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Variability in Growth Kinetics of Small Renal Masses on Active Surveillance

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Introduction: Active surveillance (AS) of small renal masses (SRM) is emerging as a safe and effective strategy. To date, there is a paucity of robust, prospective data on growth rates of these masses as they pertain to clinical outcomes.

Materials & Methods: From 2009-2015, a prospective multi-institutional registry of patients with small renal masses (tumor diameter < 4 cm) was collected. Patients electing active surveillance received regularly scheduled imaging, with tumor characteristics collected throughout their enrollment in the registry.

Results: 518 patients were prospectively enrolled, of which 236 patients (45.6%) elected AS. 186 had follow up imaging at time of this analysis, with a mean follow up of 23.7 months. Overall mean growth rate was 0.29 ± 1.81 cm/year (median: 0.10 cm/year). Growth rate and variability decreased with time, with the mean growth rates at 6, 12, 24, and 48 months of 0.22 ± 0.57 , 0.12 ± 0.38 , 0.13 ± 0.27 , and 0.09 ± 0.25 cm/year, respectively. Twenty-one patients (8.9%) crossed over to delayed intervention, with a mean growth rate of 0.56 ± 1.07 cm/year (median: 0.39 cm/year). Progression-free survival (tumor size < 4 cm and growth rate ≤ 0.5 cm/year) was 94.9% and 80.1% at 2 and 4 years, respectively.

Conclusions: Growth kinetics of SRM are highly variable upon entrance into AS, with both growth rate and growth rate variability decreasing with time. Early in AS, worrisome growth rates may warrant re-assessment of risk stratification with additional imaging or consideration of biopsy prior to treatment. As patients progress on AS, the growth rate may be an acceptable parameter for decision-making on intervention.

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Efficacy of High Intensity Local Treatment for Metastatic Bladder Cancer

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Introduction: There is evidence from other malignancies about the benefit of aggressive local treatment (LT) even in the setting of metastatic disease. Against a backdrop of stagnant mortality rates for metastatic Bladder Cancer (mBCa), we hypothesized that high-intensity LT of primary tumor, defined as the receipt of radical cystectomy or > 50 Gy of radiation therapy to the bladder, may impact overall survival (OS).

Materials & Methods: Within the National Cancer Data Base (NCDB), we identified 3,753 patients who received a multi-agent systemic chemotherapy combined with either high-intensity vs. conservative LT for primary mBCa. We defined as high intensity localized therapy those, patients who received radical cystectomy (RC) or > 50 Gy of radiation therapy (RT) to the pelvis. The conservative LT included patients who did not receive LT, or patients who received TURBT alone and/or palliative RT < 50 Gy in the pelvis. Inverse probability of treatment weighting (IPTW)-adjusted Kaplan Meier curves and Cox regression analyses were used to compare the overall survival (OS) of patients who received high-intensity vs. conservative LT.

Results: Overall, 297 (7.91%) and 3,456 (92.09%) patients with mBCa underwent high-intensity and conservative LT. Following IPTW adjustment of all variables, the distribution of baseline patient characteristics was similar. IPTW-adjusted Kaplan-Meier curves showed that median OS was longer in the high-intensity LT group (14.92 months [IQR, 9.82-30.19 months] vs. 9.95 months [IQR, 5.29-17.08 months]; $P < 0.001$). Furthermore, in IPTW-adjusted Cox regression analysis, high-intensity LT was associated with a significant OS benefit (HR = 0.56; 95% CI = [0.48-0.65]; $P < 0.001$).

Conclusions: We report an OS benefit for individuals presenting with mBCa treated with high-intensity LT, compared with their counterparts treated with conservative LT. While the findings are subject to the usual biases related to the observational study design, our preliminary data warrant further consideration for randomized clinical trials to explore this question, particularly given the poor prognosis associated with mBCa.

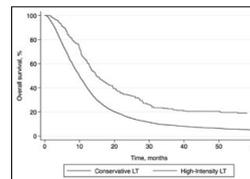


Figure 1. IPTW-adjusted Kaplan Meier analysis of OS in patients who received high intensity vs. conservative LT for mBCa.

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National Trends of Perioperative Outcomes and Costs for Open, Laparoscopic and Robotic Cytoreductive Nephrectomy

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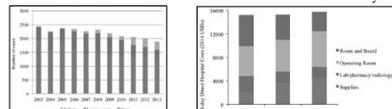
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Introduction: Over the past decade, the advent of targeted therapy as well as widespread adoption of minimally invasive surgery (MIS) has changed the management of metastatic renal cell carcinoma (mRCC). We aimed to perform a population-based study comparing utilization trends, perioperative outcomes and costs for open, laparoscopic and robotic cytoreductive nephrectomies (CNx) in the U.S.

Materials & Methods: We used International Classification of Diseases Ninth Revision codes to identify patients who underwent an open, laparoscopic, or robotic nephrectomy for the treatment of mRCC in the U.S from 2003 to 2013, using a contemporary hospital discharge database (Premier, Inc., Charlotte, North Carolina). Logistic and median regression analyses were used to compare 90-day perioperative outcomes among the three surgical approaches, adjusting for baseline characteristics. Propensity weighting was used to minimize selection bias. Sampling weights were used to yield a nationally representative sample.

Results: The study cohort included 24,221 patients. The annual number of CNx consistently decreased from 2500 to 1900 over the study period. Meanwhile, utilization of MIS increased from 22% to 33% with robotic surgery rising more rapidly after 2010 (Figure 1). Robotic surgery had a lower probability of prolonged length of stay than open and laparoscopic surgery (ORs: 0.32 and 0.64, respectively; p values < 0.05). Compared to open surgery, robotic and laparoscopic surgery had lower probabilities of requiring an intensive care unit admission (ORs: 0.49 and 0.57, respectively; p values < 0.001) and blood transfusions (ORs: 0.40 and 0.41, respectively; p values < 0.001). Robotic surgery had longer operating room time than open and laparoscopic surgery (adjusted median: 36 and 30 minutes, respectively; p values < 0.05). Despite no statistically significant difference in the total costs among the three approaches, a large amount of costs for open surgery was due to room and board, while a large amount of costs for robotic surgery was due to operating room time and supplies.

Conclusions: In the era of targeted therapy for mRCC, CNx is declining. Though open surgery continues to be the dominant approach, MIS, particularly robotic surgery, is assuming a larger role for surgical management of mRCC. While costs are comparable among the three approaches, MIS was associated with less morbidity thus potentially decreasing the time to systemic therapy. Future studies should be aimed at elucidating the benefits of MIS in combination with shorter time to systemic therapy on patient outcomes.



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The Safety of Preoperative Aspirin for Patients Undergoing Renal Surgery: A Population-Based Analysis

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Introduction: Urologic guidelines recommend discontinuing aspirin prior to major urologic surgery due to the perceived risk of hemorrhage. However, in certain high-risk patients holding aspirin for surgery may place undue risk of perioperative cardiovascular or cerebrovascular complications. We utilized a contemporary nationally representative database to assess the safety of perioperative aspirin for patients undergoing renal surgery.

Materials & Methods: Using the Premier Hospital Database (Premier Inc, Charlotte, NC), which is a hospital discharge database including over 600 hospitals in the United States, we captured patients undergoing elective radical or partial nephrectomy for the management of kidney cancer or renal mass from 2003 to 2013, and divided the cohort by aspirin use on the day of surgery. We excluded patients from hospitals with no record of any perioperative aspirin use during the study period and those who had a possible cardiovascular or cerebrovascular event on the day of surgery. Multivariable regression analyses, controlling for patient and hospital factors as well as surgical approach, were used to assess the association between aspirin use and perioperative outcomes. Sampling weights and hospital clustering were employed to achieve a nationally representative estimate.

Results: The cohort was comprised of 304,055 patients, with 3044 (1.0%) receiving aspirin on the day of surgery; 79,661 (26.2%) underwent a partial nephrectomy. There were no significant differences between the two groups regarding intraoperative and post-operative complications (Table); there was a significantly increased odds for 30-day myocardial infarction in the aspirin group (OR 2.93, $p = 0.001$). The same associations were seen with subgroup analyses for radical and partial nephrectomy.

Conclusions: We did not find that aspirin use was associated with an increase in surgical morbidity for renal surgery even though the patients on aspirin in our cohort potentially had an elevated cardiovascular risk, as reflected by the higher incidence of post-operative myocardial infarction. Continuing aspirin among patients undergoing renal surgery appears to be safe.

	Full Cohort n=304,055 OR (95% CI)	Radical Nephrectomy n=224,388 OR (95% CI)	Partial Nephrectomy n=79,661 OR (95% CI)
In-Hospital Events			
Prolonged Operating Room Time			
< 270 minutes	0.93 (0.71 to 1.24)	0.68 (0.60 to 1.3)	0.9 (0.57 to 1.41)
> 270 minutes	1.00 (0.66 to 1.55)	1.1 (0.7 to 1.73)	0.7 (0.28 to 1.79)
Blood Transfusion	1.00 (0.64 to 2.01)	1.03 (0.63 to 2.06)	1.28 (0.33 to 4.84)
1+ units	1.05 (0.64 to 2.01)	1.03 (0.62 to 2.06)	1.28 (0.33 to 4.84)
4+ units	2.08 (0.64 to 7.01)	0.98 (0.43 to 2.21)	0.34 (0.05 to 2.25)
Prolonged length of stay	0.9 (0.67 to 1.21)	0.93 (0.68 to 1.26)	0.79 (0.39 to 1.58)
30-day Events			
Myocardial Infarction			
	2.93 (1.67 to 5.14)***	2.82 (1.37 to 5.83)***	1.92 (1.11 to 3.22)**
Cerebrovascular Accident			
	1.28 (0.79 to 2.12)	1.23 (0.71 to 2.11)	1.43 (0.53 to 3.67)
30-day Events			
Major Complication (Clavien 3-5)			
	1.1 (0.77 to 1.58)	1.09 (0.74 to 1.61)	1.19 (0.53 to 2.67)
Reoperation			
	0.8 (0.56 to 1.14)	0.86 (0.59 to 1.23)	0.64 (0.32 to 1.28)
*** $p < 0.05$			
** $p < 0.01$			

Synchronous Metastases in Upper Tract Urothelial Carcinoma Has Doubled in the Last 10 Years: An Analysis of Staging and Treatment Trends Using the National Cancer Database
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Introduction: Upper tract urothelial carcinoma (UTUC) is a relatively rare malignancy, accounting for approximately 5,000 new diagnoses per year. Nephroureterectomy (NU) and endoscopic treatments achieve good outcomes in organ-confined disease, but survival is significantly lower in patients with metastases. Chemotherapy can also be employed for high-risk or systemic disease, with increasing attention to neoadjuvant use as post-NU CKD may be limiting. The National Cancer Database (NCDB), which captures 75% of all cancer diagnoses in the US, allows analysis of diagnosis and treatment trends that may not be apparent in smaller single-center series.

Materials & Methods: Using the NCDB, we identified all patients diagnosed with urothelial carcinoma of the renal pelvis or ureter between 2004-2013. Data comprising baseline tumor (e.g. staging), patient (e.g. age, gender) and facility (e.g. region) factors were extracted from the database. Treatment data including surgery and chemotherapy were also extracted. Data on timing of chemotherapy were available after 2005. Comparisons were conducted using the chi-squared test.

Results: A total of 48,845 cases of UTUC were included and analyzed. Over the ten-year capture period of the NCDB, the gender and age distribution of new UTUC diagnoses were stable at 60% male, with median age at diagnosis 72 years. The proportion of patients diagnosed with cT1/cT1 increased over ten years (60% to 67%, p < 0.001), and the proportion of ≥ cT2 decreased from 35% to 28%, (p < 0.001). However, presentation with metastatic disease (clinical M1) rose from 4.6% to 8.9% (p < 0.001). The rate of nephrectomy/nephroureterectomy was stable at 59% for ≥ cT2 and 51%-52% for < cT2 disease. Similarly, the rate of adjuvant therapy was stable at 11% (19% for ≥ cT2). The rate of neoadjuvant chemotherapy, however, increased from 0.8% in 2006 to 2.3% in 2014 for all stages, and from 0.6% to 4.4% in ≥ cT2 disease (p < 0.001). Overall, patients with ≥ cT2 were more likely to undergo NU than patients with < cT2 (60.8% v. 52.6%, p < 0.001). Similarly, ablation/minor excision was more common in < cT2 tumors than ≥ cT2 (18.3% v. 3.7%, p < 0.001). Patients older than 65 years were more likely to not receive surgery (16.1% vs. 11.6%, p < 0.001) or to undergo ablation/excision (12.4% vs. 8.6%, p < 0.001) compared with younger individuals, which remained stable. Men were more likely than women to undergo surgery of any kind (84.3% v. 81.4%, p < 0.001) by a small margin.

Conclusions: While UTUC demonstrates largely stable basic demographic trends over the past ten years, the rate of synchronous metastatic disease has increased despite a decrease in ≥ cT2 diagnoses. An apparent concomitant rise in utilization of neoadjuvant chemotherapy and persistent utilization of adjuvant chemotherapy is notable. Observations from any administrative dataset are hypothesis drivers, and potential for reporting bias exists. Further investigation into etiology of the increased rate of metastases is warranted, as this is the first such report. Additionally, variables predicting management, including age and gender, and subsequent survival, as well as comparative effectiveness of UTUC surgical and adjuvant therapies are forthcoming.

