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Radical Cystectomy versus Trimodality Therapy for Muscle-Invasive Urothelial Carcinoma of the Bladder

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Introduction: The comparative effectiveness of radical cystectomy (RC) and trimodality therapy (TMT) for muscle-invasive bladder cancer remains uncertain, as no randomized data exist. A phase 3 trial (SPARE) was attempted in the UK, but randomization was deemed infeasible and the trial was closed. Herein, we emulated the SPARE trial to evaluate the comparative effectiveness of RC versus TMT.

Materials & Methods: We used the NCDB to emulate a target trial designed to resemble the SPARE trial. We identified patients aged 40-79 with cT2-3 cN0 cM0 urothelial carcinoma of the bladder diagnosed from 2006-2015 who were treated with multiagent neoadjuvant chemotherapy + RC with lymphadenectomy (RC arm) or multiagent chemotherapy + 3D conformal radiotherapy to the bladder (≥64 Gy; or ≥55 Gy in ≥2.5 Gy/fraction; or 39-45 Gy with salvage RC; TMT arm). We fit a flexible logistic regression model for treatment to estimate the propensity score, and then used inverse probability of treatment weights (IPWs) to evaluate the associations of treatment group with overall survival (OS).

Results: A total of 2,048 patients were included, of whom 1,812 underwent RC and 236 underwent TMT. After IPW-adjustment, baseline characteristics were balanced. Median follow-up was 29.0 months, during which time 838 deaths occurred. The 5-year IPW-adjusted OS was 53% for RC and 44% for TMT (p=0.42; **Figure 1**). Compared to RC, TMT was not associated with a statistically significant difference in OS (HR 0.97; 95% CI 0.64-1.19; p=0.40). When examining heterogeneity of treatment effects according to cT stage, age, and Charlson score, RC appeared to be associated with improved OS only for patients with cT3 disease (HR 0.42, p=0.01; **Figure 2**). Similar results were observed in sensitivity analyses.

Conclusions: In observational analyses designed to emulate the SPARE trial, there was no statistically significant difference in OS between RC and TMT. Heterogeneity of treatment effects suggested improved survival with RC only for cT3 disease.

Figure 1: IPW-adjusted Kaplan-Meier plot of overall survival for radical cystectomy (RC) versus trimodality therapy (TMT).

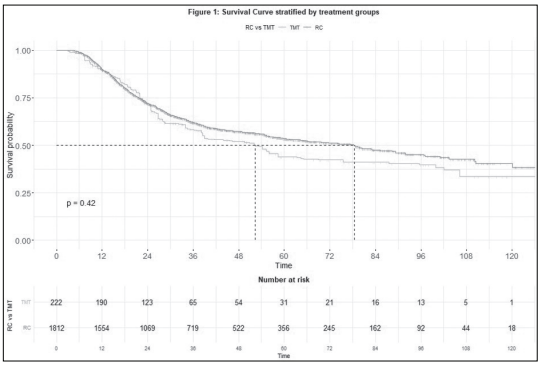
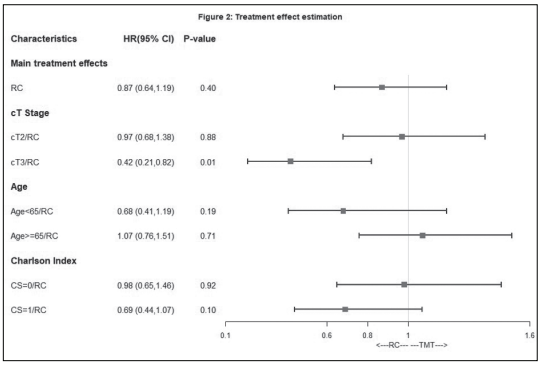


Figure 2: Heterogeneity of treatment effects according to cT stage, age, and Charlson score.



2

Pre-Nephroureterectomy Diagnosis of Low-Grade Urothelial Carcinoma Does Not Predict Low Grade Disease on Final Pathology

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Introduction: Upper tract urothelial carcinoma (UTUC) treatment depends on stage and grade of the disease. The gold standard of treatment is radical nephroureterectomy. In recent years UTUC treatment trends for low grade (LG) disease have shifted more towards minimally invasive and endoscopic approaches. Due to the potentially aggressive nature of UTUC, there is a risk of undertreatment especially if high grade (HG) disease is not confirmed on endoscopic biopsies. We sought to explore the risk of upgrading of UTUC, pathological, and long-term outcomes.

Materials & Methods: A retrospective analysis of nephroureterectomy for UTUC cases performed at our hospital system from 1/1/2006 - 12/31/2020 was completed. Clinicopathologic features of patients were collected. Pre-operative pathology and diagnostic methods were analyzed, and descriptive statistics were summarized. Paired, nominal data of pre-operative and post-operative grading were compared using McNemar's test. All analyses were completed using SPSS Version 26 (IBM Corp, Armonk NY).

Results: 97 patients were included. 68/97 (70%) of patients were diagnosed with UTUC pre-operatively via endoscopic biopsy. 11 (11%) were diagnosed visually by endoscopy and 14 (14%) were diagnosed by cross sectional imaging. Of the 68 patients with biopsies, 37 (54%) were LG and 31 (46%) were HG. Of all patients with preop LG UTUC 25/37 (68%) were upgraded to HG UTUC (p<.0001) on final pathology. A total of 56/68 (84%) patients had HG UTUC on final pathology. Of patients with upgraded final pathology (n=25), 16 (64%) were cT1, 8 (32%) cT2, and 1 (4%) was cT3 and were changed to 10 (40%) pTa, 7 (28%) pT1, 2 (8%) pT2, 5 (20%) pT3, and 1 (4%) pT4. Of upgraded patients with LG and HG on final pathology 2 (16%) and 11 (44%) ultimately passed away, respectively. Type of endoscopic biopsy device was not associated with a difference in LG biopsy upgrading.

Conclusions: Management of LG UTUC on endoscopic biopsies carries significant risk due to potential of undergrading. Caution is highly advised when selecting patients for minimally invasive or endoscopic management even if adequate pathology specimen has been harvested and results in LG disease. A pre-nephroureterectomy diagnosis of LG UTUC is a poor predictor of final pathology.

3

Standard Versus Extended Lymph Node Dissection at the Time of Radical Cystectomy for Bladder Cancer: Emulation of a Clinical Trial

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Introduction: It is uncertain whether lymphadenectomy (LND) provides a survival benefit in patients undergoing radical cystectomy (RC). In the only completed randomized trial on this topic - LEA AUO AB 25/02 - extended LND (eLND) was associated with improved survival compared to limited/standard (sLND), although these associations did not reach statistical significance. Herein, we emulated a pragmatic clinical trial designed to resemble the LEA trial.

Materials & Methods: We identified patients in the National Cancer Database who met the following eligibility criteria based on the LEA trial: adult 40-79 years old, Charlson 0-1, underwent RC with LND for high-grade cT1 / cT2-T4a cNany cM0 urothelial carcinoma of the bladder from 2006-2015, without neoadjuvant chemotherapy, at a hospital performing ≥16 RC/year. sLND and eLND were defined as removal of 4-11 and ≥12 lymph nodes based on the LEA trial. A propensity score (PS) was estimated for receipt of eLND, and the associations of LND type with overall survival (OS) were evaluated adjusting with inverse probability of treatment weights (IPW).

Results: A total of 2248 patients formed the study cohort, including 436 with sLND and 1812 with eLND. Baseline characteristics were well-balanced after PS adjustment. During a median follow-up of 37.5 months, eLND was associated with significantly improved 5-year OS compared to sLND (60% vs. 48%; HR 0.72, 95%CI: 0.61-0.85, p<0.01; **Figure 1**). Effect estimates were consistent across all potential treatment effect modifiers, including cT stage, cN stage, and age (**Figure 2**). Results were robust in sensitivity analyses that modified the definitions for LND and relaxed the annual RC hospital volume requirement.

Conclusions: In observational analyses designed to emulate a completed clinical trial, eLND was associated with improved OS compared to sLND among patients undergoing RC. Survival and effect estimates were similar to those in the LEA trial but statistically significant due to larger sample size.

Figure 1: Adjusted association of extended (eLND) vs standard (sLND) LND with OS among patients undergoing RC for bladder cancer.

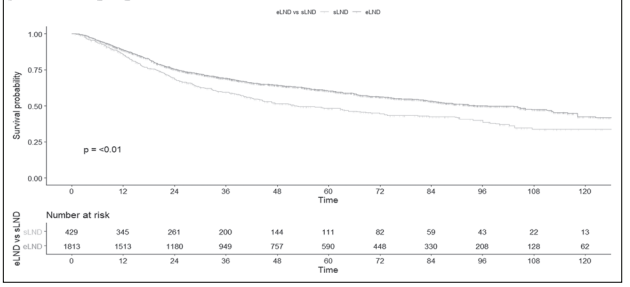
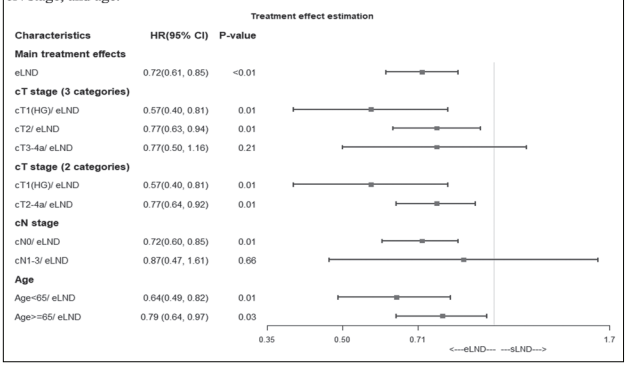


Figure 2: Forest plot of treatment effects across potential effect modifiers, including cT stage, cN stage, and age.



4

Social and Environmental Risk Factors at the Census Tract Levels for Patients Undergoing Radical Cystectomy for Urothelial Carcinoma in Rhode Island in the Last 20 Years

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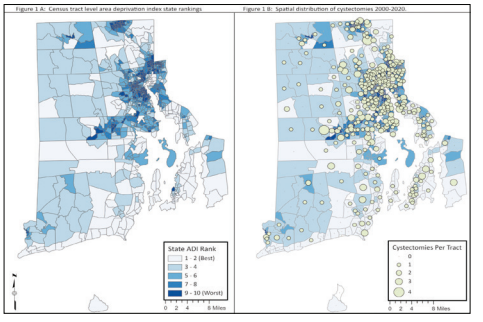
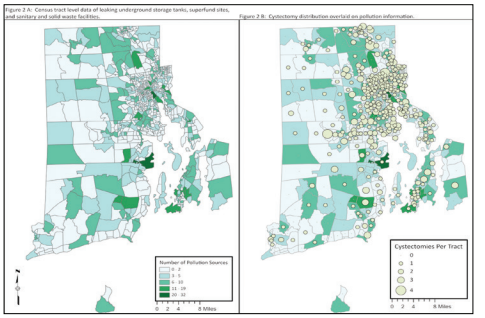
Introduction: Tobacco smoking and occupational exposure are well documented urothelial carcinoma (UC) risk factors. Potentially upstream neighborhood-level factors are underexplored. We examined the association between sociodemographic and pollution composition and incidence of UC treated by radical cystectomy (RC) and overall survival (OS) in Rhode Island.

Materials & Methods: 484 patients underwent RC from 1/2000 to 12/2020 at Brown University affiliated hospitals. Patient addresses were linked to census tractlevel data on neighborhood sociodemographic composition and locations of leaking underground storage tanks, superfund sites, sanitary waste sites, and active solid waste facilities. Using Poisson and Cox proportional hazards models, we assessed incidence of RC and OS as a function of neighborhood pollution, area deprivation index (ADI), poverty, and racial composition quartiles in separate models adjusted for year and age at time of RC.

Results: Average age was 68 years, 73% men, and 90% white, with clinical stage T2 in 32%, Tis in 5%, Tx in 8%, and 3% had no information. Likelihood of RC positively correlated with greater neighborhood pollution (RR for 4th vs. 1st quartile:1.39, 95% CI:1.08,1.79), predominance of white population (RR for 4th vs. 1st quartile:1.94, 95% CI:1.41,2.66) and negatively with greater poverty (RR for 4th vs. 1st quartile: 0.44, 95% CI:0.33, 0.58). Five-year OS rate was 56%, in neighborhoods with highest poverty rates (Q4) was 45%, and in neighborhoods with lowest rates of poverty (Q1) was 62%. Compared with Q1, the hazard ratio for those in Q4 poverty neighborhoods was 1.72 (95% CI:1.16,2.55).

Conclusions: Inequalities in social determinants of health influence incidence and outcomes of UC patients undergoing RC. Patients undergoing RC were more likely to be white and living in affluent neighborhoods (**Figure 1**), however, this could be an artifact of selective survival. Those living in neighborhoods with greater number of pollutants underwent RC at greater rates (**Figure 2**). Risk of death in the first five years following RC was greatest for those living in neighborhoods with low socioeconomic status. Further research is needed to study contextual factors defining the differences in RC use and OS of patients with UC. Health policies and screening programs can target these high-risk UC hot-spots in order to improve earlier detection and patient outcomes.





5

Clinical Utility of Routine Overnight Vital Signs in Patients Undergoing Cystectomy

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Introduction: Obtaining vital signs every four hours, including the overnight period, is routine practice in patients hospitalized after major surgery. However, increasing attention has been drawn to patient sleep disruption as a potential contributor to impaired recovery, hospital delirium, and patient dissatisfaction. We sought to assess whether routine overnight vital signs (as opposed to those obtained for a clinical indication) led to the diagnosis of serious conditions that would otherwise have been missed.

Materials & Methods: Using the electronic medical record, we obtained all vital signs obtained on postoperative days (POD) 0 through 6 of all patients undergoing cystectomy at our institution between January 2016 and December 2020 (a period of five years). The data were filtered to identify complete sets of vital signs obtained between the hours of 22:00 and 05:30, inclusive. Sets of vital signs were then flagged as "abnormal" based on parameters that would generally have prompted a call to the patient's responding clinician (temperature ≥ 101.0°F or < 95.0°F, pulse < 50 or > 120 bpm, systolic blood pressure < 85 or ≥ 190 mm Hg, respirations ≤ 8 or ≥ 22/min, oxygen saturation < 90%). The primary outcome was the degree of intervention, if any, prompted by the abnormal vital signs as determined by chart review. Interventions were categorized as none (event judged clinically insignificant, or intervention was already under way), minor (administration of IV fluids, antipyretics, reordering a patient's home medications, etc.), moderate (antibiotics, blood/urine cultures, imaging studies), or major (ICU transfer or reoperation).

Results: Our search criteria captured a total of 754 patients with 22,382 complete sets of vital signs representing 4,701 patient-nights in the hospital. Of the complete sets of vital signs, 6,920 were obtained between the hours of 22:00 and 05:30. Of these, we identified a total of 47 unique cases of abnormal vital signs reflecting a new change in the patient's status during the overnight period. Most of these cases (24/47, 51%) were deemed clinically insignificant, while 11/47 (23%) prompted a minor intervention, 7/47 (15%) a moderate intervention, and 5/47 (11%) a major intervention. Thus, a total of 12 new-onset clinical events prompting a moderate or major intervention occurred over a total of 4,701 patient-nights in the hospital, a rate of 0.26%. Subjectively, most adverse events reviewed were associated with additional signs or symptoms that would likely have prompted evaluation independently of the abnormal vital signs.

Conclusions: The rate at which routine overnight vital signs (as opposed to those obtained for a specific clinical indication) leads to the diagnosis of a new adverse clinical event is very low. Consideration should be given to omitting routine overnight vitals in stable, uncomplicated patients undergoing cystectomy. We are currently undertaking additional analyses to identify low- and high-risk groups for adverse events and to quantify the costs and benefits of omitting routine overnight vital signs.

6

Radical Cystectomy in a Bubble: Catching All Complications and Readmissions

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Introduction: Radical cystectomy (RC) is a highly morbid procedure with frequent complications and readmissions. Our institution is the only academic center in state and provides a vast majority of cystectomy care. A large integrated health network, EMRs, and a statewide health information exchange (HIE) make hospitalization and outpatient records readily available to us. Here we report adverse advents after RC for all patients from 2015-2019 with detailed 90d results available for every patient.

Materials & Methods: A single institution, prospectively maintained database identified 159 consecutive patients who underwent RC from 2015-2019. Complications were graded and classified by the MSKCC system. Complications and readmissions occurring statewide for 90d after surgery were recorded and analyzed. Univariable and multivariable logistic regression analyses were conducted for all complications, high grade complications, and readmission.

Results: For 159 consecutive patients, 90d follow up was available for 100% of patients and long-term follow-up was available for 101/104 (97.9%) of living patients. Patient demographics are shown in table 1. For patients with ≥ cT2 disease at diagnosis 58/112 (60.7%) received neoadjuvant chemotherapy. Overall, 292 complications were recorded with 79.8%, 13.0%, and 7.2% occurring by 30d, 60d, and 90d, respectively. Individual patient highest complication grades were 0, 1, 2, 3, 4, & 5 occurring at 21.4%, 15.7%, 34.0%, 18.9%, 7.5%, and 2.5% respectively. Readmission rate was 38.4% (61/159) at a median time of 10.0 days after discharge with 22/61 (36.1%) having a diagnosis of infection related to GU source. On multivariable analysis, risk factors for any complication were Age, EBL, ASA, and intraoperative transfusion ($p < 0.05$). No risk factors were identified for high grade complications or readmission.

Conclusions: Our types of complications (class and grade) are comparable to many large series. By incorporating outside hospital EHR, however, we noted higher than expected complication and readmission rates (78.6% & 38.4%, respectively). We believe capturing complications and readmissions statewide (up to 5 hr+ travel radius) allowed for increased detection of adverse events. This data will guide prospective studies aimed at improving patient care for a large rural state.

Table 1. Patient demographics, complications, & readmissions for all radical cystectomy patients from 2015-2019.

Patient Demographics (n=159)		
		Frequency (%), Mean [SD], or Median {IQR}
Age		70.7 [±9.7]
Male Sex		117 (73.6%)
Race (Caucasian)		158 (99.4%)
BMI (median)		27.3 {23.9-31.1}
BMI >30		50 (31.4%)
ASA 3-4		134 (84.2%)
Neoadjuvant Chemo (≥cT2, =112)		68 (60.7%)
All complications (n=292)		
Class	*n=*	*% total*
Gastrointestinal	**57**	**19.5%**
Infectious	**73**	**25.0%**
Wound	25	8.6%
GU	28	9.6%
Cardiac	21	7.2%
Pulmonary	11	3.8%
Bleeding	**33**	**11.3%**
Thromboembolic	12	4.1%
Neuro	10	3.4%
Miscellaneous	19	6.5%
Surgical	3	1.0%
All Readmissions (n=61)		
Class	*n =*	*% total*
Gastrointestinal	6	9.8%
Infectious	**27**	**44.3%**
Wound	4	6.6%
GU	7	11.5%
Cardiac	5	8.2%
Pulmonary	0	0.0%
Bleeding	0	0.0%
Thromboembolic	1	1.6%
Neuro	5	8.2%
Miscellaneous	6	9.8%
Surgical	0	0.0%
Highest grade for each patient		
Grade	*n=*	*% total*
Grade 0	34	21.4%
Grade 1	25	15.7%
Grade 2	54	34.0%
Grade 3	30	18.9%
Grade 4	12	7.5%
Grade 5	4	2.5%

7

Real-World Evidence for Pathological Downstaging of Muscle Invasive Bladder Cancer at Radical Cystectomy

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Introduction: Pathological downstaging of muscle invasive bladder cancer to no residual disease (pT0) at radical cystectomy (RC) is an important surrogate marker for favorable oncologic outcomes. Randomized data supports increased rates of pT0 at RC with neoadjuvant chemotherapy (NAC), but real-world evidence is lacking. We therefore examined real-world rates of pathological downstaging and evaluated patient and tumor characteristics associated with pT0 at RC using a nationwide oncology dataset.

Materials & Methods: We identified adults with cT2-4 cN0 cM0 urothelial carcinoma of the bladder diagnosed between 2006-2016 in the National Cancer Database (NCDB) who underwent RC. Rates of pathological downstaging to pT0 and pT0 pN0 were evaluated according to baseline patient and tumor characteristics. The associations of baseline characteristics with pT0 at RC were evaluated using logistic regression.

Results: A total of 10,483 patients were included in the cohort. Median age at diagnosis 68 (IQR 60-75) years, and 28% of patients received NAC. The overall rates of pT0 and pT0 pN0 were 8.1% and 7.3%, respectively. The pT0 rate was 18.3% among patients receiving NAC, and 4.3% among those who did not receive NAC (p<0.01). The rate of pT0 increased across study years (p<0.01; **Figure 1**). On multivariable analysis (**Table 1**), gender (OR 0.82; 95% CI 0.69-0.98 for female vs male), later year of diagnosis (OR 3.41: 95% CI 1.91-6.75 for 2016 vs. 2006), higher cT stage (OR 0.64; 95% CI 0.49-0.82 for cT3; OR 0.58; 95% CI 0.41-0.81 for cT4 vs. cT1), and receipt of NAC (OR 4.14; 95% CI 3.56-4.82) were independently associated with pT0 at RC. Interestingly, higher income level and educational status were associate with increased rates of pT0 on univariable analysis but not multivariable analysis.

Conclusions: Real-world rates of pathological downstaging are lower than reported in randomized trial data. Univariable results suggest coexistent socioeconomic disparities. Of all patient and tumor characteristics examined, receipt of NAC was associated with the greatest likelihood of pT0 at RC.

Figure 1: Rates of pT0 across study years.

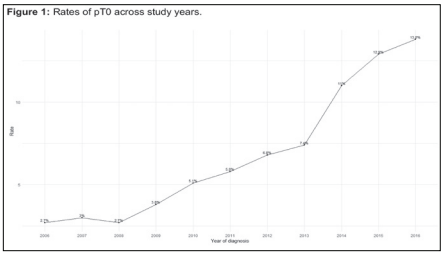

Table 1: Multivariable logistic regression predicting pT0 at RC according to baseline patient and tumor characteristics. Adjusted for other clinicopathological factors not shown here in the table.

Characteristic	Adjusted OR (95% CI)[1]
Gender	
Male	—
Female	0.82 (0.69, 0.98)*
Year of Diagnosis	
2006	—
2013	1.95 (1.06, 3.93)*
2014	2.96 (1.64, 5.93)*
2015	3.43 (1.91, 6.82)*
2016	3.41 (1.91, 6.75)*
cT stage	
cT2	—
cT3	0.64 (0.49, 0.82)*
cT4	0.58 (0.41, 0.81)*
Multiagent NAC	
No	—
Yes	4.14 (3.56, 4.82)*

[1]OR= Odds Ratio, CI = Confidence Interval

8

Determinants of Risk-aligned Bladder Cancer Surveillance - Mixed-Methods Evaluation using the Tailored Implementation for Chronic Diseases Framework

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Introduction: Guidelines for surveillance of patients with non-muscle invasive bladder cancer recommend aligning surveillance frequency with underlying cancer risk. We previously found that risk-aligned surveillance is not commonly provided. Lack of risk-aligned surveillance means too many unnecessary surveillance cystoscopy procedures for low-risk patients and not enough surveillance for high-risk patients with associated delays in detection of cancer recurrence. This mixed-methods study sought to examine whether practice determinants differ between sites where risk-aligned surveillance was more common ("risk-aligned sites") versus those where risk-aligned surveillance was less common ("need improvement sites").

Materials & Methods: We used our prior quantitative data to identify two "risk-aligned sites" and four "need improvement sites" within the Department of Veterans Affairs (VA). Across these sites, we sampled 40 VA staff members (18 bladder cancer providers, 5 nurses, 5 schedulers, and 12 leaders). We performed semi-structured interviews guided by the Tailored Implementation for Chronic Diseases framework that were deductively coded. We integrated quantitative data ("risk-aligned site" versus "need improvement site") and qualitative data from the interviews by cross-tabulating salient determinants by site type (**Table**).

Results: There were 14 participants from the two "risk-aligned sites" and 26 participants from the four "need improvement sites." Irrespective of site type, we found a lack of knowledge on guideline recommendations. Additional salient determinants at "need improvement sites" were a lack of resources ("The next available without overbooking is probably seven to eight weeks out") and an absence of standard routines to incorporate risk-aligned surveillance ("I have my own guidelines that I've been using for 35 years").

Conclusions: Knowledge, resources, and lack of standard routines were salient barriers to risk-aligned bladder cancer surveillance. Implementation strategies addressing knowledge and resources can likely contribute to more risk-aligned surveillance. In addition, reminders for providers to incorporate risk into their surveillance plans may standardize their routines.

Table. Crosstabulation of exemplary quotes by "risk-aligned sites" vs "need improvement sites".

Determinant	Risk-aligned sites	Need improvement sites
Availability of necessary resources	"If I run into a predicament where we do not have […] enough slots, then I would advise the urology Chief and he would […] see if there's patients that can be moved around […]."	"I think we could use more [cystoscopy slots]. Yeah, so I mean I think actually we're actually working towards increasing our throughput. "
Nature of behavior / Routines	"It's templated into every single patient, that this is the guidelines. " [RA009] "Just follow the NCCN guidelines that I have with me. You know, it's pretty automatic."	"I have my own guidelines that I've been using for 35 years." "I think that the practice pattern is individual based on like just a kind of clinical judgment of the provider."

9

Impact of Tobacco Use on Postoperative Morbidity and Mortality Following Surgery for Renal Masses

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Introduction: Tobacco use has been shown to be an independent risk factor for postoperative morbidity following a variety of major surgeries. While tobacco use is both a risk factor for kidney cancer and associated with worse long-term survival, there is minimal data regarding its association with postoperative complications following nephrectomy.

Materials & Methods: We performed a retrospective cohort study of patients undergoing nephrectomy for renal masses between 2003-2017 using the Premier Hospital Database, a discharge dataset representing approximately 20% of non-federal hospitalizations in the United States. Using multivariable logistic regression analyses (MVA), we evaluated the association between tobacco use and the risk of 90-day postoperative complications as defined by the Clavien classification system, adjusting for patient demographics and comorbidities, hospital characteristics, and disease status. We completed subgroup analyses of surgical approach (open vs. minimally-invasive; radical vs. partial), and assessed postoperative complications by system.

Results: 108,430 patients were included in the analysis. 34,368 (31.7%) were identified as tobacco consumers, who were more likely to be male and harbor higher comorbidity indices. On MVA, tobacco consumption was associated with a significantly increased risk of minor complications (Clavien grades 1-2, OR 1.17, 95% CI 1.14-1.21) and non-fatal major complications (Clavien grades 3-4, OR 1.28, 95% CI 1.21-1.35), but no difference with respect to postoperative mortality (OR 0.93, 95% CI 0.79-1.11). Similar results were seen on all subgroup analyses by surgical approach (**Figure 1**). Within complications by system, our analysis demonstrated an association between tobacco use and increased surgical, pulmonary, urologic, infectious, renal, gastrointestinal, and cardiac complications (**Figure 2**).

Conclusions: Tobacco consumption is associated with significantly increased risk of minor and non-fatal major post-operative complications in patients undergoing nephrectomy for renal masses regardless of surgical approach, with the strongest association for surgical, pulmonary, and urologic complications. It is therefore appropriate to encourage tobacco cessation among patients planning to undergo kidney surgery in an effort to optimize postoperative outcomes.

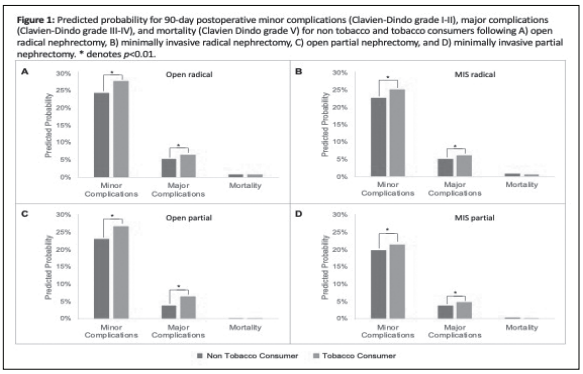

Figure 1: Predicted probability for 90-day postoperative minor complications (Clavien-Dindo grade I-II), major complications (Clavien-Dindo grade III-IV), and mortality (Clavien Dindo grade V) for non tobacco and tobacco consumers following A) open radical nephrectomy, B) minimally invasive radical nephrectomy, C) open partial nephrectomy, and D) minimally invasive partial nephrectomy. * denotes $p<0.01$.

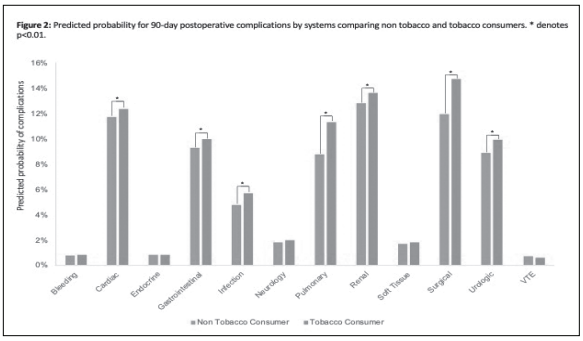

Figure 2: Predicted probability for 90-day postoperative complications by systems comparing non tobacco and tobacco consumers. * denotes p<0.01.

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Early Experience and outcomes with Robotic retroperitoneal lymph node dissection

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Introduction: Retroperitoneal lymph node dissection (RPLND) remains a standard of care option in the management of early stage testicular cancer and in the setting of for post-chemotherapy NSGCT with residual retroperitoneal mass. As robotic expertise with complex surgery improves, more teams have embraced this approach which offers the promise of lower morbidity than a standard, open approach via midline incision. We present our single institution experience with robotic RPLND for testis cancer as well as a video illustration of our technique.

Materials & Methods: All robotic RPLND were performed by either two-fellowship trained urology attendings or an attending and fellow. Patients were positioned in a modified lateral position and either the Si or the Xi Da Vinci robot was used. Bilateral template dissection was performed for all post-chemotherapy RPLND (PC-RPLND) cases and required re-positioning and re-docking, a process made easier with the Xi robot. For one bilateral template post-chemotherapy case we used the 'reverse prostate' position with the robot docking over the patient's head and patient supine and in Trendelenberg. For stage I disease, the decision for bilateral or unilateral template dissection was individualized for each patient.

Results: A total of 14 patients underwent robotic RPLND from 2016 to 2020. Patient demographics and perioperative outcomes are highlighted in the **Table**. Of note, 64% of patients underwent primary RPLND while 36% were in the post-chemotherapy setting. Median operative time for unilateral cases was 4.4 hrs (IQR 4.4-4.6) and for bilateral cases was 6.2 hrs (4.8-7.8). Estimated blood loss (EBL) was 100mL (IQR 63-213) and the median hospital stay was 2 days (IQR 1-2). Overall, 4 patients experienced complications within 90 days and the highest was Clavien Dindo 2--abdominal pain with emergency room visit which was assumed due to pancreatitis from passing a gallstone. One late complication occurred beyond 90 days post-op: a patient presented with a unilateral ureteral stricture, which was successfully managed endoscopically with dilation. None of the patients in the primary RPLND setting had positive nodes however 4 patients in the PC-RPLND setting had positive nodes (3 with teratoma and 1 with residual germ cell tumor who received further chemotherapy). All patients are without recurrence at a median follow-up of 24 (IQR 6.3-42) months. Of those that we were able obtain information on antegrade ejaculation (n = 9), six patients (67%) retained ejaculation. Of the three patients without antegrade ejaculation, all were in patients undergoing PC-RPLND.

Conclusions: Robotic RPLND is safe and feasible in both primary and post-chemotherapy settings in properly selected patients, with shortened convalence compared to the open approach. Early experience suggests a low rate of perioperative complications and excellent oncologic outcomes.

Follow up months (median, IQR)	24 (6-42)
Age (median, IQR)	32 (29-40)
BMI (median, IQR)	26 (23-27)
ASA (median, IQR)	2 (2-2)
Primary RPLND (n, %)	9 (64%)
Post-chemo RPLND (n, %)	5 (36%)
Bilateral template (n, %)	8 (57%)
EBL mL (median, IQR)	100 (63-213)
Operative time min (median, IQR)	293 (261-388)
Hospital stay (median, IQR)	2 (1-2)
Number of nodes (median, IQR)	34 (24-43)
Case with positive nodes (n, %)	29%
Any complications within 90 days (n, %)	4 (29%)
Highest Clavien Dindo complication	2
Antegrade ejaculation preserved (n, %); N total = 9	6 (67%)
Adjuvant therapy (n,%)	1 (7%)
Recurrence (n,%)	0 (0%)

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Improved Efficiency of Thulium Versus Standard Holmium Ureteroscopic Laser Lithotripsy Leads to Large Cost Savings

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Introduction: Nephrolithiasis prevalence approaches 10% in the United States with an almost $5 billion/year associated cost of care. As laser lithotripsy is one of the most common urologic procedures, small cost savings per case can have a large financial impact. Recently, the FDA approved thulium fiber laser (TFL) lithotripsy. This technology decreased our average ureteroscopic lithotripsy case time for comparable stones when compared to a standard 100W holmium laser (Hol:YAG). Here, we perform a cost benefit analysis to show projected cost savings at our institution.

Materials & Methods: Capital cost for Olympus SOLTIVE™ SuperPulsed Laser system was obtained. Price of individual Hol:YAG and TFL fibers were compared. Direct and indirect operating rooms costs per min when using laser at our institution in 2020 were calculated by the financial department. TFL was not introduced until late October and therefore weighted Hol:YAG fiber cost contribution in direct cost calculations was also considered. Indirect costs were assumed to be equal for Hol:YAG and TFL lithotripsy. Average operative times for each modality were determined. Expected annual cost savings were calculated as follows: Time saved (min/case) x Direct OR cost ($/min) x Cases/year = Annual cost saving ($/year).

Results: Initial capital costs for 2 SOLTIVE SuperPulsed laser systems based on list price was $350,000. Individual TFLs cost $319.50 vs. $450.00 for holmium fibers. Direct operating room costs for the facility were calculated at $33.82/min, which includes a blended average of Hol:YAG and TFL fiber costs, heavily weighted to Hol:YAG. Average operation time with TFL was 13 min less than with Hol:YAG, saving $440/case. Including laser fiber cost savings not fully accounted for in the calculated direct cost/min raises estimated savings to as high as $570/case. Annually ~670 cases are performed at our institution, giving a range of $294,800 to $381,900 savings per year.

Conclusions: Switching from standard Hol:YAG to TFL lithotripsy reduced our operative time significantly, leading to large cost savings ($440/case). TFLs are $150.50 less expensive than Hol:YAG fibers. Together, yearly cost savings are estimated to be $294,000-$381,900. We conservatively expect to cover TFL capital expenditure for 2 laser systems within five fiscal quarters.

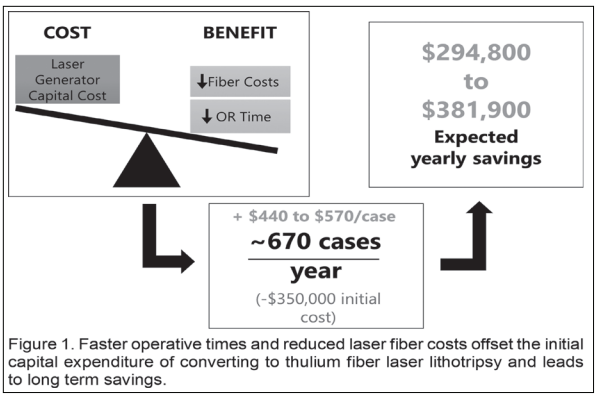

Figure 1. Faster operative times and reduced laser fiber costs offset the initial capital expenditure of converting to thulium fiber laser lithotripsy and leads to long term savings.

