 1. HU stratified by KV (a) 120 compared to 80 (b) 120 compared to 100

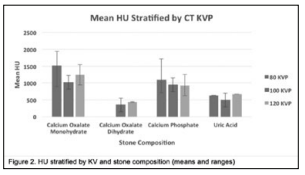

Figure 2. HU stratified by KV and stone composition (means and ranges)

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The use of Opioids for Stones and Ureteral Stents: Insights from an EDGE Consortium Patient Survey
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Introduction: With the spotlight on the nation's opioid crisis, urologists should analyze the use of opioid analgesics. Kidney stones are recognized as inherently painful. Furthermore, ureteral stents are recognized as a source of significant postoperative discomfort for many patients undergoing endourologic interventions for stone. Given high recurrence rate of urolithiasis, the implications of opioid use are potentially multiplied in this population. Using a patient survey, we sought to investigate the use of opioids both during acute episodes of urolithiasis and after urologic surgery in which a stent was placed post-operatively.

Materials & Methods: A previously validated survey assessing impact of decreased quality of life and use of opioid pain medication was distributed to patients with a history of ureteral stent at seven academic centers between July 2016 and September 2017. Responses were encoded in duplicate to ensure accuracy. Statistical analysis was performed using Chi square analyses, Stata 13.1.

Results: A total of 249 surveys were completed, 116 (47%) were from female patients. Most patients (75%, 186/249) used an opioid at some point during either their acute stone episode or for stent-related pain. 61% (147/242) of patients reported using opioid pain medication for their stone pain, versus 39% (94/242) who used opioids for stent-related pain. Patients with increased number of prior stone episodes were more likely to use opioids for their most recent episode (p < 0.001). In addition, increasing age was associated with a decrease in likelihood of needing opioids for stone pain (p = 0.014). Younger patients were more likely to use opioids for stent-related pain (p < 0.001). This held true when accounting for sex, patient-perceived health status, and the number of prior stone episodes. When assessing whether patients used more opioids for their stent-related pain or the stone pain, 46.5% reported using more opioids for their stone episode than for stent-related pain, while 16% reported using more opioids for the stent-related pain. Only 10% (25/249) patients required opioids only for the stent-related pain and not the stone pain.

Conclusions: Amid a national opioid epidemic, it is important to assess patient perspectives on opioid utilization. Patients who have suffered through more prior episodes are more likely to have used opioids for their most recent episode. Although ureteral stents have been shown to be associated with a decreased quality of life, our study shows that the use of opioids for stent-related pain is less than that for stone pain. Younger patients are less likely to tolerate a stent without opioid analgesics. Such findings may help target those for whom more aggressive opioid-alternative strategies should be developed.

*Max J, Willscher Award Eligible

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Active Surveillance in Patients with Asymptomatic Kidney Stones: A Systematic Review
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Introduction: The natural progression of asymptomatic kidney stones remains unclear. Such knowledge may promote value-aligned care for patients and reduce potentially unnecessary procedures. We performed a systematic review to assess the effects of active surveillance on the natural history of asymptomatic kidney stones in adults.

Materials & Methods: We followed the Cochrane's recommended methodology as well as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to report our methods and results. With search themes of "Kidney Stone" and "Active Surveillance," we searched for studies in MEDLINE, all Cochrane libraries, EMBASE, Cumulative Index to Nursing and Allied Health Literature, BIOSIS, Scopus, and Web of Science from inception through October 2017 – in addition to ClinicalTrials.gov, American Urological Association Annual Meeting Abstracts (2014 to 2017), Google Scholar, and reference lists of included studies and prior reviews. Two blinded reviewers independently extracted data and assessed methodological quality. We qualitatively summarized rates of surgical intervention, spontaneous stone passage, symptom development, and stone growth. We assessed the relationship between surveillance duration and rate of surgical intervention with Pearson's correlation coefficient.

Results: Of 7,034 unique records, nine observational studies and four randomized controlled trials met final eligibility criteria (Figure 1). There was substantial variation in reported rates of surgical intervention (7-26%), spontaneous stone passage (3-29%), symptom development (7-77%), and stone growth (5-66%). Mean surveillance duration spanned from 11 to 80 months (range 2-180 months). There was no correlation between average surveillance duration and surgical intervention rate across studies (n = 13, r = -0.01, p = 0.97) (Figure 2), and this finding did not change when restricting analysis to observational studies (n = 9, r = 0.10, p = 0.80). The majority of included studies lacked a control group, permitting a primarily qualitative synthesis of the results and a conservative correlation analysis of reported outcomes; otherwise, methodological quality of included studies was deemed sufficient.