Surgeon and Hospital Variation in the Costs of Radical Cystectomy for Bladder Cancer in the United States

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Introduction: On a per-patient basis, bladder cancer (BCa) is the most expensive cancer, requiring ongoing, sophisticated treatment and surveillance modalities. Of these, radical cystectomy (RC) is the most involved, with potential for serious complications, lengthy hospitalizations and costly readmissions. Though there is known variation in outcomes and practices with RC, there is no national-level data on individual surgeon and hospital impact on costs. Given this, we designed a study to assess surgeon- and hospital-level variation and predictors of 90-day hospital costs after RC.

Materials & Methods: We analyzed data from Premier Hospital Database (Premier, Inc., Charlotte, NC), a nationally representative all-payer dataset capturing over 45 million hospital inpatient discharges, representing approximately 20% of all hospitalizations at over 600 hospitals in the US. We defined a weighted cohort of 11,255 men and women who had a radical cystectomy performed by 292 unique surgeons at 144 different hospitals from 2003-2013. Using direct line-item costs, we extracted total 90-day hospital costs (2014 USD). In addition, we examined patient, hospital, and surgeon characteristics and predictors of high and low costs.

Results: The mean 90-day direct hospital cost per RC was \$32,261 (95% CI \$31220-\$33,302). The least costly decile of surgeons (<\$16,278/RC) performed RC for an average cost of \$13,654 (95% CI: \$13,191 to \$14,116). The most costly decile of surgeons (> \$51,285/RC) performed RC for an average cost of \$82,642 (95% CI: \$76,541 to \$88,744). Patient, hospital and surgical characteristics explained only a small amount of total variance in costs (4.9%, 2.1%, 0.6% respectively). In contrast, the presence of a 90-day major complication and a prolonged LOS explained 18.1% and 18.2% of variability in costs (Table 1). Comorbid patients were likelier to incur costs above the 90th percentile (Charlson score 1: OR: 1.57, p=0.03; Charlson score ≥ 2: OR: 3.45, p < 0.001), as were patients in the Northeast (OR 2.53, 95% CI 1.2-5.3, p 0.01). Compared to the open RC, the laparoscopic approach was more than twice as likely to incur high costs (OR 2.83, 95% CI: 1.52 to 5.27, p = 0.0004). The robot-assisted approach was less likely to incur high costs, however this association did not reach statistical significance (OR: 0.69, p = 0.14).

Conclusions: This study provides insight into the determinants of RC costs. In contrast to other surgeries were surgeon and hospital level factors have been shown to strongly influence cost, in RC patient and disease related factors predominate. While the scale of surgeon and hospital-level cost variation is significant, the majority of variability is explained by complications, comorbidity and prolonged length of stay—not surgeon identity or characteristics. These findings highlight the importance of patient selection and preoperative risk assessment for this complex and morbid procedure.

Type 2 Diabetes and Risk of Renal Cell Carcinoma in Two Prospective Cohorts
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Introduction: Studies of association between type 2 diabetes (T2D) and renal cell carcinoma (RCC) risk have yielded conflicting results.

Materials & Methods: We utilized two prospective cohorts, 117,616 women from the Nurses' Health Study (NHS) and 48,818 men from the Health Professionals Follow-up Study (HPFS) to evaluate the association between T2D and RCC. Multivariable Cox proportional hazards models were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs).

Results: During 36 years of follow-up in the NHS we confirmed 357 RCC cases, including 106 fatal cases. During 26 years of follow-up in the HPFS we confirmed 228 RCC cases, including 48 fatal cases. Women with T2D had a significantly increased risk of RCC compared to women without T2D (adjusted HR 1.62; 95% CI 1.18-2.23). T2D was not associated with RCC among men (HR 0.94; 95% CI 0.56-1.59). There was a non-significant increased risk of fatal RCC among women (HR 1.48; 95% CI 0.76-2.86) and men (HR 1.34; 95% CI 0.46-4.05) with T2D. Among women, there was a suggestion that the association was stronger for ≤ 5 vs. > 5 years duration of T2D (p difference = 0.06).

Conclusions: We found that T2D was associated with a significantly increased risk of total RCC in women, but not in men. T2D was suggestively associated with an increased risk of fatal RCC in both men and women.

Table 1. Contribution Of Patient, Hospital, Surgical Characteristics And Postoperative Outcomes To Variability In Costs Of Radical Cystectomy

	Adjusted R-square	%
Patient characteristics	0.0046	4.21%
Age	0.00437	0.47%
Race	0.00248	0.25%
Marital status	0.00417	0.42%
Insurance status	0.02644	2.64%
Charlson comorbidity score		
Hospital characteristics	1.84%	
Teaching status	0.00654	0.61%
Bed size	-0.00057	-0.06%
Urbanicity	-0.00038	-0.04%
Region	0.00759	0.76%
Hospital volume	0.00559	0.56%
Surgical characteristics	0.21%	
Surgeon volume	-0.00046	-0.05%
Year of surgery	-0.00149	-0.15%
Pelvic lymphadenectomy	-0.00012	-0.01%
Type of approach	0.00418	0.42%
Type of urinary diversion	0.00010	0.01%
Postoperative Outcomes		
Presence of any 90-Day Complication	0.05633	5.63%
Presence of major 90-Day Complication	0.18140	18.14%
Presence of 90-Day Mortality	0.02277	2.28%
Prolonged LOS (>50th percentile +8 days)	0.18189	18.19%

Table 2. Multivariable Logistic Regression For Patient-, Surgeon- And Hospital-Level Predictors Of High Cost (>90th Percentile) Radical Cystectomy For Bladder Cancer

Patient Characteristics	OR	95% CI	p-value
Age (years)			
<55	Ref		
55 to 64	1.50	0.70 to 3.20	0.30
65 to 74	1.89	0.85 to 4.21	0.12
≥75	1.71	0.73 to 4.01	0.22
Race			
White	Ref		
Black	1.39	0.77 to 2.53	0.28
Hispanic	1.67	0.36 to 7.75	0.51
Other	1.02	0.65 to 1.60	0.93
Charlson Comorbidity Index			
0	Ref		
1	1.57	1.05 to 2.33	0.03
≥2	3.45	2.21 to 5.38	<0.001
Insurance Status			
Medicare	Ref		
Medicaid	1.01	0.43 to 2.37	0.99
Private insurance	0.71	0.41 to 1.22	0.21
Other	0.94	0.37 to 2.37	0.90
Hospital Characteristics			
Hospital Size			
<400	Ref		
400 to 600	1.13	0.65 to 1.99	0.68
≥600 beds	0.98	0.61 to 1.58	0.92
Region			
Midwest	Ref		
Northeast	2.53	1.20 to 5.30	0.01
South	1.30	0.89 to 2.26	0.40
West	1.39	0.65 to 2.97	0.40
Surgical Characteristics			
Annual Surgeon Volume			
<75th percentile (i.e. <16/year)	Ref		
>75th percentile (i.e. >16/year)	1.06	0.62 to 1.80	0.84
Annual Hospital Volume			
<75th percentile (i.e. <320/year)	Ref		
>75th percentile (i.e. >320/year)	0.83	0.42 to 1.67	0.60
Surgical Approach			
Open	Ref		
Laparoscopic	2.83	1.52 to 5.27	0.0004
Robot-assisted	0.69	0.40 to 1.19	0.14

Racial Disparities in the Receipt of Quality Metrics Among Patients Undergoing Radical Cystectomy for Muscle-Invasive Urothelial Carcinoma of the Bladder

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Introduction: Race-based disparities in outcomes are well documented in Bladder Cancer (BCa). Specifically, while non-Hispanic white men and women are twice as likely to develop BCa, blacks are more likely to die from the disease, even when controlling for stage. Given that quality differences among racial minorities have been observed in other areas of cancer care, we sought to assess for differences in care of muscle invasive BCa—the most lethal form of the disease. To do this, we designed a retrospective, observational study to assess for race-based differences in receipt of four quality metrics across a large national sample of patients who received radical cystectomy (RC).

Materials & Methods: The National Cancer Database (NCDB) is a comprehensive clinical surveillance resource for cancer care in the United States. It includes data from >1500 accredited cancer programs and captures 70% of newly diagnosed cancer cases in the US. Using the NCDB, we identified 19,744 men and women undergoing radical cystectomy for muscle-invasive BCa between 2003 and 2012. Race was stratified into non-Hispanic white (white), black, Asian and Hispanic. We extracted data on four quality metrics: (1) receipt of neoadjuvant chemotherapy, (2) treatment ≤ three months from diagnosis, (3) ≥ ten lymph nodes removed at time of RC, and (4) use of continent urinary diversion. We compared these four quality metrics by race. Uni- and multivariate analyses were used to examine the association between race and receipt of quality metrics. Cox regression model was used to examine the association between race and overall survival.

Results: Baseline characteristics differed according to race. With respect to quality metrics, blacks and Asians were less likely to receive treatment within 90 days of diagnosis compared to whites (OR: 0.81 [CI: 0.70-0.95], p = 0.009, (OR: 0.69 [CI: 0.54-0.87], p = 0.002). Blacks were less likely to receive a continent diversion (OR: 0.70 [CI: 0.51-0.95], p = 0.022), and Hispanics were more (OR: 1.43 [CI: 1.02-2.00], p = 0.039). Blacks had significantly worse overall survival after adjustment for confounders (OR: 1.23 [CI: 1.12-1.36], p < 0.001). These findings remained significant in sensitivity analyses accounting for receipt of quality metrics (OR: 1.22 [CI: 1.11-1.35], p < 0.001).

Conclusions: Even after accounting for comorbidities and treatment disparities, blacks have a worse overall survival. The well-documented race-based disparities in BCa outcomes are likely multifactorial. While our study confirms that there may be statistically significant race-based differences in some important quality metrics, the magnitude of the differences is small and does not fully account for the racial disparities in BCa outcomes. This suggests that underlying differences in tumor biology, environmental risk factors or other unknown and unmeasured aspects of care may account for the marked race-based survival disparity.

Table 1: Receipt of quality metrics stratified according to race in 19,744 patients with stage II-IV urothelial carcinoma of the urinary bladder undergoing radical cystectomy; NCDB 2003-2012.

	Overall	White	Black	Asian	Hispanic		
	19744	17628	1248	326	542		
Lymph Node Yield	≥10	10364(52.5)	9255(52.5)	625(50.1)	183(57.2)	301(55.5)	0.084
	<10	9380(47.5)	8373(47.5)	623(49.9)	143(43.9)	241(44.5)	
Time from diagnosis to start of treatment	<90 Days	15618(79.1)	14026(79.6)	947(75.9)	251(77)	394(72.7)	<0.001
	≥90 Days	4126(20.9)	3,602(20.4)	301(24.1)	75(23)	148(27.3)	
Diversion Type	Continent	8835(44.7)	8033(45.6)	464(45.2)	130(39.9)	208(38.4)	<0.001
	Diversion	15611(77.9)	1417(8)	58(4.6)	35(10.7)	51(9.4)	
	Other Diversion	9348(47.3)	8178(46.4)	726(58.2)	161(80.1)	283(52.2)	
	Unknown	3676(18.6)	3262(18.5)	244(19.6)	57(17.4)	113(20.8)	0.404
Receipt of Neoadjuvant Chemotherapy	Yes	16068(81.4)	14366(81.4)	1004(80.4)	269(82.5)	429(79.1)	
	No						

Table 2: Multivariable model showing the association of race with receipt of individual perioperative quality metrics in patients with urothelial carcinoma of the urinary bladder undergoing radical cystectomy; NCDB 2003-2012.

	Receipt of Neoadjuvant Chemotherapy		≥10 Lymph Nodes Removed		Receipt of Continent Diversion		Receipt of treatment in less than 90 days	
	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
White	Ref		Ref		Ref		Ref	
Black	1.06 (0.90-1.23)	0.50	0.91 (0.79-1.06)	0.25	0.70 (0.51-0.96)	0.022	0.81 (0.70-0.95)	0.009
Asian	0.95 (0.71-1.27)	0.72	1.17 (0.90-1.52)	0.244	1.48 (0.99-2.23)	0.057	1.17 (0.89-1.54)	0.253
Hispanic	1.14 (0.92-1.42)	0.24	1.17 (0.92-1.48)	0.193	1.43 (1.02-2.00)	0.039	0.69 (0.54-0.87)	0.002

Prognostic Utility of a Multi-Gene Signature (The Cell Cycle Proliferation Score) in Patients With Renal Cell Carcinoma (RCC) after Radical Nephrectomy: Analysis in Testing and Validation Cohorts

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Introduction: There are currently no RCC biomarkers being routinely used in the clinic, and prognostic nomograms rely almost entirely on tumor size, stage and age. There is a critical need for improved prognostic discrimination given the increasing awareness that some patients may be managed with active surveillance, while others with higher risk disease might benefit from adjuvant therapy following surgery. We hypothesized that a previously developed multi-gene proliferation signature would predict long-term oncologic outcomes in surgically resected RCC.