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Feasibility of a Non-opioid Pathway Post Ureteroscopy: Joint Analysis from Two Academic Center

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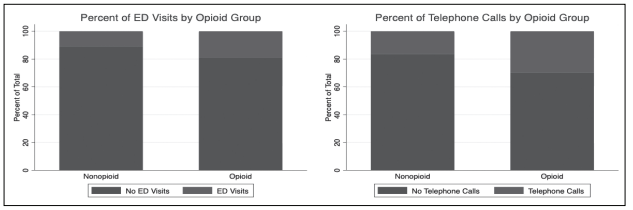
Introduction: In an effort to combat the alarming amount of postoperative opioid prescribing in the United States (U.S.), many surgical specialties are implementing pathways to limit the routine use of postoperative opioids with the goal of zero opioid prescribing. We sought to examine the durability of established non-opioid post ureteroscopy (URS) pathways previously implemented at two academic urology centers in the U.S.

Materials & Methods: We examined patients who underwent URS at two academic centers utilizing a non-opioid postoperative pathway between November 2016 and March 2020. Primary outcomes evaluated included adverse events (Emergency Department (ED) presentation, and Office phone calls for postoperative genitourinary symptoms) for patients discharged with and without opioids. Secondary outcomes were factors associated with adverse events.

Results: In total, 699 patients underwent URS with stent placement. Of these, 652 (89.4%) were discharged without opioids and 74 (10.6%) received opioids postoperatively. Of those discharged without opioids, 484 (77.4%) received non-steroidal anti-inflammatory medications. The majority of patients were prescribed adjunct medications (acetaminophen, phenazopyridine, and/or tamsulosin) upon discharge. Compared to patients discharged without opioids, patients who were prescribed opioids were more likely to present to the ED (67 (10.7%) vs. 14 (19.9%), p=0.037) and call the clinic postoperatively for genitourinary symptoms (102 (16.3%) vs. 22 (29.7%), p=0.004). In a multivariate analysis, patients prescribed opioids post URS (OR 1.9, 95% CI 1.1 - 3.5, p=0.024) and patients who had an opioid prescription preop (OR 2.2, 95% CI 1.1 - 4.5, p=0.032) were associated with higher odds of calling the clinic for genitourinary symptoms. Older patients (OR 0.98, 95% CI 0.97 - 0.99, p=0.006) were less likely to call the clinic for genitourinary symptoms.

Conclusions: The study highlights that almost 90% of patients can be discharged safely without opioids following URS. In our cohort, patients prescribed opioids experienced higher postoperative healthcare interactions (ED visits and office phone calls). We hope our results will encourage other urologists to consider non-opioid pathways post URS.



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PSA Density is Complementary to Prostate MRI PI-RADS Scoring System for Stratifying Clinically Significant Prostatic Malignancies

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Introduction: While PSA has traditionally been used for prostate cancer(PCa) risk stratification, prostate MRI has more recently allowed improved diagnosis of clinically significant PCa(CSPC). However, it is not well described if these two tests are complementary to each other. The objective of this study was to determine if prostate MRI and PSA can provide complementary insights into PCa risk-stratification.

Materials & Methods: Biopsy results were reviewed from 327 patients who underwent MR/US fusion targeted prostate biopsy. Each biopsy sample from the lesions was given a Gleason grade (GG) and pathologic outcomes were stratified by various parameters, including PI-RADS v2 score. CSPC was defined as Gleason score ≥7. Logistic regression was used to determine OR with 95%CI.

Results: A total of 709 lesions were analyzed. We found PSA density (PSAD) and PIRADS-score provided complementary predictive value for diagnosis of CSPC (AUC PSAD: 0.67, PIRADS: 0.72, combined: 0.78, p<0.001). When using a PSAD cut-off of ≥0.15 ng/ml/cc, 24% of all PIRADS-4 and 47% of all PIRADS-5 lesions were found to have CSPC, compared to 11% of PIRADS-4 and 35% of PIRADS-5 lesions with PSAD<0.15 (figure 1). When controlling for PIRADS-score, age, and race, multivariate analysis showed that PSAD was independently associated with CSPC using the cutoff of ≥0.15 ng/ml/cc (OR 2.24, 95%CI 1.41-3.54, p<0.001). This finding was also supported when performing multivariate analysis controlling for PIRADs, age and race using PSAD as a continuous variable (OR 1.03 per 0.01 PSAD increase, 95% CI 1.02-105, p<0.001).

Conclusions: PSAD appears to be a useful marker that can stratify the risk of CSPC in a complementary manner to prostate MRI. Further studies are warranted to help determine optimal PSAD cut-offs by PI-RADS scores to optimize CSPC predictions.

	Holmium:YAG	Thulium Fiber Laser	p-value
n	51	51	
Gender (%)			
Female	20 (39.2)	26 (51.0)	0.32
Male	31(61)	25(49.0)	
BMI (median [IQR])	29.50 [24.58, 33.71]	28.12 [25.76, 32.25]	0.503
Cumulative Stone Diameter (mm) median [IQR]	10.00 [8.00, 12.00]	10.60 [6.74, 13.00]	0.992
Pre-stented (%)	19 (37.3)	12 (23.5)	0.196
Impacted Stones (%)	8 (15.7)	6 (11.8)	0.774
Ureteral Access Sheath Used (%)	37 (72.5)	32 (62.7)	0.397
Dominant Stone Composition (%)			0.899
Calcium Oxalate	40 (78.4)	41 (80.4)	
Calcium Phosphate	8 (15.7)	8 (15.7)	
Uric Acid	3 (5.9)	2 (3.9)	
Stone Location (%)			
Intra-renal	27 (52.9)	28 (54.9)	1
Intra-ureteral	35 (76.1)	29 (59.2)	0.124
Distal ureter	21 (41.2)	10 (19.6)	0.031
Mid ureter	1 (2.0)	8 (15.7)	0.036
Proximal ureter	15 (29.4)	12 (23.5)	0.654
Mean Operative Time (number of included cases)			
Overall	62.78 (51)	49.84 (51)	0.021
Cumulative Stone Diameter <15mm	55.88 (41)	41.93 (40)	0.007
Cumulative Stone Diameter <10mm	53.77 (30)	36.5 (24)	0.002
Patients Returning to ED within 30 days (%)	3 (6)	3 (6)	1

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Sagacity of Same Day Discharge: Incidence and Timing of Postoperative Adverse Events Following Minimally Invasive Urologic Surgery

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Introduction: Among efforts to judiciously utilize resources and contain cost, is a push to reduce postoperative length of stay, resulting in several groups promoting same day discharge (SDDC) for patients undergoing minimally invasive prostatectomy (MIP) and minimally invasive partial nephrectomy (MIpN). We aimed to 1) describe the incidence and timing of adverse events and 2) compare the incidence of these outcomes for patients undergoing SDDC and non-SDDC following MIP and MIpN.

Materials & Methods: We review the American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database for patients undergoing MIP and MIpN from 2015 to 2019. The primary outcomes were to describe the incidence of adverse events, readmission, reoperation, and death and the timing of these outcomes after surgery. We compared the incidence of outcomes of interest between patients undergoing same day discharge (SDDC) vs. non-SDDC using the chi-squared test.

Results: A total of 64,975 patients underwent MIP (46,869) and MIpN (18,106), of which 650 (1%) had a SDDC. We noted 4,593 complications in 3,560 (5.5%) patients. Compared with non-SDDC patients, SDDC patients had similar incidence of any complication (5.2% vs. 5.4%, p=0.830), reoperation (0.9% vs. 1.3%, p=0.372), readmission (3.5% vs. 4.4%, p=0.268), or death (0.16% vs. 0.13%, p=0.836). With regards to timing of adverse events, 984/1057 (93%) blood transfusions, 59/129 (46%) myocardial infarctions, 40/86 (47%) cardiac arrests, 91/397 (23%) reoperations, 219/2857 (8%) readmissions, and 14/87 (16%) deaths occurred within 2 days of the index surgery.

Conclusions: The perioperative period for patients undergoing MIP and MIpN remains a critical period in which serious adverse events do occur. Same day discharge may be a viable option for select patients, but a period of observation to ensure patients safety should remain the standard of care for most individuals undergoing MIP and MIpN.

Figure 1. Mean Opioid Doses Prescribed in 2019 vs. 2020

	2019 (N=257)	2020 (N=266)	
Emergency Department Opioid Administration, Means (MME)			P-Value
Oxycodone Dose	8.75	12.5	0.42
Morphine Dose	5.87	5.27	0.36
Dilaudid Dose	5.76	5.07	0.20
Percocet Dose	9.25	12.86	0.12
Vicodin Dose	5.0	6.43	0.41
Total Opioid Dose	**6.42**	**6.61**	**0.71**
Total Discharge Opioid Prescription, Means (MME)			
Oxycodone Dose	67.79	12.5	0.23
Morphine Dose	5.87	5.27	0.42
Dilaudid Dose	5.76	5.07	0.31
Percocet Dose	9.25	12.86	0.26
Vicodin Dose	5.0	6.43	0.52
Total Opioid Dose	**65.84**	**73.98**	**0.04**
Daily Opioid Dose (MME/d)	**12.74**	**14.68**	

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Computer Modeling for Optimization of Endourological Robotic Devices
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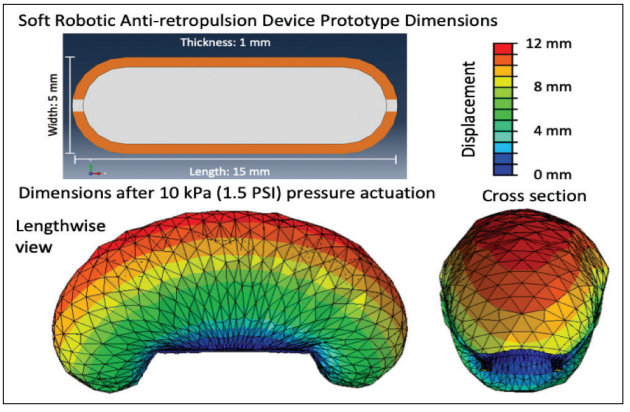
Introduction: Soft robotics uses deformable materials to create minimally invasive surgical devices and has implications in endourology, where gentle manipulation of tissue is crucial. We propose a novel soft robotic anti-retropulsion device to prevent stone migration during ureteroscopy. The ideal anti-retropulsion device must be thin enough to slide past a ureteral stone, yet be able to deploy and expand to over 10mm in diameter to prevent proximal stone fragment migration. To reduce in-person laboratory work during the COVID-19 pandemic, we use commercially available software to design and test our device.

Materials & Methods: Prototype soft robotic anti-retropulsion devices and actuators were tested in the finite element modeling (FEM) software, Abaqus (Dassault Systèmes). Material properties were programmed from previously published, experimentally validated soft robotic actuator modeling. We used Ecoflex 00-30 silicone given its superior compliance (expansion under pressure) for balloon actuation. Simulated pressure was applied to the inner surface of balloon actuators of varying dimensions, and the final geometry (deformation) after expansion under pressure was modeled.

Results: Configurations of soft robotic actuators were iteratively designed and tested in Abaqus software. The initial device design was a cylindrical, 1-mm-diameter balloon tested at 0.1mm and 0.05mm thickness of Ecoflex silicone. Simulated pressure of 30kPa (4.5 PSI) and 20kPA (3 PSI) resulted in deformation diameters of 4.5mm and 7.3mm, respectively, below our ideal 10mm diameter. Final device design (below) was 1mm thick and planar, resulting in deformations greater than 12mm at 10kPa (1.5 PSI), large enough to prevent stone migration proximally in a dilated ureter. Our device conforms to the irregular geometry of the ureter upon deployment with low pressure actuation. This minimizes the potential tissue trauma when compared with current high pressure, low compliance balloons (861 kPa, 125 PSI) or metal devices.

Conclusions: Computer modeling tools enable rapid prototyping of soft robotic endourological surgical devices. We demonstrate by optimizing balloon deformation under pressure for a novel soft robotic anti-retropulsion device. Our final design can slide by ureteral stones then gently actuate over 12mm at low pressure to minimize tissue trauma.



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Association of Urinary Stone Surgery and Patient-reported Complications in Spinal Cord Injury
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Introduction: People with spinal cord injury (SCI) have an increased risk of urinary stone formation and an increased risk of morbidity from the surgeries to remove them. Some have postulated that the highest risk of stones is in the first year after SCI yet the natural history and health-related impact of stone disease among this patient population remains poorly defined. We hypothesized that a history of urinary stones requiring surgery would be associated with an increased incidence of SCI-related complications and lower quality of life (QOL).

Materials & Methods: 1479 participants with SCI in the Neurogenic Bladder Research Group registry were asked about urinary stone history (pre-dating or since SCI), SCI-related complications and neurogenic bladder-related QOL. Eligibility: age ≥ 18 years with acquired SCI and followed for 12 months. Neurogenic Bladder Symptom Score (NBSS) score was used to determine bladder symptoms for QOL assessment. Continuous variables and NBSS categories were compared by the t-test and categorical variables were compared by the chi-square test (R version 3.5.2). Because the presence of stones was assessed by participant recall, we stratified our groups by history of stone surgery in order to ensure we were capturing clinically significant urinary calcifications.

Results: At study entry participants were a median of 11 years post-SCI and 189 (12.8%) reported a history of bladder or kidney stones surgery; 99.5% of these occurred after the SCI. Median time between SCI and the first stone was 5.6 years (interquartile range [IQR] 1.8-12.8). During the year of observation, the incidence of stone surgery was 8% - 9% in those with a remote history of stone surgery and 2% per year in those without prior stone surgery (p=0.001). SCI-related complications and QOL are shown in **Table 1**. There was no significant difference in the rate of patient-reported UTIs but there was an increased incidence of UTI-related hospitalizations in those with prior kidney (18%) or bladder stone surgery (16%) compared to those with no stone surgery (11%, p=0.013). There was a higher rate of hospitalization for those with a history of stone surgery, with common reasons including blood clots, UTI, pressure ulcers and pneumonia (p=0.001). There was no clinically significant difference in NBSS QOL domains across the three cohorts.

Conclusions: People with SCI are at high risk for urinary stones and this risk continues over the long term. People who experience a stone are at increased risk for future stones. Kidney stones are associated with other negative outcomes such as hospitalization for UTI, pressure ulcers, deep venous thrombosis and pneumonia though they do not appear to affect QOL. People with a history of urinary stones warrant careful surveillance both for additional stone episodes and for other negative health outcomes.

	No Prior Stone Surgery N=1289	Prior Bladder Stone Surgery N=100	Prior Kidney Stone Surgery N=89
Number of UTIs in 12 months, N (%), *P* = 0.442			
0	347 (27)	23 (23)	18 (20)
1-3	588 (46)	50 (50)	39 (44)
>=4	353 (27)	27 (27)	32 (36)
UTI Hospitalization in 12 months, N (%), *P* = 0.013			
Yes	145 (11)	16 (16)	16 (18)
Any hospitalized complication, N (%), *P* = 0.001			
Not Hospitalized	737 (57)	41 (41)	28 (31)
Blood clot	50 (4)	4 (4)	5 (6)
Bowel problems	22 (2)	1 (1)	0 (0)
Kidney failure	0 (0)	1 (1)	0 (0)
Pneumonia	22 (2)	3 (3)	4 (4)
Pressure ulcer	106 (8)	9 (9)	13 (15)
Urinary stone(s)	2 (0)	2 (2)	4 (4)
UTI/kidney Infection	221 (17)	30 (30)	29 (33)
Other	128 (10)	9 (9)	6 (7)
No complication checked	1 (0)	0 (0)	0 (0)

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Evaluating Spontaneous Stone Passage Rates During the COVID-19 Pandemic

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Introduction: During the COVID-19 pandemic our institution limited elective surgery including management of kidney stones. Additionally, patients themselves were reluctant to pursue elective surgery. This presented us a unique opportunity to reassess the natural history of symptomatic nephrolithiasis given potentially prolonged periods of conservative management.

Materials & Methods: A retrospective review was performed of patients presenting to the emergency room (ER) with flank pain secondary to nephrolithiasis from March to April of 2020 (COVID peak period of elective surgery limitations), and a comparative cohort from March and April 2019. Assessed outcomes included definitive stone treatment at initial presentation to the ER, rate of spontaneous stone passage, and time to elective surgery from initial ER presentation. Chi-square or Mann- Whitney U tests were utilized for dependent binary variables and continuous variables, respectively. A Kaplan Meier analysis was used to demonstrate differences in time to elective surgery between the two eras.

Results: Baseline characteristics did not differ between groups (**Table 1**). Patients discharged from the ER were more often offered medical expulsive therapy (71.6% vs. 55.0%, p = 0.026) during the COVID era. The rate of surgical stone management or stent placement at initial presentation did not differ, however, discharged patients waited longer from initial ER presentation to elective surgery (55.3 vs. 33.1 days, p = 0.02) (**Figure 1**). Spontaneous stone passage rates were similar between groups despite the delay, and similar stone location and stone size between eras.

Conclusions: During the height of the COVID pandemic, ER patients with symptomatic stones had similar characteristics at presentation but were more often offered MET. Spontaneous stone passage during the pandemic was no different than in 2019, despite a significant difference in time to elective surgery from initial presentation to the ER with flank pain.

Variables	March-April 2019	March-April 2020	*p*-value
Number of Patients	146	98	
Average Age (years)	49.8 (20-79)	46.7 (19-80)	0.06
Gender			0.60
Male	68 (46.6%)	49 (50%)	
Female	78 (53.4%)	49 (50%)	
Average BMI	31.1 (15.0 – 56.6)	30.27 (17.6-54.3)	0.31
Average Charleston Comorbidity Index (CCI)	1.5 (0-10)	1.2 (0-11)	0.06
Average Stone Size (mm)	4.9 (1-30)	5.1 (1-16)	0.32
Stone location			
1 (distal ureter/UVJ)	62 (45.9%)	56 (61.5%)	
2 (mid ureter)	22 (16.3%)	7 (7.7%)	
3 (proximal ureter)	29 (21.5%)	16 (17.6%)	
4 (UPJ)	7 (5.2%)	4 (4.4%)	
5 (renal stone)	14 (10.3%)	8 (8.8%)	
Hydronephrosis	117 (80.7%)	88 (89.8%)	0.07
Discharged from ER	120 (82.2%)	81 (82.7%)	0.92
Discharged with MET	66 (55%)	58 (71.6%)	**0.02**
Surgery on presentation	23 (15.8%)	12 (12.2%)	0.44
Stent Placement	15 (10.3%)	6 (6.1%)	
Ureteroscopy	8 (5.5%)	6 (6.1%)	
Spontaneous Passage	43 (29.5%)	28 (28.6%)	0.77
Time to Elective Surgery (days)	33.1 (6-171)	55.3 (8-112)	**0.02**

*MET – Medical Expulsive Therapy, defined as discharge from ER with Tamsulosin or other alpha-blocker

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Multidisciplinary Stone Clinic May be Associated with Equalizing Urine Volume Irrespective of Socioeconomic Status

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Introduction: Poor fluid intake and associated low urine volume (<2 L) on 24-hour urine collection are known risk factors for nephrolithiasis. Kidney stone risk is higher in certain demographics, and low 24-hour urine volumes have been associated with certain socioeconomic status such as low-income. We aimed to compare 24-hour urine volumes amongst high-risk stone formers followed in a multidisciplinary stone clinic (MSC) where patients are seen by urologists, nephrologists, and dietitians in one patient encounter.

Materials & Methods: A retrospective review of patient records at a single academic medical center MSC was conducted. Patient demographics (race/ethnicity, gender assigned at birth, insurance status, and religious status) and 24-hour urinary volume were collected. Urine volumes of patients who completed multiple 24-hour urine collections were averaged to produce one mean urine volume per patient. T-tests and ANOVA were used for statistical analysis to assess for differences between groups.

Results: A total of 117 patients were included in the analysis with an overall mean 24-hour urine volume of 1,980+-684 mL. No significant difference was detected between white and non-white patients (1,893+-754 mL versus 1,977+-671 mL respectively, p=0.645) and between female and male patients (1,917+-757 mL vs. 2,019+-577 mL respectively, p=0.409). Patients with Medicare, Medicaid, and private insurance had similar urine volumes (1,851+-562 mL vs. 1,882+-673 mL vs. 2,018+-713 mL respectively, F(2,114)=0.641, p=0.529). Christian, Jewish, and non-religious groups had similar urine volumes (1,974+-667 mL vs. 2,082+-675 mL vs. 1,811+-873 mL respectively, F(2,114)=0.327, p=0.722).

Conclusions: There were no significant differences in 24-hour urine volume among patients from different socioeconomic status related to race/ethnicity, gender assigned at birth, insurance, and religion. Although previous studies suggest an increased risk for kidney stones in certain demographics, this study demonstrates that an MSC model may optimize the patients' risk factors for stone formation irrespective of their socioeconomic status. Thus, clinicians should consider the potential benefit of a multidisciplinary approach in stone formers across all social determinants of health. Further investigations are necessary to characterize the impact of MSC in different populations.

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Association of Urine Findings with Metabolic Syndrome Traits in a Population of Patients with Known Nephrolithiasis

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Introduction: The odds of nephrolithiasis increase with an increasing number of metabolic syndrome (met-s) traits. An inverse relationship between met-s traits and decreasing urine pH and decreasing ammonium/net acid excretion (NH4/NAE) has been observed in non-stone formers. Uric acid stone formers have been shown to have lower urine pH and lower NH4/NAE than BMI matched controls on a similar diet. We evaluated associations of urine factors from 24-hour urine studies and stone composition with the number of met-s traits in a large cohort of stone-forming patients.

Materials & Methods: A retrospective review of records of patients >18 years with 24 h urine collections from July 2009 to December 2018 was conducted. Patient factors, laboratory values and associated diagnoses were identified within 6 months of urine collection and stone composition within 1 year. Four groups based on the number (0, 1, 2, > 3) of met-s traits (hypertension, obesity, dyslipidemia, diabetes) were evaluated. Trends across the groups were tested using linear contrasts in analysis of variance for continuous variables and linear terms in logistic regression for categorical variables.

Results: 1473 unique patients met inclusion criteria (835 with stone composition). Met-s groups were 0=684, 1=425, 2=211, 3 and 4 =153. There were no differences among the groups for urine volume, calcium, or NH4/eNAE. There was a significant trend ($p< 0.001$) and decreasing proportion of calcium phosphate stones ($p=0.09$) and calcium oxalate stones ($p=0.01$) with an increasing number of met-s traits.

Conclusions: Stone forming patients with met-s have a defined pattern of metabolic and dietary risk factors that contribute to an increased risk of stone formation including higher acid excretion, largely the result of higher protein intake, and lower urine pH. We did not find evidence of reduced NH4 excretion as an explanation for the low urine pH in met-s described in previous studies.

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Pre-operative Urinary Evaluation Prior to Ureteroscopy and Post-operative Infection Rates

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Introduction: Current AUA guidelines strongly recommend obtaining a urinalysis in all patients and urine culture in patients with suspected UTI or recurrent UTIs prior to ureteroscopy. Prior studies report positive urine culture results in 7.0 to 49.6 % of patients prior to ureteroscopy or PCNL for stone disease. We investigate the impact of urine culture results on the development of post-operative infectious complications in patients undergoing ureteroscopy for stone disease.

Materials & Methods: We performed a single center retrospective study of patients undergoing ureteroscopy with laser lithotripsy for stone disease between January 2016 and December 2018. We reviewed the post-operative infectious complications (fever, sepsis, pyelonephritis) within 30 days of the procedure. Pre-operative urine culture results were stratified into negative (<10k CFU/mL), mixed flora (20-100k CFU/mL), or positive (>100k CFU/mL). Pre-operative urinalysis data (bacteria, leukocyte esterase, nitrites) was obtained for patients without pre-operative urine culture results.

Results: 762 of 796 patients (96%) had urine culture results collected prior to ureteroscopy. Of those patients, 536 patients (70.3%) had a negative urine culture, 136 patients (17.8%) had mixed flora, and 90 patients (11.8%) had a positive urine culture. Patients were treated with antibiotics prior to the day of surgery in 98% of positive cultures, 31% of mixed flora, and 7% of negative cultures. Urine cultures were collected within 30 days of the procedure in the majority of patients (479 of 667; 71.8%), between 31 and 60 days in 127 patients (19.0%), and more than 60 days in 61 patients (9.1%). Of the 35 patients without urine culture results, 29 patients (83%) had a urinalysis prior to ureteroscopy which was negative for nitrite and leukocyte esterase in 100% and 86% of patients, respectively.

Conclusions: A large majority of patients in this single center study were pre-operatively evaluated for the presence of bacteria in urine according to AUA guidelines. Most patients with a positive culture were appropriately treated with pre-operative antibiotics, but there was inconsistency in treating mixed flora with pre-operative antibiotics. Rates of infectious complications were low in all 3 groups ranging from 2.9 to 3.3 %.

	Number of Patients	% of Patients	Number of Patients with POF/UTI	% of Patients with POF/UTI	Number of Patients with Sepsis/ Pyelonephritis	% of Patients with Sepsis/ Pyelonephritis
Positive (>100k CFU/mL)	90	11.8	3	3.3	0	0
Mixed Flora/Isolate (20-100kCFU/mL)	136	17.8	4	2.9	0	0
Negative (<10k CFU/mL)	536	70.3	15	3.2	2	0.4
Total	762		22		2	

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Does Achieving Your Own Access In Percutaneous Nephrolithotomy Decrease Pain and Opioid Use Among Patients?

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Introduction: Percutaneous nephrolithotomy (PCNL) is a combination of two procedures that first requires the establishment of percutaneous renal access followed by endoscopic stone fragmentation. At many institutions, renal access is obtained by interventional radiologists (IR) prior to stone treatment by urologists, whereas other urologists obtain access at the time of PCNL. While efforts to reduce opioid use during and after PCNL are ongoing, narcotic medications are still standard of care postoperatively for many urologists. We sought to compare the differences in opioid use in patients whose access is established by urology vs. IR at our institution.

Materials & Methods: A retrospective analysis of 287 patients included from January 2016 - December 2020 undergoing PCNL at an academic institution was performed to compare those who had their nephrostomy access by IR vs. own urologist. IR access was performed in the radiology suite the same day under sedation, whereas urologist access was performed in the operating room at time of PCNL. Length of procedure was determined by times in the operating room alone. Opioid medication dosing was converted to morphine equivalent daily dosing (MEDD) for comparison. An ANOVA analysis was conducted for inpatient opioid use and outpatient opioid prescriptions to determine differences.

Results: 287 patients were included in the analysis. 250 patients underwent PCNL with IR access vs. 37 patients with own urologist access over the time interval. 76.8% of IR group received opioids postoperatively while inpatient vs. 56.8% of own access patients (P=0.03). The IR group received a median of 10 morphine milligram equivalents/day (MEDD) on floor vs. 7.5 MEDD for own access (P=0.194). Opioids were prescribed at discharge for 77.6% of IR vs. 56.8% for own access (p=0.012). MEDD of discharge opioids was 30 for both groups (p=0.226) but median quantity prescribed was 10 tablets for own access vs. 20 tablets for IR group (p=0.002). Length of procedure was 81 min for patients undergoing PCNL with urologist access vs. 47 min for IR obtained access (p< 0.001). Length of stay was 31.5hrs for own access vs. 46hrs IR group (p=0.228). Differences in moderate-severe complications (Clavien-Dindo 3+) were not statistically significant between the two groups (3% for own access vs. 11% for IR group (p=0.589).

Conclusions: Achieving nephrostomy access by the urologist at time of PCNL decreases opioid use for patients including MEDD dispensed as inpatients as well as outpatient opioid tablets prescribed, but at the cost of increased length of procedure. Further research is needed for opioid reduction strategies for patients undergoing either urologist or IR obtained access.

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The "Fragile" Urethra as a Predictor of Early Artificial Urinary Sphincter Erosion

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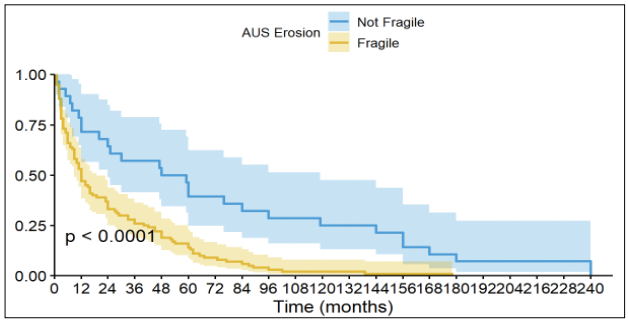
Introduction: Artificial urinary sphincter (AUS) cuff erosion occurs in 2-15% of patients. Some have described "fragile" urethras (previous pelvic radiation, failed AUS, or urethroplasty) to be at higher risk of erosion. Others have described risk factors such as androgen deprivation therapy (ADT), transcorporal placement, and 3.5 cm cuff. Most studies on AUS erosion have only included data on AUS cuffs placed at high volume university centers. Because university centers may have a higher concentration of high-risk men, this could skew findings through a referral bias. We sought to study risk factors for erosion among a cohort of men who underwent AUS placement by either community-based or university surgeons in order to gain a more representative sample of men and see if previously described risk factors hold true.

Materials & Methods: This was a multi-institutional retrospective review of all patients with AUS cuff erosions who underwent AUS explant from at 6 institutions. Cuff removals were all done by university physicians, but included men who were referred for removal after AUS placement by community surgeons. Univariate analyses included t-test and chi-square test. A Cox proportional-hazards model for time to erosion was performed with the predictors being the components of a fragile urethra controlling for other previously described risk factors. Kaplan-Meier survival curves and log-rank test compared "fragile" urethras with "not fragile" urethras. All statistical analysis was done using R version 3.5.2.

Results: Of the 128 men included, 38% had undergone AUS placement by community-based surgeons. Median time to AUS explant was 15.5 months (interquartile range [IQR] 5.8 - 52.2). Eighty-one men (63%) had pelvic radiation, 49 (38%) ADT, 16 (12%) prior urethroplasty, 44 (34%) prior failed AUS, 39 (30%) transcorporal cuff, and 11 (9%) had a 3.5cm cuff. One hundred men (78%) had "fragile" urethras. Radiation (Odds ratio [OR] 1.60, 95% CI 1.05-2.44) and urethroplasty (OR 2.22, 95% CI 1.23-4.00) were independently associated with earlier time to erosion. The Kaplan-Meier estimates for AUS survival time by cohort show 1- and 5-year survival rates of 71.4% and 39.3%, respectively, for "not fragile" urethras and 47.0% and 14.0% for "fragile" urethras (**Figure 1**, p<0.0001).

Conclusions: In a cohort of men whose AUS cuff eroded after placement by either community-based or university-based surgeons, previous findings about the "fragile" urethra held true. A "fragile" urethra remains a significant risk factor in cuff erosion; in fact, a large majority of the erosions occurred in men with fragile urethras.



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Variable Growth Patterns of Transition vs. Peripheral Zones of Prostate - Implications for BPH Therapy

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Introduction: As men age, the prostate gland continues to grow at around 2.9% per year depending on the initial prostate size. While the variable growth rate of the total prostate gland is recognized, the growth rate patterns of the different prostate zones among adult males remain largely unclear. The continuous prostate growth leads to the development of Benign Prostatic Hyperplasia (BPH) in elderly men. 5-alpha reductase inhibitors (5ARIs) are one of the main medical therapies for BPH and are known to reduce the total prostate size. Here, we evaluated the growth rate patterns of different prostate zones and measured the effect of 5ARI treatment on zonal growth rates.

Materials & Methods: Prostate MRI data and clinical information were obtained retrospectively on 160 patients who had a history of BPH or low-grade prostate cancer and underwent at least three prostate MRIs between 2003 and 2018. Prostate volume was measured and calculated for the central gland, peripheral gland, and total prostate. The outcome was analyzed using linear regression.

Results: We observed that prostate growth rates vary depending on age, the prostate zone, and 5ARI use. Body mass index (BMI) and Transition zone index (TZI) are associated with the growth rate of the peripheral zone ($p=0.027$, $p<0.001$ respectively), but not the central zone growth rate. 5ARI use is significantly associated with the reduction in the central zone growth rate (Regression coefficient [RO]: -0.123 to -0.005; $p=0.035$), not the peripheral zone. In addition, patients with TZI greater than 60% had the most significant reduction in the central zone growth rate while taking 5ARI (RO: -0.151 to -0.063; $p<0.001$).

Conclusions: The growth pattern of the prostate varies between the central and peripheral zones and is dependent on age and BMI. In addition, reduction of the prostate size as a result of the 5ARI treatment occurs mainly in the central zone. Patients with TZI greater than 60% had the greatest reduction of the central zone growth rate with 5ARI treatment.

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Describing the Urinary Microbiome in Pre-operative Urine Specimens of Lichen Sclerosus Induced and Non-Lichen Sclerosus Induced Urethral Stricture Disease

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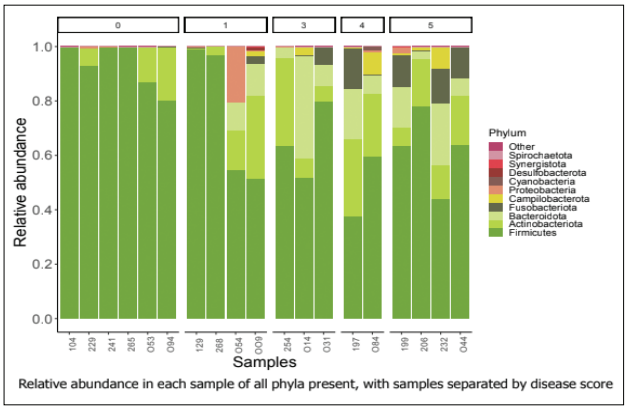
Introduction: Lichen sclerosus (LS) is a chronic inflammatory condition that can affect both the penile skin and urethral epithelium in men. Over time, severe impairment of sexual and urinary function can result, from preputial adhesions and phimosis, skin tearing with erections, acquired buried penis, and urethral stricture disease (USD). The pathophysiology of LS USD is poorly understood, with a heterogeneous presentation and disease severity. This study seeks to describe differences in the urinary microbiome of patients with pathologically confirmed LS USD vs. non-LS USD.

Materials & Methods: An IRB-approved protocol of men with USD was performed. Pre-operative clean-catch voided urine was collected in 34 men with pathologically confirmed LS USD and non-LS USD. Bacterial genomic DNA was extracted using the PowerMag Soil DNA Isolation Kit. 16S rRNA gene sequencing was performed using the MiSeq platform for paired-end sequencing. Amplicon sequence variants (ASVs) were generated via dada2 v1.16.0. ASV taxonomy was assigned up to genus level using the SILVA v.138 database. The pathologic evaluation of strictures was based on 5 typical histologic features of LS (Prabhu et al 2013). For the purpose of this study, two groups were formed based on the following LS score: non-LS strictures (LS score 0-1) and LS strictures (LS score 3-5).

Results: Sufficient bacterial DNA for analysis was obtained from 19 patients (10 non-LS USD and 9 LS USD). Significant differences in alpha diversity (within sample variance) and beta diversity (between sample variance) were observed ($p<0.05$) between the two cohorts. β diversity, as described by observed ASV, showed median ASVs for NLS samples were 25, whereas LS were 57 ($p=0.016$). β diversity is significantly different between scores 0 and 5 ($p<0.05$) by PERMANOVA analysis including Bray-Curtis, and weighted and unweighted UniFrac scores. 2 phyla were noted to be significantly different between status groups, bacteroidota more common in LS ($p=0.012$) and firmicutes more present in NLS ($p=0.037$). Overall, alpha and beta diversity of samples is statistically significant between disease status groups, with a trend towards increasing diversity with higher pathologic scores.

Conclusions: LS USD exhibits significant alterations in diversity and differential abundance of urine microbiota compared to non-LS USD controls, with a trend of diversity increasing along with pathologic LS score. While further validation in a larger sample is necessary, this finding could be used to guide further investigation into the role of bacteria and the urinary microbiome in LS USD pathogenesis, the severity of presentation, and stricture recurrence.