Conclusions: Active surveillance appears to be a durable strategy for a majority of patients with asymptomatic kidney stones, as longer average surveillance durations do not correlate with increased risk of failure and subsequent need for surgical intervention. The majority of our studies were observational, thereby suggesting that clinical judgment is appropriate in selecting patients with asymptomatic kidney stones who can avoid surgery most of the time. Higher-quality studies are needed to ascertain which patients would benefit most from active surveillance.

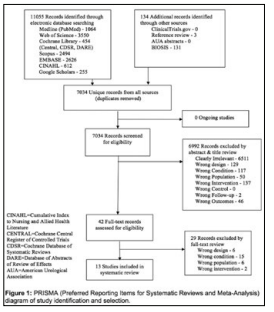

Figure 1: PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) diagram of study identification and selection.

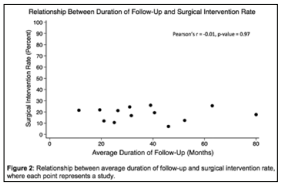

Figure 2: Relationship between average duration of follow-up and surgical intervention rate, where each point represents a study.

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15 Month Experience with a Non-Opioid Pathway for Postoperative Pain after Ureteroscopy
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Introduction: In light of the American opioid epidemic, efforts have begun to implement non-opioid protocols for outpatient urologic surgery. Previously, we reported our initial six month experience demonstrating that ureteroscopy (URS) with stent placement is possible without postoperative opioids for pain control and stent-related symptoms. In this study, we report our 15 month experience demonstrating the continued feasibility of a non-opioid discharge pathway compared to standard opioid medications for postoperative pain following URS and stent placement.

Materials & Methods: Charts of patients who underwent URS with stent placement by a single surgeon over a 15 month period from November 2016 to March 2018 were retrospectively reviewed. During this time period, efforts were made to substitute opioid pain medications on discharge for either no prescription or diclofenac, an NSAID. All patients having normal renal function and no evidence of current or prior opioid tolerance were eligible for the non-opioid protocol. Feasibility was evaluated by measuring the frequency of postoperative events including visits to the emergency room (ER) for stent-related symptoms, stent-related clinic telephone calls, and requests for prescription refills for pain medication in the opioid and non-opioid groups.

Results: 206 patients underwent URS with stent placement: 151 patients were discharged without opioid medications (73.3%) and 55 received opioids (26.7%). Of those discharged without an opioid, 129 received diclofenac and 22 received no pain medication. The majority of patients received adjunct medications such as tamsulosin (71.4%) and phenazopyridine (75.2%) on discharge. A similar percentage of patients receiving opioids and non-opioids had postoperative visits to the ER for genitourinary-related concerns (7 patients receiving opioids (12.7%) and 15 patients without opioids (9.9%); $p = 0.567$). Patients in the non-opioid group made significantly fewer telephone calls (25 patients receiving opioids (45.4%) and 32 patients without opioids (21.2%); $p = 0.0006$). The number of pain medication refill requests was also significantly fewer among patients given non-opioids, as compared to patients given opioids (13 patients receiving opioids (23.6%) and 11 patients without opioids (7.3%); $p = 0.001$).

Conclusions: Our experience using a non-opioid pathway post ureteroscopy and stent placement reveals that approximately 3/4 of patients can be discharged without opioids. Compared to patients receiving opioids, patients receiving non-opioid therapies had similar postoperative adverse events with overall lower impact on outpatient resource utilization. We intend to further elucidate the patient characteristics leading to the necessity for opioids after ureteroscopy in a future subgroup analysis.

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Stent Duration and Increased Pain in the Hours after Ureteral Stent Removal: An EDGE Multi-Institutional Survey
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Introduction: Factors associated with pain after ureteral stent removal have not been well elucidated. Stent duration may have a significant impact on pain after stent removal. We aimed to understand the relationship between pain after ureteral stent removal and duration of stent placement, method of removal, patient age and gender.

Materials & Methods: A survey designed to assess the relationship between quality of life and subsequent treatment decisions was distributed to patients ≥ 18 years of age and with a history of a ureteral stent across seven academic medical centers across the U.S. participating in the Endourology Disease Group for Excellence (EDGE) Consortium between July 2016 and January 2018. Responses were encoded in duplicate and cross-referenced to ensure accuracy. Statistical analyses were performed using Chi-square and multiple logistic regression.