Materials & Methods: The cell cycle proliferation (CCP) score was derived after radical nephrectomy in 305 patients who were treated at a single institution from 2000 to 2007 for clear cell, papillary or chromophobe RCC with localized disease (N0M0). Sixty-four percent of the cohort had stage I disease. The primary endpoint was disease specific survival (DSS), and disease recurrence (local or metastatic) was a secondary endpoint. Association with outcomes was evaluated by CoxPH survival analysis and likelihood ratio tests. Hazard ratios (HR) are given for one-unit increase in CCP score (equivalent to a doubling of gene expression). CCP score was then compared with current clinical nomograms for prediction of recurrence and survival. A second cohort of 262 patients with similar baseline characteristics, and from a separate institution was used as a validation cohort.

Results : Patient data were censored at 5-years of follow-up, by which time 68 patients (12%) recurred and 32 (6%) died of disease. In the development cohort, the median CCP score was 0.095 (IQR -0.50 to 0.60). In univariable analysis, CCP score was a significant prognostic variable for recurrence (p < 1t; 0.0001) and DSS (p < 1t; 0.0001). After adjusting for clinical variables including tumor size, stage, and grade, the CCP score HR for recurrence was 1.74 (95% CI (1.14, 2.65)), and for DSS was 2.59 (95% CI (1.43, 4.67)). There was no interaction between CCP and any clinical variable. Comparative bivariate analysis demonstrated that CCP score added significant predictive value to the Karakiewicz nomogram for DSS. The validation cohort demonstrated a consistent and significant prediction of recurrence and DSS, with the strongest association being for DSS. Kaplan-Meier analyses for DSS in both cohorts are shown in Figure 1.

Conclusions: The CCP score appears to be a significant and independent predictor of key long-term oncologic outcomes in patients who have undergone nephrectomy for RCC, providing prognostic information beyond what is available from clinical parameters. With further validation, the CCP score may have utility in the clinical management of patients with RCC.

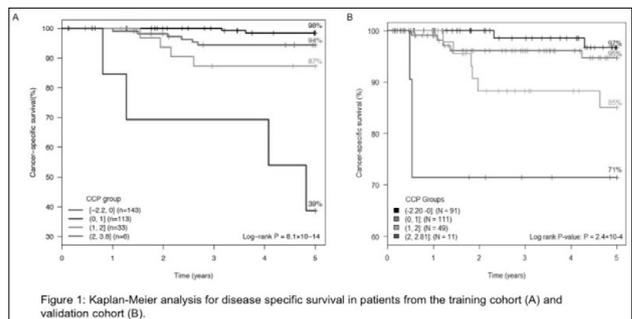


Figure 1: Kaplan-Meier analysis for disease specific survival in patients from the training cohort (A) and validation cohort (B).

Timing of Confirmatory Biopsies Influences Eligibility for Active Surveillance

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Introduction: While serial biopsies are a key component of most active surveillance (AS) programs, surveillance protocols differ as to when the first surveillance biopsy should be performed. Some protocols mandate a confirmatory biopsy while in others, the first surveillance biopsy is performed at 1 year. In the present study we sought to determine differential impact of obtaining the first surveillance biopsy either within 6 months or at 9-15 months after diagnosis.

Materials & Methods: We retrospectively identified patients who enrolled in a prostate cancer active surveillance (AS) program during 2004-2015 and underwent a biopsy either between ≤ 1-6 months or 9-15 months after their initial diagnostic biopsy. Eligibility for enrollment in AS was defined according to MSK criteria (biopsy Gleason: ≤ 6; biopsy T stage: cT1c or cT2a, diagnostic PSA 12, then number of positive cores ≤ 25% of the total cores). We compared MSK-defined eligibility for AS in patients who received a second biopsy at either ≤ 1-6 or 9-15 months after their initial diagnostic biopsy.

Results: 62 (53.9) and 53 (46.1%) of patients underwent a second biopsy at ≤ 1-6 or 9-15 months after their initial diagnostic biopsy, respectively (table). Delaying re-biopsy to 9-15 months was associated with a significant reduction in AS eligibility defined by MSK criteria (69.4 vs. 47.2%; p = 0.022). Patients originally AS eligible rebiopsied at 9-15 months were more apt to be reclassified as ineligible than patients rebiopsied at ≤ 1-6 months (42.9 v. 25.0%, p = 0.082).

Conclusions: Surveillance protocols differ as to when the first surveillance biopsy is performed. 25% of AS patients are deemed ineligible on confirmatory biopsy at ≤ 1-6 months. Waiting until 9-15 months resulted in 42.9% of patients becoming ineligible. These data may be helpful in patient counseling prior to AS enrollment.

Eligibility for Active Surveillance on Rebiopsy		Time between biopsy #1 and biopsy #2	Time between biopsy #1 and biopsy #2	p		
		≤1-6 months	9-15 months			
Number of patients (n; %)		62 (53.9)	53 (46.1)	-		
Age (years) (mean ± SD)		61.9±6.0	62.9±6.1	0.354		
Biopsy #1	Total cores (median; IQR)	12 (12-12)	12 (11-12)	0.644		
	Number of positive cores (median; IQR)	1 (1-2)	2 (1-2)	0.159		
	PSA (ng/ml) (median; IQR)	4.9 (4.0-6.0)	4.9 (3.5-6.5)	0.680		
	D'Amico Risk (n; %)					
	Low	61 (98.4)	46 (86.8)	0.023		
	Intermediate	1 (1.6)	7 (13.2)			
MSK criteria for AS (n; %)	Does not meet criteria	6 (9.7)	11 (20.8)	0.117		
	Meets criteria	56 (90.3)	42 (79.2)			
Biopsy #2	Total cores (median; IQR)	15 (12-16)	12 (12-12)	<0.001		
	Number of positive cores (median; IQR)	2 (1-3)	2 (1-4)	0.041		
	PSA (ng/ml) (median; IQR)	4.9 (3.8-5.8)	5.1 (3.3-7.4)	0.452		
	D'Amico risk (n; %)					
	No cancer	13 (21.0)	9 (17.0)	0.205		
	Low	34 (54.8)	23 (43.4)			
	Intermediate or high	15 (24.2)	21 (39.6)			
MSK criteria for AS (n; %)	Does not meet criteria	19 (30.6)	28 (52.8)	0.022		
	Meets criteria	43 (69.4)	25 (47.2)			
Change from Biopsy #1 to Biopsy #2	MSK-defined eligibility for AS (n; %)	Patients who did not originally meet MSK criteria for AS	Became eligible for AS	1 (16.7)	1 (9.1)	1.0
		Patients who originally met MSK criteria for AS	No change - remained ineligible for AS	5 (83.3)	10 (90.9)	
		No change - remain eligible for AS	Became ineligible for AS	42 (75.0)	24 (57.1)	0.082
			Became eligible for AS	14 (25.0)	18 (42.9)	

Post-Prostatectomy Radiation: Are Indications and PSA Thresholds Changing?

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Introduction: The criteria for adjuvant (A) and salvage (S) post-prostatectomy radiotherapy (RT) continue to be debated. Given recent ASTRO/AUA guidelines recommending ART for patients with adverse pathologic features, and the availability of more sensitive PSA testing, we hypothesized that the characteristics of patients receiving post-prostatectomy RT is changing. As such, we examined the incidence of post-prostatectomy RT and the rate of secondary recurrences at our center.

Materials & Methods: We retrospectively identified patients who underwent radical prostatectomy (RP) and subsequently received SRT or ART between Dec 1, 2003-2013. Demographic, clinical, and pathologic features were extracted. Patient cohorts were defined as either (i) ART: PSA < 0.2, treatment within 1 year post-RP, (ii) Traditional SRT: PSA > 0.2 prior to RT, or (iii) Modern SRT: rising PSA + 0.2 and > 1 year post-RP. The incidence and time to secondary recurrence were compared between each RT treatment group.

Results: 3,570 patients underwent RP; 209 patients received post-RP RT (5.9%). 39 (18.7%), 30 (14.4%) and 140 (67.0%) underwent ART, modern SRT and traditional SRT. The incidence of ART and modern SRT significantly increased during 2008-2013 (p < 0.001). Pathologic stage and margin rates were significantly different between groups, with ART being the highest. In line with our RT treatment definitions, the last PSA prior to RT was significantly different between groups (p < 0.001). Overall, there was a significant difference in rates of second recurrences between groups (p = 0.003), which remained significant in covariate analyses accounting for stage, PSA and Gleason score.

Conclusions: In accordance with ASTRO/AUA guidelines, adjuvant RT is being given with increased frequency at our institution. Similarly, modern SRT is being given more often. We feel this is due to the advent of hypersensitive PSA. According to ASTRO/AUA guidelines, "data from retrospective and prospective trials tend to support the notion that more favorable biochemical outcomes are associated with very low PSA values at the time RT is offered." Our study supports this as the secondary recurrence rate of modern SRT was significantly lower than traditional SRT (13.3% v 39.3%). Further study is needed to determine if ultrasensitive assays will result in improved outcomes for patients.

		ART	Modern SRT	Traditional SRT	p
Patients (n; %)	Total	39 (18.7)	30 (14.4)	140 (67.0)	-
	2003-2007	8 (20.5)	2 (6.7)	71 (50.7)	<0.001
	2008-2013	31 (79.5)	28 (93.3)	69 (49.3)	
Follow-up time (median; IQR) (months)		35.0 (14.0-65.0)	20.0 (14.0-42.3)	36.0 (18.3-63.5)	0.019
Age at surgery (years) (mean ± SD)		59.3±5.4	60.5±7.0	59.6±6.3	0.684
Last PSA prior to surgery (ng/ml) (median; IQR)	PSA pre-RT	5.7 (4.4-9.1)	5.8 (4.6-7.1)	5.8 (4.2-8.2)	0.395
	PSA pre-RT	0.0 (0.0-0.1)	0.12 (0.09-0.16)	0.3 (0.2-0.4)	<0.001
D'Amico Risk (n; %)	Low	8 (20.5)	9 (30.0)	19 (13.5)	
	Intermediate	17 (43.6)	11 (36.7)	76 (53.9)	0.184
	High	14 (35.9)	10 (33.3)	45 (32.1)	
Gleason score (n; %)	6	0 (0)	1 (3.3)	6 (4.3)	
	7	24 (61.5)	22 (73.3)	97 (69.3)	
	8	4 (10.3)	4 (13.3)	12 (8.6)	5
	9	11 (28.2)	3 (10.0)	25 (17.9)	
	≥10	5 (12.5)	9 (30.0)	51 (37.0)	
Pathologic T stage (n; %)	pT3/pT4	33 (86.8)	18 (66.7)	87 (63.0)	0.020
		33 (84.6)	18 (60.0)	66 (47.1)	<0.001
Time between surgery and RT (months) (median; IQR)		5.0 (3.0-7.0)	18.5 (14.0-35.5)	22.5 (10.0-39.0)	<0.001
Time from RT to second recurrence (for those that re-occurred) (months) (median; IQR)		11 (28.2)	4 (13.3)	49 (35.0)	0.061
Time from RT to second recurrence (for those that re-occurred) (months) (median; IQR)		15.0 (3.0-52.0)	9.0 (3.3-32.8)	13.0 (5.0-27.0)	0.664
Patients who experienced a second recurrence (n; %)		7 (17.9)	4 (13.3)	55 (39.3)	0.003

Gene Expression and Risk Refinement within Gleason Score 7 (GS7) Prostate Cancer at Biopsy Using a Validated 17 Gene Genomic Prostate Score

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Introduction: The Genomic Prostate Score (GPS) is clinically validated as an independent predictor of both adverse pathology (AP) at surgery and biochemical recurrence (BCR) in men with NCCN low and intermediate risk prostate cancer. A higher percentage of Gleason pattern 4 (GP4) disease and specific GP4 histological subtypes have each been associated with adverse long term outcomes in men with biopsy Gleason score 7 (GS7) prostate cancer. However, men with GS7 cancer on biopsy are downgraded at prostatectomy and outcomes for men with organ confined Gleason 3+4 cancer are considered favorable.

Materials & Methods: 1,143 GS7 prostate biopsies received at the Genomic Health Inc. clinical lab were centrally reviewed for percentage GP4 (%GP4) and GP4 morphologic subtype. Specimens were subdivided based on %GP4 and morphological subtype. The GPS was calculated based on the validated algorithm of 12 cancer-related and 5 reference genes for each specimen; median GPS was calculated for each sub-group.

Results: 1005 (88%) and 138 (12%) of GS7 biopsies were 3+4 and 4+3, respectively. The median GPS value for 3+4 was 31 (IQR 23-40) and for 4+3 was 37 (IQR 27-47). Among cases with 3+4, the median GPS was 29 (IQR 22-38), 33 (IQR 26-43), and 35 (IQR 27-46) for men with a percentage of GP4 of 1%-10%, 11%-25%, and 26%-50%, respectively. Poorly formed glands was the most common GP4 morphologic type (PFG, 54%, n = 619), followed by fused glands (FG, 24%, n = 270), cribriform (CRIF, n = 214), and glomeruloid (GL, n = 40). Cribriform morphology had the highest median GPS 34 (IQR 26-44), followed by PFG 32 (IQR 24-41), FG 30 (IQR 22-40), and glomeruloid 25 (IQR 20-32). Overall, 78 (7%) of GS7 biopsies were found to have likelihood of favorable pathology more consistent with NCCN Low risk after incorporation of GPS. A more favorable risk of adverse pathology consistent with NCCN low was identified within all %GP4 and GP4 morphologic categories.