Relative abundance in each sample of all phyla present, with samples separated by disease score

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Selective Laser Enucleation of the Prostate: Preserving Sexual Function without Compromising Urinary Outcomes

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Introduction: Holmium laser enucleation of the prostate (HoLEP) is recommended for prostate glands of all sizes and is becoming a popular alternative to the transurethral resection of the prostate (TURP). Side effects of the procedure include stress incontinence, irritative lower urinary tract symptoms, and sexual function, most commonly retrograde ejaculation. Our goal was to evaluate perioperative outcomes related to sexual function and urinary function in patients who underwent selective laser enucleation of the prostate.

Materials & Methods: Retrospective review of the first 150 cases of HoLEP was performed from May to December 2020. Twelve patients within our cohort underwent selective enucleation of the prostate for an intravesical median lobe or a high bladder neck. Criteria for choosing to treat patients with selective enucleation must have the above criteria without obstructing lateral lobes. Patients were asked to comment on whether they had retrograde ejaculation during their follow up appointment. Urinary function was assessed using the American urological association symptom score (AUA-SS) and asking if they were experiencing urinary incontinence during their follow up appointment. Descriptive statistics and student t-test was used to assess outcomes.

Results: Mean age of our cohort was 64.2 years of age (Range 52-82 years). One of our patients was in urinary retention requiring an indwelling foley catheter prior to surgery. Average peri-operative AUA-SS scores significantly improved (22.6 vs. 3.7, p=0.0003). Average peri-operative quality of life scores significantly improved (4.5 vs 0, p=<0.0001). Average peri-operative post void residual volumes were significantly improved (257.9 vs. 60.8, p = 0.04). Of the 12 patients undergoing selective enucleation, 7 patients reported normal ejaculation after the procedure. Two patients were not sexually active prior to their procedure. Data was missing from two patients. One patient had retrograde ejaculation. One patient had to be placed on Myrbetriq post-operatively for persistent irritative voiding symptoms.

Conclusions: In our case series of selective laser enucleation of the prostate urinary function significantly improved peri-operatively with preservation of ejaculation in the majority of our patients. A larger series is necessary with a longer follow up period to further investigate the durability of these findings.

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Assessing the Quality and Content of Online Information About Benign Prostatic Hyperplasia

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Introduction: Benign Prostatic Hyperplasia (BPH) is a common disease, affecting around half of men over the age of 50 worldwide. While urologists specialize in treatment of BPH, general practitioners are often the first physicians to diagnose and start medical treatment for BPH. Consequently, it is common for patients to search the Internet before and after urologic consultation to better understand their diagnosis and treatment options. However, online health information is not well regulated and may be unreliable or difficult for patients to access or comprehend. This study aims to evaluate the readability and quality of available websites describing BPH treatment options.

Materials & Methods: Three search engines, Google, Bing, and DuckDuckGo, were used to search the terms "BPH," "BPH surgery," and "BPH treatment" to replicate a patient seeking self-education about BPH. 62 websites were identified, 23 of which were designated advertisements. Three readability formulas (Flesch-Kincaid Grade Level, Flesch-Kincaid Reading Ease, SMOG) were used to generate readability scores. The DISCERN standardized questionnaire was used to evaluate website quality.

Results: According to two out of three readability formulas, mean readability scores for the websites analyzed were in line with the American Medical Association-recommended 7th grade reading level. The mean DISCERN score for all websites was 68, equating to "Excellent" quality. However, the DISCERN scores for advertisements were significantly lower than non-advertisements (48.8 vs. 74.2, t = -23.3, p <0.05), being rated of "Fair" quality versus the "Excellent" quality of non-advertisements. Additionally, we noted that of the sites advertised in search results 58.3% were selling herbal supplements.

Conclusions: Overall, websites about BPH treatment are written at the recommended 7th grade reading level. However, it is also clear that advertised websites, which hold the most optimal search result positions, have lower quality, reliability, and are largely selling unproven herbal supplements. We postulate that this gives supplement companies, who largely have unproven products and heavy bias, an outsized influence on the online education of patients with BPH.

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Urine miRNA Biomarkers that are Differentially Expressed in Lichen Sclerosus Induced and Non-Lichen Sclerosus Induced Urethral Stricture Disease

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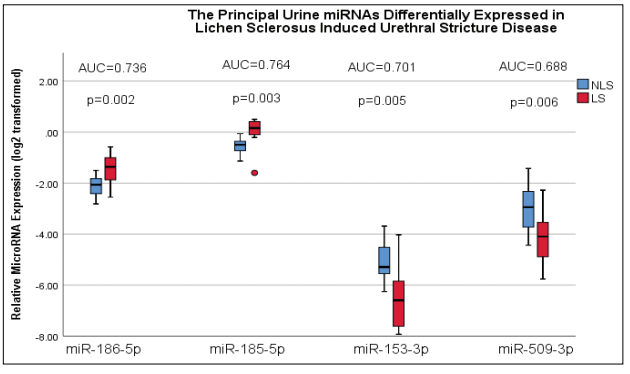
Introduction: Identifying non-invasive biomarkers that distinguish Lichen Sclerosus (LS) induced from non-LS induced urethral strictures would have broad implications for the diagnosis, counseling, and treatment of urethral stricture disease (USD). The objective of this study is to determine which miRNAs are differentially expressed in urine samples from patients with LS USD versus non-LS USD.

Materials & Methods: A prospectively maintained institutional USD database of patients who underwent urethroplasty was queried for patients with an available pre-operative voided urine sample obtained between July 2018 and February 2020. Urine miRNA were analyzed in patients with and without histologically confirmed LS USD. Total RNA was isolated and reverse transcribed from each urine supernatant sample. miRNA expression was then profiled using RT-qPCR arrays for 376 unique miRNAs. Urine samples were excluded if there was recent catheterization, if the urine was obtained from a suprapubic tube, or if the patient had a history of hypospadias.

Results: In total, 24 patients met inclusion criteria, 14 (58%) of which were post-operatively histologically classified as having LS. There were no significant differences between the LS and non-LS USD groups regarding patient age, body mass index, history of smoking, or history of diabetes mellitus. Of the 376 miRNAs tested, forty-five unique miRNAs were differentially expressed in LS urines ($p<0.05$), 4 of which had a p-value of <0.01. Of those four, miR-186-5p (p=0.002, AUC 0.736) and miR-185-5p (p=0.003, AUC 0.764) were upregulated in LS, while miR-153-3p (p=0.005, AUC 0.701) and miR-509-3p (p=0.006, AUC 0.688) were downregulated (**Figure 1**).

Conclusions: This is the first study to demonstrate unique urine miRNA that distinguish LS from non-LS USD. This discovery could be used to create a non-invasive urine test to distinguish the LS vs non-LS USD, therefore obviating the need for biopsy. The two most promising candidates, miRNAs 185-5p and 186-5p, have been shown to mediate the androgen receptor, fibrosis pathways, and cell proliferation pathways. Further investigation is needed to validate these findings in a larger cohort.

Figure 1: Relative expression levels of the top four microRNA differentially expressed in the urine of LS patients.



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"En Bloc" with Early Apical Release Compared to Standard Holmium Laser Enucleation of the Prostate During Initial Learning Curve

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Introduction: Holmium laser enucleation of the prostate (HoLEP) has emerged as an alternative treatment to transurethral resection of the prostate for bladder outlet obstruction. Widespread adaptation has been limited by the steep learning curve necessary to master HoLEP. We sought to compare operative efficiency of HoLEP using both the standard, multi-incisional approach and "en bloc" with early apical release (EBAR) during the initial learning curve.

Materials & Methods: We retrospectively reviewed the initial 95 consecutive men who underwent HoLEP between April 2019 and September 2020 by a single surgeon. 50 patients underwent standard HoLEP procedure, and 45 patients underwent EBAR. We compared patient demographics, pre and post-operative metrics, (Table 1) as well as intra-operative metrics (Table 2) between both groups. Differences between groups were evaluated with Mann-Whitney U and Kruskal-Wallis tests.

Results: There were no statistically significant differences between groups among the variables listed in **Table 1**. Compared to a standard HoLEP, EBAR was associated with lower volume of saline irrigation used (48.66 L vs. 57.99 L, p = 0.037) and decreased operative time (131.84 minutes vs. 152.90 minutes, p = 0.007) (**Table 2**), even with similar weight of tissue removed. There was no difference in length of stay (0.91 days vs. 0.96 days, p = 0.362) or in laser energy used (204.19 kJ vs. 203.34, kJ, p = 0.897). There were no differences in Clavien ≥ 2 complications between the groups.

Conclusions: The utilization of the EBAR technique during the initial learning curve allows for a faster, more efficient operation without any difference in functional outcomes or major complications compared to a standard HoLEP.

Table 1

	Overall	Standard	"En bloc"	
	N = 95	N = 50	N = 45	
	Mean (STD)	Mean (STD)	Mean (STD)	p-value
Age (years)	68.61 (7.86)	68.62 (8.17)	68.60 (7.59)	0.846
BMI	28.49 (5.17)	29.22 (5.51)	27.67 (4.69)	0.107
Charlson Comorbidity Index	2.99 (1.37)	3.10 (1.50)	2.82 (1.21)	0.466
Prostate Volume (cc)	93.09 (43.46)	96.68 (37.92)	88.94 (49.27)	0.069
Pre-op AUA Symptom Score	21.34 (6.64)	22.09 (6.89)	20.44 (6.33)	0.307
Pre-op AUA QOL	4.64 (1.11)	4.67 (1.11)	4.62 (1.13)	0.886
Post-op AUA Symptom Score	5.94 (6.17)	5.60 (5.36)	6.40 (7.29)	0.933
Post-op AUA QOL	1.42 (1.89)	1.17 (1.72)	1.73 (2.09)	0.421
Pre-op PVR (cc)	213.49 (253.39)	162.05 (148.13)	264.92 (320.57)	0.708
Post-op PVR (cc)	34.51 (37.27)	29.88 (30.29)	40.20 (44.11)	0.386
	N (%)	N (%)	N (%)	
Prior Bladder Outlet Surgery	11 (11.58)	5 (10.0)	6 (13.33)	0.614
Anticoagulation	30 (31.58)	17 (34.0)	13 (28.89)	0.595
Prior α-blockers/ 5-ARIs	90 (94.74)	46 (92.0)	44 (100)	0.219
Intravesical Median Lobe	64 (67.37)	36 (72.0)	28 (29.47)	0.245
Pre-op Urinary Retention	36 (37.89)	21 (42.0)	15 (33.33)	0.387

Table 2

	Overall	Standard	"En bloc"	
	N = 95	N = 50	N = 45	
	Mean (STD)	Mean (STD)	Mean (STD)	p-value
Operative Time (minutes)	142.92 (54.40)	152.90 (45.71)	131.84 (61.29)	**0.007**
Saline Irrigation (L)	53.27 (25.27)	57.99 (24.41)	48.66 (25.53)	**0.037**
Laser Energy (kJ)	203.77 (90.90)	203.34 (81.40)	204.18 (100.09)	0.897
Pathology Volume (g)	60.74 (39.13)	57.58 (32.50)	64.24 (45.50)	0.763
Length of Stay (days)	0.94 (0.56)	0.96 (0.45)	0.91 (0.67)	0.362

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Real-World Healthcare Resources Analysis Reveals UroLift PUL has Similar Surgical Retreatment Rates and Lower Post-Operative Complications vs. TURP and GreenLight Laser PVP

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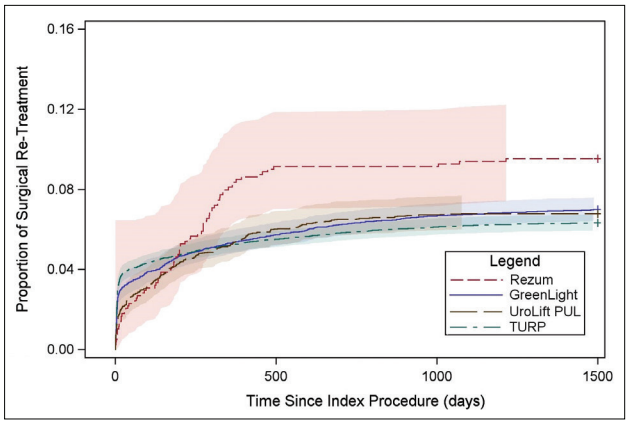
Introduction: The surgical approach to resolving prostatic obstruction has evolved from being a TURP-only pathway to include innovative options that minimize toxicity with continued effectiveness. Real-world studies which compare outcomes for MISTs and traditional surgery for BPH and impacts on health care systems are sparse. Here, Medicare and commercial claims are analyzed for rates of surgical retreatment and post-operative complications experienced by patients who underwent a traditional surgery (TURP/GreenLight Laser PVP) or MIST (Prostatic Urethral LIFT (PUL utilizing the UroLift System)/Rezum steam injection) for LUTS/BPH.

Materials & Methods: Longitudinal patient-level data was acquired from a retrospective observational analysis of a representative sample of Medicare and commercial medical claims (obtained from IBM Watson). Men with a BPH diagnosis code who received an outpatient index procedure of TURP, GreenLight, UroLift PUL, or Rezum from January 2015-December 2019 were included. Surgical retreatment was defined as undergoing TURP, GreenLight, UroLift PUL, Rezum, or HoLEP secondary to the index procedure. Post-operative complications were defined as secondary procedures with a CPT or ICD10-PCS code. Rates for complications and surgical retreatment and were calculated through 1 and 4 years respectively via cumulative incidence curve.

Results: The database includes the following patient distribution: 18,794 TURP patients, 9,894 Greenlight, 4,639 UroLift PUL and 780 Rezum patients. 9.5% of Rezum patients had a surgical retreatment over 4yrs, which was higher than retreatment after TURP (6.3%), GreenLight (7.0%), and UroLift PUL (6.8%) (logrank p=0.004) (**Figure 1**). The lowest incidence of 1-year overall complications occurred after PUL (16%), and was highest after Rezum (23%). Rates of the following complications at 1-year were highest for the following procedures: catheterization - Rezum 7.3%, stone removal - TURP 4.5% and GreenLight 3.6%, and cystoscopy - UroLift PUL 4.1%. Other complications (e.g. bleeding control, stricture repair, fulguration) occurred at a frequency of ≤1%.

Conclusions: The largest healthcare claims analysis for BPH procedures reveals that complications are lowest after UroLift PUL. Surgical retreatment occurs with similar frequency between UroLift PUL, TURP and GreenLight, and is highest after Rezum.



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Hypoalbuminemia is Associated with Increased 30-day Complications Following Rectourethral Fistula Repair: A NSQIP Study

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Introduction: Surgical management of rectourethral fistula (RUF) is complex and can include bowel and urinary diversion, bowel resection, cystectomy, or urethral reconstruction. Hypoalbuminemia is a marker of poor nutrition and has been associated with increased complications in other major surgical procedures including cystectomy and colorectal surgery. Yet, the limited prevalence of RUF makes it a challenging entity to study. We sought to utilize a large national database to describe the population of men undergoing RUF repair and to evaluate the effect of hypoalbuminemia on postoperative complications.

Materials & Methods: The American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database was queried for all male patients who underwent RUF repair from 2006-2018. Postoperative 30 day complications included wound infection, organ space surgical site infection, wound dehiscence, urinary tract infection, sepsis, venous thromboembolism, pneumonia, mortality, and return to operating room.

Results: A total of 250 patients were identified. At the time of RUF repair, 17.2% underwent concurrent bowel diversion and 13.6% underwent bowel resection. Additional concurrent procedures included cystectomy (8.0%) and urethroplasty (14.8%). A muscle, myocutaneous, or fasciocutaneous flap was used in 75.7% of those undergoing urethroplasty. Overall, median age was 66.0 years (IQR 59.0-72.0), BMI 26.6 kg/m2 (IQR 23.7-29.5), and 98.8% were functionally independent. Comorbidities included hypertension on medication (56.0%), smoking (22.0%), diabetes (6.8%), COPD (4.4%), and CHF (0.4%). Hypoalbuminemia (<3.5 g/dL) was present in 19.8%. Overall, 20.4% of patients experienced a complication within 30 days of surgery including wound infection (5.6%), sepsis (5.2%), organ space infection (4.4%), urinary tract infection (3.2%), and venous thromboembolism (3.2%). Hypoalbuminemia was associated with increased odds of an adverse event (OR 3.1, p=0.02). Median hospital length of stay was 5.0 days (IQR 3.0-8.0), and was significantly longer among patients undergoing cystectomy (8.0 days, IQR 6.0-13.0; p<0.01). Overall 30-day mortality was 2.0% and did not differ by concurrent procedures.

Conclusions: Patients who underwent surgical repair of RUF were often functionally independent with limited major comorbidities. Hypoalbuminemia was associated with increased odds of an adverse postoperative event, thereby suggesting a role for nutritional optimization prior to RUF repair.

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The Climate of Medical Malpractice in Reconstructive Urology

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Introduction: Urologic medical malpractice continues to evolve and has the potential to influence physician decision making through efforts to mitigate risk with defensive practice. To date, little is known about the medical malpractice climate in reconstructive urology. We provide data on reconstructive urology malpractice claims and associated costs.

Materials & Methods: National, provider level medical professional liability claims data were obtained from the Medical Professional Liability Association Data Sharing Project from 2014-2018. We utilized ICD 9/10 codes to query claims for reconstructive urology conditions and associated procedures including ureteropelvic junction obstruction (UPJO)/ureteral stricture, urethral stricture, bladder neck contracture, rectourethral fistula, Peyronie's disease, buried penis repair/penile skin graft procedures, erectile dysfunction, and male incontinence. Defense expenses were reported as allocated loss adjustment expenses (ALAE) for closed claims.

Results: Over the 5-year study period, urology ranked 13 of 29 specialties with 926 closed claims. The majority of claims did not result in an indemnity payment (paid:closed ratio 30%). Total indemnity payments were $101,594,296. The average indemnity payment was $365,447 and average ALAE was $49,490. With respect to presenting reconstructive urology conditions, there were a total of 66 closed claims with a paid:closed ratio of 24%. Total indemnity payments were $3,494,450, average indemnity payment was $218,403, and average ALAE was $45,685. The most common reconstructive urology conditions that resulted in claims were male incontinence (n=25, 38%) and erectile dysfunction (n=19, 29%) followed by UPJO/ureteral stricture (n=7, 11%), urethral stricture (n=6, 9%), bladder neck contracture (n=4, 6%), Peyronie's disease (n=3, 5%), buried penis (n=2, 3%), and rectourethral fistula (n=0). The most common specified procedures associated with these presenting conditions were procedures on the urethra (n=12) and incontinence procedures (n=7). The severity of patient injury was most commonly mild (emotional, insignificant, or minor temporary injury; n=32, 48%) or moderate (major temporary or minor permanent injury; n=24, 36%).

Conclusions: The incidence of medical malpractice claims in reconstructive urology is low and the majority of claims do not result in indemnity payments. Male incontinence and erectile dysfunction were the most common presenting conditions associated with claims. These findings can be applied to improve risk mitigation strategies and patient care.

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Transurethral Reconstruction of Fossa Navicularis Strictures with Dorsal Inlay Buccal Mucosa Graft Urethroplasty

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Introduction: Fossa navicularis strictures are a challenging clinical entity. Successful reconstruction not only involves the creation of a widely patent urethra, but also requires attention to cosmesis. We describe a novel technique of single stage urethroplasty for fossa navicularis strictures using a transurethral dorsal inlay buccal mucosa graft and review the outcomes for this approach to reconstruction that avoids splitting the glans.

Materials & Methods: We conducted a retrospective review of a prospectively maintained urethral stricture database to identify all fossa navicularis strictures that were reconstructed with a single stage, transurethral dorsal inlay buccal mucosa graft urethroplasty between 5/2015 and 6/2020 at our institution. The surgical technique involved creation of transurethral dorsal urethrotomies down to healthy corpus spongiosum to allow for excision of a triangular wedge of fibrotic urethra. The fossa navicularis was calibrated to ensure the lumen was at least 20 Fr. A buccal mucosa graft was then tailored to the triangular defect and secured in place with 5-0 monocryl suture. Patients were discharged the same day with a 14 Fr Foley catheter that remained in place for 1 week. Primary outcomes were anatomic success, defined as the ability to pass a 17 Fr flexible cystoscope, and functional success, defined as the lack of obstructive voiding symptoms and no need for further procedures. Secondary outcomes were postoperative complications and patient satisfaction.

Results: Of the 43 patients that underwent reconstruction of fossa navicularis strictures during this time period, transurethral dorsal inlay buccal mucosa graft urethroplasty was performed in 16 men. Mean age was 63.1 years (43.9-75.6) and mean stricture length was 1.7 cm (1.4-2.0). Stricture etiology included internal trauma (62.5%), idiopathic (25.0%), and lichen sclerosus (12.5%). Prior endoscopic procedures were done in 75% of patients. Over a median follow-up of 19.3 months (IQR 7.6-24.1), anatomic success was 93.8% (15/16) and functional success was 100% (16/16). The single anatomic recurrence was at 4.2 months postoperatively. No additional procedures were required. Urinary tract infection occurred in 25% (4/16). There were no instances of de novo erectile dysfunction, chordee, wound infection, or hematoma. All patients would recommend urethroplasty to others and all patients were either very satisfied (83.3%) or satisfied (16.7%) with the procedure. Penile sensitivity was unchanged in 83.3%, increased in 8.3% and decreased in 8.3%.

Conclusions: Transurethral dorsal inlay buccal mucosa graft urethroplasty is a viable option for reconstruction of fossa navicularis strictures that avoids splitting the glans and results in excellent cosmesis.

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How Many Cores are Enough? Optimizing the Systematic Transperineal Prostate Biopsy Template

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Introduction: Most urologists use a 10-12 core systematic transrectal (TR) prostate biopsy template. However, a similar consensus template has not been reached for transperineal prostate biopsy (TP) regarding the optimal number and location of biopsy cores. We examined our institutional cohort to define an optimal systematic template for TP.

Materials & Methods: We prospectively monitored our first 200 consecutive free-hand TP biopsies. Men who were biopsy naïve (BN, n=117), had elevated PSA with prior negative biopsy (PNB, n=18), and men on active surveillance (AS=65) were included. All underwent 20 core TP biopsy with each core placed in a separate specimen container. 10, 12, and 16 core templates were designed a priori and compared within each patient to the 20-core standard (**Figure 1**). The primary outcome was detection of Grade Group ≥ 2 (GG2) relative to detection of Grade Group 1 (GG1) prostate cancer. An historic cohort of 12 core TR biopsy (n=170) was used to compare prostate cancer detection between techniques. Sub-group analyses of BN men and men stratified by PSA density (<0.15 vs. ≥0.15ng/cc/mL) were performed.

Results: ≥GG2 cancers were detected in 98 (49%, 20 core), 93 (47%, 16 core), 91 (46%, 12 core), and 82 (41%, 10 core, p=0.13) men. More ≥GG2 were detected in the 20 core compared to the 10 core template (49% v. 41%, p = 0.02). Additional cores did not result in increased GG1 detection (20 core: 35 vs. 10 core: 44, p = 0.09) reflecting improved detection of concomitant ≥GG2 with more cores sampled. There was no significant difference in ≥GG2 detection between an historic 12 core BN TR series (n=148) and the 12 core BN TP cohort (38% vs. 44.5%, p = 0.11). Among BN men, detection of ≥GG2 was similar to the overall cohort: 56 (48%, 20 core), 53 (46%, 16 core), 52 (45%, 12 core), and 47 (41%, 10 core, p=0.14). In men with a PSA density of <0.15ng/cc/mL, ≥GG2 was found in ≤ 25% of samples across all templates.

Conclusions: A 20 core TP systematic biopsy template demonstrated improved detection of ≥GG2 prostate cancer compared to a 10 core TP template. Increasing core number did not result in greater detection of GG1 tumors. Systematic templates with fewer cores may be feasible in patients with PSA density < 0.15 ng/ml/cc. We propose a 20 core systematic TP biopsy template against which future work including MRI-targeted TP biopsies can be compared.

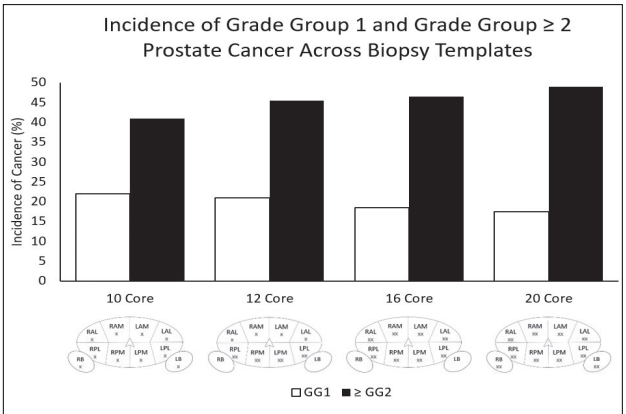

Figure 1. Incidence of GG1 and ≥GG2 prostate cancer by TP biopsy template.

RAL – right anterior lateral; RAM – right anterior medial; RPL – right posterior lateral; RPM – right posterior medial; RB – right base; LAL – left anterior lateral; LAM – left anterior medial; LPL – left posterior lateral; LPM – left posterior medial; LB – left base

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Association Between Lymph Node Burden and Overall Survival Among Patients Treated with Adjuvant Radiation Therapy Following Radical Prostatectomy

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Introduction: Although there is increasing evidence to support the use of adjuvant radiation therapy among patients with lymph-node positive prostate cancer after radical prostatectomy (RP), however it is unclear whether benefits persist for patients with high burdens of metastatic disease. We aimed to evaluate the association between the number of positive lymph nodes identified at the time of radical prostatectomy and lymph node dissection and overall survival after adjuvant androgen deprivation therapy (ADT) and radiation therapy (EBRT) versus ADT alone.

Materials & Methods: We identified patients with lymph node positive (pT2-4N1M0) prostate cancer treated with RP in the National Cancer Database (2004-2017). The primary study objective was to compare overall survival among patients who received adjuvant ADT alone versus ADT+EBRT across numbers of positive lymph nodes identified (<3 versus ≥3). In addition, we compared survival across numbers of positive lymph nodes identified among patients receiving adjuvant versus salvage (>6 month) radiation. We compared overall survival (OS) using multivariable Cox proportional hazards models adjusted for clinical and pathological characteristics including the number of total lymph nodes removed during PLND.

Results: We identified 6,099 patients who met inclusion criteria. After RP, 3267 patients (53.6%) received ADT alone and 2832 (46.4%) received ADT+EBRT. Patients treated with adjuvant ADT+EBRT were younger (60.9 vs 62.4 years), and a higher percentage of positive surgical margins (64.9% vs. 53.2%). However, patients receiving ADT alone had a higher mean PSA 22.4 vs. 21.2 ng/dl). Cox proportional hazards regression revealed that ADT+EBRT versus ADT alone was associated with improved OS (HR=0.65 [0.53-0.80] p<0.001) in the total cohort. This persisted at among patients with <3 positive lymph nodes identified (HR=0.61[0.48-0.79] p<0.001). However, among patients with >3 positive lymph nodes identified, ADT+EBRT was not associated with improved survival compared with ADT alone (HR=0.65 [0.52-1.09] p=0.13). Receipt of salvage RT among patients with >3 positive lymph nodes treated with salvage radiation were associated with worse OS compared with adjuvant radiation (HR=2.08 [1.08-3.85] p=0.02). Salvage radiation was not associated with worse OS in those with <3 positive lymph nodes (HR=0.79[0.49-1.27] p=0.33).

Conclusions: Although adjuvant ADT+EBRT was associated with improved survival among patients with node-positive prostate cancer at the time of radical prostatectomy, we did not identify a survival benefit among patients with greater than three lymph nodes identified. Salvage radiation may be an alternative to adjuvant radiation below 3 positive lymph nodes identified.

Figure 1. Adjusted Survival Plot of ADT vs. ADT+EBRT at >3 Positive Lymph Nodes

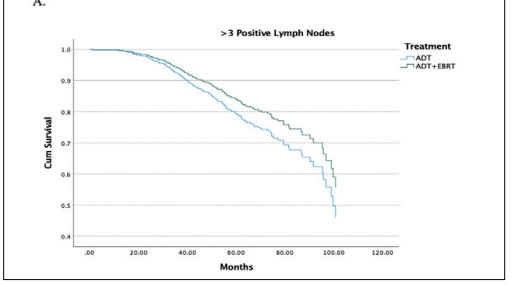
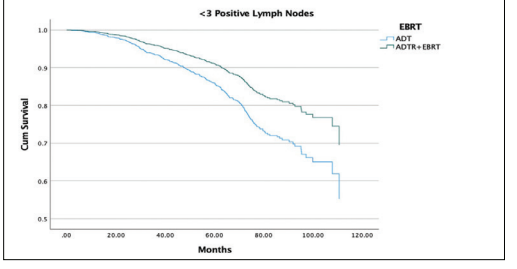


Figure 2. Adjusted Survival Plot of ADT vs. ADT+EBRT at <3 Positive Lymph Nodes



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PRState: Incorporating Genetic Ancestry in Prostate Cancer Risk Scores for Men of African Descent

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Introduction: Prostate cancer (PrCa) is the most heritable of the solid organ malignancies. In addition, incidence and aggressive phenotypes are higher in African American men. Prior research into genetic heritability has focused on ancestry as defined by the patient. We explored ancestral genetic backgrounds with forensic genetic tools to define and develop a polygenic risk score (PRS) in African Americans.

Materials & Methods: Single nucleotide polymorphisms (SNPs) were imputed from a PrCa case-control study of >99,000 men (ELLIPSE) using the Michigan Imputation Server, 1000 Genomes Project, Eaglev2.3. Ancestral likelihood ratios were calculated by Forensic Research Reference on Genetics (FROG)-kb based on a previously described 55-SNP panel and define genetically separate African and European cohorts. GWAS was performed to identify PrCa risk SNPs and PRSice 2.3.1 to develop a PRS. An 80:20 split training:testing groups was used with AUC and ROC analysis.

Results: FROG-kb identified 4,507 and 5,334 individuals of African and European ancestry, respectively (**Figure 1**). In the African group, multiple loci reached significance on chromosome 1, 8, and 11. From this GWAS, 6 SNPs unique to African ancestry, were used to create a PRS. Individually, family history (FH), age, and PRS achieved AUCs of 0.56, 0.54, and 0.60 respectively. Combined PRS, FH, and Age improved AUC to 0.64 (**Figure 2**).

Conclusions: A 55-SNP panel identified genetic ancestral groups for GWAS analysis, which defined 6 PrCa associated SNPs specific to African genetic inheritance. The resulting PRS predicted PrCa better than FH and Age in African American men. A combined model performs similar to previously published studies in European cohorts. Here we have achieved comparable AUC using only 6 SNPs, in a group at higher risk for aggressive PrCa.

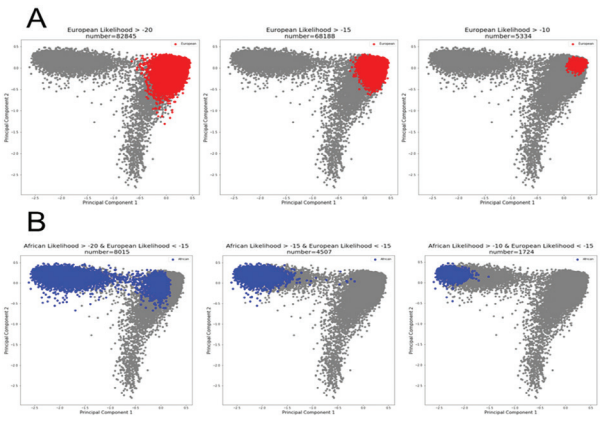

Figure 1: FROG-kb Ancestral Group selection. PCA analysis conducted with Kidd et al ancestry informative markers (AIMs). Identified groups were determined from European and African likelihood ratios as determined through FROG-kb using Kidd et al. panel. A) European discovery cohort includes individuals with European likelihood ratio > -10, (right panel, n= 5334. B) African discovery cohort includes individuals with African likelihood ratio > -15 and European Likelihood ratio < -15 (middle panel, n=4507)

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Limitations of Multiparametric Magnetic Resonance Imaging for Detection of Extraprostatic Extension in Prostate Cancer: Implications for Nerve Sparing Approaches

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Introduction: Multiparametric magnetic resonance imaging (MRI) is increasingly used for pre-operative staging of prostate cancer as well as for surgical planning. Concern for extraprostatic extension (EPE) on MRI suggests that wider dissection (inter-, extra-fascial, or non-nerve sparing approaches) may be warranted. It is not clear how MRI findings and Grade Group (GG) interact to determine the presence of EPE on surgical pathology.

Materials & Methods: A retrospective review of a robotic assisted laparoscopic radical prostatectomy (RALP) database from a single academic institution from 2016-2020 was performed. MRI reports were assessed for positive or possible EPE findings to determine the sensitivity and negative predictive value (NPV) for pathological EPE. The data was further stratified by GG to determine the relationship between tumor grade and MRI findings.

Results: A total of 173 patients underwent at least one MRI prior to RALP. 106/173 (61%) patients had GG 3-5 tumors, 59/173 (34%) had GG 4-5 tumors, and 45/173 (26%) had GG 5 tumors. The overall sensitivity of MRI for pathological EPE was 37.6%, and stratification by GG yielded the following sensitivities: GG 3-5, 40.6%; GG4-5, 50.8%; GG 5, 53.3%. The overall NPV was 50.2%, and stratification revealed the following NPVs: GG 3-5, 31.6% ; GG 4-5, 16.2%; GG 5, 12%.

Conclusions: The sensitivity of MRI for EPE improved with higher grade prostate tumors, but remained relatively low even with GG 5 tumors. NPV for EPE was low and decreased further with higher grade tumors. This suggests caution in aggressive nerve sparing approaches with higher grade tumors even in the setting of a reassuring MRI.

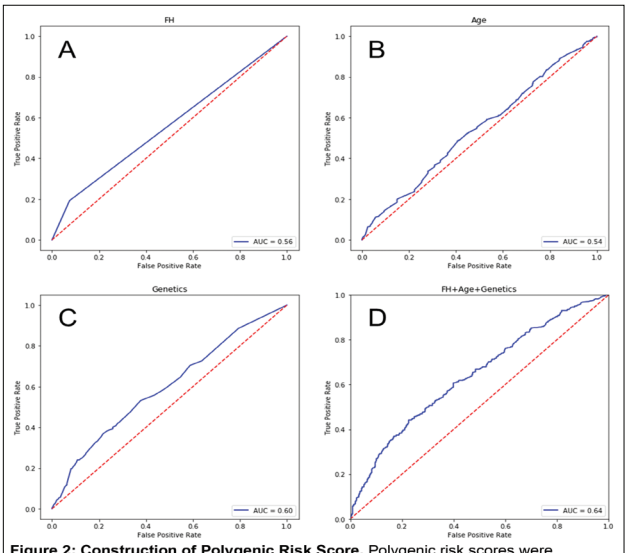

Figure 2: Construction of Polygenic Risk Score. Polygenic risk scores were constructed with PRSice using summary statistics from 80% training data set and evaluating performance on 20% test data set. **(A)** ROC curve for family history prediction of prostate cancer risk. **(B)** ROC curve for Age prediction of prostate cancer risk. **(C)** ROC curve for genetic prediction of prostate cancer risk. **(D)** ROC curve for combined family history, age and genetic prediction of prostate cancer risk.

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Discriminative Ability of Decipher to Predict Biopsy Upgrade on Active Surveillance

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Introduction: Although initially validated as prognostic tools in the setting of definitive prostate cancer (PCa) treatment, tissue-based gene expression tests have become increasingly utilized in active surveillance (AS) of favorable-risk PCa. We aimed to assess the prognostic significance of the Decipher assay, a 22-gene signature associated with PCa outcome, on biopsy grade progression during AS.