Results: A total of 272 completed surveys were analyzed. Twenty six percent of patients reported increased pain in the hours after ureteral stent removal. A negative trend was observed in the proportion of patients reporting pain after stent removal by duration of time spent with a stent, as defined by a few days (35.5%), about one week (31.0%), and more than a week (22.2%, $p = 0.17$). Patients with a stent one week or less were significantly more likely to experience pain after stent removal compared to those with a stent more than one week (33.0% vs. 21.2%, $p = 0.04$). After adjustment for age, sex, and health status, patients with a stent more than one week were significantly less likely to report pain in the hours after stent removal (OR: 0.57, 95% CI: 0.32-0.99). Women were 88% more likely to experience pain after ureteral stent removal, but this finding did not persist after adjustment (OR: 1.73, 95% CI: 0.98-3.1) After adjustment, age was negatively associated with pain after stent removal (OR: 0.60, 95% CI: 0.41-0.88).

Conclusions: Approximately, one in four patients will experience increased pain after ureteral stent removal. Patients with a shorter duration of ureteral stent placement and who are younger may be more likely to experience an increase in pain in the hours after stent removal. With increased emphasis on setting post-procedural expectations for pain across multiple clinical disciplines, an understanding of factors associated with post-stent removal pain could be helpful in appropriately counselling and managing patients at high risk for morbidity after stent removal.

*Max J, Willscher Award Eligible

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Trends in Regional Narcotic and NSAID Use in Emergency Department Patients with Acute Renal Colic
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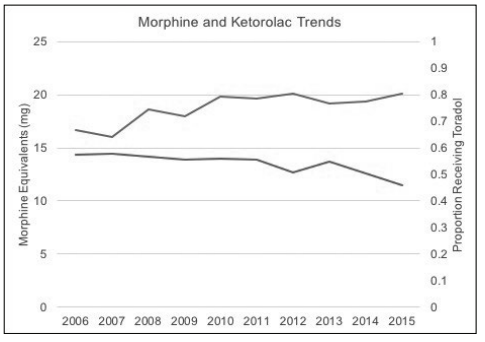
Introduction: Since 1999, the rate of fatal prescription drug overdoses in the United States has nearly quadrupled. A national effort to decrease opiate administration has been undertaken. This study examines the trends in narcotic and ketorolac administration in the Emergency Department amongst patients presenting with a diagnosis of acute renal colic.

Materials & Methods: We identified all individuals presenting to the Emergency Department with a primary diagnosis of urolithiasis (ICD9 592.0, 592.1, 592.9, 274.11) from 2006-2015 in the Premier Hospital Database, a nationally representative discharge database. To focus on non-toxic patients, we limited our cohort to patients with the following criteria: discharge in one day or less, no intravenous antibiotics, no admission to the ICU, no procedures, and no inpatient mortality; we also excluded patients with a history of chronic pain syndrome and renal insufficiency. We then assessed for trends in the receipt of narcotic pain medication, based on morphine equivalents, and ketorolac, through multivariable regression models adjusting for patient and hospital characteristics.

Results: The total amount of morphine received by renal colic patients in the Emergency Department increased from 16.7 milligrams in 2006 to 20.1 milligrams in 2015 (Figure 1). Over this same time, the percentage of all patients receiving ketorolac decreased from 57.3% to 46.0% (Figure 1). There was an increased utilization of narcotics in the Midwest (14.5 to 17.6 milligrams), Northeast (16.0 to 18.3 milligrams), and South (15.6 to 19.6 milligrams) regions over time. The West region's median narcotic utilization was stable (25 milligrams) but higher than the other regions.

Conclusions: Over the study period, patients received higher amounts of morphine during encounters in the Emergency Department for acute renal colic. In this same period, fewer patients were given ketorolac. This study demonstrates that despite a national movement to reduce the use of opiate pain medications in favor of non-narcotic agents, patients presenting with acute pain due to renal colic receive more opiates in the Emergency Department now than a decade ago.



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Do Accountable Care Organizations Impact Prostate Cancer Screening?

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Introduction: Accountable care organizations (ACO) are an alternative payment model designed to reduce low value care and financially incentivize efficient, coordinated care. In this model, rather than paying individual providers based on the volume of care -ACO are reimbursed at the level of the institution, with incentives for providing high quality care. Prostate cancer screening is a service with large variations in utilization and controversy regarding value of care—especially among men over 70. We analyzed trends in PSA screening and prostate biopsies of American men depending on whether their providers joined ACOs.

Materials & Methods: We relied on Medicare claims data to identify hospitals and providers who joined ACOs between 2010 and 2014. We examined whether trends in PSA and biopsy rates from 2010 to 2104 were different in men whose primary care providers were ACO-affiliated versus those with non-ACO affiliated providers. Inverse-probability weighting and difference-in-differences analyses were utilized to compare utilization of both screening tests. Analyses were stratified by age groups: 1) 66-69 and 2) ≥ 70.