Conclusions: There is a positive association between GPS and higher %GP4. However, widely overlapping GPS values across %GP4 and GP4 morphologies suggest a biologic continuum beyond what can be determined by traditional pathologic measures. The GPS is able to refine risk classification in men within all GS7 categories, helping to identify more appropriate treatment options in NCCN Intermediate patients

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Revisiting Prostate Cancer Screening Practices among Vermont Primary Care Physicians
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Introduction: The role of prostate-specific antigen (PSA) testing as a screening tool for prostate cancer has been a controversial issue. The United States Preventive Services Task Force (USPSTF) determined that the potential benefit did not outweigh the harm, and thus recommended against PSA-based screening in 2012.¹ However, no consensus has been reached regarding clinical practice guidelines. We assessed the use of PSA testing and digital rectal examination (DRE) as tools to screen for prostate cancer by primary care physicians in Vermont.

Materials & Methods: Surveys were emailed to practicing primary care physicians in Vermont. Completed surveys were received from 27.2% of physicians. The percentage of primary care physicians using PSA testing and DRE to screen for prostate cancer was determined. Data was stratified based on number of years in practice. The results were compared with a prior study performed in 2001.²

Results: 27.7% of physicians in practice < 10 years recommended PSA testing, compared with 55.9% of physicians in practice ≥ 10 years (p = 0.006). 34.0% of physicians in practice < 10 years recommended DRE, compared with 58.3% of physicians in practice ≥ 10 years (p = 0.013). Of those who changed their prostate cancer screening recommendations in the past five years, 96.1% reported that the USPSTF statement influenced their decision. Of the physicians using DREs, respondents were less likely to recommend cessation after age 80 than those previously surveyed (58% in 2014 vs. 93% in 2001; p < 0.001). Physicians using PSA testing were also less likely to stop screening after age 80 compared with prior respondents (51% in 2014 vs. 74% in 2001; p < 0.001).

Conclusions: The use of DRE and PSA by Vermont primary care providers in an effort to detect clinically significant prostate cancer (screening) in the context of the American Urological Association, American Cancer Society, international guidelines, and USPSTF recommendations demonstrated significant practice variations between physicians in practice < 10 years and those in practice ≥ 10 years. These disparities became more significant when present practice patterns were compared with those in 2001. Physicians in practice less than 10 years were less likely to recommend PSA screening, suggesting that they are more likely to adapt their practice in accordance with changing guidelines than those in practice for 10 or more years. Nationally, PSA screening has declined among men older than age 50 years since 2012. Despite this, one-third of men aged 75 and older continue to be screened.³ Improved informational and educational processes for evolving prostate cancer early detection (screening) nomograms must be developed to improve men's health in light of these discrepancies.

¹Screening for Prostate Cancer: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med* 2012;157:1-44.

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³Drazer MW, Huo D, Eggen SE. National Prostate Cancer Screening Rates after the 2012 USPSTF Discouraging PSA-Based Screening. *J Clin Oncol* 2015 Aug 1;33(22):2416-23.

Active Surveillance is a Viable Option for Men with Borderline Low-Risk Prostate Cancer
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Introduction: Eligibility criteria for active surveillance (AS) for low-risk prostate cancer have been defined by multiple series reported in the literature. In clinical practice occasional patients who do not meet all criteria may choose AS. We investigated outcomes in borderline cases.

Materials & Methods: We investigated our institutional database of 990 men on AS between 1997-2014. Our guidelines for AS eligibility, formalized in 2008, include Gleason ≤ 6, stage ≤ cT2a, PSA < 10 ng/mL, ≤ 3 of 12 cores positive at diagnosis, and ≤ 20% of any core involved at diagnosis. For this analysis, we defined borderline cases for AS as those patients with one or more of either Gleason score 7, PSA > 10, stage cT2a, > 33% of cores positive at diagnosis, or > 20% of any core involved at diagnosis. Survival analyses were conducted using Kaplan-Meier and Cox proportional hazards.

Results: In the entire cohort (n = 990), mean age at diagnosis was 66.9 years (± 7.9) and median PSA 5.1 (IQR 4-6.87). While the majority met all AS criteria, 312 patients (31.5%) met at least one of the borderline AS criteria; 2.4% of patients had Gleason 7, 7.6% had PSA > 10, 8.0% were cT2a, 4.1% had > 33% of cores positive at diagnosis, and 18.4% had > 20% of any core involved. With mean follow-up 5.2 years, univariate survival analysis demonstrated no difference in freedom from treatment (FFT) between patients with Gleason 7 vs. ≤ 6, > 33% vs. ≤ 33% cores involved, or PSA > 10 vs. ≤ 10. Lower FFT was noted among patients with cT2a vs. ≤ cT1c disease (59.4% vs. 70.6%, p = 0.04) and > 20% vs. ≤ 20% of any core involved (56.5% vs. 69.5%, p = 0.01). In multivariate analysis, > 20% core involvement remained a significant predictor for treatment, adjusting for PSA > 10, Gleason > 6, > 33% cores involved, and stage. Among the 312 borderline AS cases, there were only 5 (1.6%) cases of metastasis and 1 (0.3%) prostate cancer-specific death. These adverse outcomes were equivalent to the remainder of the cohort meeting strict AS criteria, which included 10 (1.5%) cases of metastasis and 2 (0.3%) prostate cancer-specific deaths.

Conclusions: Active surveillance remains a viable option for select patients who are borderline cases per current AS criteria. However, patients with higher volume disease may be more likely to progress to treatment. Long-term clinical outcomes in these patients should continue to be investigated.

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Impact of Numeracy on Understanding of Prostate Cancer Risk Reduction in PSA Screening

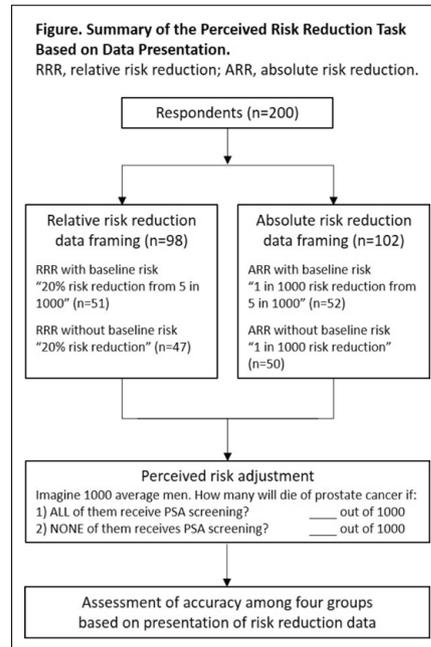
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Introduction: Prostate-specific antigen (PSA) screening in men of average risk remains controversial. Results from PSA clinical trials are widely cited in patient education materials, but patients' ability to incorporate probability and risk data into their decision-making may depend on their numeracy, or facility with quantitative concepts. This study assessed patients' numeracy and its impact on their understanding of the risk reduction benefits of PSA screening.

Materials & Methods: We used a randomized, cross-sectional survey design. Men 40-75 years old attending a general medicine clinic were randomized to complete one of four surveys. All surveys included demographics, personal PSA and prostate cancer (CaP) history, and a validated three-item numeracy test. Numeracy was scored as the number of items correctly answered (range 0-3). Surveys differed in their presentation of PSA testing risk reduction data derived from the European Randomized Study of Screening for Prostate Cancer (absolute (ARR) vs. relative risk reduction (RRR), with or without baseline risk (BR)) (Figure). Respondents were asked to adjust their perceived risk of CaP mortality using the risk reduction data presented. Accuracy of risk reduction was evaluated relative to how risk information was presented. Descriptive analysis was performed.

Results: 200 men completed the survey (60% response rate). Mean age was 60 years, and 91% were high-school graduates. 51% had received a PSA test, and 5% reported a CaP diagnosis. Demographic characteristics were not significantly different among the four survey groups. A majority of respondents incorrectly answered one or more of the three numeracy items; half could not convert "1 in 1000" to a percentage, and one-quarter were unable to calculate 1% of 1000. Overall accuracy of adjustment in perceived risk was 20% among all groups. Accuracy varied with data presentation format: when presented with RRR, respondents were 13% accurate without BR and 31% accurate with BR; when presented with ARR, they were 0% accurate without BR and 35% accurate with BR. Including BR data significantly improved accuracy for both RRR (p = 0.03) and ARR groups (p = 0.0001). Accuracy was significantly related to numeracy: 6% of respondents were accurate with a numeracy score of 0, 5% accurate with a score of 1, 9% accurate with a score of 2, and 36% accurate with a score of 3 (p = 0.006). Neither PSA testing history nor CaP history was associated with accuracy.

Conclusions: Patients' numeracy was significantly associated with the accuracy of interpreting quantitative benefits of PSA screening. Although accuracy improved when the presentation of risk reduction data was framed by baseline risk, numeracy in this screening population of men was poor overall. The findings suggest that alternative methods of communicating concepts of risk to patients may facilitate shared decision-making.



Are Statistics Subjective? An Assessment of Risk Thresholds to Proceed with Prostate Biopsy

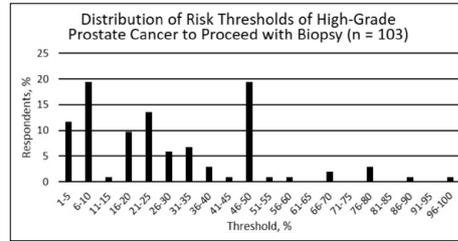
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Introduction: “Shared decision-making” (SDM) tools, such as the Prostate Cancer Prevention Trial nomogram, provide quantitative risk information to guide patients’ decisions regarding prostate biopsy (PBx). Newer diagnostic tools (eg, 4Kscore Test) purport to further refine risk predictions. It is unknown if and how patients systematically consider these risk data in their decisions for PBx. We sought to delineate the range of “risk thresholds” for PBx in a urology clinic population to determine how statistical prediction may impact decision-making.

Materials & Methods: Men 45-75 years old attending a multispecialty urology clinic were invited to complete a survey at registration. Collected data included demographics, educational background, employment status, personal and family history of prostate cancer (CaP), and PBx history. Respondents were presented with a summary of the procedural details, risks, and benefits of trans-rectal ultrasound-guided PBx, then asked to indicate on a matrix the risk threshold (%) for high-grade CaP (Gleason score ≥ 7) at which they would proceed with PBx. This was intended to mirror a clinic visit in which we share this information with patients in an SDM format. Data were compiled for descriptive analysis.

Results: 103 men completed the survey (53% response rate). Mean age was 61 years (interquartile range [IQR] 56-66.5), and 97% were high-school graduates. Eighteen respondents (17%) had a personal history of CaP, and 31 (30%) had undergone PBx. The median risk threshold for high-grade CaP to proceed with biopsy was 25% (IQR 10%-50%). Respondents’ thresholds did not vary significantly with race, educational background, or employment, but thresholds were higher for men with lower income ($p = 0.048$). Personal history of CaP or PBx was significantly associated with lower mean thresholds (18.7% vs. 31.7% [$p = 0.02$] and 23.2% vs. 32.8% [$p = 0.04$], respectively). Family history of CaP, lethal CaP, or biopsy complications did not significantly affect thresholds. The sample was divided into quartiles based on thresholds for biopsy; there were significantly higher rates of history of CaP and prior PBx among lowest vs. highest quartile respondents (36% vs. 1% [$p = 0.01$] and 46% vs. 17% [$p = 0.008$], respectively).

Conclusions: We found a wide range of high-grade CaP “risk thresholds” to proceed with prostate biopsy, underscoring the importance of individualized discussions with men in an SDM setting. Men with a prior history of CaP or biopsy reported lower thresholds to proceed with biopsy, which may reflect their greater concern for and exposure to this disease. It is unclear to what extent refined risk prediction tools will improve SDM or influence decisions to proceed with PBx. Further study of risk thresholds in a more CaP-naïve primary-care population may help clarify patient perspectives.



Assessing the Effect of Multidisciplinary Care on the Quality of Prostate Cancer Care
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Introduction: Multidisciplinary care (MDC) holds the promise of facilitating optimal patient cancer (PCa) management. MDC teams of trained specialists from different oncological disciplines have been developed to address these concerns and provide an objective, shared decision-making strategy to patient care. A number of single institution studies have shown that MDC leads to better diagnostic evaluation and disease classification, improved adherence to NCCN guidelines, improved patient outcomes as well as improved clinician and patient satisfaction. To our knowledge, no prior study has assessed the clinical impact of MDC in PCa care across multiple institutions for important outcome measures. This study assessed whether MDC resulted in improved oncological outcomes and quality of care (QOC) for those men treated for PCa.

Materials & Methods: Men treated for localized PCa between 1992 and 2009 were identified from the latest SEER-Medicare database. Patients were stratified according to those who saw both a urologist and radiation oncologist between diagnosis and definitive treatment within the first year of diagnosis (receipt of MDC) and those that did not. Cox proportional hazards models estimated the effect of MDC on all-cause and PCa-specific mortality. Logistic regression analysis measured the impact of MDC on multiple QOC metrics.