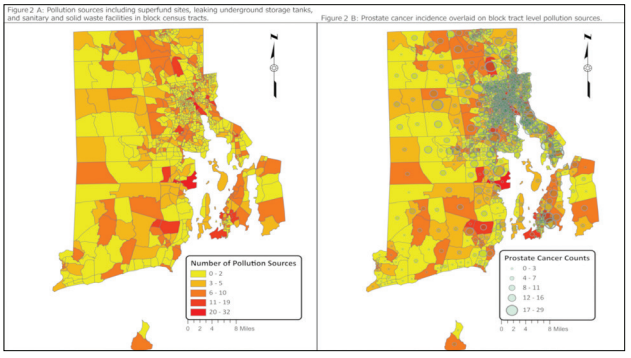
Materials & Methods: Between July 2016 and November 2020, 133 men on AS underwent 146 separate MRI - ultrasound fusion targeted biopsies and systematic biopsies with their prostate tissue sent for Decipher testing. Demographic information, PIRADS, and Decipher scores were prospectively recorded. Decipher risk categories (DR) were labeled by commercial risk categories as low (<0.45), intermediate (0.45-0.60), or high (>0.60) score. Pathologic upgrade was defined as an increase in Gleason Grade Group (GG) on subsequent biopsy. We assessed the association between Decipher score and upgrade using univariate statistics and logistic regression adjusted for clinical and pathologic factors.

Results: Median age was 67.7 years (IQR = 62.4 - 71.4). Median PSA was 5.6 ng/mL (IQR = 4.3-7.1). In this cohort, 75.9% and 24.1% of men had GG1 and GG2 PCa, respectively. Median time between biopsy was 13.6 months (IQR = 11.9-16.9). Median Decipher score was 0.39 (IQR 0.25-0.48) and upgrade occurred in 32.3%. Decipher scores were similar among patients who did and did not experience upgrade (0.36 vs. 0.40, p = 0.27). Upgrade rates were also similar using DR (31.9% [low] vs. 32.4% [intermediate] vs. 46.7% [high], p = 0.455). Multivariable logistic regression revealed increasing Decipher score was associated with greater odds of upgrade (OR 1.31 per 0.10 unit increase, p = 0.033) (**Table 1**). When stratifying by GG, Decipher score was associated with upgrade among patients with diagnostic GG1, (OR 1.43 per 0.10, p = 0.023), but not GG2 disease. Time to biopsy was not independently associated with upgrade. Decipher score remained predictive of upgrade with time to biopsy incorporated in our model (OR 1.36 per 0.10, p = 0.021).

Conclusions: Increasing Decipher scores was associated with greater odds of upgrade among men AS for PCa. The lower spectrum of Decipher scores among men on AS may suggest that distinct categories may be appropriate for risk grouping in this population.

Table 1

Variable	p-value	Odds Ratio	95% C.I.for OR	
			Lower	Upper
Age	0.442	1.019	0.971	1.070
MRI Upgrade	0.402	0.667	0.000	16.373
PSAD	0.344	0.073	0.581	3.873
Decipher	**0.033**	1.31	1.021	1.689



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Associations of Neighborhood Deprivation Index, Household Income, Diversity, and Pollution with Prostate Cancer Incidence and Mortality from 2000-2020 in Rhode Island

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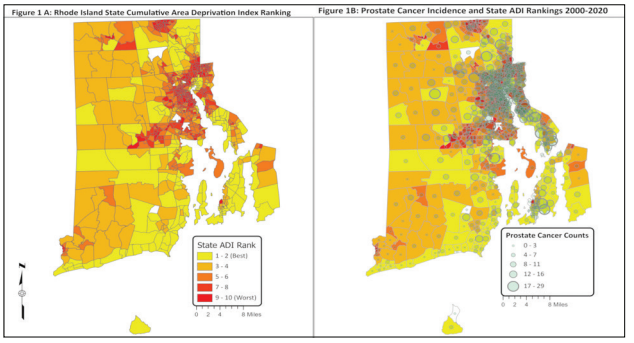
Introduction: Despite advances in prostate cancer (PCa) screening and treatment, socioeconomic inequities continue to impact both PCa risk and survival. We investigated the association between neighborhood sociodemographic and neighborhood pollution composition and PCa incidence and survival.

Materials & Methods: 4,614 patients received treatment for PCa from 2000 to 2020 Brown University affiliated hospitals. Patient addresses were linked to census tract-level data on neighborhood sociodemographic composition and locations of pollution sources. Pollution sources include superfund sites, sanitary and solid waste facilities, and leaking underground storage tanks. Using Poisson and Cox proportional hazards models, we assessed incidence of PCa as well as overall and progression free survival as a function of neighborhood pollution, area deprivation index (ADI), median household income (MHI), and racial composition quartiles (Q1, lowest; Q4 highest) in separate models adjusted for year and age at time of diagnosis.

Results: Average age at time of diagnosis was 65 years, 82% of men were non-Hispanic white, and mean overall survival was 86 months. Likelihood of PCa diagnosis was positively correlated with greater neighborhood pollution (Q4 vs. Q1: RR: 1.26; 95% CI:1.09,1.45), greater composition of non-Hispanic white residents (Q4 vs. Q1: RR:1.37; 95% CI:1.18,1.59), and higher neighborhood MHI (Q4 vs. Q1: RR:1.46;95% CI:1.46,1.96). Overall, 5-, 3-, and 1-year survival rates are 75%, 82%, and 92%, respectively. Likelihood of dying within 5-years of diagnosis was greatest for those in neighborhoods with high ADI (Q4 vs. Q1: HR:1.33; 95% CI:1.05,1.69) and lowest for those in predominantly white neighborhoods (Q4 vs. Q1: HR:0.76;95% CI: 0.60, 0.96) and neighborhoods with higher MHI (Q4 vs. Q1: HR:0.72;95% CI:0.56- 0.91).

Conclusions: Neighborhood sociodemographic and pollution composition are associated with both incidence of PCa diagnosis and survival, such that those in more polluted and more affluent areas are both more likely to have a PCa diagnosis (**Figure 1 and Figure 2**) and to experience greater overall survival. These findings are in line with observed associations between higher individual-level income and higher probability of both detection of PCa and access to curative treatment in the literature. These findings might be explained by differential survival, and the inequities that affect different neighborhoods, racial groups, and socioeconomic statuses, including access to timely screening and treatment. Future research and policy programs may target specific areas of the state to better address the screening and treatment needs in high-risk neighborhoods and PCa hotspots.



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Transperineal Multiparametric Magnetic Resonance Imaging-ultrasound Fusion Targeted Prostate Biopsy Improves Cancer Detection Over In-office Transperineal Template Biopsy

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Introduction: Transperineal (TP) prostate biopsy provides an effective approach to prostate cancer detection. The improvement over the standard template with multiparametric MRI (mpMRI) imaging guidance for TP prostate biopsy has yet to be examined in a large cohort of patients.

Materials & Methods: We identified all men who underwent in-office transperineal biopsy with mpMRI fusion guided software from September 2019 to February 2021 using the Precision Point device and UroNav guidance platform. We assessed clinicopathological factors, MRI and biopsy characteristics. We compared pathological results between standard transperineal biopsy template and targeted biopsies.

Results: Three hundred and one (n=301) men underwent concomitant standard template and targeted biopsy procedures. The median age was 67(IQR, 62-73), and the median PSA was 6.0 ng/mL (IQR, 4.4-8.8). The median prostate volume by MRI was 45 cc (IQR, 33-61), and the median PSA density was 0.14 ng/mL/cc (IQR, 0.09-0.20). Twenty cores constituted the standard template biopsy set. Target lesions on MRI were sampled with 3 targeted cores per patient (IQR 3–4). The overall prostate cancer detection rate was 74.1% and 63.5% by standard template and targeted biopsy, respectively, of which 52.5% and 59.9% were clinically significant prostate cancer, respectively. Targeted biopsies missed 19.8% of cancer cases while templated biopsies missed 6.3% of cancer cases ($p<0.001$). Templated biopsies showed significantly higher cancer detection rate than the target biopsy ($p<0.001$) but slightly lower clinically significant cancer detection rate ($p=0.662$). Of 176 cases with combined overall cancer diagnosis, 18.8% had an upgraded Gleason score (GS) with targeted biopsies while 18.2% cases were upgraded with the standard template.

Conclusions: Transperineal MRI guided fusion biopsy combined with the standard template provides a higher detection rate of clinically significant prostate cancer in men with suspicious lesions than the standard template alone and should be included as part of the biopsy procedure.

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Unilateral ROI on MRI, Do We Really Need to Sample the Contralateral Gland?

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Introduction: Debate exists regarding the added utility of performing systematic biopsy at the time of MRI targeted prostate biopsy. Existing literature suggests that a number of patients with clinically-significant prostate cancer (csPCa), defined as Gleason Grade Group 2 or above, would be missed if only targeted biopsy is performed. Whether this represents the sampling of discrete MRI invisible lesions, or is merely a field effect around the target lesion, remains unknown. We aim to assess the cancer detection rate (CDR) and clinically-significant cancer detection rate (csCDR) in the contralateral gland for patients with unilateral lesions on MRI undergoing targeted and concomitant 12-core systematic prostate biopsy.

Materials & Methods: We performed a retrospective chart review of all patients who have undergone TRUS-guided fusion prostate biopsy at a single institution from 2015-2020. All patients had been found to have at least one PIRADS-3, -4, or -5 lesion on MRI prior to undergoing subsequent UroNav® targeted fusion biopsy. Number of targeted cores obtained were at the discretion of the urologist performing the biopsy. A standard 12-core systematic biopsy was performed simultaneously on all patients. Biopsies were performed by two senior urologists and cores evaluated by a dedicated genitourinary pathologist. Lesions were retrospectively categorized as right or left and anterior or posterior.

Results: Of 736 patients identified, 514 (74%) had unilateral lesions on MRI. The indication for MRI was cancer screening in 367/514 (71%) patients and active surveillance for 141/514 (27%). A median of three targeted cores were obtained per lesion. The overall CDR in the contralateral gland was 15% for PIRADS-3, 21% for PIRADS-4, and 29% for PIRADS-5 lesions. The csCDR in the contralateral gland was 5% for PIRADS-3, 9% for PIRADS-4, and 12% for PIRADS-5. Only one percent of patients (7/514) had clinically-significant cancer detected in the contralateral gland only (i.e not detected on targeted or ipsilateral cores). For patients with unilateral PIRADS-5 lesions, there was no added detection of csPCa from biopsying the contralateral gland.

Conclusions: For patients with unilateral lesions on MRI, there was a 1% detection rate of csPCa in the contralateral gland only. The added yield of systematic biopsy of the contralateral gland for patients with unilateral lesions undergoing MRI-TRUS fusion prostate biopsy may be extremely low.

Contralateral gland cancer detection in patients with unilateral lesions (N=514)

	CDR	**csCDR**
PIRADS-3	24/156 (25%)	8/156 (5%)
PIRADS-4	51/242 (21%)	22/242 (9%)
PIRADS-5	33/115 (29%)	13/115 (11%)
All	108/514 (21%)	43/514 (8%)

Detection of prostate cancer only within the contralateral gland (N=514)

	CDR	csCDR
PIRADS-3	10/156 (6%)	1/156 (1%)
PIRADS-4	9/243 (4%)	6/243 (2%)
PIRADS-5	1/115 (1%)	0/115
All	20/514 (4%)	7/514 (1%)

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MRI Monitoring for Focal Ablation Series

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Introduction: We report the utility of MRI-based follow-up and short-term outcomes of primary focal ablation for localized low-risk prostate cancer (PCa).

Materials & Methods: We conducted retrospective analysis of 19 men who underwent focal targeted cryoablation (n=16) or Nanoknife electroporation (n=3) from 2014-20. MRI-US fusion biopsy (FBx) and systematic core needle biopsy were conducted at 6 and 24 months. Clinically significant PCa was defined as >GG2. Biochemical recurrence was defined by Phoenix criteria. Treatment failure was defined by radical prostatectomy (RP), radiation therapy, or repeat ablation.

Results: Median age, PSA, and prostate volume at ablation were 64 years, 8.2ng/mL, and 53cc. Pre-ablation highest grade was grade group 1 (GG1) in 4 men, GG2 in 10, and GG3 in 5. Median follow up was 25.5 months. Two weeks after ablation, 1 high-risk patient (PSA>20) exhibited residual PIRADs-5 lesion and underwent RP. 16 patients underwent 6-month FBx (median: 6.9 months). On MRI, no suspicious lesions were visualized in the ablation zone, but 1/16 (6.3%) patients had GG4 disease in the ablation cavity. 2/16 (12.5%) patients developed contralateral (CL) MRI-visible lesions, but no corresponding csPCa on Fbx.10 patients had second Fbx (median: 24.1 months). 1 patient (10%) exhibited a PIRADs-4 lesion in the ablation zone but no csPCa. 1 patient (10%) had two CL PIRADs-4 lesions without corresponding csPCa, but had an un-visualized ipsilateral GG2cancer. 2 additional patients had un-visualized cancers: 1 (10%) with GG2 in the ablation zone and 1 (10%) with an ipsilateral GG2 cancer. 3 patients underwent RP, 2 radiation, and 1 ablation for CL recurrence. Mean pre-ablation PSAD for patients with treatment failure was 0.24, compared to 0.17 for those without. No new or worsening urinary incontinence occurred, but 4/19 patients had new/worsening erectile dysfunction. 1/19 patients were lost to follow[NJ1] up, but all other patients without treatment failure continue on PSA surveillance without evidence of BCR.

Conclusions: For primary focal ablation, MRI based monitoring alone may be insufficient for monitoring disease recurrence. None of the 4 patients with csPCa detected on biopsy had corresponding lesions detected on MRI. Patients with higher pre-ablation PSAD may be at more risk for treatment failure. We report a 24-month salvage treatment free rate of 68.4%.

Table 1: Patient characteristics	
Median age (range)	64 years (53-77 years)
Median pre-treatment PSA (range)	8.2 ng/ml (4.3-23.9 ng/ml)
Median pre-treatment prostate volume (range)	53cc (19-131cc)
Gleason Grade	
GG1	4/19 patients (21.1%)
GG2	10/19 patients (52.6%)
GG3	5/19 patients (26.3%)
Median follow-up time (range)	25.5 months (6.2-54.9 months)
Treatment	
Nanoknife	3/19 patients (15.8%)
Cryoablation	16/19 patients (84.2%)
Treatment failure prior to 6-month biopsy	1/19 patients (5.3%)
Biopsy 1	
Median time to bx (range)	6.9 months (5.31-28.72 months)
Ablation zone PIRADs 3+ (# biopsy positive)	0/16 patients (0)
Ablation zone csPCa on bx (# visible on MRI)	1/16 patients (0)
Out of Field PIRADs 3+ (# biopsy positive)	2/16 patients (0)
Out of field csPCa on bx (# visible on MRI)	0/16 (NA)
Biopsy 2	
Median time to bx (range)	24.1 months (18.2-26.4 months)
Ablation zone PIRADs 3+ (# biopsy positive)	1/10 patients (0)
Ablation zone csPCa on bx (# visible on MRI)	1/10 patients (0)
Out of Field PIRADs 3+ (# biopsy positive)	1/10 patients (0)
Out of field csPCa on bx (#visible on MRI)	2/10 patients (0)
Treatment Failure	
Radical prostatectomy	3/19 patients (15.8%)
Radiation	2/19 patients (10.5%)
Repeat ablation	1/19 patients (5.3%)
Time to failure	3.0-56.7 months
PSAD (non-failure cohort)	0.24 (0.17)

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The NCDB Forgot about DRE?

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Introduction: The digital rectal exam (DRE) is currently included in the AUA/NCCN risk strata for prostate cancer. Specifically, a patient cannot be "low risk" if they have palpable disease in more than half of one side of the prostate (cT2b or higher), which may render them ineligible for surveillance or other lower intensity treatments. However, it is unclear how frequently DRE findings are reported, particularly with respect to substaging (i.e., cT2a, cT2b, cT2c). We hypothesized that there is no documentation of tumor substage for a large number of patients, and that the rate of reporting has decreased over the last decade.

Materials & Methods: We queried the National Cancer Database for nonmetastatic prostate cancer cases from 2004-2016. We evaluated the number of cases missing clinical T2 substaging for each year (cTx). To estimate the potential change in risk grouping if DRE were missing, we also calculated the number of patients whose risk stratification would change based on clinical exam alone (i.e., PSA and Gleason score) for patients whose Gleason Grade Group, PSA, and clinical T2 substage were available.

Results: A total of 335,852 cases were included, of which 65,376 (20%) were missing a substage. The rate of missing substage documentation increased from 15% of cT2 cases in 2004 to 25% in 2015, then dropped to 10% in 2016. Of the patients with available cT2 substage (cT2a-c), 2,591 (11%) of 23,706 otherwise low risk patients were upstaged to unfavorable intermediate risk based on DRE alone. Similarly, of 30,385 otherwise favorable intermediate risk patients, 8,479 (28%) were upstaged to unfavorable intermediate risk based on DRE alone.

Conclusions: One in five prostate cancer cases is missing clinical T substaging, knowledge of which changes risk stratification in 20% of patients with otherwise low or favorable intermediate risk. This disconnect may reflect poor recording or reporting of DRE for palpable disease, or suggests that this level of accuracy in the DRE for risk stratification purposes may need to be reevaluated. Even if this finding only applies to the NCDB, given one in five localized prostate cancer cases is missing key staging information, use of the AUA/NCCN risk stratification with the NCDB should be done with caution.

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The Association Between the 17-gene Genomic Prostate Score Result and Active Surveillance, Therapy Intensity and Complications in NCCN Favorable Intermediate-Risk Prostate Cancer Patients

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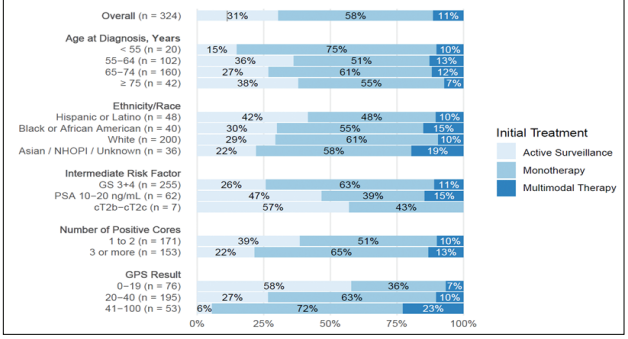
Introduction: This study determined how the 17-gene Genomic Prostate Score® (GPS™) molecular assay guides treatment decisions in patients with NCCN favorable intermediate-risk (FIR) prostate cancer (PCa).

Materials & Methods: This retrospective study included 324 patients from 7 urology practices in the United States. All had NCCN FIR PCa, defined as <50% positive biopsy cores and only one of the following risk factors: grade group 2 (Gleason Score 3+4), clinical stage T2b-T2c, or PSA 10-20 ng/mL. All had a GPS assay report dated May 2017 to April 2019. The GPS assay reports a result between 0 and 100, with higher values associated with higher likelihood of adverse pathology and higher risk of distant metastasis and PCa-specific mortality. Data were collected from patients' charts/electronic health records. The proportions who selected active surveillance (AS) and definitive treatment with monotherapy or multimodal therapy were calculated with 95% confidence intervals (CI) using the Clopper-Pearson method. In addition, the association of several clinical variables, including Gleason Score, PSA, and number of positive cores, and the GPS result with AS selection was evaluated in uni- and multivariable logistic regression models.

Results: Among the 324 patients, 79% had grade group 2 tumors, 19% had PSA 10-20 ng/mL, and 2% were clinical stage T2b. Median follow-up time was 18 months, and one PCa-related metastasis and 2 deaths (neither PCa-related) were reported. For the GPS assay, 76 patients had results <20, 195 had results between 20 and 40, and 53 had results >40. Overall, 31% (95% CI 26%, 36%) selected AS. Gleason Score, PSA, number of positive cores and GPS result were all significantly associated with AS selection in univariable logistic regression models and number of positive cores and GPS result remained significant in multivariable models including these four variables. AS percentage decreased as GPS results increased: 58% (95% CI 46%, 69%) selected AS with GPS results 0-19, 27% (95% CI 21%, 33%) with GPS results 20-40, and 6% (95% CI 1%, 16%) with GPS results 41-100. AS percentage was lower for patients with more positive cores: 39% (95% CI 31%, 46%) of patients with 1-2 positive cores selected AS and 22% (95% CI 15%, 29%) with 3 or more positive cores. Patients with GPS results 0-19 and 20-40 were more likely to receive monotherapy than with GPS results >40. Patients with GPS results >40 were more likely to receive multimodal therapy (**Figure 1**). Complications (erectile dysfunction, urinary/bowel incontinence) were more common in treated than AS patients. AS persistence was 91% (95% CI 82%, 95%) at 12 months; patients discontinued AS due to disease progression (61%) or patient preference/unknown reasons (39%).

Conclusions: The GPS result appears to be associated with selection of AS and treatment intensity in this first examination of a genomic classifier in a cohort of NCCN FIR PCa patients.

Figure 1. Treatment intensity, overall and by relevant clinical variables and by GPS result. Monotherapy: radical prostatectomy (RP), radiation therapy (EBRT), androgen deprivation therapy (ADT), focal therapy, or other; multimodal therapy: EBRT plus ADT, RP plus EBRT, brachytherapy plus ADT.



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New Findings Regarding the Influence of Assistants on Intraoperative Inflatable Penile Prosthesis Complications

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Introduction: Inflatable penile prosthesis (IPP) placement is a critical component of urology residency education. Resident trainees are useful in IPP cases, but resident assistance is not always available to prosthetic urologists. Registered Nurse First Assistants (RNFAs) can also serve as capable assistants during IPP procedures. We reviewed our data to compare intraoperative and postoperative complications in IPP cases with residents or RNFAs as assistants. We also compared the differences in the surgical procedures with either type of assistant.

Materials & Methods: Medical records of patients who underwent IPP placement by a single surgeon between 2017 and 2020 were retrospectively reviewed with IRB approval. Baseline patient characteristics, details of surgical procedure, and outcomes were collected. A logistic regression model was used to identify predictors of complications. Student's T test was used to examine for differences in total OR time between different assistants.

Results: A total of 210 patients who underwent IPP surgery were identified, among which 168 (80%) placements were assisted by RNFAs, and 42 (20%) by urology residents. Complications were reported in 37 (17.6%) patients. Clavien-Dindo complications were grades V (1%, n=2), IIIb (11%, n=23), II (0.5%, n=1), and I (7%, n=14). There was no significant difference in the rate of complications for IPP placement assisted by a resident or RNFA (OR 0.95, CI 0.35 - 2.31) but this was limited by the overall power in assessing complications. Resident-assisted IPP placements were found to be associated with longer operative time than those assisted by RNFAs (86.2 ± 23.1 min vs. 72.9 ± 35.5 min, $p<0.01$). Patient factors including new IPP, BMI>30, DM, and positive urine culture were also not associated with increased complication rate. Current smokers were noted to have more complications (OR 2.51, CI 0.94 - 6.30), although this was not statistically significant. Patients were followed for 12.2 ± 10.8 months postoperatively.

Conclusions: Resident-assisted IPP placement with a high-volume surgeon is not associated with observable increase rate of complications comparing to those assisted by RNFAs. Moreover, resident involvement is only associated with slight increase in operative time compared to RNFA-assisted IPP placement. Overall complications were low in this series.

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Virtual Learning with Remote Proctoring for Inflatable Penile Prosthesis (IPP) Training: A Feasibility Study for Socially Distanced Education

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Introduction: COVID-19 has changed the educational landscape precluding in-person surgical training opportunities. Our objective is to examine the utility and feasibility of remote proctoring for IPP surgical skills training using a validated full-procedural hydrogel simulation model.

Materials & Methods: Nine urology residents at the University of Rochester (PGY 1-4) were paired and remotely proctored by an expert at Boston University using the Zoom web conferencing tool. During IPP training sessions, both participants and proctor were given a model with a full surgical setup. Pre-learning included a narrated full-procedural demonstration by the proctor followed by a full procedure IPP simulation guided by proctor feedback. Pre- and post-training surveys assessed confidence (0-100) and procedural knowledge (15 questions). Opinions on virtual learning and its application to this training session were collected.

Results: 66.7% of residents never performed a live IPP placement, while the remaining completed a median (IQR) of 6 cases (4.5-8). All confidence and knowledge measures significantly increased after the remote session (**Table 1**). Knowledge assessment scores increased by 13% following the remote session, which was reflected in an increase in participants' confidence in the ability to perform a simulated IPP procedure, knowledge of IPP procedural steps, and applied anatomy by 48%, 22%, and 18%, respectively. Despite 77.8% (7/9) of residents having no prior experience with hands-on virtual training, 100% found remote training valuable and beneficial for learning basic IPP skills and steps of the procedure. The residents highly rated the ability to practice complex skills with zero-patient harm (88.9%), the non-biohazardous nature of the model (66.7%), and having their own hydrogel training model (88.9%). 66.7% preferred a hybrid (virtual combined with in-person learning) for future sessions. The limitations include single session, lower quality communication, and lack of an interface for physical guidance within the virtual environment.

Conclusions: Remote proctoring using a web conferencing tool and non-biohazardous IPP simulation model is feasible with improvement in both confidence and procedural knowledge. Despite its limitations, this approach provides essential opportunities for hands-on training with remote experts in a safe environment during the cessation of in-person training events.

Table 1: Confidence and knowledge measures pre-training versus post-training.

Table 1: Confidence and knowledge measures pre-training versus post-training.

	Pre-Training Median [IQR]	Post-Training Median [IQR]	Change (Δ)Median [IQR]	*p-value*
Confidence in Knowledge of Applied Anatomy	50 [30-65]	68 [62-72]	+18 [12-31]	0.005
Confidence in Knowledge of IPP Procedural Steps	35 [23-61]	57 [47-75]	+22 [9-27]	0.052
Confidence in Ability to Perform a Simulated IPP	26 [15-60]	74 [60-82]	+48 [22-46]	<.001
Confidence in Ability to Perform a Live IPP	23 [11-35]	59 [41-65]	+36 [18-39]	0.001
Knowledge Assessment %	67 [63-78]	80 [75-92]	+13 [7-18]	0.045

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Inflatable Penile Prosthesis Patients Treated with Multimodal Analgesia Have Reduced Risk of Prolonged Opioid Dependence

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Introduction: The utilization of multimodal analgesia (MMA) in inflatable penile prosthesis (IPP) surgery has demonstrated durable results in reducing opioid usage and improving pain control in the postoperative period. Rates of opioid dependence following opioid-based (OB) or MMA pain management in penile implant recipients has yet to be defined. We assessed the risk of prolonged narcotic usage following IPP surgery by comparing prior opioid-based management patients with multimodal analgesia patients.

Materials & Methods: This is a multicenter retrospective review of 344 three-piece IPP recipients who underwent implantation from 12/2014 to 12/2020. A total of 133 patients (38.7%) were managed with an OB regimen while 211 patients (61.4.0%) received MMA. Development of prolonged opioid dependence was defined as active opioid prescriptions 90 days after surgery. Perioperative and postoperative opioid usage was assessed with the Prescription Drug Monitoring Program (PDMP). Patients were excluded if PDMP data was incomplete or if preexisting history of opioid dependence was identified.

Results: Postoperative inpatient narcotic use was higher in the OB group, with substantially more total morphine equivalents (TME) used (41.3 vs. 13.8, p<0.001). After discharge, the OB group required greater narcotic refills (31.5% vs. 9.8%, p<0.001) and higher total refill TME (276.0 vs. 22.3, p<0.001). IPP recipients managed with MMA had an absolute risk reduction of 3.6% in developing opioid dependence (ARR=0.036). More OB patients developed opioid dependence with more recipients (6/133, 4.5%) developing opioid dependence despite smaller OB cohort size. All 6 OB patients with prolonged opioid dependence were primary IPPs. MMA patients who developed prolonged opioid dependence were predominantly complex revision cases (p=0.045). The OB and MMA groups demonstrated similar ages, incidence of chronic pain, and diabetes but differed in BMI (32.0 vs. 30.6, p=0.045) and race (p=0.001). Intraoperative factors did not demonstrate statistical significance.

Conclusions: Our series demonstrates that multimodal analgesia recipients have a decreased risk of prolonged narcotics dependence compared to patients managed with opioids alone, particularly after primary IPPs. Substantial differences in opioid use were noted postoperatively between the cohorts, with MMA patients requiring fewer inpatient TMEs and fewer narcotic refills postoperatively.

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Safety Analysis of an Oral Testosterone Undecanoate (TU) Formulation Following 2 Years of Administration in Hypogonadal Men

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Introduction: An oral testosterone (T) replacement therapy (TRT) would be the preferred administration route for many hypogonadal men. Until recently, the only oral TRT approved in the US was methyl-T which has been associated with hepatotoxicity. The objective of this study was to evaluate the safety and efficacy of a novel oral T undecanoate (TU) formulation with 2 year follow up.

Materials & Methods: Two open-label, multicenter, dose-titration trials were conducted in hypogonadal men (serum T ≤ 300 ng/dL) age 18-75 years. Trial I was a randomized, active-controlled, 2-arm, 12-month study. Trial 2 was a long-term extension of those who completed Trial 1. Statistical analyses were only conducted with the subjects who completed Trial 1 and continued treatment in Trial 2, thus providing up to 2 full years of data. Safety was assessed by physical exam, AE reporting, and routine clinical laboratory measurements.

Results: Overall, 86 subjects participated in both studies. T concentration increased from 193.75 ± 9.44 ng/dL (Mean ± SEM) at baseline (BL) to 475.5 ± 49.7 ng/dL after 24 Mo of therapy with oral TU, and 84% of men achieved T in eugonadal range (300-1000 ng/dL) after 90 days of therapy. Mean T concentrations remained in the eugonadal range throughout Trial 2. There were no clinically significant changes in liver function tests - ALP (64.05 ± 1.95 to 53.74 U/L ± 1.86 U/L), ALT (27.8 ± 1.40 to 26.7 ± 1.6 U/L), AST (21.6 ± 0.76 to 22.0 ± 1.0 U/L), and bilirubin (0.58 ± 0.03 to 0.52 ± 0.03 mg/dL) throughout the two studies. At d270, one subject had an ALT level of 227 U/L, which was > 4x the ULN (ULN for ALT = 45 U/L). Despite continued use of oral TU, ALT was measured again on d290, and the level dropped to 87 U/L, < 2x ULN. This was the only instance of an LFT elevation. There was a modest increase in PSA (0.26 ± 0.28 ng/mL vs. BL @ d730). There were not any significant changes in IPSS total score (-0.06 ± 3.9 vs. BL). There were significant, yet modest, increases in mean HCT (44.3 ± 0.3 to 46.6 ± 0.5%, p < 0.001) and cuff systolic BP (127.1 ± 1.2 to 131.8 ± 1.67 mmHg vs. BL, p = 0.006). The change in prostate-related growth variables and CV endpoints changed initially and stabilized throughout the 2 trials. For example, systolic BP varied 3 - 6 mm Hg from BL throughout the study.

Conclusions: 2 year follow up data with this oral TU formulation is an option for hypogonadal men and has a safety profile consistent with other approved T products. Notably, no evidence of liver toxicity was observed. The long-term efficacy and safety profile at 2 years of oral TU may provide a treatment option that avoids issues associated with other TRTs, such as injection site pain or transference to partners and children.

Table 1. Percent of cases correctly diagnosed as Top 1, 3, or 5 conditions of the differentials.

Online Symptom Checker	Top 1			Top 3			Top 5		
	ED	PD	SP	ED	PD	SP	ED	PD	SP
WebMD	0%	0%	6.67%	0%	0%	20%	0%	0%	30%
MedicineNet	90%	100%	10%	100%	100%	23.33%	100%	100%	36.67%
Everyday Health	0%	0%	6.67%	0%	0%	23.33%	0%	0%	26.67%
Sutter Health	60%	0%	13.33%	86.67%	0%	26.67%	100%	0%	26.67%
Mean	**37.5%**	**25%**	**9.17%**	**46.67%**	**25%**	**23.33%**	**50%**	**25%**	**30.00%**

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Safety Analysis of an Oral Testosterone Undecanoate (TU) Formulation Following 2 Years of Administration in Hypogonadal Men

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A Multicenter Investigation Examining Timing of Penile Prosthesis Infections and Responsible Organisms

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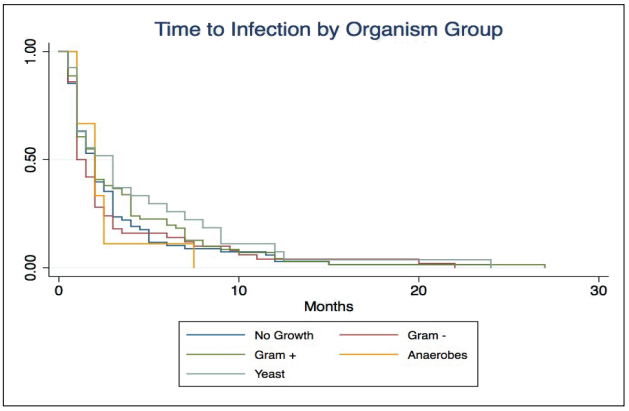
Introduction: Penile prosthesis infections are thought to occur either shortly after surgery or in a delayed fashion. Differences in responsible organism pathogenicity is believed to explain why some patients present with infections later compared to others (i.e. acute vs. indolent infections). However, in the era of antibiotic-coated devices and increasing antibiotic resistance, little is known about current patterns in timing of device infections. Therefore, we sought to examine the timing of penile prosthesis infections by different responsible organisms.

Materials & Methods: We performed a retrospective cohort study of patients who underwent penile prosthesis salvage or explant procedures due to infection between 2001 and 2018. Patients were followed for three years. The primary outcome of interest was time to penile prosthesis infection, which was defined as the number of months from initial implant to a salvage or explant procedure. Intraoperative culture data was reviewed for each infection and grouped by responsible organism, including no growth cultures, gram positives (GPs), gram negatives (GNs), yeast and anaerobes. Cox proportional hazard models were used to compare median time to infection by responsible organism and pre-operative antibiotic regimen. Chi-square analysis was used to examine the type of salvage procedure used for early (< 3 months) and delayed infections (> 3 months).

Results: The study sample consisted of 225 patients from 33 implanters across 6 different countries. Intraoperative culture data showed no growth in 30.2% of cases. The most common organisms responsible for infections included GPs (31.6%), GNs (22.2%), Yeast (12.0%), and Anaerobes (4.0%). Median time to infection was 2 months and did not significantly differ by responsible organism (p=0.52): yeast (3 months), GPs (2 months), no growth cultures (2 months), anaerobes (2 months), and GNs (1.3 months, Figure 1). Infections were polymicrobial in 23.6% of cases. Median time to infection did not differ significantly between single organism (2 months) and polymicrobial infections (1 month, p=0.92). Similarly, median time to infection did not significantly differ by type of pre-operative antibiotic regimen (p=0.22). A higher proportion of patients with delayed infections underwent device explant (37.4% vs. 50.0%) and three piece salvage (25.2% vs. 28.4%) compared to those with early infections, while those with delayed infections underwent fewer malleable salvage procedures (37.4% vs. 21.6%, p=0.02).

Conclusions: Two-thirds of penile prosthesis infections occur within 3 months of surgery. Median time to device infection is similar amongst responsible organisms as well as pre-operative antibiotic regimens. These findings may suggest that more indolent infections are less common in the age of antibiotic-coated devices and increasing antibiotic resistance.



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Satisfaction Rates of Inflatable Penile Prosthesis in Men Who Have Sex with Men

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Introduction: Men with erectile dysfunction have high patient satisfaction after placement of inflatable penile prostheses (IPP), but the impact on satisfaction and quality of life has never been studied in men who have sex with men (MSM) with erectile dysfunction. This study aims to assess the satisfaction rates and quality of life of MSM after placement of IPP for erectile dysfunction.

Materials & Methods: A multi-institutional, retrospective study enrolled adult men who self-identified as MSM and underwent inflatable penile prosthesis placement with either AMS 700™ LGX, AMS 700™ CX or Coloplast Titan™ models. Two questionnaires were administered at one timepoint post-operatively. The Erectile Dysfunction Inventory of Treatment Satisfaction (EDITS) is a 11-item validated questionnaire measured on a 0-100 scale. The Quality of Life and Sexuality with Penile Prosthesis (QoLSPP) is a 16-item questionnaire subcategorized into 4 domains: functional, relational, social, and personal. Fisher's exact test and paired t-test were used to calculate significance with p-values <0.05 considered significant.