Results: For those providers whose primary care providers joined ACOs between 2010 and 2014, the prevalence of PSA screening for men aged 66-69 declined from 62.4% to 55.9%. Non-ACO affiliated providers also had a similar decline in rates of PSA screening from 62.4% to 55.9%. Trends in biopsy rates were similar in both groups: 4.7% to 5.3% from 2010 to 2014 in ACOs and 4.6% to 5.3% in non-ACOs. The difference-in-differences analyses showed that the change in use of PSA from 2010 to 2014 was not significantly different at ACOs and non-ACOs (p = 0.3). Similarly the trend in use of biopsies from 2010 to 2014 was not significantly different in ACOs and non-ACOs (p = 0.7). Similar non-significant differences were observed when the analyses were performed in those aged ≥ 70 years old (Table 1).

Conclusions: Overall, the trend in PSA screening and biopsies from 2010 to 2014 was similar at both ACO and non-ACO affiliated providers, and this was true regardless of patient age. This suggests that the implementation of ACO status did not have an impact on the use of PSA screening or biopsy, including in older age ranges where PSA screening is generally considered to be lower value.

Table 1: Prevalence of Biopsy and PSA Screening in 2010 and 2014 with Difference in Difference Analysis Comparing Men Whose Providers Joined ACOs During the Study Period

	ACO Cohort		Non-ACO Cohort		Difference in Difference
	2010	2014	2010	2014	p value
Ages 66-69					
PSA	62.4	55.9	60.5	54.4	0.3
Biopsy	4.7	5.3	4.4	5.2	0.7
Ages 70+					
PSA	54.3	46.0	54.2	46.4	0.2
Biopsy	4.3	4.8	4.1	4.6	0.5

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Optimizing the Threshold for Pelvic Lymph Node Dissection in the Contemporary Surgical Management of Prostate Cancer

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Introduction: Pelvic lymph node dissection (PLND) is considered standard of care in the surgical management of intermediate and high-risk prostate cancer, but it is associated with potential morbidity. NCCN guidelines recommend PLND in patients with greater than 2% lymph node invasion (LNI) risk, but this threshold is controversial. To better balance the potential benefits and harms of PLND, we examined the relative diagnostic yields and complication rates at different LNI risk thresholds at our institution.

Materials & Methods: We performed a retrospective analysis of all robotic-assisted laparoscopic prostatectomies (RALP) with PLND from 2010 until 2016. Patients undergoing salvage RALP or cystoprostatectomy, receiving neoadjuvant therapy, and those with inadequate data to calculate the pre-RALP LNI risk using the MSKCC nomogram were excluded. Final pathology and rate of symptomatic lymphocele and deep vein thrombosis (DVT) were recorded. The pN1 diagnostic rate and PLND complications were evaluated at various PLND thresholds according to predicted risk of LNI.

Results: The study cohort included 204 patients. The average number of lymph nodes removed was 11. The overall percentage of positive LNs was 15.2%. The balance of diagnostic yield and reduction in morbidity, including percentage of PLND avoided, across LNI risk thresholds is summarized in Table 1. Increasing the threshold for PLND from greater than 2% to greater than 5% would have avoided 22% of PLNDs, but this would have resulted in 9.68% of undetected pN1 disease. At the 5% threshold, four symptomatic lymphoceles and two DVTs would be avoided.

Conclusions: In our contemporary single institution series, increasing the PLND threshold from the currently recommended 2% to 5% reduced symptomatic lymphoceles by 31%, DVT by 33%, and the number of PLND by 22%, with only 9.68% of pN1 patients going undetected. At LNI risk of 5%, our data is within the accepted undiagnosed pN1 disease rate of less than 15%. Each complication adds to procedure morbidity, requiring invasive therapies or anticoagulation. Given the increased surgical risk and morbidity of a PLND, this data represents an opportunity for further research to validate a higher, PLND threshold.

Table 1

PLND Threshold:	> 2%	> 3%	> 4%	> 5%	> 6%	> 7%
# PLND	195	176	167	159	144	130
% PLND Avoided	4%	14%	18%	22%	29%	36%
% Undetected pN1 Disease	0.0%	9.7%	9.7%	9.7%	16.1%	19.4%
# SymptomaticLymphocele	13	10	10	9	8	8
# DVTs	6	4	4	4	3	3

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Specialist Density and Surgery vs. Radiation Therapy for Prostate Cancer: Does Supply Induce Demand?

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Introduction: There is substantial regional variation in rates of surgery and radiation therapy (RT) for prostate cancer (CaP), and lack of objective explanations for why this occurs. Workforce supply (i.e. of urologists (URO) and radiation oncologists [RADONC]) is one potential explanation for treatment variation between regions. In this study, we evaluated whether population density of URO and RADONC was associated with higher rates of surgical and radiation treatment, respectively.