Results: The final study cohort included 151,488 men of whom 84,965 (56%) received MDC. MDC men were younger, married, white, had higher educational attainment and incomes and treated by high volume clinicians. MDC patients chose radiation therapy (RT) primarily (89%). For all men, receipt of MDC was associated with decreased all-cause mortality (HR 0.84, 95% CI 0.81-0.88, $p < 0.0001$) and specifically for those treated by Observation (HR 0.75, 95% CI 0.70-0.82, $p < 0.0001$). However, MDC was associated with increased PCa-specific mortality (HR 1.37, 95% CI 1.23-1.53, $p < 0.0001$), especially amongst those receiving androgen deprivation therapy (HR 1.74 [95% CI 1.48-2.06], $p < 0.0001$). They were nearly twice as likely to receive follow up with their treating physician. MDC patients receiving radical prostatectomy (RP) were more likely to receive adjuvant androgen deprivation therapy (ADT) (OR 2.4, $p < 0.0001$) and adjuvant RT (OR 7.8, $p < 0.0001$). MDC patients ≥ 75 with low risk disease and life expectancy < 10 years were more likely to receive definitive treatment (OR 16.1, $p < 0.0001$).

Conclusions: Overall, MDC was associated with decreased all-cause mortality but an increased PCa-specific mortality. Patients receiving MDC for their localized PCa are more likely to choose RT, receive definitive treatment and adjuvant therapy. They are more likely to be treated by high volume physicians and receive appropriate follow up with them. MDC however, results in an increased risk of potentially inappropriate over-treatment in a select cohort of patients.

	HR (95% CI)	p-value
All Patients		
All Cause Mortality	0.842 (0.809 – 0.877)	<0.0001
Prostate Cancer Specific Mortality	1.373 (1.230 – 1.532)	<0.0001
Radical Prostatectomy Patients		
All Cause Mortality	0.910 (0.787 – 1.053)	0.2044
Prostate Cancer Specific Mortality	0.671 (0.407 – 1.107)	0.1179
ADT Patients		
All Cause Mortality	0.991 (0.912 – 1.078)	0.8371
Prostate Cancer Specific Mortality	1.743 (1.475 – 2.059)	<0.0001
Observation Patients		
All Cause Mortality	0.754 (0.697 – 0.816)	<0.0001
Prostate Cancer Specific Mortality	1.042 (0.827 – 1.313)	0.7264

Predicting the Return of Erectile Function Following Prostate Cancer Treatment in Clinical Practice Using EPIC-CP

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Introduction: While models predicting survival after prostate cancer (PC) treatment are prevalent, few predict post-treatment quality of life outcomes. We previously developed and externally validated models predictive of functional erections sufficient for intercourse two years following radical prostatectomy (RP), external beam radiation (EBRT) or brachytherapy (BT) using EPIC-26 (Alemozaffar et al, JAMA 2011). However, challenges with using EPIC-26 in clinical practice may preclude realistic use of these models. EPIC for Clinical Practice (EPIC-CP) is a one-page, 16-item questionnaire validated to measure health related quality of life in PC patients in the clinical setting (Chang et al J Urol 2011). We aimed to recalibrate these models for use with EPIC-CP to better enable point of care prognostication of sexual function in clinical practice.

Materials & Methods: Using a previously described multicenter longitudinal cohort, we identified 493 men treated with RP, 217 with EBRT and 230 with BT with complete sexual domain and model covariate information. We used the established covariates in the EPIC-26-based models to recalibrate the multivariable logistic regression models for use with EPIC-CP. We examined Pearson residuals to determine goodness of fit and compared the individual predictions based on the revised models with those generated by the EPIC-26-based models.

Results: The recalibrated EPIC-CP-based models are presented in Tables 1, 2, and 3 for RP, EBRT, and BT, respectively. The models demonstrated excellent discrimination (AUC 0.76 for RP, 0.81 for EBRT, and 0.87 for BT). Odds ratio estimates for the EPIC-CP models changed by no more than 0.2 from their EPIC-26 counterparts, and remained significant. EPIC-CP and EPIC-26-based predictions had good concordance: the mean ± SD difference in predicted probability between EPIC-26 and EPIC-CP models was 0.0 ± 0.08 in each treatment group. Predicted probabilities were within 10%, 15.4%, and 15.8% for 95% of the RP, EBRT and BT subjects, respectively.

Conclusions: EPIC-CP-based nomograms predicting erectile function two years after RP, EBRT, and BT are in good agreement with established EPIC-26-based tools and offer an easily applied and accurate prediction regarding a common and impactful side effect of PC treatment. Their use in clinical practice may help adjust patient expectations for different treatment options and facilitate patient-centered care.

Table 1. Model Predicting the Likelihood of Erections Sufficient for Intercourse after Radical Prostatectomy

	EPIC-CP Score		
	0	2	4
Nerve-sparing			
Age 50-59			
PSA ≤ 10	67	50	34
PSA > 10	46	30	18
Age 60-69			
PSA ≤ 10	53	36	22
PSA > 10	32	19	11
Age 70+			
PSA ≤ 10	39	24	14
PSA > 10	21	12	6
Non-nerve sparing			
Age 50-59			
PSA ≤ 10	35	21	12
PSA > 10	19	10	6
Age 60-69			
PSA ≤ 10	23	13	7
PSA > 10	11	6	3
Age 70			
PSA ≤ 10	15	8	4
PSA > 10	7	3	2

Table 2. Model Predicting the Likelihood of Erections Sufficient for Intercourse after External Beam Radiotherapy

	EPIC-CP Score		
	0	2	4
Without neoadjuvant hormone therapy			
PSA < 4 ng/mL	90	78	58
PSA ≥ 4 ng/mL	75	54	32
With neoadjuvant hormone therapy			
PSA < 4 ng/mL	75	54	31
PSA ≥ 4 ng/mL	49	28	13

Table 3. Model Predicting the Likelihood of Erections Sufficient for Intercourse after Brachytherapy

	EPIC-CP Score		
	0	2	4
African-American			
Age 60			
BMI < 25	96	88	68
BMI ≥ 25, < 35	92	76	47
BMI ≥ 35	73	43	18
Age 65			
BMI < 25	95	84	60
BMI ≥ 25, < 35	89	69	39
BMI ≥ 35	65	35	13
Age 70			
BMI < 25	93	79	52
BMI ≥ 25, < 35	85	61	31
BMI ≥ 35	57	28	10
Non-African-American			
Age 60			
BMI < 25	91	74	45
BMI ≥ 25, < 35	81	55	26
BMI ≥ 35	51	23	8
Age 65			
BMI < 25	88	67	37
BMI ≥ 25, < 35	75	46	20
BMI ≥ 35	42	17	6
Age 70			
BMI < 25	83	59	29
BMI ≥ 25, < 35	68	38	15
BMI ≥ 35	34	13	4

Maximal Tumor Diameter, Biochemical Recurrence in Organ Confined High-Grade Prostate Cancer

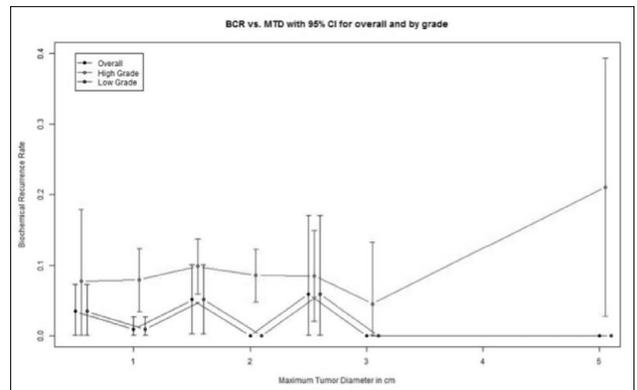
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Introduction: With MRI criteria developed for the identification of high-grade prostate cancer (Gleason score ≥ 7 = HGPCa), there is a potential to increase the detection of small tumors of uncertain clinical significance. Studies suggest that prostate cancers are clinically significant if their volume is > 5 cc, corresponding to a maximum tumor diameter (MTD) of 1 cm. However this prior work has predominantly focused on low-grade prostate cancers with a Gleason score ≤ 6 (LGPCa). Our intent is to investigate the relationship between biochemical recurrence (BCR) and MTD to determine if this relationship varies based on the presence of HGPCa.

Materials & Methods: Pathologic data and BCR rates were obtained prospectively from 1999 to 2012 from a single tertiary care center's prostatectomy database. Inclusion criteria were organ-confined pathology (pT2a-T3a), negative surgical margins, and minimum of 12 months follow-up. Exclusion criteria were androgen deprivation therapy, prior TURP, seminal vesicle invasion, or nodal metastases. Two groups were compared; LGPCa versus any lesion with HGPCa. Index lesion MTD was measured in 1 mm increments and divided into 7 groups: ≤ 0.5 cm, 5-10 mm, 10-15 mm, 15-20 mm, 20-25 mm, 25-30 mm, > 30 mm. The relationship between BCR and MTD was assessed using a Cochran-Armitage Trend Test. A Cochran-Mantel-Haenszel analysis tested difference in association between BCR and MTD for LGPCa and HGPCa groups. The relationship between BCR and grade (LGPCa and HGPCa) was tested using a chi-squared test.

Results: 1048 men were followed for a median period of 54 months (12-156 months). 73 (6.9%) men with organ-confined disease had a BCR. Median time to BCR was 22.5 months. Rates of BCR for LGPCa and HGPCa were 2.7% and 9% respectively (p = 0.0002). Overall the relationship between BCR vs. MTD was significant (p = 0.03), but not for either the LGPCa vs. HGPCa groups independently. The Cochran-Mantel-Haenszel statistic for difference in trend for high vs. low grade was also not significant.

Conclusions: In a large contemporary cohort of patients with organ confined prostate cancer, MTD is a predictor of BCR. HGPCa lesions have BCR rates significantly greater than for LGPCa lesions. There is no evidence to suggest that a small HGPCa < 1 cm has a lower BCR than a larger HGPCa. This suggests that MRI identified high-grade lesions in 0.5-1 cm range should undergo targeted biopsy.



The Role of Patient-Specific 3D Prostate Model Based on Preoperative MRI for Robot-Assisted Laparoscopic Prostatectomy
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Introduction: The goal of robot-assisted laparoscopic prostatectomy (RALP) is to completely excise the prostate cancer and gland while maximizing the postoperative erectile function by preserving the neurovascular bundles (NVB) and urinary function by preserving the external urinary sphincter (EUS). The objective of this study is to evaluate the impact of patient-specific 3D models, generated from MRI, on intraoperative decision-making.

Materials & Methods: Twenty-six subjects underwent a RALP by a single surgeon and pre-operative 3 tesla MRI under IRB-approved protocol. The following structures were segmented manually using the 3D Slicer (open source software: www.3DSlicer.org) to generate the individual's 3D prostate model (see figure): whole gland, NVBs, EUS, and all tumors. At 3 different time points, (1) before reviewing the MRI, (2) after reviewing the MRI, and (3) after reviewing the 3D model, the surgeon provided (A) decision regarding NVB sparing for each side, (B) likelihood of extracapsular extension (ECE) and (C) likelihood of seminal vesicle involvement (SVI). For (A), the surgeon also scored the confidence in his answers (1-5; 5 is highest). The decisions regarding NVB sparing were also correlated with left posterior and right posterior margins in the histopathology. Confidence scores were compared with the final decision, while (B) and (C) were compared with the histopathology.

Results: Among 52 NVBs, 39 were spared and 13 were resected. 6 were changed from non-nerve-sparing (NNS) to nerve-sparing (NS) after reviewing the 3D model. 4 of these cases had negative margins on pathology, which shows that change in management was correct in 67% of the cases. None were changed from NS to NNS. Following review of the 3D prostate model, the surgeon was more confident in sparing the NVB ($p < 0.001$) when compared to confidence scores before reviewing the MRI. The surgeon also reported a lower pre-operative likelihood of ECE and SVI in patients with negative pathology ($p = 0.04$ for ECE, $p < 0.001$ for SVI).

Conclusions: The confidence in the decision to spare the NVB increased significantly after reviewing the 3D model. Review of the 3D model provided better prediction of negative ECE and SVI. The 3D model can help surgeons make decisions regarding NVB sparing.