Results: Forty-nine MSM were assessed with a median age of 62 years (interquartile range [IQR], 53-69) with median follow-up of 14.2 months (IQR, 8.1-21.9). AMS 700™ LGX, AMS 700™ CX or Coloplast Titan™ IPPs were placed 2, 2 and 45 men, respectively. For the entire cohort, the median EDITS score was 93 (IQR, 91-95) and the median QoLSPP scores each domain were functional 23/25 (IQR, 22-24), relational 17/20 (IQR, 15-18), social 15/15 (12-15), personal 18/20 (IQR, 17-19) with a total of 72/80 (IQR, 68-76).

Conclusions: MSM report high satisfaction rates and quality of life after IPP placement for ED.

Table 1. Patient baseline characteristics
QR = interquartile range; SHIM = Sexual Health Inventory for Men

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Characteristic	Value
Age (y), median (IQR)	62 (53-69)
Body mass index (kg/m²), median (IQR)	28 (25-30)
Follow-up (mo), median (IQR)	14.2 (8.1-21.9)
Ethnicity, n (%)	
White	42 (86)
Black	4 (8)
Asian	3 (6)
Pre-op SHIM score, median (IQR)	6 (5-7)
Inflatable penile prosthesis, n (%)	
AMS 700™ LGX	2 (4)
AMS 700™ CX	2 (4)
Coloplast Titan™	45 (92)
Surgical Approach, n (%)	
Penoscrotal	19 (39)
Infrapubic	28 (57)
Subcoronal	2 (4)

QR = interquartile range; SHIM = Sexual Health Inventory for Men

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Defining the Incidence of Postoperative Scrotal Hematoma After Three-piece Inflatable Penile Prosthesis Surgery

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Introduction: Development of scrotal hematoma is a rare but serious complication following inflatable penile prosthesis (IPP) surgery. Multiple techniques to mitigate hematoma formation are implemented by penile implant surgeons, including temporary device inflation, Mummy wrap usage, drain placement and appropriate suspension of anticoagulation (AC). We assessed the incidence of scrotal hematoma formation in primary and complex IPP recipients managed with these techniques.

Materials & Methods: This is a multicenter retrospective review of 246 patients from 2/2018 to 12/2020 with 194 (78.9%) primary and 52 (21.1%) complex IPP surgeries. Revisions, removal/replacements, or IPPs with concomitant procedures were considered complex. All patients underwent surgery with appropriate suspension of AC as well as postoperative Mummy wrap and drain placement. Drain outputs on postoperative day (POD) 0 and 1 were collected. Device activation varied between two and four weeks, based on surgeon preference. Incidence of postoperative bleeding with hematoma formation was assessed along with risk factors and postoperative management.

Results: Primary and complex IPP hematoma patients were similarly matched groups compared to non-hematoma formers. The incidence of postoperative hematoma formation in complex cases (5/52, 9.6%) is more than double that of primary cases (7/194, 3.1%) (HR=2.61). Complex IPP hematomas have a higher propensity for OR evacuation than primary hematomas (p=0.028). AC status impacted 25% (3/12) of hematoma formers with 40% (2/5) of complex hematomas related to AC resumption (HR=2.40). Patients with scrotal hematomas had increased pain on the postoperative night immediately following surgery (Visual Analog, VAS, score 5.3 vs. 3.2, p=0.012). However, hematoma formers had similar VAS scores in PACU (2.7 vs. 1.9. p=0.485) and POD1 (4.5 vs. 3.4, p=0.316) and comparable drain outputs to non-hematoma patients on POD0 (66.8cc vs. 49.6, p=0.488) and POD1 (20.0cc vs. 40.3, p=0.114). Difference in duration of temporary device inflation between 2 and 4 weeks did not contribute to hematoma formation. Penoscrotal approach accounted for 6/12 (50%) of hematomas (p=0.298).

Conclusions: Complex IPP surgeries (revisions or concomitant cases) are more likely to result in hematoma requiring OR management with anticoagulated status as an associated risk factor. It may be prudent to manage complex IPP cases with prolonged drainage along with an increased duration of holding postoperative anticoagulation.

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Partner Involvement Reduces Postoperative Care Burden Following Penile Prosthesis Placement

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Introduction: The spouses and partners of patients undergoing implantation of an inflatable penile prosthesis (IPP) are often active participants in the perioperative process. Many urologists encourage partner involvement for penile implant patients, but there is little information on the role partners play perioperatively. We analyzed the effect of perioperative partner involvement on planned postoperative care.

Materials & Methods: This is a retrospective study conducted using data obtained from primary IPPs performed by a single surgeon between October 2016 and January 2021. A standardized postoperative course was used, including planned follow-up visits at 2 weeks (for wound check and device deflation) and 6 weeks (for device teaching). Patient characteristics, including demographics, partner involvement, and the number of follow-up visits were obtained from the medical record. Logistic regression modeling was performed to determine the influence of partner involvement on planned postoperative scheduled visits.

Results: During the study period, n = 170 primary IPP patients were identified and 147 (67%) of these patients had partners. Partners were involved in all perioperative visits for 92 patients (54%). Unplanned follow up visits were seen for 58 patients (34%) between 0-6 weeks and for 28 patients (17%) after 6 weeks postoperatively.
Partner involvement was associated with a reduced odds of additional follow up visits, both at 0-6 weeks (unadj: OR 0.43, 95% CI 0.23-0.83; adj: OR 0.40, 95% CI 0.20-0.79) and after 6 weeks (unadj: OR 0.32, 95% CI 0.13-0.76; adj: OR 0.33, 95% CI 0.13-0.81), both in unadjusted analysis and when adjusted for obesity and presence of complications.
Clavien-Dindo complications were identified in 29 patients (17%) intraoperatively or postoperatively. Mean surgical time was 69 minutes (SD = 19). Mean patient age was 62 years (SD = 9). Comorbidities included obesity (52%), diabetes (37%), hyperlipidemia (72%), and hypertension (84%).

Conclusions: Partner involvement equated to a 2.5 fold decrease in the odds of unplanned postoperative visits among primary IPP patients. Though the mechanism of this reduction is unclear, having partners attend perioperative visits is easily implemented, low cost, and minimal risk. We would recommend that urologists routinely encourage patients considering insertion of a penile prosthesis involve their partners in perioperative visits.

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The Use of Adjuvant Dexamethasone and Dexmedetomidine in Bupivicaine Penile Nerve Block During Penile Prosthesis Surgery for Peri-operative Analgesia

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Introduction: Inflatable penile prosthesis (IPP) surgery is the gold standard treatment for medication-refractory erectile dysfunction. While results are overall highly satisfactory, post-operative pain and narcotic requirement remains a concern. Use of intra-operative dorsal penile nerve block with long acting local anesthetic can improve post-operative analgesia. Recent studies in non-urologic surgical fields have demonstrated prolonged analgesia but minimal adverse effects with local nerve blocks containing long acting local anesthetic mixed with either dexamethasone or dexmedetomidine. The aim of this study was to evaluate the analgesic effectiveness of the addition of these adjuvant medications to bupivacaine penile nerve block as compared to plain bupivicaine block during primary IPP surgery.

Materials & Methods: This is a retrospective single institution IRB-approved comparative study of intraoperative dorsal penile nerve block with either plain 0.25% bupivacaine versus combination 0.25% bupivicaine + 70 mcg dexmedetomidine + 4 mg dexamethasone in patients undergoing primary IPP surgery (December 2019 to 2020). The primary outcome was pain level (Analog Pain Scale) throughout the first 24 hours post-operatively (PACU arrival, 2, 6, 12, 18, and 24 hours post operatively). The secondary outcome measures were intra- and post-operative narcotic consumption (total morphine equivalents, TME).

Results: 62 patients (mean age 60.5 years) were included in the study. 32 received plain bupivacaine, whereas 30 received the combination block. Mean pain levels in PACU, 2 hours, and 12 hours post-operatively were significantly lower in the combination block group (0 vs. 4; 1 vs. 5; 3 vs. 5.5; $p<0.05$). Mean total narcotic consumption (TME) was lower for the combination block (42 vs. 65, $P<0.05$). There was no significant difference in the intraoperative narcotic administered between the treatment groups. Two patients who received the combination block had intraoperative bradycardia but did not require intervention.

Conclusions: Intraoperative dorsal penile nerve block consisting of long acting local anesthetic mixed with dexmedetomidine and dexamethasone can safely enhance immediate post-operative analgesia and decrease opioid consumption in the first 24 hours after surgery. A prospective randomized study is underway to further evaluate outcomes. This type of combination penile nerve block may also be a useful tool for other penile and scrotal surgeries.

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Analyzing the Quality of YouTube Videos on Inflatable Penile Prosthesis Surgery

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Introduction: Video websites, predominantly YouTube.com, offer patients unfiltered and unregulated medical content. Patient commonly use these online medical resources to investigate intimate conditions. It remains unknown whether YouTube videos on penile prosthesis surgery are useful or informative for patients. We assessed the quality and reliability of YouTube videos pertaining to penile prosthesis surgery.

Materials & Methods: We compiled penile prosthesis videos on YouTube using a combination of multiple pertinent keyword searches. Videos were screened by two reviewers. Videos that were irrelevant, not in English, or without audio and also without captioning were excluded. Video demographics and viewership information were collected and categorized by channel type.

Videos were categorized by themes, which included useful, misleading, or patient views. Reliability was assessed using a modified 5-point DISCERN tool and videos were rated using 5-point Global Quality Scale (GQS). Video comprehensiveness was evaluated using a 5-point content score. Interobserver agreement was assessed using Cohen's kappa score (*k*) and intraclass correlation coefficient.

Results: Of the 165 videos that initially met inclusion criteria, 23 were hidden or deleted from YouTube at the time of analysis. The remaining 142 videos totaled 1.21 million views, with an average view count of 85,914. Of these, 57 (40.4%) were from universities, professional organizations, non-profits or physicians/physician groups. An additional 56 (39.7%) were medical advertisements from for-profit companies. 20 videos (14.2%) were from individual channels and 13 (9.2%) were stand-alone health information websites.

The average reliability score was 3.56 (±0.0773), *k*=0.489. The average GQS was 3.22 (±0.0733), *k*=0.128. The average content score was 1.83 (±0.087), *k*=0.683. Intraclass correlation coefficient was calculated as for 0.537 for DISCERN and 0.662 for GQS, suggesting moderate reliability. 76 videos (53.9%) were identified as self-promotional. 20 videos (14.1%) were identified as patient testimonials. 123 videos (86.6%) were identified as "useful", 2 videos (1.41%) "misleading" and, 17 videos (12%) as "patient views".

Conclusions: There is room for improvement in the quality and reliability of YouTube videos pertaining to penile prosthesis surgery. The analyzed YouTube videos also have low content comprehensiveness. Results were consistent across reviewers. Over half of penile prosthesis surgery videos on YouTube are clearly identified as self-promotional by reviewers.

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An Initiative to Reduce Door to Incision Time for Patients with Testicular Torsion

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Introduction: Time from symptom onset of testicular torsion to detorsion predicts likelihood of testicular salvage. We aimed to reduce time from door-to-incision to under 120 minutes at our institution.

Materials & Methods: We developed a streamlined process to prioritize suspected torsion cases, coordinating a multidisciplinary team including urology, emergency medicine, radiology, anesthesiology, perioperative services, and transport services. The Initial intervention involved rapid identification of suspected cases in the emergency room (ER), immediate parallel notification of urology and radiology for evaluation, case prioritization by perioperative services, and rapid assessment by anesthesiology. We subsequently implemented portable bedside ultrasound in the ER for all suspected torsion cases. We assessed the effects of the intervention with statistical X-mR process control charts and used Nelson rules to determine special cause.

Results: From January 2019 to February 2021, we observed 33 torsion events requiring surgical intervention, 15 before and 18 after the intervention. Following improvement efforts, mean door-to-incision time decreased from 221 minutes to 123 minutes. After the intervention there was a significant decrease in door to incision time through a shift of 8 patients below the control limit. We further identified a significant reduction in patient-to-patient variation through a shift of 8 in the moving range below the control limit. Compared to cases prior to our intervention time from arrival to ultrasound remained unchanged from 60 minutes to 62 minutes, and time from arrival to urology evaluation decreased from 135 minutes to 62 minutes, ultrasound duration decreased from 43 minutes to 36 minutes, and time from ultrasound to incision decreased from 157 minutes to 76 minutes.

Conclusions: Implementation of multidisciplinary improvement work reduced door to incision time for patients with suspected testicular time. These interventions provide a reproducible model to improve efficiency in treating patients with testicular torsion.

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Is a Preoperative Type and Screen Required in Patients Undergoing Common Urological Procedures? A Cost-Benefit Analysis

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Introduction: Our objective was to evaluate the cost-effectiveness of obtaining preoperative type and screen (TS) for common urological procedures and to determine patient and hospital factors associated with receiving blood transfusions.

Materials & Methods: Retrospective database analysis of the 2006-2015 Nationwide Inpatient Sample (NIS) was performed to identify patients undergoing a variety of urological procedures. A total of 4,113,144 cases were identified. Transfusion rates were then determined from NIS data, and multivariate regression analyses was used to identify factors associated with transfusions. A cost-effectiveness analysis was performed to determine the incremental cost-effectiveness ratio (ICER) of obtaining preoperative TS to prevent an emergency-release transfusion (ERT), with a willingness-to-pay threshold of $1,500.

Results: Transfusion rates of common urological procedure ranged from .91% to 33.14%. On multivariate modeling, all comorbidities with the exception of obesity were significantly associated with blood transfusion. Some examples included diabetes (OR, 1.26; 95% CI, 1.19-1.33), liver disease (OR, 1.20; 95% CI, 1.13-1.29), and metastatic cancer (OR, 2.69; 95% CI 2.54-2.85) ($p < 0.01$ for all). One-way sensitivity analysis demonstrated that the risk of transfusion should exceed 4.12% to justify preoperative TS. The ICER of preoperative TS for radical prostatectomy (transfusion rate = 3.88%) and penile implants (transfusion rate = 0.91%) were $1,607 and $7,709 per ERT prevented, respectively.

Conclusions: Based on a large national database, institutions should consider a risk of transfusion greater than or equal to 4.12% to justify a preoperative TS. A selective TS policy for high risk patients may reduce costs and unnecessary workload for laboratory staff.

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Caprini Score Compliance and Changes in Practice Patterns at an Academic Urological Practice

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Introduction: The Caprini score (CS) accurately predicts those at risk of a venous thromboembolism (VTE) and determines the duration prophylaxis (ppx). The American Urological Association acknowledges high risk individuals and recommends inpatient VTE ppx but fails to provide clear guidelines for outpatient ppx. We sought to assess the practice patterns of urologists prescribing VTE ppx in the post-operative setting for major urological cases after a hospital wide mandate to utilize the CS.

Materials & Methods: A retrospective chart review after institutional review board approval identified patients that had a (robotic, open, or laparoscopic) partial nephrectomy (n = 247) and a (robotic) prostatectomy (n = 317) at an academic medical center from the year 2014-2020. Basic demographic, clinical, operative, and anticoagulation data was collected.

Results: Partial nephrectomy patients had a CS of 5.3 (range 2-19), inpatient VTE ppx was used 99% of the time, and readmission rate was 12.6% (**Table 1**). In 2 years since CS implementation, >50% of patients were assigned a CS, and in 4 years >50% with a CS of >4 received VTE ppx (**Figure 1**). Prostatectomy patients had a CS of 6.0 (range 1-10), inpatient VTE ppx was used 97.5% of the time, and readmission rate was 2.2%. In 2 years since CS implementation, >50% of patients were assigned a CS, and in 3 years >50% of patients with a CS of >4 received VTE ppx. No correlation was found between VTE ppx for patients with CS >4 and the readmission rates for partial nephrectomy or prostatectomy patients (r= 0.526, p = 0.23 and r= 0.107, p = 0.82, respectively).

Conclusions: Compliance with national guidelines for inpatient thromboprophylaxis remains high. The Caprini scoring system takes 4 years after a hospital wide mandate to translate into clinical practice while readmission rates remain stable.

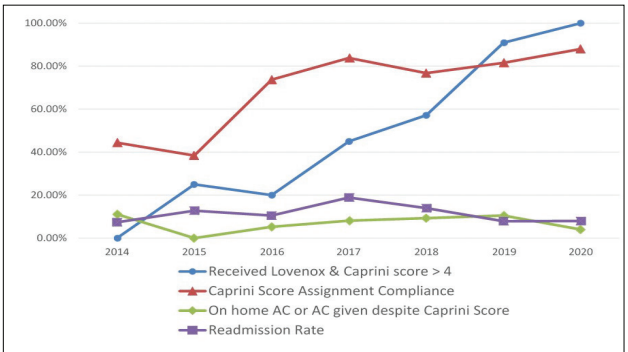

Figure 1: Caprini Score, thromboprophylaxis usage and readmission rates over time for partial nephrectomy patients. AC: anticoagulation

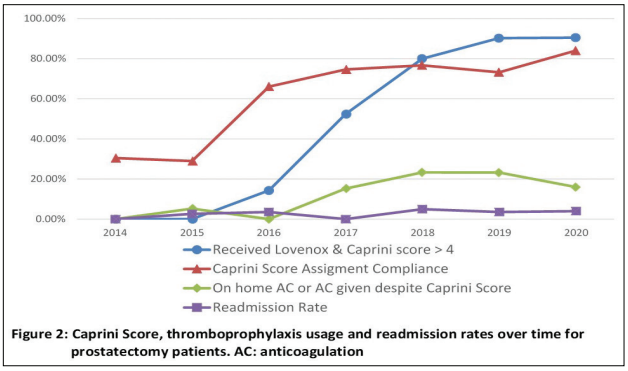

Figure 2: Caprini Score, thromboprophylaxis usage and readmission rates over time for prostatectomy patients. AC: anticoagulation

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Antibiotic Prophylaxis Prior to Outpatient Urologic Procedures: Outcomes From a Department-Wide Quality Improvement Project

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Introduction: Urinary tract infections (UTI) are a common complication following office-based lower urinary tract procedures. While the American Urological Association Best Practice Statement provides guidelines on antibiotic prophylaxis in this setting, significant variability remains in practice. We assessed the effects of operationalizing a standardized approach to antibiotic use for outpatient lower tract procedures through a nursing-driven algorithm.

Materials & Methods: In February 2019, we implemented a clinical decision-support algorithm based on the Best Practice Statement within a regional healthcare network including five practice sites across two states. Covered procedures were outpatient cystourethroscopies with or without manipulation and urodynamic testing. Antibiotic selection was based on an algorithm consisting of established patient risk factors. Nursing staff assessed risk factors and administered single dose 3g oral fosfomycin for eligible patients. We evaluated the impact of our protocol in reducing site-level variation in antibiotic use, abnormal urinalysis, and rates of UTI.

Results: 12,909 patients were seen from January 2018 to December 2020, with 7,711 falling under the antibiotic protocol. We observed a reduction in the variation of antibiotic administration post-protocol (difference in SD = -10.55, $p < 0.001$), accompanied by an overall decrease in antibiotic use rate (- 9.4%, $p < 0.001$). Changes varied by site, with the pre-intervention highest utilizer experiencing a decrease (absolute percent change – 30.70%, relative percent change - 60.99%) and the lowest utilizer experiencing an increase (absolute percentage change +14.92%, relative percentage change +46.83). Antibiotic use rate changes were not accompanied by a change in abnormal urinalysis (+2.69%, p = 0.437) or urinary tract infection (+0.04%, p = 0.652).

Conclusions: Operationalizing a standardized nurse-driven antibiotic prophylaxis pathway for office based cystoscopy reduced practice-level variation in antibiotic administration across a regional healthcare system. Changes in antibiotic practices were not associated with measurable changes in overall rates of UTI.

Table 1: Patient demographics, Operative, Hospital, Caprini and Thromboprophylaxis Data

Variables	Partial nephrectomy (n= 247)	Prostatectomy (n = 317)
Age (years)	56 (20 – 89)	61 (42 – 75)
Male (%)	58	100
BMI (kg/m^2)	30.4 (17.5 – 53.1)	28.2 (15.7 – 45)
Comorbidity		
Diabetes (%)	26	26
Hypertension (%)	58	65
Hyperlipidemia (%)	48	45
Coronary Artery Disease (%)	7	5
Deep vein thrombosis history (%)	6	2
Surgical Approach		
Open (%)	18	0
Laparoscopic (%)	40	0
Robotic (%)	42	100
Operative Time (minutes)	180 (101 – 551)	209 (62 – 439)
Estimated Blood Loss (mL)	299 (50 – 1600)	287 (50 – 2000)
Length of Stay (days)	3.1 (0 – 12)	1.5 (1 – 10)
Average Caprini Score (range)	5.3 (2 – 19)	6 (1 – 10)
Inpatient thromboprophylaxis (heparin) usage (%)	99	97.5
Outpatient thromboprophylaxis with Lovenox (%)	25.5	21.5
Average length of thromboprophylaxis (days)	11.4 (6- 30)	9.5 (5 – 11)
Readmission Rate (%)	12.6	2.8
Bleeding (%)	4	0
DVT/PE (%)	0.4	0

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Urology Match 2021: Characteristics and Outcomes of Successful Applicants Amid COVID-19

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Introduction: Urology is historically a highly selective residency, and the 2021 urology match rate of 74% was the lowest in 5 years. It is unclear whether this is a result of COVID-related disruptions or is due to other factors such as increased interest in urology. Only 34% of applicants surveyed preferred virtual interviews, and many expressed concerns about match outcomes in the months prior to it. Unfortunately, applicant data are scarce compared to those published by other specialties. Thus, our aim was to describe the characteristics and outcomes of recently matched urology applicants.

Materials & Methods: The popular Urology Match Google spreadsheet was accessed in February 2021 and reviewed to summarize anonymous, crowdsourced, self-reported data for matched applicants, including a complete match list for all residency programs. Results were compared to historical data published by the AUA.

Results: Of 198 matched applicants with data, 64 (18%) matched at their home program while 32 (9%) matched where they completed an away rotation. Six of 143 (4%) programs matched all home students. Of 83 matched applicants with data, 73 (88%) were US allopathic seniors, 8 (10%) were osteopaths, 2 were foreign grads, and 20% had no home residency program. Additional data are displayed in the **Table**. USMLE scores were consistent with prior reports and >70% sent Step 2 CK scores to programs. Most matched applicants were in the top class quartile, with 39% earning AOA status. On average, matched applicants had 4 published articles and 9 other research items. They completed 2 urology sub-internships at home or away sites and applied to 80 programs. Matched applicants received 19 interviews, 2-3 being from the waitlist, and attended and ranked 15. Over half matched in their top 2 choices with 83% in their top 5. 11% matched from a waitlist interview and 21% matched at a program ranked lower than their home/away rotation sites.

Conclusions: In an unprecedented academic year and application cycle, matched urology applicants remained highly competitive and obtained their desired programs even while completing fewer away rotations. Interview metrics were not notably higher than in prior years, despite concerns of virtual interviews leading to inflation and hoarding. A significant minority matched from the waitlist, lending support to the new interview invitation process's utility.

Table **Self-Reported Characteristics and Outcomes of Matched Urology Applicants in the 2021 AUA Match Year**

Characteristic	Average	Median (IQR)	Range
Step 1 Score	244.9	247 (18.5)	208 - 268
Step 2 CK Score	253.6	253 (17)	230 - 274
Class Quartile [a]	1.5	1 (1)	1 - 4
Peer-Reviewed Publications [b]	4.3	4 (3)	0 - 19
Posters, Podiums, Other Publications	8.9	7 (6)	0 - 50
Urology Sub-I Rotations Completed [c]	1.9	2 (2)	0 - 4
Programs Applied To	79.7	77 (38.5)	10 - 139
Total Interview Offers Received	18.8	18 (12)	2 - 50
Interview Offers from Waitlist	2.7	2 (3)	0 - 14
Interviews Attended	15.0	15 (8)	2 - 31
Programs Ranked	14.8	15 (8.5)	2 - 28
Rank List Position Matched	3.3	2 (3)	1 - 15

Characteristic	Percent
No Home Residency Program	19.8%
Member of AOA [d]	38.6%
Step 2 CK Score Sent to Programs	72.3%
Matched from Waitlist Interview Offer	10.8%
Matched Below Home/Sub-I [e]	20.7%

Abbreviations: AOA, Alpha Omega Alpha. AUA, American Urological Association. CK, clinical knowledge. Sub-I, sub-internship.
[a] Quartile 1 indicates top 25% of class rank, 4 indicates bottom 25%.
[b] Includes only full articles, excluding published abstracts.
[c] Includes both home program and away rotations, for those eligible to complete them.
[d] 15.7% of respondents did not have an AOA designation offered by their medical school.
[e] Indicates that applicant matched at a program which they ranked lower than all programs where they rotated, including both their home residency program and any away rotations completed.

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Urology Resident Surgical Ergonomics

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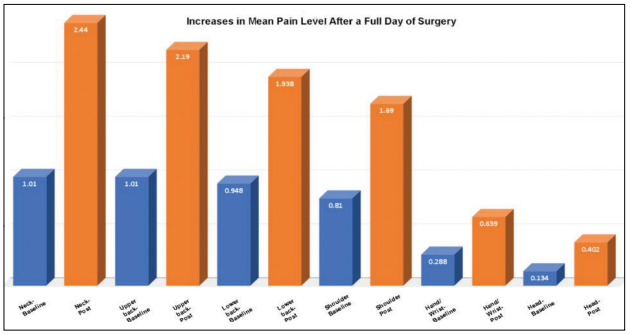
Introduction: Surgery is a physically demanding occupation which can lead to the development of musculoskeletal pain (MSKP). These injuries can inflict long-term physical, emotional, and economic consequences. Surgical ergonomics has been an understudied topic within the field of urology and specifically during residency education. We sought to further characterize urology residents' knowledge and experiences regarding surgical ergonomics.

Materials & Methods: An online survey was created to assess topics such as work-related pain, provoking factors, and ergonomics education. This questionnaire was sent by email to all accredited urology residency program directors listed on the American Association of Urology website. This was then disseminated to eligible residents.

Results: We received a total of 98 responses (66 male- 67.3% and 32 female- 32.7%). Mean age and post-graduate year were 30.3 years and 3.2, respectively. Work-related MSKP was reported in 64.3% of respondents. Of all residents, 60.2% plan to pursue fellowship, and 10.4% stated that subspecialty choice was influenced by work-related pain. 74.5% affirmed that their program does not address surgical ergonomics. Procedures which most commonly led to MSKP were open-pelvic (56.1%), endoscopic (39.8%), and open-retroperitoneal (34.7%) cases. The greatest increases in pain after a full day in the OR were described in the neck, shoulders, and upper back (figure 1). Seven residents stated that work-related pain has either led to operative mistakes or the inability to operate. A total of 42.7% of trainees have used NSAIDs for pain control, many as often as 1-3 times per week. Improved ergonomics training was desired in 88.5% of participants in the form of instruction while operating, simulation training, and lectures/didactics.

Conclusions: Two-thirds of urology trainees have experienced work-related pain or injuries most commonly reported in the neck, back, and shoulders. There currently exists a substantial opportunity to improve residency education regarding surgical ergonomics with most trainees desiring more instruction to prevent MSKP.



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Impact of Redeployment during the COVID-19 Pandemic on Urology Resident Education and Perceptions of the Equity of Redeployment Strategies

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Introduction: During the height of the COVID-19 pandemic in spring 2020, residents and attending physicians from various specialties, including urology were reassigned to COVID units. Didactic education was easily transitioned to virtual platforms, but the implications of decreased urologic surgical volumes on trainee education and attending and trainee perceptions of the redeployment require further investigation.

Objective: To assess urology trainees and faculty redeployment and ascertain if there are any concerns about the long-term sequelae of redeployment on urology resident education.

Materials & Methods: An anonymous 14-question survey was administered between May 26, 2020 and June 30, 2020 to urology program staff and trainees at all accredited U.S. urology residency programs.

Results: 81 faculty, residents, and fellows representing all the AUA sections participated in our survey. 90% of respondents stated their institution had a redeployment strategy. 59% of participants felt that their institution's redeployment strategy was fair and equitable. However, a subgroup analysis comparing resident and attending responses, demonstrated a significant difference between faculty and residents who agreed that the redeployment plan was fair and equitable (67.9% vs 40.5%, respectively). The redeployment most often included residents (84%) and attendings (69%), followed by advanced practice providers (APPs) (63%) and fellows (52%). 48% of participants felt that deployed residents were still able to attend urologic education during redeployment. However, 31% of participants believed that COVID and redeployment will affect residents' ability to reach the required surgical volume or competency goals for graduation.

Conclusions: In response to the unprecedented COVID-19 pandemic, urology residency programs across the country sought to maintain trainee education in the midst of decreased surgical volumes and redeployment. Our study demonstrates a level of concern regarding the fairness of redeployment strategies, especially within resident respondents, and their impact on urology resident competency that should be considered in future redeployment strategies should they be necessary.

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Radical Cystectomy with Junior Residents: Longer Days, Equivalent Outcomes

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Introduction: Radical cystectomy (RC) is known to be a highly morbid, complex, and technically challenging operation. At academic centers, the assistant is traditionally a chief or senior resident. Our institution has one urology resident per year and annually performs a total of 40-50 open or robotic radical cystectomies. This leads to junior residents (PGY2, PGY3) frequently participating as the primary assistant. Here we explore the impact of resident experience level on operative, hospital, and post-operative outcomes in RC.

Materials & Methods: A single institution, prospectively maintained database identified 159 consecutive patients who underwent open or robotic RC from 2015-2019. Residents involvement was recorded in 154 cases. Operative time, estimated blood loss (EBL), intraoperative transfusion rate, length of stay (LOS), in hospital complication, complication within 90d, readmission at 90d, and urinary diversion complications (eg uretero-ileal stricture) were compared between junior (PGY2 & PGY3) and senior (PGY4 & PGY5) residents. Patient demographics including age, sex, BMI, preoperative neoadjuvant chemotherapy, and ASA score were examined. Statistical analysis was performed with SPSS.

Results: Over a 5-year period, junior residents assisted in 53 of 154 cases (34%) where a resident was involved. The number of cases done by PGY2, PGY3, PGY4, & PGY5 residents was 6, 47, 44, and 57, respectively. The percentage of open versus robotic cases was similar. There were no differences in examined patient demographics between groups. Cases with junior residents took an average of 29.1 min (CI 3.4-54.8, p=0.027) longer than when a senior resident was present. No other statistically significant differences between the two groups were seen when comparing EBL, intraoperative transfusion rate, surgical margin status, LOS, hospital complication, 90d complication, 90d readmission, or long-term urinary diversion complication (**Table 1**).

Conclusions: Radical cystectomy remains a challenging urologic operation demanding technical excellence. Our data suggests that participation by junior residents increases the length of operation by ~10% (29.1 min) but does not negatively impact patient outcomes. We propose this is explained by increased oversight from the attending surgeon, which allows junior residents to participate safely in an otherwise complex surgery.

Table 1. Open and robotic radical cystectomy outcomes when comparing junior and senior residents as the primary surgical assistant.

Radical Cystectomy Outcomes by Resident Experience Level				
	Diff (95%CI)	*Junior mean (SD)*	*Senior mean (SD)*	*p=*
Operative Time (min)	**29.1 (3.36–54.8)**	**391.8 (70.3)**	**362.7 (79.9)**	**0.027**
Estimated Blood Loss (ml)	74.5 (-68.2-217.2)	607.8 (445.1)	533.3 (415.6)	0.304
		median (IQR)	*median (IQR)*	*p=*
Length of Stay (days)		6.0 (6.0-9.0)	7.0 (5.0-9.0)	0.922
		n (%)	*n (%)*	*p=*
Case type				p=0.58
	Open	42 (79)	76 (75)	
	Robotic	11 (21)	25 (25)	
Intraoperative Transfusion				P=0.29
	No	44 (83)	90 (89)	
	Yes	9 (17)	11 (11)	
Surgical Margins				p=0.74
	Neg	51 (96)	96 (95)	
	Pos	2 (4)	5 (5)	
In Hospital Complication				p=0.70
	No	24 (45)	49 (49)	
	Yes	29 (55)	52 (51)	
Complication within 90d				P=0.98
	No	12 (23)	23 (23)	
	Yes	41 (77)	78 (77)	
Readmission at 90d				p=0.42
	No	30 (57)	65 (64)	
	Yes	22 (42)	36 (36)	
Urinary Diversion Complication				p=0.17
	No	45 (85)	72 (71)	
	Yes	8 (15)	25 (25)	

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Optimizing Patient Selection for Telehealth: Results from a Large-Scale Urology Telehealth Implementation

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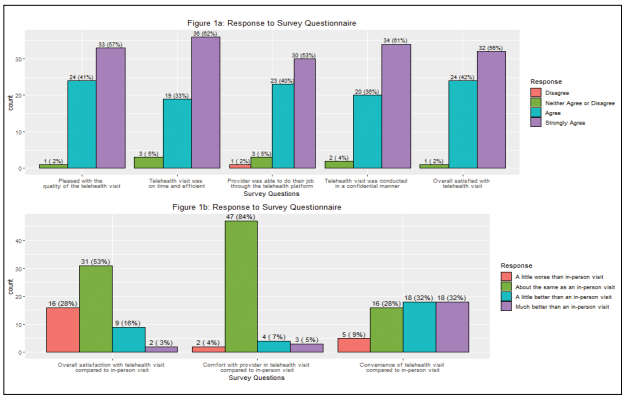
Introduction: Telehealth has a number of potential benefits for patients and providers, including reductions in time and cost required to obtain healthcare, expanded access to specialty providers, and reductions in existing healthcare disparities. Despite these benefits, patients vary in their satisfaction with the telehealth experience. Herein, we characterized patient satisfaction with telehealth visits and evaluated predictors of satisfaction with telehealth visits to improve patient selection when booking telehealth visits.

Materials & Methods: We invited patients who had a telephonic or video telehealth visit from April-May 2020 at our institution to complete an online survey, via single-wave email invitation. We abstracted baseline characteristics for respondents from the medical record, and linked zip-code level socioeconomic data from the US Census. To improve patient selection for telehealth, we used univariable logistic regression to evaluate the associations of baseline characteristics with patient preference for telehealth over an in-person visit for a future encounter.

Results: 58 respondents (22% response rate) were included in the study, of whom 79% were male, 91% were white, and 45% of were privately insured. This was the first telehealth experience for 69% of patients. Reasons for consultation were: oncologic in 48%, nephrolithiasis in 10%, BPH/voiding dysfunction in 34%, and other in 7% of patients. Overall, 93% of patients would recommend telehealth to a friend/family member. When asked their preferred format for a future visit, 51% responded telehealth while 49% responded traditional, in-person visit. Additional survey responses are summarized in **Figure 1**. On univariable regression, having a prior telehealth visit was associated with preference for future telehealth visit format (OR 3.74; 95% CI 1.16-13.6); self-reported tech-savviness did not reach statistical significance (OR 3.47; 95% CI 0.99-14.3).

Conclusions: In this study, respondents reported high satisfaction with telehealth visits. Prior telehealth experience was the best predictor of patient preference for a future telehealth visit. These results suggest allowing patients to choose their preferred visit format may be a simple mechanism for optimizing patient satisfaction with telehealth.



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Differences in Healthcare Expenditures and Utilization by Race for Common Benign Urologic Conditions

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Introduction: Little is known about racial disparities in the care of urology patients. We sought to identify differences in healthcare expenditures and utilization by race in patients treated for common benign urologic conditions.

Materials & Methods: A retrospective secondary data analysis was conducted of patients with common benign urologic conditions using 2016-2018 Medical Expenditure Panel Survey data. Benign conditions included urolithiasis, cystitis, erectile dysfunction (ED), pelvic organ prolapse (POP), urinary incontinence (UI), and benign prostatic hyperplasia (BPH). Generalized linear models were used to evaluate the relationship between total healthcare expenditures and utilization and race for each condition. Adjusted analyses accounted for age, sex, number of chronic conditions, poverty category, self-reported health status, marital status, highest degree of educational attainment, insurance status, and survey year.