Materials & Methods: Regional rates of radical prostatectomy (RP) and RT (external beam therapy and brachytherapy) among male Medicare beneficiaries with CaP were obtained for 2007-2012 from the Dartmouth Atlas (www.dartmouthatlas.org). These rates were adjusted for age and race. Workforce data for URO and RADONC were obtained from the American Medical Association for 2012, and the population density of specialists for 306 hospital referral regions (HRR) was calculated. We calculated Pearson correlations for specialist density and rates of surgery and radiation therapy, and compared rates of treatment for highest and lowest 20 HRRs based on specialist density.

Results: Mean regional URO density was 97 per 100,000 male Medicare beneficiaries (median 82, range 20-270). Mean regional RADONC density was 40 (median 32, range 10-410). There was no significant correlation between URO density and regional rate of RP (r = -0.12, p = 0.11), nor for RADONC density and regional rate of RT (r = -0.02 p = 0.74). Comparing the highest and lowest 20 regions for URO density, there was no significant difference in average rate of RP (109 vs. 126 per 1,000 male beneficiaries with prostate cancer, p = 0.13), though there was slightly higher RP volume in low density regions. Comparing highest and lowest 20 regions for RADONC density, there was no significant difference in RT, though there was a higher rate of RT in high RADONC density regions (259 vs. 232, p = 0.11).

Conclusions: There is no clear relationship between specialist density and rates of definitive treatment for CaP. These data suggest that it is not merely the presence of specialists, but other cultural and systemic factors that are contributing to the use of certain therapies. As patient decisions should not depend on availability of specialists but rather personal and medical criteria, these data are tentatively reassuring. Further research in drivers of treatment decisions, with goals of ensuring shared decision-making, are needed.

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PROSPER: A Phase 3, Randomized, Double-Blind, Placebo (PBO)-Controlled Study of Enzalutamide (ENZA) in Men With Nonmetastatic Castration-Resistant Prostate Cancer (M0 CRPC)

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Introduction: Men with M0 CRPC and rapidly rising prostate-specific antigen (PSA) are at high risk of developing metastatic (M1) CRPC. ENZA improves overall survival (OS) and radiographic progression-free survival in men with M1 CRPC. We hypothesized that ENZA will improve metastasis-free survival (MFS) in men with M0 CRPC.

Materials & Methods: Eligible men with M0 CRPC, PSA doubling time ≤ 10 mo and PSA ≥ 2 ng/mL at screening continued androgen deprivation therapy (ADT) and were randomized 2:1 to ENZA 160 mg or PBO. The primary endpoint was MFS. Secondary endpoints included time to PSA progression, time to first use of new antineoplastic therapy, OS and safety.

Results: In 1401 men, ENZA significantly prolonged median MFS (36.6 mo vs. 14.7 mo [P < .0001]), time to first use of new antineoplastic therapy (39.6 mo vs. 17.7 mo [P < .0001]) and time to PSA progression (37.2 mo vs. 3.9 mo [P < .0001]) compared to PBO (Table). In the first interim analysis of OS there was a trend in favor of ENZA (hazard ratio [HR] = 0.80; P = .1519). Median duration of treatment was 18.4 mo vs. 11.1 mo for ENZA vs. PBO. Adverse events (AEs) were higher with ENZA vs. PBO (any grade: 87% vs 77%; grade ≥ 3: 31% vs. 23%; serious: 24% vs. 18%); 10% with ENZA discontinued treatment due to AE vs. 8% with PBO.

Conclusions: In men with M0 CRPC and rapidly rising PSA, ENZA treatment resulted in a clinically meaningful and statistically significant 71% reduction in the risk of developing M1 CRPC or death. AEs were consistent with the established safety profile of ENZA.

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Baseline Characteristic	ENZA + ADT (n = 933)	PBO + ADT (n = 468)
Age, median, y	74	75
PSA doubling time < 6 mo, no. (%)	715 (77)	361 (77)
Serum PSA, ng/mL	11.1	10.2
Endpoint		
MFS, median (95% CI), mo	36.6 (33.1-NR)	14.7 (14.2-15.0)
HR (95% CI)	0.29 (0.24-0.35)	
P value	< .0001	
Time to first use of new antineoplastic therapy, median (95% CI), mo	39.6 (37.7-NR)	17.7 (16.2-19.7)
HR (95% CI)	0.21 (0.17-0.26)	
P value	< .0001	
Time to PSA progression, median (95% CI), mo	37.2 (33.1-NR)	3.9 (3.8-4.0)
HR (95% CI)	0.07 (0.05-0.08)	
P value	< .0001	
OS, median (95% CI), mo	NR (NR-NR)	NR (NR-NR)
HR (95% CI)	0.80 (0.58-1.09)	
P value	.1519	