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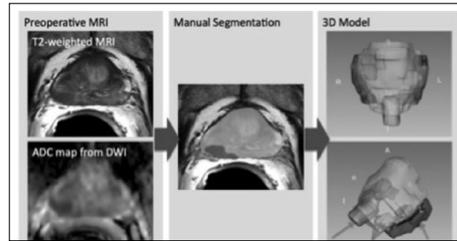


Table. Confidence scores in the decision to spare NVB and likelihood scores of ECE and SVI

	NVB (confidence)		ECE (likelihood score)		SVI (likelihood score)	
	Spared (n=39)	Not spared (n=13)	Positive (pathology) (n=10)	Negative (pathology) (n=16)	Positive (pathology) (n=4)	Negative (pathology) (n=22)
Before reviewing MRI (baseline)	3.33±0.96	3.31±1.11	3.30±0.67	2.75±0.58	3.00±0.00	2.23±0.61
After reviewing MRI report	3.28±1.26	3.77±0.83	3.10±0.74	2.38±1.02	3.25±0.96	2.09±0.81
After reviewing model	4.26±1.12*	4.15±0.80	3.30±0.95	2.06±1.29*	3.00±1.15	1.45±0.67*

Scored 1-5, 5 being the highest confidence or likelihood

p-values reflect comparison with the baseline

*p < 0.05

Multiparametric MRI/Ultrasound Fusion Biopsy Improves but does not Replace Standard Template Biopsy for the Detection of Prostate Cancer

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Introduction: Multiparametric MRI (mp-MRI) with fusion transrectal ultrasound (US) guided prostate biopsy is a recent technology, which may improve the accuracy of TRUS prostate biopsy in select patients. There exists a growing debate as to whether mp-MRI targeted biopsy alone without standard template is sufficient for evaluation of patients. We investigate and describe our experience with fusion biopsy.

Materials & Methods: We retrospectively reviewed medical charts of patients undergoing fusion transrectal US-guided biopsy from July 2014 through February 2016. Patients eligible for fusion biopsy had identifiable lesions on mp-MRI compatible to the fusion biopsy system. Each lesion was graded according to the Prostate Imaging Reporting and Data System version 2 (PIRADSv2) by a radiologist. The fusion biopsy procedure included a minimum of 2 core biopsies for each target lesion. After targeted lesions are obtained, the targeting software is turned off and standard 12 core template biopsies are then taken. Patients on active surveillance for low-risk prostate cancer periodically also have 2-4 anteriorly directed cores and these were included in our analysis. Data including biopsy indications, baseline patient characteristics, and pathologic biopsy results were extracted from the medical record. Clinically significant disease was defined as Gleason Score 7 or higher adenocarcinoma of the prostate.

Results: A total of 255 patients with a mp-MRI-identified lesion underwent fusion and standard template biopsy. Indications included elevated PSA (29), rising PSA with prior negative biopsy (134), active surveillance for prostate cancer (85) and isolated abnormal digital rectal exam (7). Within our cohort, mean age was 65.4 (range 46-84), mean was PSA 9.0 ng/mL (range 0.7-86.2 ng/mL), and mean prostate volume 55 cc (range 15-232 cc). Of patients with available PIRADS score (n = 227), 7.0%, 29.1%, 41.0%, and 22.9% had PIRADSv2 2, 3, 4 and 5 lesions, respectively. Pathologic results of the fusion-targeted biopsy were compared to those of the concomitantly performed standard template biopsies, and are summarized in Table 1. Of patients with PIRADSv2 4 or 5 lesions (n = 145), 40.0% had no cancer, 25.5% had Gleason 6, 25.5% had Gleason 7, and 9.0% had Gleason 8-10 on final histopathology. Fusion Biopsy of PIRADSv2 3 lesions (n = 66) revealed no cancer in 65.2%, Gleason 6 in 15.2%, Gleason 7 in 19.7% and Gleason 8-10, in 0% of patients. Of 83 patients with clinically significant cancer, 26 (31.3%) would have been missed on standard biopsy and 12 (14.5%) would have been missed using fusion biopsy alone. Concordance between both biopsy modalities was 63.1%.

Conclusions: The technology of mp-MRI/US transrectal fusion biopsy improves the detection of clinically significant prostate cancer in select patients. However, our results demonstrate that a significant proportion of Gleason Score 7 or higher lesions will not be

detected by targeted biopsy alone. Therefore, standard template biopsies should remain an integral component of any fusion biopsy program.

Fusion Standard Biopsy	No Cancer	Gleason 6	Gleason 3+4	Gleason 4+3	Gleason ≥ 8	Total
No Cancer	99	17	6	3	2	127
Gleason 6	25	31	10	4	1	71
Gleason 3+4	2	4	15	2	0	23
Gleason 4+3	3	0	4	7	3	17
Gleason ≥ 8	2	1	1	4	9	17
Total	131	53	36	20	15	255

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Nationwide Survey of Prostate Specific Antigen Based Screening and Counseling for Prostate Cancer

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Introduction: Controversy surrounds the use of PSA screening following the 2012 United States Preventive Services Task Force's grade D recommendation. There is limited evidence evaluating patterns of PSA counseling and patient perceptions of the PSA test since 2012. We evaluated the association between prostate cancer screening counseling and patient sociodemographic factors in a nationally representative sample.

Materials & Methods: Using data from the 2013 Health Information National Trends Survey, we identified 768 male respondents aged 40-75 and without a prior prostate cancer diagnosis. Using logistical regression, we assessed trends in prostate cancer screening, counseling and PSA utilization.

Results: 54.1% of respondents reported ever having a PSA test. Men undergoing PSA testing were more likely to have had a prior cancer diagnosis other than prostate cancer (OR 3.58, 95% CI 1.09-11.72), to have at least some college education (OR 10.58, 95% CI 3.10-36.12), and were older (OR 10.17, 95% CI 3.98-26.03). Prior cancer history (OR 2.47, 95% CI 1.15-5.31) and older age (OR 4.82, 95% CI 1.49-15.59) were associated with greater odds of being counseled on the potential adverse effects of prostate cancer treatment. Older men were more likely to discuss the PSA test with a healthcare professional (OR 5.32, 95% CI 2.15-13.16) and to be informed of the controversy surrounding PSA screening (OR 5.34, 95% CI 1.03-11.51).

Conclusions: We show that certain men receive substantially different PSA screening counseling. Healthcare providers should be aware of these potential biases and their impact on shared patient-provider decision making prior to PSA counseling.

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In Contrast to Prior Study, New Data Shows Bacteria Found at Revision IPP Surgery Differs from Previously Identified Biofilm

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Introduction: In 1995, Licht et al introduced the idea that organisms found at removal and replacement of an IPP for non-infectious reasons were subsequently responsible for those found at later IPP infection if it occurred. Three of their culture positive patients later became infected and higher colony counts of the same organism were found at time of explantation. None of their IPP patients with a negative culture at reoperation developed a subsequent prosthetic infection. This is the only study to our knowledge that compares cultures at removal and replacement with cultures at later surgery. We reviewed our series of similar surgical IPP patients undergoing removal and replacement to see if this remains true today.

Materials & Methods: We identified 304 patients at our four institutions that had undergone revision of an IPP between June 2001 and December 2012. Eleven later underwent another IPP revision surgery and additional cultures were drawn. Complications leading to revision surgery included mechanical failure (6), autoinflation (1), floppy glans (1), hematoma formation (1), loss of fluid (1), and retained components (1). These patients then later underwent IPP revision surgery for: infection (7), autoinflation (2), bladder laceration (1), and erosion (1). We reviewed patient charts to compile appropriate perioperative and follow up data.

Results: Eight cultures taken at the time of removal and replacement were negative, and six of these prostheses subsequently became infected. In contrast, three IPPs had positive cultures (two *s. epidermidis*, one *s. lugdunensis*) at removal and replacement. Only one became infected, and the native agent was identified as *s. warneri*. All IPPs had been in place for an average of 4.4 years (range 1 month to 12 years). Mean patient age was 69 (range 54-81). Four of the eleven patients were diabetics. Time to infection was approximately 6.2 months (range 1 week to 30 months). Ten total organisms were identified in these eleven cases with the following frequency: *s. epidermidis* (3), *e. faecalis* (2), *candida* (1), *citrobacter* (1), *e.coli* (1), *MRSA* (1) and *s. warneri* (1).

Conclusions: In contrast to the findings of Licht et al, our series shows that bacteria (or lack thereof) found at revision surgery are not the same bacteria as those found in subsequent revision, explantation, or salvage. These findings may be due to both infection retardant coatings and antimicrobial washout, which has become the standard of care in IPP revisions. This is the first study to our knowledge that directly refutes the conventional wisdom established by Licht et al.

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Effects of Urinary Retention and/of Perioperative Anticoagulation/Antiplatelet in Large (80 mL) or Very Large Prostates (130 mL) on the Outcome and Morbidity of 180W GreenLight Laser Photo-Vaporization of Prostate (PVP)

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Introduction: Previous studies suggest higher perioperative morbidities in patients with acute urinary retention (AUR) or anticoagulation/antiplatelet (AP/AC) therapy, specifically those with large prostate size. We study the safety and efficacy of 180W XPS PVP in this group of patients.

Materials & Methods: Between October 2010 and May 2014, we examined patients with prostate volumes > 80 cc who underwent 180W XPS PVP procedure. Perioperative and one-year outcomes of patients who had AUR, or were on AP/AC, were studied. All analyses were conducted using SPSS v16.

Results: 520 patients with BPH underwent PVP in the study period. 137 patients had prostate volumes ≥ 80 mL. Of these patients, 53 (38.7%) patients had prostate volumes > 130 cc, 77 (56.2%) were in AUR and 105 (76.6%) were on anticoagulation/antiplatelet. Patients with AUR had larger prostate size in comparison with patients with no AUR (134.91 vs. 120.03 mL), and those on anticoagulants/antiplatelet were older compared with those not on anticoagulants/antiplatelet (74.44 vs. 69.53). Comparison of IPSS, quality-of-life (QoL), post void residual volume (PVR) and maximal urinary flow rate (Q_{max}) of patients before PVP (baseline) and at 3-6 months follow up showed significant improvements in all subgroups. Furthermore, there was an expected reduction in total serum prostate-specific antigen (PSA) at 3-6 months follow up for all groups. AUR and/or perioperative AC/AP had no significant adverse effects on voiding parameters in either large or very large groups (Table 1-2). Despite the slightly higher number of complications with Clavien-Dindo grade II and III amongst patients on AC/AP, the overall rate of complications in all groups was relatively low. No patient required blood transfusion (Table 3). All patients remained continent, postoperatively.

Conclusion: 180W GreenLight Laser Photo-Vaporization is a safe and effective procedure for patients in acute urinary retention or on anticoagulants/antiplatelet with large or very large prostates.

Table 1. Clinical outcome with or without AUR

	No AUR (60 Patients)			AUR (77 Patients)		
	Baseline	3-6 months Post-operation	Change	Pre-operation	3-6 months Post-operation	Change
AUA	22.26±6.08	7.37±6.08	-65.5%	20.83±8.08	6±5.04	-64.5%
QoL	4.40±1.03	1.57±1.50	-62.5%	4.35±1.37	1.45±1.14	-61.3%
PSA	4.87±3.12	2.84±1.82	-30.2%	6.29±3.45	3.23±2.02	-44.4%
QMax	7.89±3.70	18.37±7.11	196.7%			
PVR	124 (0 to 950)	40 (0 to 235)	-69%			

Table 2. Clinical outcome with or without anticoagulation

	No anticoagulants (32 Patients)			On anticoagulants (105 Patients)		
	Baseline	3-6 months Postop	Change	Pre-operation	3-6 months Postop	Change
AUA	21.54±6.99	6.61±6.75	-67.9%	21.53±7.25	6.68±5.35	-64.3%
QoL	4.46±.96	1.46±1.26	-63.7%	4.36±1.27	1.52±1.34	-61.5%
PSA	4.73±2.20	2.32±1.48	-49.3%	5.74±3.51	3.19±1.97	-34.3%
QMax	7.13±2.30	19.33±1.76	198.2%	7.44±3.96	18.19±7.74	196.4%
PVR	318 (60 to 950)	61 (0 to 235)	-90%	114 (0 to 517)	40 (0 to 305)	-63.3%

Table 3. Complications table

	NO AUR 60	AUR 77	NO Anticoagulant 32	Anticoagulant 105	Large Prostate 84	Very Large Prostate 52
Capsular Perforation	0	1 (1.3%)	0	1 (1.3%)	0	1
Bladder Wall Injury	0	0	0	0	0	0
Ureteric Orifice Injury	0	0	0	0	0	0
Clot Retention	4 (6.7%)	3 (3.9%)	0	7 (6.7%)	3 (3.6%)	4 (7.5%)
Re-catheterization						
Blood Transfusion	0	0	0	0	0	0
UTI	6 (10%)	6 (7.8%)	2 (6.2%)	10 (9.5%)	8 (9.5%)	4 (7.5%)
Urethral stricture	2 (3.3%)	1 (1.3%)	0	3 (2.9%)	2 (2.4%)	1 (1.9%)
Anejaculation	12 (20%)	10 (13%)	6 (18.8%)	16 (15.2%)	16 (19%)	6 (11.3%)
Bladder neck contracture	2 (3.3%)	0	0	2 (1.9%)	2 (2.4%)	0
Incontinence	0	0	0	0	0	0
Delayed Hematuria	3 (5%)	6 (7.8%)	0	9 (8.6%)	4 (4.8%)	5 (9.4%)
Clavien Dindo						
1	11 (18.3%)	11 (14.3%)	8 (25%)	14 (13.3%)	13 (15.5%)	9 (17%)
2	8 (13.3%)	10 (13%)	0	18 (17.1%)	13 (15.5%)	5 (9.4%)
3	4 (6.7%)	4 (5.2%)	0	8 (5.8%)	3 (3.6%)	5 (9.4%)
Reoperation	4 (6.7%)	4 (5.2%)	0	8 (7.6%)	3 (3.6%)	5 (9.4%)
Readmission	8 (13.3%)	5 (6.5%)	0	13 (12.4%)	9 (10.7%)	4 (7.5%)

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Multicenter Investigation of the Microorganisms Involved in Penile Prosthesis Infection: Are the AUA and EAU Guidelines Appropriate for Penile Prosthesis Prophylaxis and Infection Management?