Results: The weighted analysis sample consisted of 27,110,416 patients, of whom 80.9% were Non-Hispanic white, 6.9% Non-Hispanic black, and 12.2% other minority races. After adjustment, total healthcare expenditures were significantly lower for Non-Hispanic blacks (Incidence Rate Ratio [IRR] = 0.19, 95% CI: 0.06 - 0.61) and other minority races (IRR = 0.30, 95% CI: 0.10 - 0.88) treated for ED compared to Non-Hispanic whites (Figure 1). Similarly, compared to Non-Hispanic whites, healthcare expenditures were significantly lower for Non-Hispanic blacks treated for UI (IRR = 0.56, 95% CI: 0.35 - 0.90). After adjustment, Non-Hispanic blacks (IRR = 0.71, 95% CI: 0.53 - 0.94) and other minority races (IRR = 0.83, 95% CI: 0.69 - 0.99) had significantly lower total healthcare utilization for cystitis and BPH respectively.

Conclusions: Healthcare expenditures are significantly lower for Non-Hispanic blacks treated for ED and UI in the U.S. Utilization is also significantly lower for Non-Hispanic blacks and other minority races treated for cystitis and BPH respectively. Future research is needed to determine if these differences represent an inequality in the delivery of urologic care for patients with these conditions.

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COVID-19 Pandemic Results in Decreased Non-Urgent Urologic-Related Presentations to the Emergency Department

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Introduction: Recent international medical research has focused specifically on changes to urologic presentations to the ED during the COVID-19 pandemic. Urologic-related visits to the ED are variable in their acuity, ranging from non-emergent to life-threatening. Our research focuses on differences in frequency between urgent and non-urgent visits during the first months of the pandemic to further elucidate delayed access to urologic care in the ED. We hypothesized that there would be a significant difference in urological cases evaluated in the ED during the first four months of 2019 compared to that of 2020. Furthermore, we investigated compelling trends amongst specific disease presentations during this time.

Materials & Methods: Data was collected from emergency department records from two academic institutions in the United States. All adult urologic-related cases that presented to the ED, during the time periods of January-April 2019 and January-April 2020. Presentations were included if the chief complaint or diagnosis included urologic conditions. Retrospective data was collected on these individuals and through these two separate time intervals, 1,838 urological presentations were organized by diagnosis category. They were then divided into urgent and non-urgent categories based on clinical diagnosis. A retrospective analysis was performed comparing the frequency and type of urologic-related presentations. Interrupted time series regression models were used to determine how urologic-related ED visits changed due to the COVID-19 pandemic. All statistical analysis was performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results: A total of 1,838 urologic-related ED visits were included in the analysis. (**Table 1**). There was a statistically significant decrease in total urologic-related ED visits after the COVID-19 pandemic began by 76 visits per month with a 36.9% reduction (p=0.002). While there was no difference in the number of urgent ED visits due to the COVID-19 pandemic (p=0.13), there was a statistically significant decrease in non-urgent ED visits by 68 visits per month with a 37% reduction (p=0.002). When examining the individual visit types, there were no differences in visit volume except for hematuria and nephrolithiasis/ureterolithiasis visits. There was a statistically significant decrease in hematuria-related ED visits, by 11 visits per month (p=0.03). Similarly, there was a statistically significant decrease in nephrolithiasis/ureterolithiasis-related ED visits, by 28 visits per month (p=0.04).

Conclusions: The COVID-19 pandemic coincided with a significant decrease in the number of non-urgent urologic presentations to our institution's ED. Specifically, there was a significant decrease in the number of patients presenting with hematuria and nephrolithiasis-related issues. There was no significant decrease in the number of urgent urologic consults. Follow up study is indicated to investigate the downstream effects of delayed evaluation for these non-urgent urologic diagnoses.

Table 1: Urologic-Related ED Visits by Type

	Jan – April 2019	Jan – April 2020
Total	1009	829
Urgent	46	47
Non-urgent	963	782
Bladder Mass	7	3
Encounter for care or replacement of suprapubic tube, Nephrostomy, Foley catheter	74	71
Fournier gangrene	1	2
Gross Hematuria	215	150
Hydronephrosis	3	16
LUTS without retention	59	54
Nephrolithiasis/ Ureterolithiasis	349	308
Obstructive Pyelonephritis	8	13
Penile pain/ Swelling/ Paraphimosis	10	7
Post-Operative	11	8
Priapism	7	4
Prostate Cancer	4	0
Prostatitis	3	0
Renal lesion, mass, cyst, abscess	16	15
Scrotal infection	9	6
Sepsis	21	17
Testicular pain/ Epididymitis/ Orchitis	33	19
Testicular torsion	5	2
Urethritis	30	16
Urinary incontinence	0	5
Urinary retention	125	100
Urologic Trauma	2	7
Varicocele/ Hydrocele/ Testicular Mass	17	6

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Effects of Vibegron on Ambulatory Blood Pressure in Patients With Overactive Bladder: Results From a Double-Blind Study

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Introduction: Ambulatory blood pressure monitoring (ABPM) is a sensitive method used to determine whether small changes in blood pressure (BP) and heart rate (HR) are induced by new drugs. This randomized, double-blind, placebo-controlled ABPM trial was used to characterize the BP and HR profile of the novel β_3-adrenergic receptor agonist vibegron in patients with OAB.

Materials & Methods: Patients were randomized to once-daily vibegron 75 mg or placebo for 28 days. The primary endpoint was change from baseline (CFB) to day 28 in mean daytime (waking hours) ambulatory systolic BP (SBP). Key secondary endpoints were CFB to day 28 in mean daytime ambulatory diastolic BP (DBP) and HR and in mean 24-hour ambulatory SBP, DBP, and HR. Point estimates for treatment group means and treatment differences were presented with a 2-sided 90% confidence interval (CI). For the primary endpoint, the upper limit of the CI was evaluated against a criterion of 3.5 mmHg.

Results: A total of 214 patients with OAB were randomized; of these, 96 in the vibegron group and 101 in the placebo group had evaluable ABPM measurements at baseline and day 28. Mean age was 59.3 years and 74.6% were female; 39.6% and 30.7% of patients receiving vibegron or placebo, respectively, had pre-existing hypertension. The least squares mean difference (LSMD; 90% CI) CFB to day 28 in daytime SBP was 0.81 (-0.88, 2.49) mmHg for vibegron vs placebo (**Table**). Changes in daytime DBP and HR were comparable for vibegron and placebo (**Table**). The 90% CIs include 0, implying no statistically significant differences were seen in mean 24-hour SBP (**Figure**), DBP, or HR (**Table**). The most commonly reported treatment-emergent adverse event was hypertension (vibegron: n=5 [4.7%, 95% CI=1.6%-10.7%]; placebo: n=4 [3.7%, 95% CI=1.0%-9.2%]); no event of hypertension with vibegron was considered treatment related.

Conclusions: In patients with OAB, once-daily vibegron was not associated with clinically meaningful or statistically significant effects on BP or HR and had a safety profile comparable with placebo.

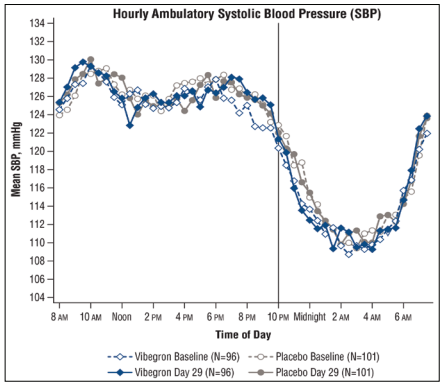

Table. Change from baseline to day 28 in daytime and mean 24-hour SBP, DBP, and HR.

	Daytime		Mean 24-Hour	
Change From Baseline to Day 28	**Placebo (N=101)**	**Vibegron (N=96)**	**Placebo (N=101)**	**Vibegron (N=96)**
SBP, mmHg				
LS mean (90% CI)	0.01 (–1.37 to 1.39)	0.82 (–0.58 to 2.22)	0.03 (–1.23 to 1.29)	0.60 (–0.68 to 1.87)
LSMD (90% CI)*	–	0.81 (–0.88 to 2.49)	–	0.57 (–0.97 to 2.10)
DBP, mmHg				
LS mean (90% CI)	0.55 (–0.40 to 1.49)	0.50 (–0.46 to 1.47)	0.70 (–0.16 to 1.56)	0.51 (–0.38 to 1.40)
LSMD (90% CI)*	–	–0.04 (–1.20 to 1.11)	–	–0.19 (–1.25 to 0.87)
HR, bpm				
LS mean (90% CI)	0.19 (–0.74 to 1.12)	1.08 (0.12 to 2.03)	–0.15 (–1.01 to 0.70)	0.80 (–0.08 to 1.68)
LSMD (90% CI)*	–	0.88 (–0.26 to 2.03)	–	0.96 (–0.10 to 2.01)

BP, blood pressure; DBP, diastolic BP; HR, heart rate; LS, least squares; LSMD, LS mean difference; SBP, systolic BP.
*Vibegron – placebo.

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How a Recording Company, a Rock Band and a Nobel Laureate Developed Computed Tomography

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Introduction: A Nobel laureate, one of the most important recording companies of the 20th century and one of the most influential musical groups of all time come together to develop computed tomography (CT).

Materials & Methods: We reviewed the medical literature regarding the life of Sir Godfrey Hounsfield, the history of Electrical Musical Industries, Ltd (EMI) and the Beatles in reference to the development of CT.

Results: During World War II, EMI played a crucial role in the war effort, working on radar systems for the allies. After the war, EMI would translate its electronic prowess into the recorded music business. In 1955 it would purchase Capitol Records and with the growth of the music industry in the 1950s, EMI would sign the Beatles. With the meteoric rise of the Beatles, EMI's profits rose 80% in their first year after signing the Beatles. Sir Godfrey Hounsfield, an English electrical engineer, served in the Royal Air Force during World War II as an instructor in radar mechanics. After the war he began his scientific career in 1951 working for EMI. He helped design and construct the first solid-state (transistor) computer in England in 1959. In 1967 Hounsfield began developing what would become the first CT-scanner. By directing x-ray beams through the body at 1 degree angles, with a detector rotating in tandem on the other side, he could measure the attenuation of the x-rays. These values were then analyzed via a mathematical algorithm to produce a 2-dimensional image of the slice of the body. Hounsfield worked with Jamie Ambrose, a radiologist, to conduct the first clinical CT-scan at Atkinson Morley Hospital in 1971 in a patient with a brain tumor. In 1971, EMI entered the medical equipment business marketing the CT-scanner using its previous sales from the recording industry (much of it due to the Beatles) to help finance its new venture. By 1976, the CT industry was booming and EMI could not produce enough CT-scanners to fill demand. In the end, as other companies would enter the CT market, EMI would have a hard day's night maintaining its monopoly and would eventually get back to the music industry. Allan MacLeod, a South African physicist, working independently of Hounsfield developed the same theory on how x-rays could be utilized to image the body. Both Hounsfield and MacLeod, neither with a medical background, would win the 1979 Nobel Prize in Medicine and Physiology for inventing the CT-scanner.

Conclusions: Let it be known that it was only yesterday when a recording company, a band and a radar scientist revolutionized medical imaging and radiology with the development of the CT-scanner. [Bonus: Can you find the names of 7 Beatles songs hidden in this abstract?]

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WITHDRAWN

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Content and Readability of Robotic and Laparoscopic Sacrocolpopexy Information Online

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Introduction: Apical pelvic organ prolapse (POP) is a common condition that impacts women, with up to 18% of affected women receiving surgical intervention. Currently, sacrocolpopexy is considered the gold standard surgical treatment. With recent advances in laparoscopic and robotic techniques, many institutions offer this minimally invasive approach as the preferred treatment modality. In today's digital era with the emergence of telehealth amidst the Covid-19 pandemic, many look to the internet for medical information. In an unregulated webspace, people may experience difficulties searching for and understanding information online. In this study, the content and readability of select internet pages describing robotic and laparoscopic sacrocolpopexy were evaluated.

Materials & Methods: Using an online keyword planner, the phrases "robotic sacrocolpopexy" and "laparoscopic sacrocolpopexy" were determined to be the most popular search terms. These terms were systematically browsed in Incognito mode in three of the most popular web search engines: Google, Yahoo, and Bing. Links that were non-text primary, duplicate, irrelevant, and non-English were excluded. Flesch-Kincaid Grade Level and Flesch-Kincaid Reading Ease indices were used to assess readability. These scores were analyzed using a one-way ANOVA on ranks.

Results: Of 300 total results, 54 unique sites were analyzed. 18 (33.3%) of these sources were private practice, 16 (29.6%) academic, and 7 (13.0%) non-academic. There were 26 (48.1%) obstetric/gynecologic-specific sites, 6 (14.8%) urology-specific sites, and 19 (35.2%) specialty-unspecified sites. The average readability of all sites was 12.9, requiring at least a 12th grade reading level, which is significantly higher than the recommended AMA/NIH level of 7th grade or below. 53 (98.1%) sites were above the recommended 7th grade reading level. 36 (66.7%) sites were written at the 12th grade level or higher. Only 8 (14.8%) were written below a high school reading level of 9.0. There was no significant difference between mean grade level or reading ease score from the type of web source (p=0.32 and 0.34, respectively), approach of surgery (p=0.91, 0.70), or specialty (p=0.48, 0.36).

Conclusions: Despite the internet's accessibility and breadth of information, navigating online resources may be challenging for a patient considering surgical management of apical POP with sacrocolpopexy. Our study shows almost all websites require at least a high school education to properly comprehend, regardless of source or specialty. Additionally, gynecologic sources outnumber those of urology, which aligns with previous studies demonstrating gynecologists perform a greater proportion of sacrocolpopexies. It is important that providers be aware of available resources, so they may direct patients to specific sites that are personally validated or provide in-office materials at an appropriate reading level.

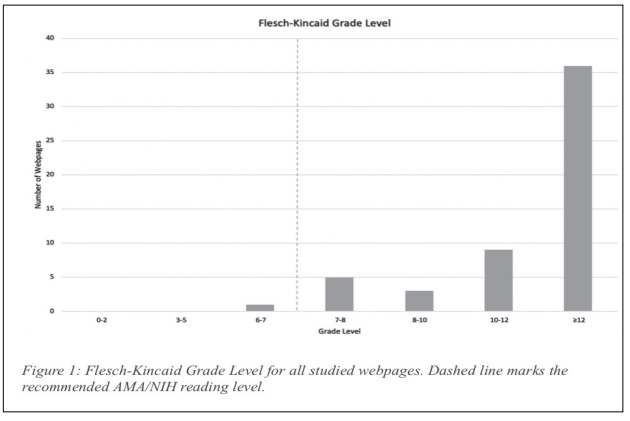

Figure 1: Flesch-Kincaid Grade Level for all studied webpages. Dashed line marks the recommended AMA/NIH reading level.

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Vibegron for the Treatment of Patients With Dry Overactive Bladder: A Subgroup Analysis From the EMPOWUR Trial

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Introduction: Overactive bladder (OAB) is characterized by urinary urgency, often accompanied by frequency and nocturia, with or without urge urinary incontinence (UUI), referred to as OAB wet and dry, respectively. In the phase 3 EMPOWUR trial, vibegron—a β_3-adrenergic agonist approved for the treatment of adult patients with OAB—was associated with significant improvements in daily number of urgency episodes (the need to urinate immediately) and micturitions vs placebo (P<0.01). These post hoc analyses of EMPOWUR assessed efficacy outcomes in patients with OAB wet and OAB dry.

Materials & Methods: In the EMPOWUR trial, patients were randomly assigned 5:5:4 to receive vibegron 75 mg, placebo, or active control (tolterodine 4 mg extended release), respectively, for 12 weeks. OAB wet criteria included an average of ≥8 micturitions and ≥1 UUI episode per diary day. Up to 25% of patients could have OAB dry, defined as an average of ≥8 micturitions, ≥3 urgency episodes, and <1 UUI episode per diary day. Outcomes assessed included change from baseline (CFB) in average daily number of urgency episodes and micturitions.

Results: Of the 1463 patients included in the full analysis set, 1127 (77%) had OAB wet (vibegron, N=403; placebo, N=405; active control, N=319), and 336 (23%) had OAB dry (vibegron, N=123; placebo, N=115; active control, N=98). Vibegron was associated with significant reductions vs placebo in least squares (LS) mean (95% CI) CFB at week 12 in urgency episodes for the wet (-3.0 [-3.3, -2.6] vs. -2.4 [-2.7, -2.0], respectively; P<0.05) and dry (-2.6 [-3.2, -2.0] vs. -1.6 [-2.2, -0.9]; P<0.05) populations; significant reductions were also seen with vibegron vs placebo at weeks 2, 4, and 8 for both populations (P<0.05, each). Vibegron was associated with significant reductions vs placebo in LS mean (95% CI) CFB at week 12 in number of micturitions for the wet (-2.1 [-2.4, -1.9] vs. -1.7 [-1.9, -1.5], respectively; P<0.01) and dry (-1.8 [-2.3, -1.3] vs. -1.0 [-1.5, -0.5]; P<0.05) populations; significant reductions were also seen with vibegron vs. placebo at weeks 2, 4, and 8 in the wet population and at weeks 4 and 8 in the dry population (P <0.05, each).

Conclusions: Once-daily vibegron 75 mg is associated with significant reductions vs placebo in daily urgency episodes and number of micturitions in patients with OAB wet and dry, suggesting that vibegron works similarly for these endpoints in OAB wet and in OAB dry.

Website type and Flesch-Kincaid grade level and Flesch Reading Ease scores

Source	Number of Sites	Average Grade Level	Average Reading Ease
Private Practice	18	13.8	30.6
Academic	16	11.9	39.0
Non-Academic	7	11.1	44.1
Health	6	14.1	32.0
Government	5	12.8	41.3
Industrial	2	16.7	38.1
Obstetrics/Gynecology	26	13.1	35.2
Urology	8	13.8	30.8
Unspecified	19	12.0	40.6

P1

Quantifying Erectile Dysfunction Two- and Four- Weeks After Cavernous Nerve Injury: Rat Model

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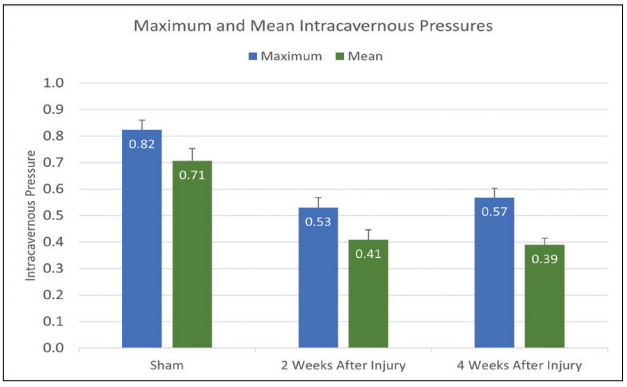
Introduction: Stimulation of the cavernous nerve (CN) and recording of intracavernous pressure in a rat has been used since 1989 to investigate the etiology and examine possible treatments of erectile dysfunction. The microsurgical techniques used vary between laboratories, making comparison of data difficult. We have recently described a modification to the existing method that simplifies the procedure and improves its reproducibility. The goal of this study was to validate the modified experimental setup and address the time course of erectile dysfunction following bilateral CN injury.

Materials & Methods: Bilateral CN injuries were made by exposing the nerves and inducing a crush injury by clamping them for two minutes with the microneedle holder. Two and four weeks following the injury, a vertical 1.5 cm skin incision was made next to the base of the penis. Palpation of ischial tuberosity was used to locate the distal portion of the penile crus with minimal dissection. A needle connected to a PE50 pressure line was inserted into the crus. After CN exposure, the electrode was placed under the nerve, the nerve was elevated, and dried. Biocompatible silicone glue was applied to isolate the electrode and nerve from the surrounding tissue. CN was stimulated using 1.5 mA, 16 Hz, 6 V, and 5 ms pulse width stimulation parameters, for 50 seconds. Three reproducible responses were analyzed for maximum and mean intracavernous pressure as well as the area under the curve. The comparison was made between three study groups: sham operated animals (n=5) which have their nerves exposed but not injured, animals two weeks (n=6), and animals four weeks after bilateral CN crush injury (n=6).

Results: CN stimulations resulted in intracavernous pressure increase. Three reproducible responses were achieved in each animal. The average maximum and mean intracavernous pressure was 82 ± 4 and 71 ± 5 respectively in the sham group, 53 ± 4 and 41 ± 4 in the group two weeks following the nerve injury and 57 ± 3 and 39 ± 2 in the group four weeks following the bilateral CN injury (**Figure 1**). The area under the curve was 39.4 ± 2.32, 22.7 ± 1.5 and 21.9 ± 1.2 in sham and the two nerve injury groups respectively (**Figure 2**).

Conclusions: The isolation of the nerve with the silicone glue resulted in reproducible intracavernous pressure increase with the CN stimulation. The bilateral CN crush injury resulted in diminished erectile response with statistically significant decrease in all measured parameters. The obtained data show that this simplified model is reproducible.



P2

Patient Risk Factors for Prolonged Opioid Dependence Following Primary Inflatable Penile Prosthesis Placement Managed with Multimodal Analgesia

Rutul D. Patel, MBS[1], Avery E. Braun, MD[2], Architha Sudhakar, MD[2], Jacob W. Lucas, MD[2], Martin S. Gross, MD[3], Jay Simhan, MD[2]

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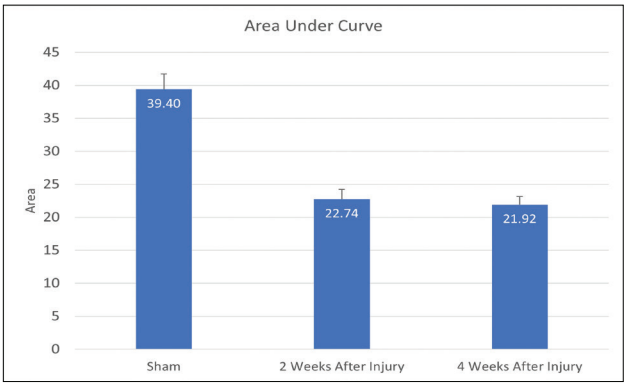
Introduction: Multimodal analgesia (MMA) following inflatable penile prosthesis (IPP) placement has previously demonstrated substantially improved pain and reduced opioid burden. Some patients managed with MMA, however, still require opioid pain management postoperatively. In this analysis, we examine patient-specific and perioperative factors predicting increased pain and prolonged use of opioids in the recovery period following primary IPP surgery in those managed with MMA only.

Materials & Methods: This is a multicenter retrospective review of 165 primary three-piece IPP recipients from 12/2018 to 12/2020 managed with a standardized MMA protocol. Patients on narcotics preoperatively were excluded. Prolonged opioid dependence was defined as active opioid prescriptions in the Prescription Drug Monitoring Program (PDMP) 90 days after surgery in previously opioid-naïve patients. Preoperative, intraoperative and immediate postoperative factors were analyzed to assess correlative risk for increased pain and development of opioid dependence in the MMA cohort.

Results: The prolonged opioid use group (2/165) demonstrated substantially higher Visual Analog Scale (VAS) pain scores in PACU (p=0.014) with trends towards higher total morphine equivalents (TME) in PACU (p=0.076). Higher TME was also observed on postoperative day 0 (p=0.0425). VAS scores on POD1 (p=0.123) and total TME prescribed at discharge (p=0.646) did not reach statistical significance. In assessing preoperative factors associated with developing opioid-dependence, age (p=0.194), race (p=0.414), BMI (p=0.202) and prevalence of diabetes (p=0.656) and chronic pain (p=0.291) did not demonstrate statistical significance. Intraoperative factors analyzed including operative time (p=0.719), surgical approach (p=1.00), cylinder size (p=0.938), use of rear-tip extenders (p=1.00), reservoir size (p=0.346) and use of drain (p=1.00) also did not yield significance.

Conclusions: Patients who developed prolonged postoperative opioid dependence tended to experience higher PACU VAS scores and increased TME requirements throughout their hospitalization. MMA appears to reduce risk of prolonged postoperative opioid dependence in this series. We found no clear preoperative or operative trends for prolonged opioid dependence in MMA patients.



P3

Trending Medicare Reimbursement in Urological Surgery: 2000-2020

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Introduction: A historical perspective of Urology reimbursement is important to inform and guide future payment policy in Urology. Physician reimbursement in the United States is largely determined by Medicare as the single largest and most dominant healthcare payer. The Medicare population is projected to increase by over 40% in the next decade. Analyzing reimbursement trends may help Urology practices prepare for upcoming financial changes. This study critically evaluates fiscal trends in Medicare reimbursement rates in Urological surgery over a 20-year period.

Materials & Methods: The 20 most commonly billed Current Procedural Terminology (CPT) codes in Urology were queried using the American College of Surgeon's National Surgical Quality Improvement Project (NSQIP) database. Reimbursement data from 2000 to 2020 was collected for each CPT code using the Center for Medicare Services Physician Fee Schedule Look-Up Tool. Relative Value Units (RVUs) were collected for each procedure. The change in annual reimbursement rates from 2000 to 2020 were compared with percent change in consumer price index (CPI) over the same period using a 2-tailed *t* test. CPI is a measure of inflation and was used to adjust all reimbursement data to 2020 US dollars. A subgroup analysis was performed to compare the average adjusted reimbursement changes across different surgical categories, including oncologic vs. nononcologic procedures.

Results: Data analysis for this study is still pending. Results will proceed as follows: Between 2000 and 2020, the mean unadjusted reimbursement rate for all included procedures * by *%. Over the same period, the CPI (a measure of inflation) increased by 52.8%, which is * compared to the change in rate of reimbursement. When all reimbursement data were corrected to 2020 US dollars to adjust for inflation, the mean reimbursement for all 20 procedures * by *%. A subgroup analysis comparing oncologic vs nononcologic procedure reimbursement demonstrates that * experienced a larger * in adjusted reimbursement. The average total RVUs per procedure * by *% from * in 2000 to * in 2020.

Conclusions: This study demonstrates that on average, Medicare physician reimbursement rates for the 20 most common Urological surgical procedures * by *% from 2000 to 2020 when adjusting for inflation. Contextualizing these changes in reimbursement is critical, given that inflation has increased by 53% over the same 20-year period and that practice expenses continue to increase. The findings of this study may be important for Urologists to consider during critical health policy decisions in the US. Urologists, policy leaders, and hospital committees should consider these trends when developing new payment models.

P4

Longitudinal Patient-Reported Outcomes Demonstrate Continued Improvements in Urinary and Erectile Function After Radical Prostatectomy Through 30 Months

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Introduction: Patient-reported outcomes measures (PROMs) are a critical component for tracking quality of life and functional outcomes in patients. Urinary incontinence and sexual dysfunction are common adverse effects many patients experience transiently or permanently after radical prostatectomy (RP). Thus, PROMs may play a role in informing patients about expected recovery trajectories after RP. We assess long-term patient-reported return of urinary and sexual function after radical prostatectomy in routine clinical practice.

Materials & Methods: The Expanded Prostate Cancer Index Composite for Clinical Practice (EPIC-CP) questionnaire was administered electronically to all patients who underwent RP at our institution in 2016 and 2017. These questionnaires were administered preoperatively and up to 30 months postoperatively. Our primary outcomes of interest were postoperative return of urinary and sexual function. We respectively defined these outcomes as either no urinary pads or use of one pad per day without overall urinary bother, as well as either erections sufficient for intercourse or erections sufficient for masturbation/foreplay without overall sexual bother. Kaplan-Meier estimators were used to evaluate time to return of these outcomes.

Results: Of 634 patients who underwent RP, we included 392 (62%) who completed ≥1 questionnaire; 184/392 (47%) had both preoperative and postoperative responses. The mean age of included patients was 62.4 years (SD 6.5), with 93% of patients having undergone a nerve-sparing surgery and 38% having pathologic extracapsular (≥T3a) disease (**Table 1**). At 12 months, unadjusted life table estimates for the likelihood of return to urinary continence was 55%, which improved to 88% and 98% by 24 and 30 months, respectively (**Fig. 1**). For patients with good baseline sexual function who underwent nerve-sparing surgery, 24% reported return to sexual function by 12 months, improving to 57% at 24 months and 71% at 30 months (**Fig. 2**).

Conclusions: Routine electronic solicitation of PROMs in our clinical practice revealed continued improvements in continence and sexual function up to 30 months postoperatively. These findings may help inform patients regarding typical functional recovery trajectories following RP.

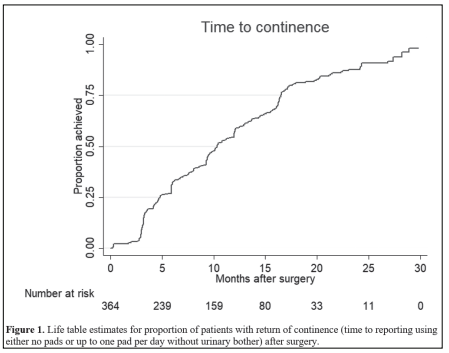

Figure 1. Life table estimates for proportion of patients with return of continence (time to reporting using either no pads or up to one pad per day without urinary bother) after surgery.

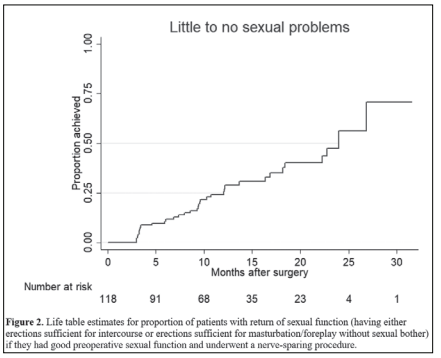

Figure 2. Life table estimates for proportion of patients with return of sexual function (having either erections sufficient for intercourse or erections sufficient for masturbation/foreplay without sexual bother) if they had good preoperative sexual function and underwent a nerve-sparing procedure.

Table 1. Baseline characteristics of patients who underwent radical prostatectomy at MGH between 2016-2017 and completed at least one PROMs questionnaire.

Characteristic	
Number of patients	392
Demographics	
Mean age (standard deviation [SD])	62.4 (6.5)
Race (%)	
White	356 (90.8)
Black	16 (4.1)
Other	20 (5.1)
Married (%)	325 (82.9)
Insurance type (%)	
Private	289 (73.7)
Medicare	98 (25.0)
Medicaid	1 (0.3)
Other	4 (1.0)
Current/former smoker (%)	163 (41.6)
Clinical features	
Mean preoperative PSA in ng/mL (SD)	7.1 (5.2)
Pathological tumor stage (%)	
T2a	34 (8.8)
T2b	1 (0.3)
T2c	204 (52.7)
T3a	115 (29.7)
T3b	33 (8.5)
Pathological node stage (%)	
NX	150 (38.8)
N0	227 (58.7)
N1	10 (2.6)
Positive surgical margin (%)	53 (13.5)
Nerve sparing (%)	
Bilateral	317 (80.9)
Unilateral	49 (12.5)
Non-nerve sparing	26 (6.6)
Gleason grade group on pathology (%)	
1	74 (19.1)
2	193 (49.9)
3	68 (17.6)
4	20 (5.2)
5	32 (8.3)

P5

Association Between Age at the Time of Surgery and Recovery of Urinary Continence in Men Undergoing Radical Prostatectomy

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Introduction: Urinary incontinence is one of the most concerning complications of radical prostatectomy (RP). Therefore, studies have focused on predicting different preoperative factors such as age at the time of surgery. Older patients seem to be at relatively higher risk of urinary incontinence after RP. However, there is still a debate over the specific cutoff for age associated with increased postoperative urinary incontinence rate. We sought to assess the association between different pre- and intraoperative factors, including age at the time of surgery and recovery of urinary continence (UC) in men undergoing RP.

Materials & Methods: Between April 2013 and September 2020, men undergoing robotic-assisted laparoscopic prostatectomy (RALP) by a single urologist for clinically localized or locally advanced prostate cancer in our institution were studied. Age at the time of surgery, body mass index (BMI), type of surgical approach (nerve-sparing, Retzius-sparing), MRI-based prostate volume, preoperative PSA, serum testosterone level, and pathological T stage as well as Gleason grade group were documented. Achievement of UC was defined as wearing no pads or an occasional security pad by patient-reported daily pad usage within 3 (early) and 12 months (late) after RALP.

Results: One hundred seventy-eight patients underwent RALP. The median age of patients was 63 years old (interquartile range 58-67). Postoperatively, 65 (36.5%) and 133 (74.7%) men achieved early (3 months) and late (12 months) recovery of UC, respectively. Multivariate logistic regression revealed that younger age (OR 1.16; 95%CI 1.05-1.29; p=0.006) with lower BMI (OR 1.23; 95%CI 1.03-1.47; p=0.02) who underwent Retzius-sparing surgery (OR 5.12; 95%CI 1.37-19.05; p=0.01) showed early recovery of UC. Among different age categories, age of 60 years or younger was significantly associated with the achievement of early UC (OR 4.54; 95%CI 1.35-14.28; p=0.01).

Conclusions: Early recovery of UC is primarily associated with patient-driven characteristics such as age and BMI. Age ≤60 years was associated with the achievement of early UC.

Table. Univariable and multivariable logistic regression examining factors associated with the early (3 months) recovery of urinary continence in men undergoing radical prostatectomy

	Univariable			Multivariable		
	OR	95% CI	P value	OR	95% CI	P value
Age	0.95	0.90-0.99	0.04	0.92	0.86-0.98	0.01
BMI	0.91	0.85-0.99	0.02	0.93	0.84-1.01	0.11
Stage						
≤T2	1.00					
≥T3	0.83	0.44-1.54	0.56			
GG						
1	1.00					
2-3	0.26	0.02-3.01	0.28			
≥4	0.45	0.03-5.84	0.54			
Prostate volume (MRI)	0.99	0.98-1.01	0.53			
Nerve Sparing						
None	1.00			1.00		
Unilateral	2.24	0.99-5.09	0.05	1.83	0.68-4.92	0.23
Bilateral	1.61	0.67-3.88	0.28	1.20	0.40-3.60	0.74
Retzius sparing	3.88	1.87-8.05	<0.001	4.34	1.88-10.05	0.001
Single port	2.19	0.64-7.50	0.20			
Testosterone	1.00	0.99-1.00	0.96			
PSA	0.98	0.95-1.01	0.22			
PSA density	0.94	0.85-1.05	0.31			
BCR	0.98	0.38-2.49	0.97			
RT	0.55	0.27-1.14	0.11			
ADT	0.30	0.11-0.85	0.02	0.33	0.10-1.02	0.055

P6

WITHDRAWN

P7

Patient Reported Outcome Measures following Hyperbaric Oxygen Therapy for Radiation Cystitis: A Multicenter Registry for Hyperbaric Oxygen Therapy Consortium

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Introduction: Prior studies evaluating hyperbaric oxygen therapy (HBOT) have demonstrated reduced bladder bleeding interventions, however, few U.S. studies have evaluated HBOT's association with patient reported outcome measures (PROMs). The purpose of this study is to evaluate the feasibility of collecting PROMs of patient reported hematuria events and bladder symptoms before and after HBOT through a multi-institutional registry.

Materials & Methods: Prospectively collected data from 16 sites in the Multicenter Registry for Hyperbaric Oxygen Therapy Consortium were analyzed. Measures included a hematuria scale adapted from the RTOG/EROCT radiation scale for cystitis, Urinary Distress Inventory (UDI) and a question on hematuria severity and quantity. Data obtained on the first and last days of HBOT were compared using Wilcoxon rank sum test. Proportions were compared using chi-square tests.