Final analysis; †interim analysis
CI, confidence interval; NR, not reached

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Prognostic Impact of Increased Prostate-Specific Antigen Density in Men on Active Surveillance for Prostate Cancer

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Introduction: Active surveillance (AS) is an increasingly utilized option in the management of appropriately selected men with prostate cancer. Prostate-specific antigen (PSA) density at diagnosis is an important predictor of disease progression, however subsequent change in PSA density has not been thoroughly assessed. We sought to investigate the prognostic impact of post-diagnostic PSA density in men on AS.

Materials & Methods: Within our institutional database of men enrolled in AS for low-risk and favorable intermediate-risk prostate cancer between 1997-2014, we retrospectively identified 335 patients with PSA density measurements both at diagnosis and during AS. PSA density was calculated as PSA divided by prostate volume estimated by transrectal ultrasonography. The primary outcome was treatment-free survival. Secondary outcomes were adverse pathology on radical prostatectomy, metastasis-free survival (MFS), disease-specific survival (DSS), and overall survival (OS). Survival analyses were conducted using the Kaplan-Meier method and Cox proportional hazards regression.

Results: At diagnosis, median age was 66 years (IQR 60-71) and median PSA was 5.0 ng/mL (IQR 3.8-6.8). The vast majority of patients had Gleason ≤ 6 (98%) and clinical stage T1 (93%) disease. During AS, median follow-up was 4.3 years (IQR 2.7-5.6), median PSA measurements were 11 (IQR 7-16), and median prostate volume measurements were 2 (IQR 2-3). Among the 335 patients in the cohort, 100 (30%) progressed to treatment for the following reasons: pathologic progression (77%), PSA progression (16%), patient preference (5%), and other reasons (2%). Among the 100 treated patients, 30 (30%) underwent radical prostatectomy and 6 (6%) had pT3 disease on surgical pathology. On univariate analysis, predictors of progression to treatment included PSA density ≥ 0.15 ng/ml/ml at diagnosis ($p = 0.02$), involvement of greater than 20% of any core on diagnostic biopsy ($p = 0.02$), involvement of 2 or more cores on diagnostic biopsy ($p = 0.01$), and an increase in PSA density on AS ($p = 0.02$). On multivariate analysis, increase in PSA density on AS remained a significant predictor of progression to treatment (HR 1.57, 95% CI 1.02-2.39, $p = 0.04$). Increase in PSA density on AS was not associated with MFS, DSS, or OS.

Conclusions: Increase in PSA density in men on AS for prostate cancer is associated with a higher rate of progression to treatment. With the increased utilization of imaging in the management of these patients, increase in PSA density may represent an important adjunct measure for prognostication of men on AS.

V1

Laparoscopic Inguinal Lymph Node Dissection

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Introduction: Squamous cell carcinoma (SCC) of the penis is a rare cancer with an incidence of 2,380 cases expected in the United States in 2018. The need for inguinal lymph node dissection pivots on pathologic stage of the primary tumor and clinical staging of the lymph nodes. Open inguinal lymph node dissection carries a high morbidity due to local wound complications. Recently, minimally invasive approaches have been used in an effort to decrease wound complications. In this video we demonstrate a minimally invasive surgical approach to inguinal lymph node dissection.

Materials & Methods: The patient is a 70-year old man initially seen for a penile mass who underwent a partial penectomy. Final pathology demonstrated a pT2NxMx, well-differentiated squamous cell carcinoma of the penis with negative margins. CT scan revealed a 1.3 cm right inguinal lymph node suspicious for metastasis. The patient elected to undergo staged laparoscopic inguinal lymph node dissection starting with the right side.

Results: Operative time was 2.5 hours and the estimated blood loss was 10 cc. Pathology demonstrated 7 lymph nodes excised during the surgery, all of which were negative for metastatic disease. In follow up the patient had a well healing operative site and mild edema of his lower extremity. While contralateral lymph node dissection was recommended, the patient declined. He is currently being followed with cross-sectional imaging.

Conclusions: Laparoscopic inguinal lymph node dissection in the treatment of penile cancer is a minimally invasive alternative to open surgery which has the potential to decrease morbidity and improve recovery time.