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Introduction: Despite advancements in surgical technique, device improvements and adoptions of antibiotic prophylaxis guidelines, penile prosthesis infections continue to be a significant problem. The aim of this study was to investigate the microbiology of penile prosthesis infections to better understand and ultimately decrease infection rates.

Materials & Methods: This is a retrospective IRB-exempt multi-institution study of 200 patients with infected IPPs from who underwent explant or Mulcahy salvage procedure with device replacement. Intraoperative cultures were obtained in all cases. Antibiotics were recorded at implantation, preoperative hospitalization, and surgery.

Results: Between 2002 and 2015, 200 intraoperative cultures were obtained at the time of salvage or explant. Antibiotic regimens for all patients at implantation were generally consistent with AUA guidelines. No culture growth occurred in 35% of cases and gram-positive and negative organisms were found in 49% and 20.5% of cultures respectively. In addition, candida species and anaerobes were identified in 8% and 7.5% of total cultures respectively. Candida species (12.3%) and anaerobes (11.5%) comprised nearly one quarter of 130 positive cultures. Ten percent of 130 positive cultures showed MRSA infections. Antibiotic choices at preoperative hospitalization and salvage or explant surgery were widely varied compared to those at IPP implantation.

Conclusions: Our study documented a high incidence of anaerobic and candida infections, which are not covered by current antibiotic prophylaxis guidelines. In addition, over 1/3 of penile prosthesis cases had negative cultures. These findings suggest a need to broaden antibiotic prophylaxis from current guidelines as well as create a management algorithm for penile prosthesis infections.

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Consistent and Durable Improvements in Quality of Life with Long-Term OnabotulinumtoxinA Treatment in Patients with Overactive Bladder

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Introduction: We evaluated the long-term effects of onabotulinumtoxinA 100U on quality of life (QOL) of overactive bladder (OAB) patients who were inadequately managed by an anticholinergic.

Materials & Methods: Eligible patients who completed either of two phase 3 trials could enter a 3-year extension study to receive onabotulinumtoxinA treatment 'as needed' for control of symptoms. Results are reported for up to 6 treatments. Assessments included change from baseline in Incontinence-QOL (I-QOL) total score and proportions of patients who achieved/exceeded the minimally important difference (MID) in I-QOL score (+10 points) after each treatment. Consistency of response over repeat treatments was evaluated by determining whether patients achieved ≥ MID after the first treatment, and then analyzing the proportion who achieved ≥ MID for all subsequent treatments.

Results: Of the 829 patients enrolled, discontinuations due to lack of efficacy/AEs were 5.7%/5.1%. After onabotulinumtoxinA treatments 1-6, QOL improvements were consistently 2-3X MID, with most patients achieving ≥ MID (range: 65.2% to 76.1%). 72.9% of patients who achieved ≥ MID after treatment 1 maintained I-QOL improvements ≥ MID in all subsequent treatments. Over one-third (38.3%) of patients who did not achieve ≥ MID after treatment 1 achieved improvements ≥ MID in all subsequent treatments. No new safety signals were observed.

Conclusions: The consistent improvements in OAB symptoms after long-term treatment with onabotulinumtoxinA corresponded with durable QOL improvements, with no new safety signals. Patients with clinically meaningful QOL improvements after treatment 1 had similar improvements in subsequent treatments, while lack of response to treatment 1 did not preclude positive response(s) in subsequent treatments.

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Drinking from the Firehose: Analysis of Educational Content in Direct-to-Consumer Advertising for Overactive Bladder

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Introduction: Several recent overactive bladder (OAB) medications have been marketed on television. Proponents claim that direct-to-consumer advertisements promote condition and treatment awareness; critics argue that ads are too confusing or biased to be educational, particularly for patients with low health literacy. This study examines the educational content of recent OAB advertising on television to assess patients' likelihood of learning from commercials.

Materials & Methods: Two databases of broadcast news programs were queried with 20 trade and generic names of prescription drugs FDA-approved for OAB to identify ads that aired 2009-2015. Ads were examined for product content (indication, benefits, risks, side effects) and several literacy domains: fact density (number of facts given per second); use of medical jargon; distracting factors during presentation of risks; readability of text and graphics; and compliance with the FDA requirement to direct viewers to more information about the advertised products.

Results: Eight advertisements for four products were identified: fesoterodine, mirabegron, onabotulinumtoxinA, and solifenacin. Ads presented an average of 3.3 OAB symptoms, 3.1 drug benefits, 9.5 risks, and 5.8 side effects in 60 seconds. Nearly all ads (88%) contained hard-to-read text or graphics, including key facts such as clinical efficacy data, contraindicated comorbidities, or warnings about urinary retention. 38% of ads used medical jargon and did not explicitly state that the product may not work for all patients. Mean fact density was 0.4 benefits per second and 0.6 risks and side effects per second. 89% of ads presented risks in one continuous segment, and all ads increased speed or used a different voice when discussing risks; these factors are known to downplay consumer attention. During the voiceover presenting risks, all ads simultaneously displayed at least one and up to three additional data streams (e.g., contraindications as scrolling text, product website flashing onscreen). Although all ads met FDA requirements for more information, in most ads (62%) the information was illegible or only briefly legible. When these references were displayed at the end of the ad alongside other information (eg, dosing options, free trial offer), mean fact density rose substantially to 1.6 facts per second. In most ads (62%), the name of manufacturer was obscured or difficult to read.

Conclusions: Viewers of direct-to-consumer advertisements for OAB drugs had 50% less time to absorb risks and side effects compared to drug benefits. The majority of ads had one or more hard-to-read graphics and multiple audiovisual elements that could distract or minimize viewers' attention to drug risks. The findings raise concern about OAB patients' ability to obtain balanced information from television advertising, which may adversely impact help-seeking and treatment decision-making.

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Laser Photoselective Vaporization and En-bloc Enucleation of Prostate with Morcellation: The First U.S. Experience

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Introduction: Optimal endoscopic management of prostates greater than 80g in size is unclear. Holmium laser enucleation of prostate (HoLEP) is the most well-studied laser enucleation technique with encouraging short and long-term outcomes. The procedure however has a steep learning curve and has not been widely adopted by Urologists. We introduce laser photoselective vaporization and enucleation of prostate (PVEP) with prostate morcellation as an alternative to HoLEP, with improved reproducibility and versatility. PVEP differs from HoLEP in that the green light laser has better hemostatic properties than holmium laser in prostate tissue. There is improved preservation of tissue plans and the ability to combine vaporization with enucleation allows for more versatility. The side firing mechanism improves ergonomics and tissue handling. In this first U.S. case series, we introduce our surgical technique of en bloc Green light enucleation and morcellation along with short-term results.

Materials & Methods: Data from 40 patients who underwent PVEP from 9/2014 to 2/2016 was analyzed retrospectively. Median age of patients was 71.5 ± 8.08. 32.5% of patients had ASA score ≥ 3. 37.5% of patients were on aspirin, 5% on coumadin, and 5% on plavix. Median prostate size was 174.6 ± 105.9 (67 to 570 mL). Mean preoperative IPSS was 23 ± 9.3. **Surgical Technique:** 26 Fr Wolf™ resectoscope is used to locate ureteral orifices, verumontanum, and rhabdosphincter. The prostate apical mucosa is incised with laser vaporization anteriorly and carried posteriorly bilaterally. Mucosal incisions are made lateral to the verumontanum and is extended distally until it meets the apical incision. We start enucleation using blunt dissection with the resectoscope sheath. Dissection in the proper plane is ensured with easy separation along the glossy surgical capsule. Dissection is carried out circumferentially around each lobe from distal to proximal until reaching the bladder neck. Attachments are freed along the way with vaporization as necessary. Hemostasis is achieved with laser coagulation. Once the prostate is freed from all attachments circumferentially, it is pushed into the bladder. We used Wolf Piranha™ morcellator to morcellate the prostate adenoma inside the bladder.

Results: Median energy: 106.1 KJ; procedure time: 154 min ± 55.1; estimated blood loss: 34 cc ± 29.3. There were no intra-operative complications including capsular perforation, bladder wall injury, ureteral orifice injury. Hospital stay: 1.93 days ± 1.72 (60% of patients stayed only one night). Post-operative complications included early clot retention (7.5%) and early temporary stress incontinence (10%). There was no incidence of urethral stricture or delayed/prolonged hematuria. In 2 months, median IPSS improved from 23 to 5, quality of life from 3 to 1, post void residual from 100 mL to 25 mL, and max flow rate from 6.85 mL/sec to 22.8 mL/sec (p < 0.01).

Conclusions: PVEP is a promising endoscopic management option for large prostates. PVEP was successfully used in prostate sizes up to 570g with low hospital stays and morbidity along with early improvement in IPSS and high patient satisfaction. Further studies are necessary to confirm the results of this study.

Adverse Effects of Testosterone Replacement Therapy for Men

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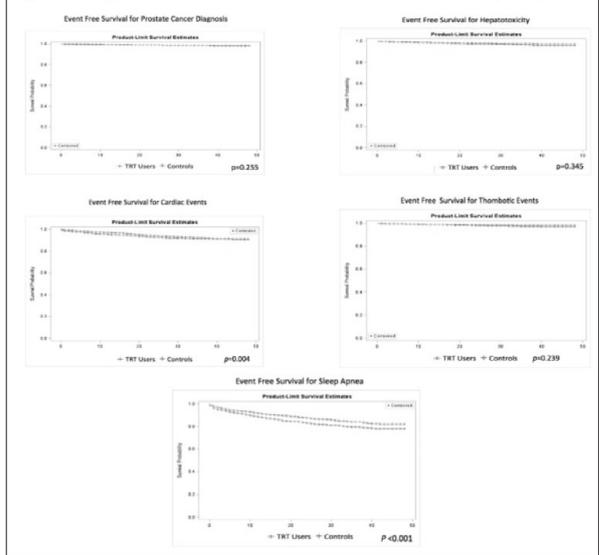
Introduction: The past decades have thus seen dramatic increase in the use of testosterone replacement therapy (TRT) for middle-aged men with testosterone levels below reference ranges for young men. While TRT may increase libido, reduce adiposity, increase muscle mass and improve bone density, some high profile studies suggest increased risk of cardiovascular, thromboembolic and prostate related complications. Much of this research was performed with older populations that are not representative of men most commonly using TRT in community settings. Given this uncertainty, we designed a study using a large national database to assess rates of prostate cancer, hepatotoxicity, thromboembolic and cardiovascular events, and obstructive sleep apnea (OSA) in a sample of adult men treated with TRT.

Materials & Methods: We utilized the TRICARE military database. TRICARE is the health care program of active members of the US Uniformed Services, retirees, and their relatives. It incorporates men using direct care (salaried military physicians) as well as purchased care (in a fee-for-service system similar to private insurance). We identified 36,882 men age 18-65, diagnosed with hypogonadism who received at least one dose of TRT between 2006-2010. We defined a matched cohort of controls who did not receive TRT. We compared event free survival and absolute risk of above complications between men using TRT and matched controls.

Results: As shown in Figure 1 there was no significant difference in event free survival for prostate cancer (p = 0.255), hepatotoxic (p = 0.345), and thromboembolic events (p = 0.239). Relative to controls, patients treated with TRT had better cardiovascular event free survival (p = 0.004) but were more likely to develop OSA (p < 0.001). The 2-year absolute risk of prostate cancer was 0.93% in the TRT cohort and 1.0% in controls (95%CI: 0.6% - 1.4% vs. 0.7% - 1.4%). The risk of cardiovascular events was 6.0% in TRT group versus 7.0% in controls (95% CI: 4.9% - 6.7% vs. 6.2% - 8.0%). The only significant difference in 2-year absolute risk was OSA, which occurred in 1.7% of the TRT men compared to 1.2% of controls (95% CI: 1.56%-1.84% vs. 1.1%-1.4%).

Conclusions: In contrast to recent high profile trials assessing TRT use in relatively elderly (age > 65) and comorbid populations, in our cohort of younger and generally healthy men using TRT in military and community based settings, there was no significant difference in the risk of prostate cancer, hepatotoxicity, thromboembolic or cardiovascular events. Prior studies performed in older and more comorbid populations suggesting adverse effects may be less generalizable to healthy, younger men using these medications in a community setting.

Figure 1: Kaplan Meier Plots of Event Free Survival for Study Endpoints



Differences in the Internal Consistency of the AUA Symptom Index in an Unselected Population of Males and Females

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Introduction: Since the AUA symptom index (AUASI) was developed in 1992, it has served as the gold standard for measurement of symptoms of BPH and as the model for subsequent symptom indices. Its features include content validity and internal consistency. The purpose of this study is to evaluate how the internal consistency of the AUASI is maintained in an unselected population of males and females.