Results: 52 patients had complete RTOG/EROTC hematuria data, 26 had UDI data and 32 had both. Patients were on average 73 (+/- 17) years old, 16/52 were diabetic, 27/52 are current or former smokers and 39/52 developed radiation cystitis due to prostate cancer related radiation treatment. Referral for HBOT occurred approximately 6.5 +/-5.3yrs following radiation. All patients had >30 treatments. RTOG/EROTC hematuria scores were significantly improved post HBOT (2.3 pre vs. 1.1 post, p=0.0001), as was self-reported hematuria (p=0.02) (**Figure 1A**); UDI scores improved, but the difference was not statistically significant (33.9+/-28.3 vs. 27.9+/-23.0, p=0.53) (**Figure 1B**). Those with UDI scores above the median pre-HBOT, did show significant reduction post (p=0.004).

Conclusions: In a novel, multi-institutional prospective data set, we demonstrate the feasibility of collecting PROMs in patients undergoing HBOT. HBOT reduced patient reported hematuria events significantly, but did not consistently reduce UDI scores in the small sample of patients with complete UDI data. Continued expansion of the registry may provide more generalizable results and allow for analysis of factors leading to improved or worsening UDI scores.

Figure 1A

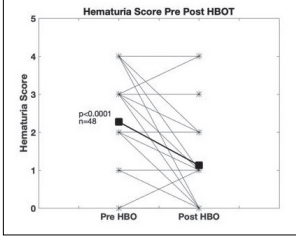
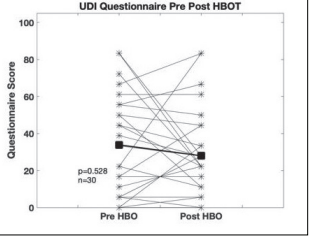


Figure 1B



P8

WITHDRAWN

P9

WITHDRAWN

P10

The Impact of the COVID-19 Pandemic on Online Interest in Urologic Conditions

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Introduction: The effects of the COVID-19 pandemic on urologic care are only beginning to be understood. Search engines can be used to track public interest in health conditions and evaluate how this interest changes in response to major societal events. We aimed to examine trends in online search behaviors related to benign and malignant urologic conditions during the COVID-19 pandemic using a major search engine.

Materials & Methods: Google Trends was queried using the terms prostate cancer, bladder cancer, kidney cancer, urinary incontinence (UI), kidney stone, erectile dysfunction (ED), peyronies disease (PD), benign prostate hyperplasia (BPH), infertility, and vasectomy between January 2019 and February 2021. Search volume index (SVI), a measure of relative search volume on Google, was obtained for each search term and examined by time period: prior to widespread public knowledge of COVID-19 (January 2019 - January 2020) and during the height of the COVID-19 pandemic in the United States (February 2020 - February 2021).

Results: Online interest in urologic malignancies decreased during the COVID-19 pandemic. Average SVI for prostate cancer (87.7 vs. 77.6, $p<0.001$), bladder cancer (74.0 vs. 65.7, $p<0.001$), and kidney cancer (62.2 vs. 54.1, $p<0.001$) significantly decreased over time. Average SVI for benign urologic conditions, including UI (80.2 vs. 77.6, $p=0.09$), BPH (79.6 vs. 78.8, $p=0.67$), ED (49.8 vs. 47.2, $p=0.12$) and PD (47.7 vs. 42.8, $p=0.16$) did not change during the pandemic, with the exception of kidney stones which decreased (86.4 vs. 82.6, $p=0.02$). Online interest in infertility significantly increased during the pandemic (52.2 vs. 57.3, $p=0.01$), while interest in vasectomies decreased (49.8 vs. 44.6, $p<0.01$).

Conclusions: Online interest in urologic malignancies was differentially impacted by the COVID-19 pandemic, which raises significant questions about the potential effects on cancer patients. The pandemic had no effect on online interest in benign urologic conditions. Infertility was the only condition that experienced an increase in online interest during the pandemic.

P12

Single Cell Sequencing Reveals Luminal Epithelial Plasticity with Fibroblast Activation Upon SRD5A2 Deletion in the Prostate

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Introduction: Steroid 5α reductase 2 (SRD5A2) is the predominant enzyme responsible for prostatic development and growth. SRD5A2 inhibitors are the only class of benign prostate hyperplasia-related medications that reduce prostate size. However, patients respond variably to 5ARI therapies. Due to epigenetic modifications, we have previously demonstrated that 30% of adult human prostatic tissues do not express the SRD5A2 gene and protein. The goal of this study is to use single cell RNA sequencing (scRNA seq) to characterize the prostate cellular and transcriptomic changes when SRD5A2 is absent.

Materials & Methods: Homozygous SRD5A2-/- mice and littermate heterozygous SRD5A2+/- control mice were generated. The intact prostate tissues were collected from 8-16 weeks old mice and digested for single cells. ScRNA seq with 10x genomics platform, followed by unsupervised clustering, was utilized to generate cell clusters based on differentially expressed (DE) gene profiles. A complete transcriptomic profile was obtained to identify cellular subsets and functional differentiation.

Results: ScRNA seq resulted in transcriptome data for clustering of 23,000 single cells, which were further annotated to 18 subpopulations demonstrating the heterogeneity within prostate. The SRD5A2 gene was identified to exclusively express in fibroblasts and myofibroblasts. Deletion of SRD5A2 induced a significant decrease of epithelial luminal cells (53.2% vs. 31.8%), while there was a significant elevation of stromal (11.3% vs. 18.0%) and immune cells (3% vs. 6.6%). Further sub-clustering of luminal cells identified 3 unique subclusters with gene signature of lineage, estrogen and progenitor pathways. Luminal cells with lineage signature and progenitor signature diminished whereas luminal cells with estrogen signature stably survived after SRD5A2 knock down. Meanwhile, cell-cell communication analysis showed that fibroblasts have broad ligand/receptor interactions with other cell types. In particular, fibroblasts support the epithelial proliferation and immune cells recruitment of prostate through secretion of growth factors (EGF, FGF and IGF families) and cytokines (CXCL, CCL and HLA). More importantly, absence of SRD5A2 in fibroblasts exhibited significantly increased expression patterns of inflammatory, epithelial-mesenchymal transition and angiogenesis genes.

Conclusions: Our data suggests that luminal cells with the signature of estrogen response gene, and fibroblasts that have the enhanced function may synergistically contribute to 5ARI treatment resistance. Understanding the mechanism(s) by which prostatic fibroblasts regulate development of epithelial luminal cells may pave the way to find new therapeutic targets to the management of BPH patients who lack of SRD5A2 expression and are potentially resistant to 5ARI.

P11

The Expression of Estrogen Receptors is Associated with Steroid 5-alpha Reductase 2 in Prostatic Tissue

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Introduction: Benign prostatic hyperplasia (BPH) is a highly prevalent health problem among elderly men. Steroid 5α reductase 2 (SRD5A2) is the predominant enzyme responsible for prostatic development and growth. However, patients respond very differently to 5α-reductase inhibitors (5ARIs). Our previous study demonstrated an "androgenic to estrogenic switch" when SRD5A2 is absent in the prostate gland. Here we wished to identify if estrogen receptors (ER) expression is associated with SRD5A2 in the prostate.

Materials & Methods: 18 prostatic specimens collected from patients who underwent transurethral resection of the prostate were used to determine the transcript and protein expressions of ERα and ERβ. Mouse and human single-cell RNA sequencing (scRNA seq) data were analyzed to identify the subpopulation for ERα and ERβ expression. The expression of ERs was correlated to SRD5A2 expression with RNA sequencing (RNA seq) data from GTEx (Genotype-Tissue Expression, n=100) in normal prostate and TCGA (The Cancer Genome Atlas, n=496) databases for prostate cancer. Human prostatic stromal cell line (BHPrS1) and epithelial cell line (BPH1) were transfected with SRD5A2 plasmid or vector to identify the c hange of transcript and protein levels of SRD5A2, ERα, and ERβ.

Results: ERα and ERβ variably expressed in both the stroma and epithelium compartments of BPH surgical samples and had nucleus expression in human prostatic cell lines. ScRNA seq analysis of human and mouse prostate tissues showed that SRD5A2 is dominantly expressed in fibroblasts. Meanwhile, ERαexpressed mainly in myofibroblasts of the human prostate and luminal cells of the mouse anterior prostate. ERα had minimal expression both in mouse and human prostate. RNA seq analysis demonstrated a significant association between SRD5A2 and ERα in human benign and malignant prostate tissue. The transcript level of SRD5A2 was significantly positively correlated with ERβ ($R=0.6797$, $p=0.0019$) and ERα ($R=0.7030$, $p=0.0011$) in surgical specimens. In addition, in BHPrS1 cells, transcript and protein expressions of total ERα and phosphorylated ERβ were upregulated in SRD5A2 overexpressed cells compared with vector control.

Conclusions: Our study demonstrates that the expression of ERα is associated with SRD5A2 expression. Targeting the estrogenic signaling pathway may serve as an effective treatment strategy in 5ARI-insensitive BPH patients.

P13

A Standardized Serum Bank for Obtaining Microrna Signatures for Assessing Prostate Cancer Risk

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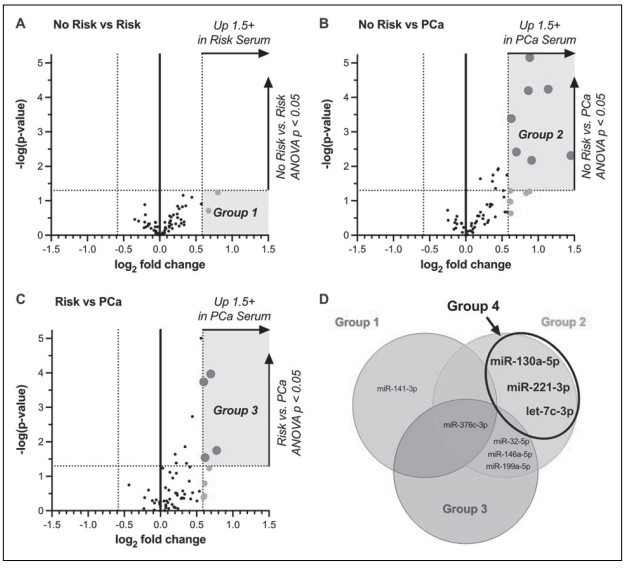
Introduction: MicroRNA (miRNA) signatures have been shown to predict long-term risk of breast and other cancers. We hypothesize a subset of cancer-free men at elevated risk ("risk") for developing prostate cancer (First degree relatives) will have a miRNA signature which distinguish them from average risk ("no risk") individuals.

Materials & Methods: 1) Serum miRNA development serum microRNA collection, processing, storage (tissue bank) and analysis by recent technologies that are reproducible; 2) Identify microRNA profiles in men at elevated risk for prostate cancer that are distinct from controls; 3) Determine the effect of time from collection, ejaculation and symptomatic benign prostatic hyperplasia on a miRNA signature; 4) Compare in-house qPCR analysis with FirePlex™ Technology to validate miRNA signature components; 5) Determine the relationships between clinical elevated risk categories that are associated with signature miRNAs.

Results: This pilot study enrolled a total of 68 cancer-free men, 51 with average risk of prostate cancer and 17 having elevated risk with a family history (First degree relative). The predictive ability of family history was compared to patient age, time from ejaculation, and PSA levels using ROC curves (AUC = 0.55, 0.42, 0.63 respectively). From a literature review, we identified 65 miRNAs associated with prostate cancer development, transition from indolent to aggressive disease, and metastasis. We found miR-141-3p and miR-376c-3p to be elevated ≥ 1.5-fold in the 17 men with a family history as compared to the 51 men with average risk factors. Further, seven miRNAs were expressed at significantly higher levels in a cohort of 15 prostate cancer patients. Four of these miRNAs are detected at lower levels in cancer-free men, independent of risk status. However, three of these miRNAs (let-7c-3p, miR-130a-5p, miR-221-3p) are not significantly different between men with elevated risk and prostate cancer patients, suggesting a function of these in prostate cancer development and future application as clinical biomarkers.

Conclusions: a) Successful establishment of scalable serum miRNA analysis that allows expression screening between patient populations with different clinical characteristics to discover miRNA signatures. b) Cancer-free men with a family history of prostate cancer have higher levels of miR-141-3p as compared to average risk. Further, miR-141-3p is well established to elevated in the serum of prostate cancer patients and suggests utility as a clinical biomarker to monitor for predicting future cancer development. c) Demonstration of no effect of ejaculation or symptomatic benign prostatic hyperplasia as an indicator of elevated risk from family history.



P14

Inhibitory Effects of STAT3 Transcription Factor by Synthetic Decoy ODNs on Autophagy in Renal Fibrosis

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Introduction: Autophagy in the proximal tubules may promote fibrosis by activating tubular cell death, interstitial inflammation, and the production of pro-fibrotic factors. The signal transducer and activator of transcription 3 (STAT3) is activated as a potential transcription factor, which mediates the stimulation of renal fibrosis. We investigated the role of the STAT3 in autophagy and its effect on the prevention of interstitial renal fibrosis.

Materials & Methods: We use synthesized STAT3 decoy oligonucleotides (ODNs), which were injected into the tail veins of unilateral ureteral obstruction (UUO) mice, to explore the regulation of autophagy in UUO-induced renal fibrosis. The expression of interleukin-6 (IL-6), interleukin-1β (IL-1β), tumor necrosis factor-β (TNF-β) and collagen were decreased by STAT3 decoy ODN. The autophagy markers microtubule-associated protein light chain 3 (LC3) and fibronectin, were identified through immunofluorescent staining, indicating that they were reduced in the group injected with ODN.

Results: The expressions of LC3, Beclin1, p62 and autophagy-related 5-12 (Atg5-12) and hypoxia inducible factor-1β (HIF-1β) were inhibited in the ODN injection group. We determined the inhibitory effect of autophagy in chronic kidney disease and confirmed that STAT3 decoy ODN effectively inhibited autophagy by inhibiting the expression of STAT3 transcription factors in the UUO group.

Conclusions: Our results suggest that STAT3 decoy ODNs may be involved in the regulation of autophagy and fibrosis, and that, thus, they are a promising new therapeutic target in chronic kidney disease.

P15

Creation and Validation of the Harmonized Arabic Version of the Expanded Practice Index Composite for Clinical Practice (EPIC-CP)

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Introduction: The Expanded Practice Index Composite for Clinical Practice (EPIC-CP) is a validated patient reported outcome (PRO) widely used for assessing the quality of life in prostate cancer (PCa) patients. It is used internationally and has been translated and, in turn, validated into several languages in addition to English. Our goal from this study was to create and validate a translated Arabic version of the EPIC-CP.

Materials & Methods: Using the established protocol as defined by the Professional Society for the Health Economics and Outcomes Research (ISPOR) for translating patient care questionnaires, a harmonized translated Arabic version of EPIC-CP was created. The questionnaire was tested in native Arabic speakers from 4 different Arabic countries (Saudi Arabia, United Arab Emirates, Jordan and Kuwait). Cronbach's alpha and interclass coefficient correlations (ICC) analyses were used to test the internal consistency and test-retest reliability, respectively. In addition, PCa characteristics were collected for participants.

Results: In total, 168 PCa patients participated in the study (39 from Saudi Arabia, 23 from United Arab Emirates, 65 from Jordan, and 41 from Kuwait). Fifty-two (31%) participants repeated the questionnaire for test-retest reliability analysis. The median age of patients included in the study was 66 (IQR 61-71). Median PSA was 9.8 (IQR 6-19). Most patients had grade group 2 PCa at diagnosis (31%), clinical stage cT1 (42%), managed primarily by urology (79%), and primary treatment was radical prostatectomy (71%). The total Cronbach's alpha coefficient was 0.84 demonstrating an acceptable internal consistency. The total ICC was also acceptable at 0.64.

Conclusions: The Arabic version of the EPIC-CP is reliable and valid tool for assessing health-related quality of life for Arabic PCa patients. To our knowledge this is the first generated Arabic template of any EPIC version, therefore filling a major need in the Arabic community where PCa rates have risen over the previous decades.

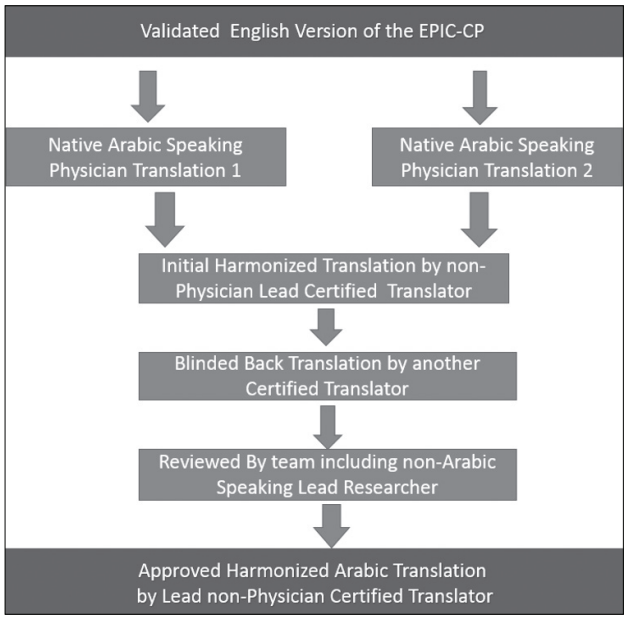

Table 1: descriptive statistics and analysis of internal consistency (Cronbach's alpha).

	Mean (SD)	Median (25,75th percentiles)	Range	Cronbach's alpha
Urinary incontinence	3.8 (3.4)	3 (1, 6)	0-12	0.75
Urinary irritation/obstruction	4.0 (3.2)	3 (1, 6)	0-12	0.80
Bowel	2.4 (2.7)	2 (0, 3)	0-12	0.78
Sexual	7.3 (3.4)	8 (5, 10)	0-12	0.64
Vitality	2.5 (2.6)	2 (0, 4)	0-12	0.62
Total	19.6 (10.4)	18 (13, 24)	0-49	0.84

SD = Standard Deviation

P16

Presenting Complaints of Transgender Women Requiring Urethral Revision After Feminizing Genital Gender-Affirming Surgery

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Introduction: Vaginoplasty is the most common feminizing gender-affirming surgery performed for the male-to-female patient and is an effective treatment for gender dysphoria. More 20% of patients require re-operation for complications following surgery for functional or aesthetic issues. Voiding symptoms following surgery are distressing and non-affirming and may be related to a variety of issues including meatal stenosis or stricture, urethral angulation, urethral fistulas, or external scarring. Given the lack of standardized patient-reported outcome measures, it is often difficult to identify patients who require revision surgery for voiding-related issues. Our aim was to evaluate the presenting symptoms of patients who required revision surgery for voiding complaints after feminizing vaginoplasty.

Materials & Methods: We performed a retrospective review of all patients who had revision surgery for voiding complaints after feminizing vaginoplasty for gender dysphoria from January 2017 to April 2021 at two institutions. Demographic and clinical characteristics, including pre-operative voiding complaints and exam findings, as well as surgical data were reviewed for each subject.

Results: A total of 22 patients were identified. The median age at revision urethral surgery was 39 (interquartile range [IQR] 30-61) years. The median time from date of primary vaginoplasty to reconstructive urethral surgery was 39 (IQR 15-50) months. The majority of patients had prior penile inversion vaginoplasty (n= 20, 90.9%). Most patients presented with 2 or more voiding complaints (n = 15, 68.2%). The most common complaints included anterior stream (68.2%), weak stream and straining (36.4%) and hygiene issues including urine pooling (27.3%). Anteriorly located urethras (n=15, 68.2%) were the most common indication for subsequent urethral surgery, followed by meatal stenosis (n=5, 22.7%). Revision surgery was done in a majority of patients using a ventral urethrotomy or 1st stage Johanson urethroplasty (90.9%). At the time of urethral revision, 18 patients (81.8%) had simultaneous procedures performed (such as labiaplasty, clitoroplasty, or procedure for canal stenosis).

Conclusions: Presenting complaints for revision urethral surgery after primary vaginoplasty can be diverse and evaluation of the external genitalia is essential for diagnosis and surgical planning. The most common complaint was deviated urinary stream secondary to an anteriorly-located meatus. This was most frequently repaired with first-stage Johanson type urethroplasty. A thorough review of symptoms should be performed prior to surgery as patients may have other genital-related concerns that require intervention at the time of urethral revision.

Table 1. Clinical and surgical characterics in patients with voiding symptoms requiring revision surgery after feminizing vaginoplasty

Primary Vaginoplasty	
Penile inversion	20 (90.9%)
Minimal Depth	1 (4.5%)
Intestinal Interposition	1 (4.5%)
Presenting Complaints*	
Anterior Stream	15 (68.2%)
Spraying/Split Stream	3 (13.6%)
Hygiene/Urine Pooling	6 (27.3%)
Obstructive LUTS (weak stream, straining)	8 (36.4%)
Irritative LUTS (urgency, frequency, dysuria)	4 (18.2%)
Recurrent UTIs	4 (18.2%)
Exam Findings*	
Anterior meatus	18 (81.8%)
Meatal stenosis	5 (22.7%)
Skin bridge	1 (4.5%)
Urethro-vaginal fistula	1 (4.5%)
Revision Type	
Y-V plasty	1 (4.5%)
1st stage Johanson urethroplasty (ventral urethrotomy)	17 (77.3%)
Meatoplasty	2 (9.1%)
Other urethral surgery	1 (4.5%)
External revision (scar, skin-related)	1 (4.5%)
Simultaneous Procedures	
Yes	18 (81.8%)
No	4 (18.2%)

*Patients may have more than 1 finding

P17

Urethral Complications in Transmasculine Genital Reconstructive Surgery (TMGRS): A Systematic Review

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Intreoduction: The purpose of this systematic review is to evaluate urethral related outcomes in Transmasculine Genital Reconstructive Surgeries (TMGRS) with urethral lengthening (UL), which includes metoidioplasty and phalloplasty.

Materials & Methods: A systematic review was planned in accordance with Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines by 4 independent reviewers and one content expert. A search for metoidioplasty and phalloplasty related literature was preformed utilizing MEDLINE, Cochrane Library, Web of Science, EMBASE, Preprint, Google Scholar, Trial Registries, and Conference Proceedings. The search was registered with Open Science Framework. Publication quality was assessed using the Methodological Index for Non-Randomized Studies criteria (MINORS). Primary outcomes extracted included demographics, phallus length, standing micturition, phalloplasty type, glanular meatus, mucocele, urethral stricture, and fistula. Results and ranges of outcome probabilities were summarized in a qualitative analysis using descriptive statistics. Studies or specific patient cohorts within studies were excluded if patients did not have a vaginectomy.

Results: Using Population, Intervention, Comparison and Outcomes tool, 2,881 articles were identified with 12 articles meeting criteria. All articles were retrospective reviews with an average (avg) patient age of 33(SD5) years with a MINORS score of 4.3/16. Evaluated phalloplasty cohorts include those who underwent the Radial Forearm Free Flap (RFFF), Anterolateral Thigh Flap (ALT), or Musculocutaneous Latissimus Dorsi Flap (MLD) with vaginectomy. Six metoidioplasty studies yielded the following results: N=874, avg length of follow up (LOF) 31 months, phallus length 5.6-7cm, standing micturition 48%-100%, stricture 1.4% - 63%, fistula 8%-50%, and mucocele 1%- 12%. Four RFFF phalloplasty studies yielded: N= 288, avg LOF 18 (SD9) months, phallus length 11cm (1 study), standing micturition 99% (1 study), glanular meatus 70%-100%, stricture 11%-81%, and fistula 10%-79%. Three studies were identified for ALT flap: N=85, avg LOF 50 (SD36) months, standing micturition 56-100%, glanular meatus 75 - 100%, stricture 20%-38%, and fistula 20%-25%. One study met criteria for MLD flap: N= 129, avg LOF 43 months, phallus length 14.6cm, glanular meatus 15% (or 63% with 2+ planned surgeries), stricture 27%, and fistula 26%.

Conclusions: Despite a continued increase in TMGRS performed with UL, in this comprehensive systematic review we demonstrate urethral related complications remain high. Further, the existing published literature remains heterogeneous and of limited methodologic quality.

P18

The State of PSA Counseling in Male to Female Transgender Patients in the U.S.

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Introduction: Describe prescreening PSA counseling (PPC) rates amongst male to female transgender (MtF-TG) patients and non-TG patients using the Behavioral Risk Factor Surveillance System (BRFSS).

Materials & Methods: This cross-sectional study used the survey data from the 2014-2018 BRFSS. Respondents were included if they were between 40-79 years old, completed both the "Prostate Cancer Screening" and "Sexual Orientation and Gender Identity" modules. Respondent characteristics analyzed included education level, income level, marital status, age, and race/ethnicity. 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 175,383 respondents were included in our analysis. Of these, 0.3% identified as MtF-TG. Overall, 62.4% of respondents reported undergoing PPC. PPC rates were lower among MtF-TG respondents when compared to the non-TG group (58.3% vs. 62.4%, p = .03). MtF-TG respondents were also more likely to report lower education level ($p < .01$), lower income level ($p < .01$), were less likely to be white ($p < .01$), and less likely to be married ($p < .01$) than non-TG respondents. Multivariable analysis adjusting for the previously mentioned respondent features demonstrated a statistically significant association between higher income level, higher education level, and marital status and increased odds of PPC, although no statistically significant association was demonstrated for MtF-TG status. No trends in PPC rates for the MtF-TG and non-TG populations were observed.

Coonclusions: PPC was less frequently reported among MtF-TG respondents than in the non-TG group, although low education level and low income level were more predictive of PPC rates in multivariate analysis. Further research is needed to ensure equivalent access to prescreening counseling for patients across the socioeconomic and gender identity spectrum.

FIGURE 1: Rates of PSA Counseling in MtF-Transgender vs. Non-Transgender Patients, 2014-2018

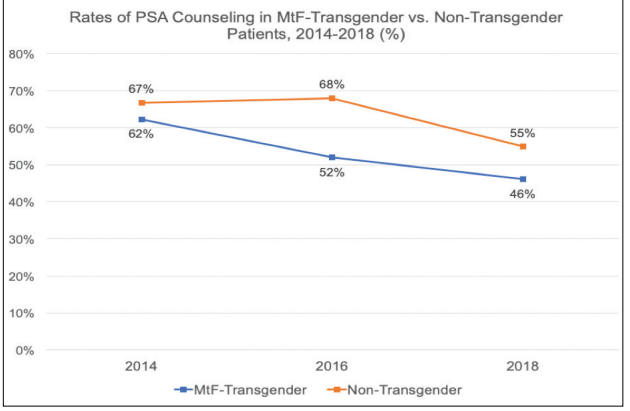

FIGURE 2: Characteristics of all respondents in the 2014, 2016, and 2018 BRFSS ages 40 - 79, by transgender status.

	Overall (n=175,383)	Identifies as Transgender – Male to Female (n=528)	Does not Identify as Transgender (n=174,855)	
	Weighted%	Weighted% (n)	Weighted% (n)	*p*
PSA Counseling	62.4%	58.3%	62.4%	0.03
Race/Ethnicity				
White	81.0%	72.2%	81.0%	<0.01
Black	6.3%	9.5%	6.3%	
AI/AN	1.2%	2.3%	1.2%	
Asian	0.5%	1.1%	0.5%	
NH/PI	0.5%	1.1%	0.5%	
Hispanic	3.9%	6.6%	3.9%	
Other	4.7%	4.7%	4.7%	
Education Level				
HS or less	34.1%	60.0%	34.0%	<0.01
Some College	25.5%	22.0%	25.5%	
College graduate	40.4%	18.0%	40.4%	
Income level (USD)[a]				
<50,000	48.4%	68.9%	48.4%	<0.01
50-75,000	15.6%	12.9%	15.6%	
>75,000	36.0%	18.2%	36.0%	
AUA Age Group [a]				
40-54 years	32.0%	34.8%	32.0%	0.34
55-69 years	47.0%	45.8%	47.0%	
70-79 years	21.0%	19.3%	21.0%	
Married	64.9%	52.8%	64.9%	<0.01

FIGURE 3: Odds Ratio of having a PSA counseling according to Transgender status, Race, Education Level, Income Level, Age, and Marital Status.

	Underwent PSA Counseling	
	Odds Ratio (95%CI)	*p*
Male to Female Transgender[a]	0.20 (-0.12, 0.52)	0.22
Race/Ethnicity		
White	0.16	
Black	0.57	
AI/AN	0.14	
Asian	-0.62	(-4.54E5, 4.54E5) 1.00
NH/PI	-0.10	
Hispanic	-0.66	
Other	-0.08	
Education Level		
HS or Lower	0.37 (-0.01, 0.73)	<0.05
Some College	0.69 (0.33, 1.05)	<0.01
College or Higher	0.92 (0.56, 1.28)	<0.01
Income level (USD)		
<50,000	-0.04 (-0.10, 0.02)	0.25
50-75,000	0.25 (0.18, 0.32)	<0.01
>75,000	0.39 (0.32, 0.45)	<0.01
AUA Age Group		
40-54 years	-1.01 (-2.21, 0.03)	0.87
55-69 years	0.31 (-0.23, 0.11).	0.64
70+ years	0.71 (-0.93, 1.56)	0.24
Married	0.32 (0.28, 0.36)	<0.01

[a] Reference group = Non-transgender

P19

Demographic Factors Associated with Non-Guideline-Based Treatment of Kidney Cancer in the United States

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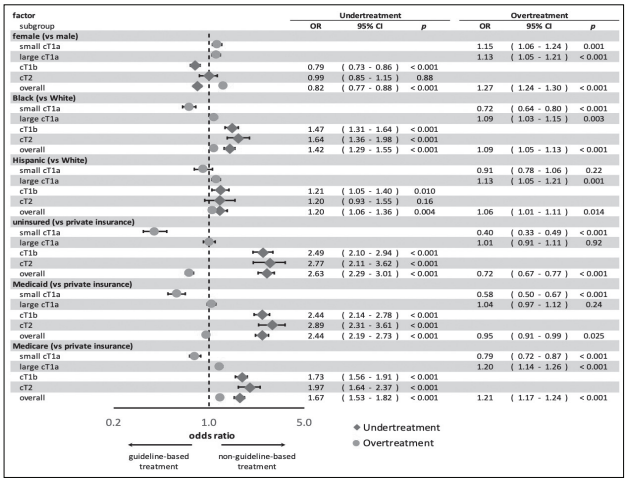
Introduction: Significant demographic disparities have been shown to exist in delivery of health care. Patients from disadvantaged socioeconomic groups are often undertreated relative to their more privileged peers in a variety of medical conditions. In patients with kidney tumors, a variety of more or less aggressive approaches may be preferred depending on clinical factors. We sought to examine the relationship of various demographic factors with receipt of both undertreatment and overtreatment in patients with kidney tumors.

Materials & Methods: This was a retrospective analysis of the National Cancer Database (NCDB). Comparatively young and healthy patients (ages 30-70, Charlson-Deyo score 0 or 1) with localized (cT1-2 N0 M0) kidney tumors were receiving guideline-based treatment, undertreatment, or overtreatment depending on treatment choice and tumor characteristics. Relationships between demographic factors and receipt of non-guideline-based treatment were explored using univariable and multivariable regression analysis.

Results: A total of 158,445 cases met study criteria, of whom 48,544 (30.6%) received non-guideline-based treatment. Results of the multivariable analysis for the overall population and clinical subgroups are summarized in **Figure 1**. Female sex was associated with lower risk of undertreatment (OR 0.82, 95% CI 0.77-0.88, $p < 0.001$) and higher risk of overtreatment (OR 1.27, 95% CI 1.24-1.30, $p < 0.001$) than male sex. Compared with White patients, Black and Hispanic patients were at higher adjusted risk of both undertreatment (OR 1.42, 95% CI 1.29-1.55, $p < 0.001$ for Black patients and OR 1.20, 95% CI 1.06-1.36, $p = 0.004$ for Hispanic patients) and overtreatment (OR 1.09, 95% CI 1.05-1.13, $p < 0.001$ and $= 0.014$ for Black patients and OR 1.06, 95% CI 1.01-1.11, $p = 0.014$ for Hispanic patients). Patterns of under- and overtreatment varied widely among clinical subgroups but were generally consistent with the overall result.

Conclusions: Significant disparities exist in treatment decision-making for kidney cancer patients, resulting in higher rates of non-guideline-based treatment for some demographic groups. Notably, this included increased risk of overtreatment as well as undertreatment for some groups.



P20

Vibegron Shows Meaningful Changes in Clinical Endpoints in Patients with Overactive Bladder: Analyses from EMPOWUR

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Introduction: Reductions in bothersome symptoms of overactive bladder (OAB) are reported to demonstrate improvement in clinical trials, often without interpreting meaningfulness to patients. In the 12-week phase 3 EMPOWUR trial, vibegron significantly reduced micturitions, urgency episodes, and urge urinary incontinence (UUI) episodes vs placebo (P<0.01, each). These analyses used an anchor-based approach to interpret the meaningfulness of symptom reduction with the patient global impression of change (PGI-C).

Materials & Methods: Median change from baseline (CFB) at week 12 in micturitions, urgency episodes, and UUI episodes was generated for each PGI-C category, pooled across treatments. Percentages of patients achieving these reductions in symptoms were determined.

Results: Patients who experienced greater CFB at week 12 in each endpoint reported greater improvement in PGI-C. Median reductions from baseline in OAB endpoints pooled across treatment groups were higher than thresholds patients perceived as improved based on PGI-C: ≥15% reduction in micturitions (moderately better; **Figure 1**), ≥50% reduction in urgency episodes (much better; **Figure 2**), and ≥90% reduction in UUI episodes (much better; similar to ≥75% reduction seen in EMPOWUR [PGI-C: moderately better]; **Figure 3**). Significantly more patients receiving vibegron vs. placebo achieved these reductions (P<0.05, each).

Conclusions: Significantly more patients treated with vibegron vs. placebo in EMPOWUR achieved meaningful reductions in micturitions and urgency/UUI episodes that were associated with patient-perceived improvement.

Figure 1. Median (median percentage) change from baseline at week 12 by patient global impression of change (PGI-C) in micturition frequency (pooled across treatment groups).

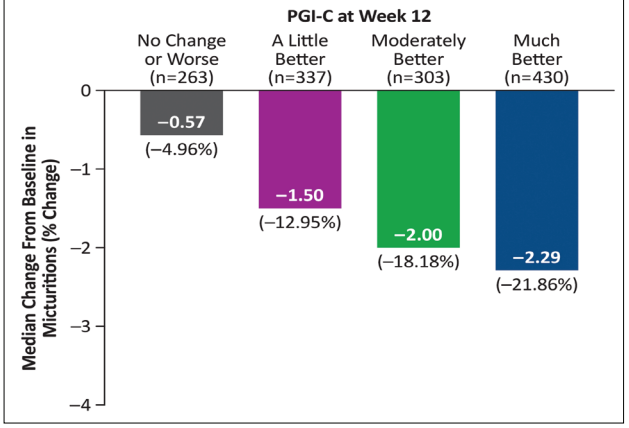


Figure 2. Median (median percentage) change from baseline at week 12 by patient global impression of change (PGI-C) in urgency episodes (pooled across treatment groups).