V2

Excision of Intravesical Mini Sling Using an Exclusively Transurethral Approach

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Introduction: Stress urinary incontinence affects up to 40% of women in the United States. The third generation of midurethral slings known as single-incision midurethral slings (SIMS) was introduced in 2006 with the goal of providing shorter operative time, less postoperative pain, and decreased rates of injury to surrounding structures (e.g. bladder and/or obturator nerve). Although unrecognized bladder injury during SIMS placement is rare complication, it can lead to irritative voiding symptoms and recurrent urinary tract infections (UTIs) and require operative intervention. Open and laparoscopic approaches to excision of extruded sling components expose patients to considerable surgical morbidity. A transurethral approach is a minimally invasive alternative, but some extruded sling components are in locations not readily accessible by this approach. To address this problem, we present a unique transurethral method of extruded sling excision using endoscopic scissors and an Endoloop™ device for countertraction.

Materials & Methods: A 75-year old woman, G4, P4, underwent total vaginal hysterectomy, anterior and posterior repair with vaginal vault suspension and MiniArc™ sling placement 2 years prior to presentation. She subsequently developed bothersome urinary urgency, frequency and recurrent UTIs. Office cystoscopy confirmed intravesical sling extrusion. The patient was taken to the operating room for a transurethral excision of extruded sling components using: a 22Fr Storz cystoscope, cystoscopic cold cup biopsy forceps, Vicryl Endoloop™ device and endoscopic scissors. The Endoloop™ device was introduced alongside the cystoscope transurethrally and secured around the extruded sling anchor. This was then used to provide medial traction of the extruded sling components. Endoscopic scissors were used to incise the eroded mesh flush against the bladder epithelium. Hemostasis was achieved using bugbee electrocautery. At the end of the case, the excised anchor and mesh were removed enbloc transurethrally using the Endoloop™ device.

Results: This minimally invasive transurethral approach allowed for a simple, inexpensive, and low risk procedure for complete removal of extruded SIMS components. The patient was discharged home on the same-day of procedure and had complete resolution of her bothersome urinary symptoms. Importantly, by using a transurethrally introduced Endoloop™ device, the extruded sling components could be manipulated independently of the cystoscope. Traction using the Endoloop™ device may enable transurethral excision of extruded components in locations that would be otherwise difficult to reach using a cystoscope, potentially avoiding the need for an open surgical procedure.

Conclusions: Bladder injury during SIMS placement is a rare event, but is associated with significant long-term morbidity. We describe a surgical approach to excision of intravesical extruded sling components that may enable transurethral excision in cases that otherwise may have necessitated a more invasive open approach. The transurethral technique is a safe and effective way to manage mesh extrusion into the bladder lumen. It helps to avoid unnecessary risks of open or laparoscopic surgical approach to mesh excision with improved patient satisfaction.

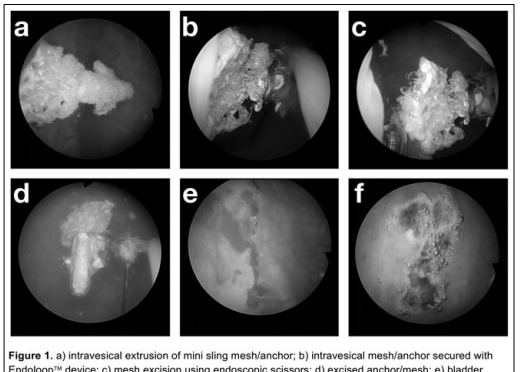

Figure 1. a) intravesical extrusion of mini sling mesh/anchor; b) intravesical mesh/anchor secured with Endoloop™ device; c) mesh excision using endoscopic scissors; d) excised anchor/mesh; e) bladder mucosa before fulguration; f) bladder mucosa after fulguration

V3

Robotic Assisted Retroperitoneoscopic Pyelolithotomy for Staghorn Calculus
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Introduction: Percutaneous nephrolithotomy (PCNL) is standard therapy for large (> 2 cm) or complex renal stones. However, it is associated with serious complications such as bleeding, sepsis and may result in failure to achieve stone free status. Retroperitoneal robotic pyelolithotomy is an alternative procedure with some advantages, including ease of access to kidney structures, greater exposure of the renal pelvis, decreased blood loss, and a higher stone free rate. This video demonstrates the utility of retroperitoneal robotic pyelolithotomy for a staghorn calculous.

Materials & Methods: A 72-year old, otherwise healthy male with a right-sided staghorn calculus elected to undergo a robotic assisted pyelolithotomy. The da Vinci Xi surgical system was used to perform the procedure. Access was obtained to the retroperitoneum with balloon dilation followed by trocar placement with the patient in full flank position. The renal pelvis, ureteropelvic junction, and ureter were exposed. A pyelotomy was made in the posterior renal pelvis. The stone was carefully extracted in its entirety. The collecting system was then repaired.