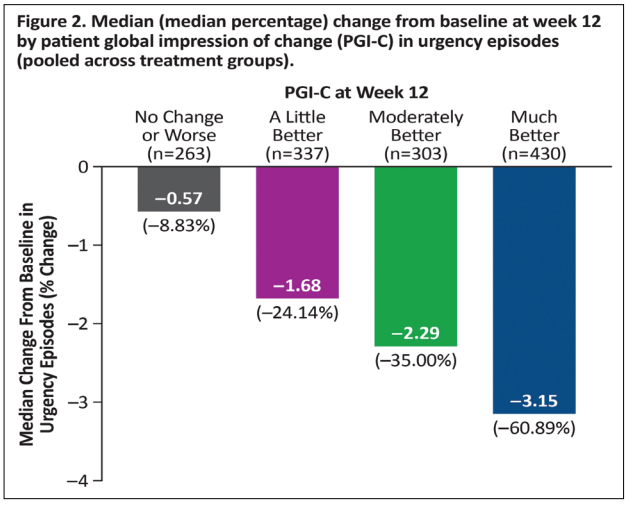
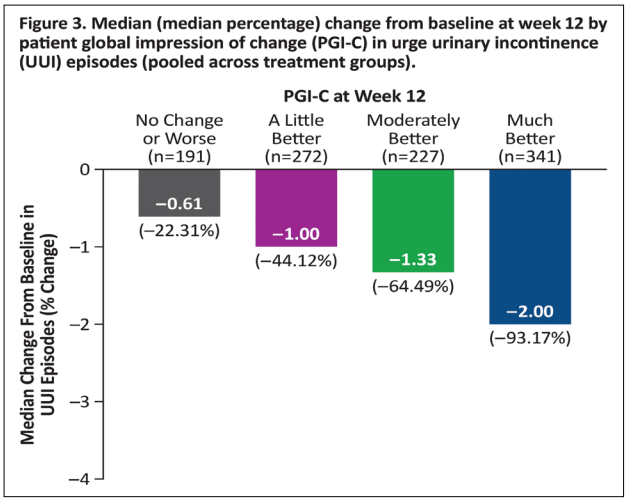


Figure 3. Median (median percentage) change from baseline at week 12 by patient global impression of change (PGI-C) in urge urinary incontinence (UUI) episodes (pooled across treatment groups).



P21

Sestamibi SPECT CT for Indeterminate Renal Lesions: A Single Center Experience

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Introduction: Incidentally discovered small renal masses are a heterogeneous group, spanning a spectrum from benign histology to indolent malignancies to aggressive phenotypes. Renal mass biopsy is warranted when the result would alter management, but the procedure is not without morbidity, and the non-diagnostic rate is 8-14%. Dual goals are to treat potentially threatening tumors, and to leave indolent or benign tumors untreated. Tc99m-Sestamibi SPECT/CT may help differentiate benign from malignant lesions, based on high density of mitochondria in oncocytomas and hybrid oncocytoma/chromophobe tumors. We present a single center experience with this technology for indeterminate renal masses.

Materials & Methods: Our institutional radiologic database was queried for patients who underwent Tc99m-Sestamibi SPECT/CT for classification of indeterminate renal masses. Lesion uptake was compared to surrounding renal parenchyma and classified as increased or no uptake. Charts were reviewed retrospectively for patient demographics and tumor characteristics.

Results: A total of 7 lesions were identified for which Tc99m-Sestamibi SPECT/CT was performed between 2020-2021. Five of seven lesions had increased radiotracer uptake, consistent with oncocytoma or oncocytic neoplasm. They all underwent biopsy as well, with pathology suggestive of oncocytic neoplasm. Patients with these "hot" lesions on Sestamibi scan all remain on active surveillance.
Two tumors were "cold" on Sestamibi, without radiotracer uptake. One underwent robotic-assisted laparoscopic partial nephrectomy. Final pathology demonstrated a cT1a chromophobe carcinoma with prominent eosinophils, a known scenario that could be considered a misleading Sestamibi SPECT/CT result, given the tumor's indolent nature. The other patient is scheduled for an upcoming open partial nephrectomy.

Conclusions: Although Sestamibi SPECT/CT has yet to be featured as part of the AUA guideline algorithm for renal mass management, we find it to be a useful tool for select patients with indeterminate renal masses to support surveillance in those with "hot" lesions, or to bolster the decision to proceed with surgery in those with "cold" lesions suggestive of malignancy. Although our sample size is small, we hope that highlighting this imaging modality brings further awareness to its utility.

P22

Lessons Learned from an Early Experience with Robotic Radical Nephrectomy and IVC Thrombectomy

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Introduction: Radical nephrectomy with inferior vena cava (IVC) thrombectomy remains a challenging and high risk surgery. This procedure is typically approached through a large chevron, thoracoabdominal, or midline incision, resulting in significant morbidity. In an effort to improve convalescence and lower complications, efforts have been made to remove the tumor thrombus and reconstruct the IVC robotically. We present our single institution experience with robotic radical nephrectomy with IVC thrombectomy as well as a video illustration of our technique.

Materials & Methods: All robotic IVC thrombectomy cases were performed by a fellowship-trained urology attending. Patients were positioned in a modified lateral position. For the left sided case, the nephrectomy portion was performed as a pure laparoscopic nephrectomy and the patient was then re-positioned for robotic IVC thrombectomy. Regional lymphadectomy was performed on all patients. The ipsilateral adrenal gland was removed in all but one patient.

Results: A total of 6 patients underwent robotic radical nephrectomy with level one tumor thrombectomy (into the IVC but <2cm above renal vein) between 2015 and 2021. The median follow up was 25 months (range 1-32). Patient demographics and perioperative outcomes are highlighted in the table. All patients had ECOG score of 0. Two patients had clinically enlarged regional nodes; and 2 patients presented with metastatic disease. Median operative time was 4.2 hrs (range 3.1-6.3). Median estimated blood loss (EBL) was 300mL (range 100-750) and the median hospital stay was 2.5 days (range 2-12). We performed complete IVC control using laparoscopic bulldog clamps in all patients and IVC repair was performed with either 5-0 prolene or 5-0 Gore-tex running sutures. One patient required IVC reconstruction using a bovine pericardial patch. There were no intraoperative transfusions or open conversions. The positive margin rate at the vein edge was 67%. One patient with a clinically enlarged regional lymph node had pathologically node positive disease. There was one diaphragmatic injury intraoperatively which was primarily repaired without issues. There was one postoperative 90-day complication: the first patient in our series experienced a postoperative bleed from a dislodged hemolock clip on a lumbar vein, requiring open surgical exploration 6 hours postop. Two patients had metastatic disease on presentation; they both received adjuvant systemic therapy and ultimately succumbed to their disease. Of patients who did not have metastatic disease on presentation (n=4), one patient (25%) has a recurrence in his lung and received radiation to this area, the median recurrence free survival is 12 months (range 1-38).

Conclusions: Robotic radical nephrectomy for level one IVC thrombus in experienced hands is safe with a low incidence of perioperative complications and relatively short convalescence.

Follow up months (median, range)	25 (1-32)
Age (median, range)	67 (54-75)
Male sex (n,%)	5 (83%)
BMI (median, range)	26 (21-36)
Charlson Comorbidity Index (median,range)	2.5 (2-11)
Right side (n,%)	5 (83%)
Tumor Size cm (median, range)	8.3 (6.5-13.9)
clinical enlarged nodes (n, %)	2 (33%)
clincally metastatic (n,%)	2 (33%)
EBL mL (median, range)	300 (100-750)
Operative time min (median, range)	252 (185-378)
Hospital stay (median, range)	2.5 (2-12)
Clear cell pathology (n,%)	5 (83%)
Positive Margin (n,%)	4 (67%)
Pathlogically Node + (n,%)	1 (17%)
Intraoperative complications (n,%)	1 (17%)
90day Postoperative complications (n,%)	1 (17%)
Highest Clavien Dindo complication	4
Recurrence (n,%), n = 4	1 (25%)
Recurrence free survival mo (median, range), n = 4	12 (1-38)
Alive (n,%)	4 (67%)

P23

Initial Experience with Transperineal Prostate Biopsy: A Painless Learning Curve

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Introduction: Transperineal Prostate Biopsy (TPBx) is gaining traction in urology. We evaluated our initial institutional experience using the PrecisionPoint system (Perineologic, Cumberland, MD), focusing on the learning curve, patient reported pain, clinically significant cancer detection rates (csCDR) and complications, compared to standard biopsy methods.

Material & Methods: After IRB approval, a retrospective review of all consecutive patients undergoing prostate biopsy (June 2019-March 2021) at a single institution was performed. Procedure time and pain scores were recorded for the first 253 pt. TPBx procedural times were modeled using single phase exponential decay fit by least squares regression. A 10-point Numerical Rating Scale (NRS) was used to record for pain during probe insertion, anesthetic block, biopsy and post-procedure. csCDR for the entire cohort (Gleason Grade Group ≥2) was compared between TPBx, transrectal ultrasound guided biopsy (TRUSBx) and TRUS/MRI fusion biopsy (MRIBx) using Fisher's exact test. Complications were compared using chi-square.

Results: 34% (234/692) of patients underwent TPBx. TPBx proficiency was achieved by the 20'th patient with a plateau procedural time of 9.1 minutes (95% CI 8.56-9.89) compared to 8.5 for TRUSBx and 12.4 for MRIBx. Median reported NRS scores for TPBx vs. TRUSBx or MRIBx fusion showed a difference during anesthetic injection (4.0 vs. 2.0 and 3.0 respectively, p=0.007) and probe insertion (2.0 vs. 3.0 and 3.0 respectively, p=0.06). This held true for sub-analysis of patients who had ≥1 prior biopsy. For screening biopsies, csCDR for MRIBx, TPBx and TRUSBx were 41.6%, 37.5% and 28.9% respectively (p=0.01). MRIBx was better than TRUSBx in detecting csCancer (p=0.03) but failed to show superiority over TPBx (p=0.2). Complication rates between TPBx and pooled TRUS biopsies were not significantly different (2.6% vs. 3.4%, p=0.51). Two sepsis events occurred in both groups.

Conclusions: The learning curve for TPBx is short with proficiency achieved after approximately 20 cases. TPBx patients report similar levels of discomfort for all aspects of the procedure compared to standard transrectal approach. csCDR rates between MRIBx and TPBx were not significantly different. Complication rates were similar between TPBx and pooled transrectal approach including 2 sepsis events in both cohorts, suggesting that while sepsis events are rarely reported in the TPBx approach, they are not impossible.

Figure 1: Learning curve for transperineal prostate biopsy

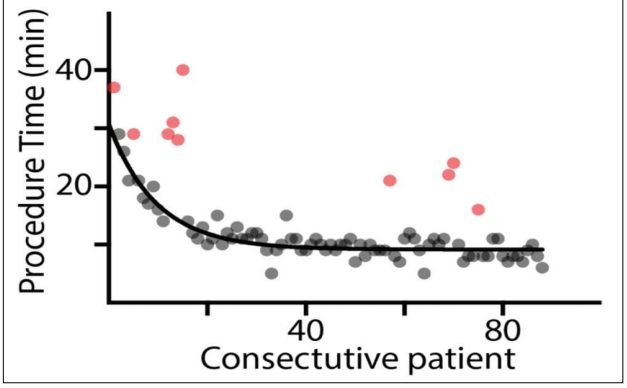

Table 1: Demographics and complication rates

	TPBX	TRUSBx	MRIBx	P value
N	234	162	296	
Age (mean (SD))	64.6 (7.4)	64.0 (6.5)	65.3 (7.2)	0.19
PSA (median [25th, 75th percentile])	6.4 [4.9, 9.9]	6.5 [4.5, 9.3]	7.5 [5.3, 10.0]	0.03
Prostate Size (cm³) (median [25th, 75th percentile])	45.0[31.0, 60.0]	42.4[29.5, 59.9]	45.1[32.6, 60.5]	0.43
Purpose (n (%))				<0.0001
Cancer screening	209 (89.3)	143 (88.3)	201 (71.0)	
Active surveillance	25 (10.7)	19 (11.7)	86 (29.1)	
DRE (n (%))				0.01
Normal	162 (74.7)	113 (70.6)	238 (82.4)	
Abnormal	55 (25.4)	47 (29.4)	51 (17.7)	
Complication (n (%))	**TPBX**	**All Transrectal**		
N	234	457		
No	228 (97.4)	441 (96.5)		
Yes	6 (2.6)	16 (3.4)		0.51
Sepsis	2 (0.9)	2 (0.5)		0.50

Table 2: NRS pain scores during biopsy procedure

All Patients	**TPBx**	**TRUSBx**	**MRIBx**	**P value**
N	80	67	94	
Probe insertion (median (IQR) minutes)	2 (0-4)	3 (1.5-4.8)	3 (1.1-4.9)	0.06
Anesthetic block	4 (2-6)	2 (1-4)	3 (1-4)	0.007
Biopsy	3 (1-5)	2 (0-4)	2.5 (1-4)	0.11
Post-procedure	0 (0-2)	0 (0-1)	0 (0-1.3)	0.20
Procedural time (median time (min) (IQR))	11 (9-13.3)	7.5 (6-11)	12 (11-14)	<0.001
Patients with ≥ 1 prior biopsy	**TPBx**	**TRUSBx**	**MRIBx**	**P value**
N	21	38	81	
Probe insertion (median NRS score (IQR))	1.5 (0-4)	3 (1.5-5)	3 (1.5-5)	0.01
Anesthetic block	4 (2-6)	2.5 (1-4)	3 (1-4.1)	0.02
Biopsy	3 (1-4)	2 (0-4)	2 (1-4)	0.36
Post-procedure	0 (0-2)	0 (0-1)	0 (0-1.5)	0.15
Procedural time (median time (min) (IQR))	11 (9-13)	7.5 (6-11)	12 (11-14)	<0.001

Table 3: Cancer detection rates of TPBx and TRUSBx compared to MRIBx (nsCancer = nonsignificant cancer)

All Patients	**N**	**No Cancer** (n (%))	**nsCancer** (n (%))	**csCancer** (n (%))	**P Value**
MRIBx	295	93 (31.5)	67 (22.7)	135 (45.8)	Reference
TPBx	232	87 (37.5)	59 (25.4)	86 (37.1)	0.13
TRUSBx	161	85 (52.8)	31 (19.3)	45 (28.0)	<0.001
Screening only	**N**	**No Cancer**	**nsCancer**	**csCancer**	**P value**
MRIBx	209	84 (40.2)	38 (18.2)	87 (41.6)	Reference
TPBx	208	77 (37.0)	53 (25.5)	78 (37.5)	0.2
TRUSBx	142	76 (53.5)	25 (17.6)	41 (28.9)	0.03

P24

Hematuria Referrals at a Safety Net Hospital: A Focus on Patient Demographics and Compliance

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Introduction: Hematuria accounts for over 20% of referrals to urology but prior studies show low completion rates of only 5-18%. Our study characterizes the referral trends for hematuria and analyzes the socioeconomic factors affecting follow-up appointment rates in a safety net hospital setting.

Materials & Methods: We performed a retrospective review of patients referred to urology at an urban safety net hospital for microscopic and gross hematuria from 2018-2019. Analyzed variables included age, gender, race, primary spoken language, insurance type, BMI, medical comorbidities, and smoking history. Appropriateness of the referral and completion of the workup, including upper tract imaging and cystoscopy, were evaluated. Univariate analysis was performed using chi-square test, Fisher's exact test or t-test, and odds ratios were calculated.

Results: A total of 333 patients were referred for microscopic or gross hematuria. We excluded 45 (13.5%) patients who did not show for consultation and 53 (15.9%) patients with a known history of genitourinary malignancy or urolithiasis. Of the remaining 235 patients, 59.2% patients had a pre-referral urinalysis with microscopy and 28.9% had a urine culture. 5.5% patients had only a dipstick urinalysis and 16.2% had no urine studies. The majority of patients were non-White (68.5%) and publicly insured (75.3%). 40.8% were non-English speaking.
One hundred and fifty (63.8%) patients completed a full hematuria workup with both upper tract imaging and cystoscopy. Of the remaining 85 patients, 28 (11.9%) missed cystoscopy, 26 (11.1%) missed imaging, and 31 (13.2%) missed both. Those with erectile dysfunction (ED) had 77% decreased odds of completing the workup (p=0.016). Patients under 40 had 2.5x odds of not completing the hematuria workup (p=0.004). Of those referred for gross hematuria, patients with a history of recurrent urinary tract infections (UTI's) had 87% decreased odds of completing the workup (p=0.007). Of those referred for microscopic hematuria, patients under 40 had 5.0x odds of not completing the workup (p=0.001). Odds of completing a hematuria evaluation, both microscopic and gross, was not significantly associated with other factors, including gender, BMI, smoking status, race, language, or insurance status.

Conclusions: Within an urban safety net hospital system, 40% of hematuria referrals were missing the recommended urinalysis with microscopy. Although workup completion rates were higher compared to prior studies, they remain relatively low regardless of socioeconomic factors. Improving counseling for younger patients may improve hematuria completion rates. Simplified 2020 AUA hematuria guidelines, which obviate the need for cross sectional imaging, may also improve completion rates in future studies.

Graph 1: Breakdown of Hematuria Workup Completion

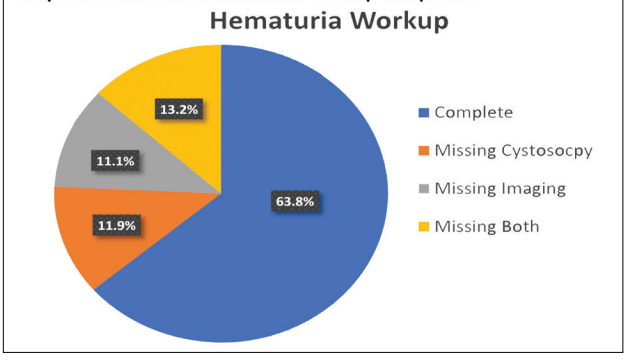

Table 1: Demographics of All Hematuria Referrals

		Total N (%) or mean ± SD
Age		55.4 ± 17.2
Gender	Female	95 (40.5)
	Male	150 (59.6)
Race	Black	92 (39.2)
	White	49 (20.9)
	Hispanic	56 (23.8)
	Asian	13 (5.5)
	Other	25 (10.6)
BMI		27.7 ± 5.8
Language	English	139 (59.2)
	Spanish	48 (20.4)
	Haitian-Creole	15 (6.4)
	Other	33 (14.0)
Smoking Status	Current	27 (11.5)
	Past	53 (22.6)
	Never	116 (49.4)
Insurance	Public	177 (75.3)
	Private	58 (24.7)
Comorbidities	Diabetes	35 (14.9)
	Hypertension	99 (42.1)
	Renal Disease	27 (11.5)
	BPH	31 (13.2)
	ED	13 (5.5)
	Recurrent UTI's	19 (8.1)
	Indwelling catheter	9 (3.8)

Table 2: Patient Age and Completion of All Hematuria Workup

Age (years)	Workup Complete	Not Complete	% Complete	p-value
< 40	22	26	45.8	0.004
40-55	41	17	70.7	
55-70	53	24	68.8	
70+	34	18	65.5	

P25

Laboratory Reporting Parameters of Microhematuria within Academic Medical Centers and Commercial Laboratories: Implications for Interpreting the 2020 AUA Guideline

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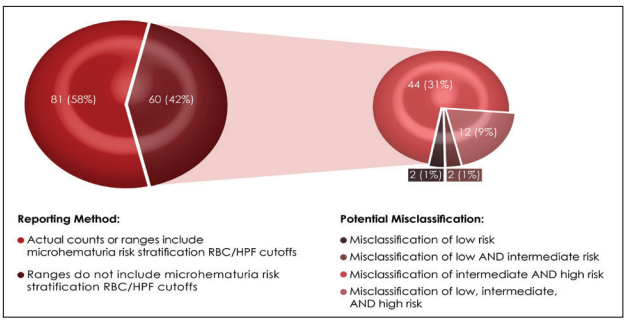
Introduction: To explore how laboratories in the United States report red blood cell per high powered field (RBC/HPF) counts on urinalysis and to evaluate whether their methods can effectively risk stratify patients in accordance with the 2020 American Urological Association/Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (AUA/SUFU) microhematuria (MH) guidelines.

Materials & Methods: Reporting methods for RBC/HPF counts (ranges or actual counts) were collected by querying urologists in United States academic medical institutions or contacting labs directly. Study outcomes were (1) to explore whether the reporting schemes were concordant with the risk stratification groups in the new MH guideline (3-10 [low risk], 11-25 [intermediate risk], and more than 25 [high risk]) and (2) to evaluate the potential for misclassification of these risk groups based on reporting methodology.

Results: Methods of reporting RBC/HPF count were collected from 141 laboratories. Seventy-two (51%) use ranges, while the remainder use actual counts or actual counts to a certain threshold number. Sixty (43%) report ranges that do not include cutoffs concordant with the MH guidelines risk stratification groups. Fifty-six (40%) do not include the cutoff of 25 RBC/HPF which impacts segregation of intermediate and high risk groups. Sixteen (11%) do not include the cut-off of 3 RBC/HPF that defines the presence of MH. Of labs that report ranges, only 12/72 (17%) include all the same cutoffs of the MH guidelines risk stratification groups. **Figure 1** illustrates the distribution of labs reporting RBC/HPF counts that are concordant with MH risk stratification cutoffs vs those that are not and the breakdown of possible misclassifications that could arise from not including these cutoffs in the reported ranges.

Conclusions: A significant number of laboratories report RBC/HPF counts in ranges that differ from thresholds in the 2020 AUA/SUFU guideline. The implication is potential misclassification of microhematuria both at minimum threshold diagnosis (3 RBC/HPF), but additionally between intermediate and high risk groups. Standardization of reporting schemes to actual RBC/HPF counts may allow improved adherence to guidelines while providing data for future guideline development.



P26

Lower Urinary Tract Symptoms in Patients with Prostate Cancer on Active Surveillance

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Introduction: Prostate cancer (PCa) patients on active surveillance (AS) may have concurrent lower urinary tract symptoms (LUTS) secondary to benign prostatic enlargement (BPE). Few studies have addressed LUTS in this population and guidelines are lacking on the management of LUTS for patients with PCa. The objective of this study is to describe the prevalence of LUTS and rates of bladder outlet treatment among men with PCa on AS.

Materials & Methods: Data are from the Canary Prostate Active Surveillance Study (PASS), a multicenter prospective cohort of men with PCa on AS. At enrollment and every 6 months thereafter data on medications and procedures for bladder outlet obstruction (BOO) were abstracted from medical records and assessments of LUTS via AUA symptom Score (AUASS) were completed. Men completed the enrollment and ≥ 1 post-enrollment AUASS and had a minimum of one year follow-up. Men who underwent bladder outlet procedures prior to enrollment or those with prostatitis at any follow-up visit were excluded. LUTS at enrollment were categorized as mild (AUASS 0-7), moderate (8-19) or severe (20-35). Rates of BOO treatments as well as PCa treatment were compared using univariable analyses.

Results: A total of 1501 men were included in the study with a median follow-up of 6.4 (IQR 3.2,9.1) years. The median AUASS at enrollment was 7 (IQR 3,11). At enrollment, the prevalence of severe LUTS was 95 (6%). Of total patients, 396 (26%) received medical treatments for BOO, 18 (1.4%) men underwent BOO procedure during the study. Compared to men with mild LUTS, men with moderate or severe LUTS were more likely to receive BOO treatments; however even among patients with severe LUTS, only 4.2% underwent bladder outlet procedures. Men with worse LUTS were more likely to have more indolent prostate cancer (Gleason Grade group 1, p=0.03); and were less likely to undergo definitive treatment for PCa (p<0.01). Among men with severe LUTS that received definitive PCa treatment, the majority underwent radical prostatectomy.

Conclusions: Patients with PCa on AS with severe LUTS were more likely to harbor indolent PCa and had a low treatment rate for PCa. Although those with severe LUTS were more likely to receive bladder outlet procedures, only 4% of those patients actually did. Additional efforts are necessary to evaluate treatment paradigms for BOO in AS patients.

	All patients (n=1501)	Mild LUTS (n=898)	Moderate LUTS (n=508)	Severe LUTS (n=95)	P-value
Age at enrollment (median, IQR)	63 (58,67)	63 (57, 67)	64 (59, 68)	64 (58, 68)	<0.01
Caucasian Race (n,%)	1327 (88%)	791 (88%)	451 (89%)	85 (89%)	0.07
BMI (median, IQR)	28 (25,31)	28 (25,31)	27 (25,30)	28 (24,32)	0.89
Prostate size (median, IQR)	43 (32,60)	41 (30, 56)	48 (34, 67)	45 (35, 62)	<0.01
AUASS at enrollment (median, IQR)	7 (3,11)	4 (2,6)	12 (10,15)	23 (21,25)	<0.01
AUASS QOL at enrollment (median, IQR)	1 (1,2)	1 (0,2)	2 (2,3)	3 (3,4)	<0.01
Clinical Prostatic Enlargement diagnosis (n, %)	640 (43%)	306 (34%)	268 (53%)	66 (69%)	<0.01
Received BOO medications at any time (n,%)	396 (26%)	165 (18%)	125 (36%)	48 (51%)	<0.01
Received BOO procedure (n,%)	18 (1.2%)	5 (0.6%)	9 (1.8%)	4 (5.3%)	<0.01
Did not receive any BOO tx (n,%)	1087 (72%)	728 (81%)	374 (74%)	43 (45%)	<0.01
Highest PCa stage cT1 (n,%)	1178 (78%)	704 (78%)	394 (78%)	80 (84%)	0.48
Highest PCa Gleason Grade Group 1 (n,%)	897 (60%)	518 (58%)	315 (62%)	64 (67%)	0.03
Received definitive treatment for PCa (n,%)	510 (34%)	332 (37%)	158 (31%)	20 (21%)	<0.01
Of those undergoing definitive tx for Pca (n=510), Radical Prostatectomy (n,%)	273 (54%)	172 (52%)	86 (54%)	15 (75%)	0.12

AUASS QOL ranges from 0-6 with a lower score indicating higher QOL.
P-values are Wilcoxon Rank sum tests for continuous variables and chi-squared test for categorical.
Two highest AUASS and AUASS QOL were censored at first event of PCa treatment, BPE surgical treatment or last study contact.

P27

Obesity-associated Proinflammatory Cytokines Regulate Prostate Cancer Cell Proliferation & Migration

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Introduction: Previous studies revealed that obesity is significantly associated with a higher incidence of prostate cancer (PCa). Meanwhile, obesity-associated inflammation plays an important role in tumorigenesis. Here we wished to identify the downstream signaling pathways of obesity-associated proinflammatory cytokines IL-6 and TNF-α effect on prostate cancer cell proliferation and migration.

Materials & Methods: Adipocytes and THP-1 macrophages were differentiated and treated with myristic acid (MA) to induce inflammatory cytokines, and conditioned media (CM) were collected to treat prostate epithelial cancer, androgen-dependent LNCaP and androgen-independent PC-3 cell lines. Cells were also treated with interleukin-6 (IL-6) 10ng/ml, tumor necrosis factor-alpha (TNF-α) 10ng/ml, oncometabolite R-2-hydroxyglutarate 50μM (R-2-HG) and Dutasteride 10μM (SRD5A1 inhibitor). Prostate cancer cell migration and proliferation were assessed by scratch assay (0h, 24h, 48h) and MTT assay (0h, 24h, 48h, 72h) and analyzed by 2-way ANOVA. Enzymes regulating steroid hormone metabolism SRD5A1, AKR1C1, AKR1C3, HSD3B2, CYP17A1 and UGT2B15 were determined by immunocytochemistry and qPCR. The protein level of SRD5A1 was measured by western blot.

Results: The proliferation of LNCaP and PC-3 cells was significantly stimulated by adding of CM for 24h, 48h, and 72h. The migration of PC-3 cells was also promoted by CM. Addition of testosterone did not change the effect of CM. Administration of IL-6, TNF-α and R-2-HG significantly increased the proliferation and migration of LNCaP and PC-3 cells. IL-6 also increased the expression of SRD5A1. The expression of AKR1C1 and HSD3B2 was downregulated, and UGT2B15 was upregulated by TNF-α. SRD5A1 was upregulated either by R-2-HG alone or combining with IL-6 and TNF-α, but downregulated by Dutasteride alone.

Conclusions: Our study suggests that obesity-associated proinflammatory cytokines, IL-6 and TNF-α, affect prostate cancer cells' proliferation and migration in an androgen-independent manner. Synergistic targeting oncometabolite R-2-HG and proinflammatory cytokines may improve the management of androgen-independent prostate cancer.

P28

Extracellular miRNA as a Marker of Invasive Urothelial Cancer

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Introduction: Determination of muscle invasion is critical in the staging, prognosis, and treatment of urothelial carcinoma (UC). MicroRNA (miRNA) have been shown to be dysregulated in both non- and muscle-invasive UC and are thought to serve an important role in tumor progression. Extracellular vesicle (EV) miRNA can be easily isolated from body fluids, such as urine. They are a novel target for development of diagnostic biomarkers that are non-invasive and overcome the constraints of tissue biopsies. We sought to identify differential expression of EV miRNA between noninvasive and invasive UC and investigate the effect of identified miRNA on tumor pathogenesis in UC cell lines.

Materials & Methods: EV miRNA was isolated from the urine of patients with biopsy-proven non-invasive (n= 14) or invasive bladder UC (n=15). Urine was collected pre-operatively and specimens were grouped according to invasion at the time of transurethral resection. Twelve miRNA were assayed via PCR and those with increased expression in invasive specimens were further examined. miRNA from four UC cell lines (J82, UMUC, RT112, and CUBIII) and EV miRNA from cell-free culture media from those lines were isolated and PCR performed for in-vitro validation. Two UC cell lines, UMUC (invasive) and CUBIII (non-invasive), were then transfected with pre-miRNA of the previously identified miRNA. Cell proliferation was evaluated at 24 and 48 hrs in the transfected cell lines by MTT assays. Potential miRNA tumor suppressor protein targets were identified based on predicted interactions, and their levels were determined via Western blots.

Results: Three miRNA (miR-222-3p, miR-320b, and miR-423-5p) had increased expression in the urine EVs of patients with invasive UC ($p<0.05$). These miRNA were also upregulated in the EVs of cultured cells with an invasive phenotype. Transfection of miR-320b and miR-222-3p was successful into both UC cell lines and increased proliferation in both the noninvasive and invasive cell lines ($p<0.05$).

Conclusions: Urine EV miR-320b and miR-222-3p are upregulated in invasive UC and may have a role in tumor progression. They are promising biomarkers that could improve diagnostic precision as well as serve as potential therapeutic targets.

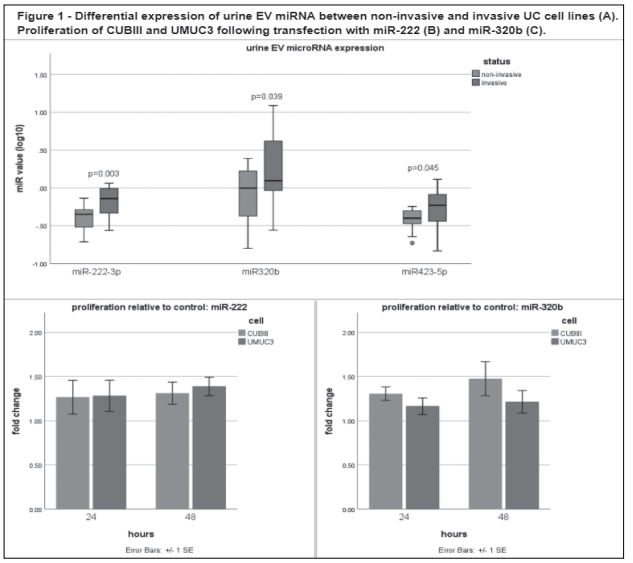

Figure 1 - Differential expression of urine EV miRNA between non-invasive and invasive UC cell lines (A). Proliferation of CUBIII and UMUC3 following transfection with miR-222 (B) and miR-320b (C).

P29

Candidate Urine microRNA Biomarkers Differentially Expressed in Preoperative Urine Specimens from Patients With pT0 Compared to Muscle Invasive Urothelial Carcinoma at Time of Cystectomy

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Introduction: Radical cystectomy with urinary diversion is crucial in managing muscle invasive bladder cancer (MIBC). Despite the increasing adoption of minimally invasive techniques to perform the operation, it remains a morbid procedure with a relatively high rate of accepted post-operative complications. A small, but significant number of patients undergoing the procedure have T0 disease on pathologic examination. This study aims to identify these pT0 patients using microRNA (miRNA) profiles from preoperative urine specimens.

Materials & Methods: Total RNA was isolated from cell-free urine of patients undergoing cystectomy for a history of muscle-invasive cancer. Each sample was profiled for 376 unique miRNA using a novel qPCR based detection system (MIRXES). Statistical evaluations were performed to determine the potential of miRNA to distinguish these cohorts using receiver operator characteristic curves.

Results: Urine samples from twenty four patients were analyzed: twelve from patients with subsequently confirmed muscle invasive bladder cancer and twelve patients with pathology of pT0. Clinical characteristics were similar between the groups. 144 miRNA were detected in each of the samples from pT0 patients while 215 were detected in each of the samples from the muscle invasive cohort. Nine miRNA were significantly differentially expressed between the cohorts ($P<0.05$). Seven of these achieved an AUC>0.75 for distinguishing MIBC.

Conclusions: This novel qPCR analysis of preoperative urine specimens was successful in identifying candidate miRNA to be further evaluated as a noninvasive test to detect eradication of MIBC prior to cystectomy. Of 9 total miRNAs that are differentially expressed in urine between pT0 and MIBC specimens, 7 exhibit an AUC > 0.75, strengthening their candidacy as markers. Validation with further samples is planned, and once complete, inquiry will shift towards optimizing a urine assay for use in clinical surveillance, intended to detect patients in whom cystectomy can be safely delayed or deferred. Subgroup analysis comparing differential expression based on type of neoadjuvant treatment is another planned direction for expansion of investigation.

miRNA	p-value	AUC	Fold Change
miR_499a_5p	0.000431	0.930	-1.86
miR_335_5p	0.0164	0.792	-1.71
miR_190a_5p	0.0207	0.722	-1.82
miR_424_5p	0.0243	0.778	2.28
miR_501_3p	0.0251	0.777	-1.60
miR_582_5p	0.0291	0.778	-1.65
miR_185_5p	0.0432	0.757	2.03
miR_10b_5p	0.0485	0.715	-1.87
miR_29a_3p	0.0496	0.750	-1.84

P30

Comparison of Signal Intensity in Bladder Urothelial Carcinomas Using pHLIP® Molecular Probes

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Introduction: Urothelial carcinomas (UC) are a heterogeneous malignancy with an acidic microenvironment. pH low insertion peptides (pHLIPs) are a class of pH specific transmembrane peptides that target the acidic microenvironment of cancer cells. pHLIP variant-3 (Var3-pHLIP) was conjugated to a near infrared fluorescent (NIRF) dye to evaluate specificity and sensitivity as a tumor targeting molecular imaging probe.

Materials & Methods: After incubation for 15 minutes with Var3-pHLIP conjugated to indocyanine green (ICG) or IRDye® 800CW, 38 *ex-vivo* bladder specimens from patients undergoing robotic assisted laparoscopic radical cystectomy for bladder cancer were placed under NIRF capable laser to excite the fluorophore. Peak signal intensity and the corrected mean intensity of malignant and nonmalignant cases were analyzed and compared using paired samples t-test. The number of lesions visible under NIRF was compared with the number identified under white light using paired samples t-test. Expression of NIRF signal and identification of lesions under white light by urologic oncology pathologist were compared to histopathology for specificity and sensitivity calculations.

Results: Of 58 lesions processed for histopathological evaluation, 47 (81%) were seen under white light and 57 (98.3%) were seen with Var3=pHLIP, representing an improved diagnosis by 17.3% ($p=0.003$). In NIRF, Var3-pHLIP demonstrated an average peak signal intensity of 116.4 relative fluorescent units (RFU) in malignant cases, and nonmalignant cases had average peak of 44.3 RFU ($p<0.001$). Corrected average signal intensity of malignant cases demonstrated an average of 52.9 RFU/μm^2 and nonmalignant cases showed an average of 25 RFU/μm^2 ($p<0.001$). Var3-pHLIP demonstrated 98% sensitivity and 100% specificity in identification of UC.

Conclusions: Var3-pHLIP NIRF enhanced visualization and improved diagnosis of UC. Categorizing into broader categories of malignant and nonmalignant, the unique Var3-pHLIP NIRF signal can be used to differentiate between the two groups based on both peak signal intensity and mean intensity per unit area of lesion. NIRF Var3-pHLIP identified UC irrespective of subtype, previous treatment, and stage. All CIS cases missed by white light cystoscopy were diagnosed using Var3-pHLIP NIRF imaging. Additional work into digital, automated analysis of Var3-pHLIP NIRF signal and development of a fluorescent signal analysis capable cystoscope can lead to diagnosis of bladder cancer at the time of cystoscopy.