Results: Total surgical time was 268 minutes, from first incision to skin closure. Estimated blood loss was 10 mL. Stone analysis revealed a carbonate apatite stone (100%). The patient was discharged home on the first postoperative day. His JP drain and foley catheter were removed one week postoperatively and his ureteral stent was removed four weeks postoperatively. There have been no early postoperative complications.

Conclusions: This video presents a successful outcome of a retroperitoneal robotic pyelolithotomy. Retroperitoneal robotic pyelolithotomy is a safe and effective alternative to PCNL for select patients with large renal stones.

V4

Robotic Right Radical Nephrectomy with IVC Thrombectomy
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Introduction: Radical nephrectomy with IVC thrombectomy is a challenging surgery that is often performed through an open approach. We present our robotic technique for performing this procedure and highlight concepts that enable its safe and efficacious completion.

Materials & Methods: The patient is a 74-year-old man who presented with a right renal mass and IVC thrombus found incidentally on follow-up imaging of a known renal cyst. He was completely asymptomatic. Preoperative CT/MRI with contrast revealed a 12cm infiltrative mass in the right kidney, level I IVC tumor thrombus, and suspicious para-aortic lymph nodes. CT chest was negative for metastases. The patient elected to undergo robotic right radical nephrectomy with IVC thrombectomy. After mobilizing the right colon and duodenum and identifying the renal hilum, we began with a retroperitoneal lymph node dissection. Large lumbar veins were clipped and ligated. We then proceeded with radical nephrectomy, which was challenging due to the size of tumor, its adherence to surrounding structures, and presence of a large IVC tumor thrombus. We first dissected around and stapled the right renal artery. Next we circumnavigated the right renal vein, which was thickened with tumor thrombus. Intra-operative ultrasound was used to identify thrombus borders, which extended superiorly to 2-4 cm below the short hepatic veins. Smaller short hepatics were taken with the bipolar, larger ones with clips, and a very large vein stapled, enabling excellent superior lift on the liver and IVC exposure. We placed bulldog clamps inferiorly on the distal IVC, left renal vein, and superiorly on the proximal IVC. We then used endoshears to open the IVC and found tumor thrombus adherent to IVC at the os of the right renal vein. We performed a wide dissection, taking an ellipse of IVC with our specimen. However we safely left an adequate amount of IVC for primary repair with a 4-0 Goretex running suture. The distal bulldog clamp was released, revealing brisk bleeding from a small lumbar vein which was oversewn with 5-0 Prolene. Finally we removed the clamps from proximal IVC and left renal vein. Hemostasis remained excellent, and no significant reduction of IVC diameter was noted.

Results: Estimated blood loss was 300 cc, and IVC clamp time 29 minutes. The patient was discharged on POD2 after an unremarkable postoperative course. Pathology revealed a 13 cm, grade 2-3, pT3b type 2 papillary renal cell carcinoma with negative margins and no malignancy identified in 18 para-aortic lymph nodes.

Conclusions: Key points for the case include adequate preoperative imaging to characterize extent of thrombus, intra-operative ultrasound to confirm thrombus boundaries, complete venous control and mobilization of IVC before its opening, and maintaining adequate IVC lumen diameter. The same oncologic principles of open surgery apply, and there should be a low threshold for conversion if those principles are in question. With appropriate patient selection, adequate surgical planning, and robotic experience, radical nephrectomy and IVC thrombectomy through a robotic approach can be performed safely and effectively with low blood loss and good patient recovery. Additional studies may be useful in determining long-term oncologic outcomes.

V5

Immediate Evaluation and Robot-Assisted Repair of a Urinary Injury Following Hysterectomy
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Introduction: Urinary injuries occur in approximately 0.33% of gynecologic laparoscopic procedures for benign indications[1]. Of these, the majority are recognized intra-operatively and require surgical repair.

Materials & Methods: A 48-year-old women sustained an injury to her trigone during a vaginal hysterectomy. The patient was transferred to our hospital where the injury was evaluated cystoscopically, radiographically and laparoscopically. The injury was repaired acutely in a laparoscopic, robot assisted fashion.

Results: The accompanying video illustrates the following principles; #1: Appropriate evaluation of a urinary injury following gynecological surgery; #2: Separation and mobilization of the bladder and vaginal walls to allow a tension free closure; #3: Development of a peritoneal and omental flap to augment the repair; #4: The value of the robotic approach for precise visualization and suturing deep in the pelvis.

Conclusions: The accompanying video illustrates the principles for evaluation and repair of a urinary injury following hysterectomy and the advantages of a laparoscopic, robot assisted approach in an appropriately selected case.