Materials & Methods: This is a cross-sectional study of 254 consecutive patients who underwent joint replacement between 1/1/13 and 5/30/14. The AUASI was administered as part of a standardized pre-operative evaluation by a single nurse practitioner.

Results: A total of 103 males and 151 females completed the AUASI. The mean ages of males and females were 65.7 and 68.3 years. Median AUASI was 5 (range 0-34) with no significant difference in scores between males and females (p = 0.93). The internal consistency of the index was confirmed to be similar to historical results (Cronbach's alpha = 0.79) for all respondents (Table). When separated by gender, reliability estimates were similar for both males and females (Cronbach's alpha = 0.82 for males and = 0.77 for females). The strength of the internal correlations differed depending on gender. Factor analysis showed mathematical support for a 2 factor solution along the lines of the traditional distinction between obstructive (voiding) and irritative (storage) categories (Cronbach alpha = 0.74) for all cases. When analyzed by gender, symptoms separated into 2 factors which correlated differently for males and females: among females, the obstructive and irritative categories were maintained, while among males, the symptom of incomplete emptying correlated to both obstructive and irritative categories.

Conclusions: The symptoms of the AUA symptom index are not specific for pathological conditions of the prostate. The test is internally consistent in both males and females. Statistical analysis confirms distinct internal correlations among subjectively irritative and obstructive symptoms. Symptoms correlate differently in men and in women both by 1-factor and 2-factor analysis.

Correlation Matrix, All Respondents

	Inc. Empty	Frequency	Intermittency	Urgency	Weak Stream	Straining	Nocturia
Inc. Empty	1.000						
Frequency	0.431	1.000					
Intermittency	0.526	0.403	1.000				
Urgency	0.425	0.522	0.416	1.000			
Weak Stream	0.437	0.431	0.409	0.365	1.000		
Straining	0.378	0.276	0.474	0.202	0.443		
Nocturia	0.241	0.405	0.210	0.306	0.191	0.159	1.000

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Novel Bioceramic Bulking Agents Elicit an Improved Host Tissue Response in a Rat Model

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Introduction: Urethral bulking therapy has long been a promising procedure for urinary incontinence. To date, the clinical effects of bulking have not been durable likely due to imperfect bulking agents. We tested the physical properties and host response to two new bioceramic particles, silica-calcium phosphate (SCPC10) and cristobalite, suspended in hyaluronic acid sodium salt in a rat animal model and compared their biocompatibility to the current clinically utilized urethral bulking materials.

Materials & Methods: The novel bulking materials, synthesized under controlled thermal treatment and compact pressure, were suspended in hyaluronic acid sodium salt and injected into the mid urethra of a total of 12 rats (6 per group). An additional 9 rats (3 per group) were injected with bulking materials that are currently in clinical use. Physiological response to the bulking materials was assessed using in vivo voiding trials, and host tissue response was evaluated using hard tissue histology and immunohistochemical analysis. Distant organs were evaluated for the presence of particles or their components.

Results: Five months after intraurethral injection of the bulking agents, we observed a significant decrease in the voiding frequency in the SCPC10 injection group, a significant increase in frequency in the Coaptite group, but no difference in the cristobalite injection group. Histological analysis showed that in comparison to the commonly used bulking agents, both SCPC10 and cristobalite induced a more robust fibroblastic and histiocytic reaction, promoting integration and encapsulation of the particle aggregates and leading to a larger bulking effect. Concentrations of Ca, Na, Si, and P ions in the distant organs of animals injected with SCPC10 or cristobalite were within the physiological range, comparable to the corresponding concentrations in control animals.

Conclusions: This side-by-side examination of urethral bulking agents using a rat animal model and hard tissue histology techniques compared two newly developed bioactive ceramic particles to three of the currently used bulking agents. The local host tissue response and bulking effects of bioceramic particles was superior while also possessing a comparable safety profile.

WITHDRAWN

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Review of the Most Commonly Used Herbal Supplements for Prostate Enlargement: Where is the Evidence?

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Introduction: Herbal supplements are widely used by patients with BPH, yet little is known about the efficacy of these products and their scientific evidence. We describe the ingredients of herbal supplements marketed for BPH and review its scientific evidence.

Materials & Methods: We conducted a search of all Amazon products using the search term "prostate enlargement." Out of the 85 products found, 41 were identified as herbal supplements claiming to relieve BPH symptoms. Information including product name, company, price, claimed effects, consumer satisfaction, active and inactive ingredients were extracted from each product. 2,400 pages of Google Scholar were used to research for evidence behind ingredients (4 pages per ingredient). We categorized scientific evidence for each ingredient into human (systematic reviews, randomized-control trials, cohorts, case-controls, epidemiology), animal, and in vitro (cellular/molecular) studies.

Results: Out of 41 products, 34 (82.9%) were produced by American companies. The price per month of supply ranged from \$2.63 to \$319.98 (Median: \$ 26.47). Less than half (46.3%) had a money back guarantee. Thirty-six products were reviewed by customers with satisfaction score ranging from 3.1 to 5 out of 5 (mean: 4.38 ± 0.55). 14 (34.1%) products did not even list ingredients on the nutrition fact table and therefore were excluded from this study because of lack of data. 11 (26.8%) products did not list inactive ingredients. The most commonly used ingredients were Saw palmetto (74.1%), zinc (74.1%), Lycopene (51.9%), β-Sitosterol (51.9%), Pygeum Africanum (44.4%), and Stinging Nettle (44.4%). A total of 60 different ingredients were identified, out of which 10 showed clinical efficacy in human studies (8 RCTs, 1 systematic review, and 1 case-control). 9 showed benefits in animal study models and 1 product had ingredients with only molecular and in vitro evidence of efficacy. 35 ingredients had no scientific evidence and 5 had conflicting evidence. Out of the 27 products that listed their ingredients, 25 had at least one scientifically proven ingredient based on human studies. Only 1 product had an ingredient with systematic review level of evidence and all other 24 products had at least one ingredient with RCT level of evidence. One product had ingredients only shown to be effective based on animal studies. One product did not contain any ingredient known to be effective for BPH. For these 27 products, the average number of ingredients scientifically proven to be effective based on human, animal, and in vitro/molecular studies was 2.93 (± 1.86), 1.3 (± 1.44), and 0.07 (± 0.27), respectively. There was no statistically significant correlation between number of effective ingredients and monthly supply cost or consumer satisfaction.

Conclusions: Herbal supplements are widely available and heavily advertised to patients with BPH symptoms. They enjoy the lack of scrutiny and accountability that are mandatory for FDA-approved medical therapies. These products are quite diverse in their active and inactive ingredients with scant scientific evidence supporting their efficacy. Physicians, specially urologists, should be more familiar with these products given their widespread use and play a more active role in educating their patients in this regard.

P1

Methylation of 5- α Reductase may Trigger an Androgenic to Estrogenic Switch in Prostatic Tissue Growth

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Introduction: The steroid-5 α reductase type 2 gene (*SRD5A2*) and protein play a significant role in the development and growth of prostate tissue. As a result, strategies to block *SRD5A2* using 5- α reductase inhibitors remain a mainstay in the treatment of benign prostatic hyperplasia (BPH). Our previous studies show that 30% of adult prostates do not express the *SRD5A2* gene or protein due to methylation of the promoter region of the *SRD5A2* gene. We hypothesized that in the absence of prostatic *SRD5A2* there may be alternate pathways driving growth of prostatic tissue. Here, we performed molecular profiling of prostatic tissue with and without *SRD5A2* promoter methylation to determine whether molecular subtypes of clinical relevance could be identified.

Materials & Methods: Prostatic tissue specimens were obtained from 22 patients with symptomatic BPH undergoing prostate debulking surgery. *SRD5A2* promoter methylation status was determined by PCR. RNA was extracted from each specimen and whole-transcriptome profiling was performed using Illumina Human BeadChip Arrays. Supervised analysis of gene expression data was performed using Gene Set Enrichment Analysis (GSEA). Prostatic protein expression of *SRD5A2*, androgen receptor (AR), estrogen receptor (ER) subunits, and aromatase were determined in a panel of six BPH patients by Western blot, immunohistochemistry (IHC), and ELISA assays.

Results: We performed whole-transcriptome profiling of prostatic tissue from 22 patients with symptomatic BPH. By GSEA, we compared the gene expression profiles of *SRD5A2*-methylated vs. unmethylated patients, and we found that estrogen response genes are among the most significantly upregulated genes in patients harboring *SRD5A2* promoter methylation. To validate these results and define the relationship between androgen vs. estrogen signaling, we measured prostatic protein expression of *SRD5A2*, aromatase, and the androgen and estrogen receptors in a panel of six BPH patients with and without *SRD5A2* methylation. We demonstrate that when *SRD5A2* is absent, there are increased levels of aromatase and phosphorylated ER α (p-ER α). Aromatase enzyme levels were quantitated by ELISA and found to be significantly elevated in prostate samples lacking *SRD5A2* expression.

Conclusions: Our study identifies for the first time that there are distinct molecular subtypes of BPH corresponding to the presence or absence of *SRD5A2* methylation and protein expression, and we find that estrogen response genes are a key distinguishing feature of the two molecular subtypes. Our findings of elevated aromatase and p-ER α levels in samples lacking *SRD5A2* expression suggests an "androgenic to estrogenic switch" that modulates prostatic growth. With this alternate growth pathway activated, targeting the aromatase-estrogen-ER axis may serve as an effective treatment strategy in carefully selected patients who lack *SRD5A2* expression

P3

Ensuring Evidence-Based Practice: A Study of Factors Associated with Non-Utilization of AUA Guidelines

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Introduction: The American Urologic Association (AUA) publishes evidence-based guidelines to improve the quality and consistency of urological care. The 2014 AUA Census reported a unique field regarding providers' utilization of AUA guidelines (AUAG). We sought to identify factors associated with non-utilization of AUAG to understand how education and dissemination of these guidelines might be improved.

Materials & Methods: Using 2014 AUA census data, providers were stratified based on self-reported utilization or non-utilization of AUAG. Bivariate analyses and multivariable logistic regression analysis was performed to identify factors associated with non-utilization. Post-stratification weights were used to calculate national estimates (SAS 9.4, Cary, NC).

Results: There were 2202 survey respondents representing 11,680 practicing urologists. Utilization of AUAG was reported in 95.0% of the weighted population. There was no significant difference in utilization based on gender, race, country of origin, practice type, or having completed a fellowship. After controlling for other variables, urologists who reported practicing in a rural area were more likely to be non-utilizers (OR 1.06, 95% CI 1.03, 1.09). Additionally, urologists who had been practicing longer were less likely to utilize guidelines compared with those earlier in their careers; OR 1.15 (95% CI 1.10, 1.21) for practicing 10-20 years and OR 1.13 (95% CI 1.09, 1.18) for practicing > 20 years vs. < 10 years of practice ($p < 0.05$).

Conclusions: Despite continued publication and dissemination of AUAG, about 5% of urologists do not utilize guidelines. Later career status and rural geography were associated with non-utilization. These data may inform efforts to improve dissemination and education regarding evidence-based practice.

P2

RNA-seq Analysis Revealed the Upregulation of p21 Gene Expression in Neuroblastoma Cells Treated with FTY720 and Fenretinide

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Introduction: Neuroblastoma (NB) is the most common extra-cranial solid tumor in childhood. Poor outcomes for children with advanced disease underscore the need for novel therapeutic strategies. Our prior study as well as others has shown that FTY720, a FDA-approved multiple sclerosis drug, has potent preclinical anti-cancer activity in various cancers including NB. However, FTY720 as a combination therapy with fenretinide (4-HPR), a prevalent anti-cancer drug in current clinical trial for NB, has not been reported. Herein for the first time we tested the combination therapy with FTY720 and 4-HPR in NB cells and determined the integral transcriptional changes triggered by these treatments in order to better understand how both drugs work in NB and further to develop novel molecular targets against NB.

Materials & Methods: Methylthiazolyl-diphenyl-tetrazolium bromide (MTT) assay was performed to assess the effect of FTY720, 4-HPR and their combination on the cell viability in both SK-N-BE(2) and SK-N-AS NB cells. RNA from samples were isolated and sequenced to yield around 50 million reads per sample. Sequencing reads were checked for quality and those that passed quality filtering were aligned to the reference genome using RNA-Seq by Expectation-Maximization program. Differential gene expression was then estimated using the DESeq package followed by the Ingenuity Pathway Analysis (IPA), further confirmed by real-time PCR and western blot analysis.

Results: FTY720 or 4-HPR alone significantly inhibited NB cell viability while their combination showed strong synergistic inhibitory effects in both NB cell lines. DESeq analysis from SK-N-BE(2) cells treated with FTY720 and 4-HPR showed that 309 out of ~23000 genes had the lowest adjusted p value ($p = 0$) and the biggest induction/reduction fold changes (Fold > 5 or < 0.2). Among them, IPA analysis indicated that the gene *p21* and its related signaling pathway was one of the major potential targets that the combination therapy affected. Real-time PCR and western blot analysis further confirmed that *p21* was significantly induced by either FTY720 or 4-HPR and the combination therapy further enhanced its expression in both NB cell lines.

Conclusions: Our data for the first time demonstrated that combination therapy with FTY720 and 4-HPR had strong anti-cancer activity in NB cells via induction of *p21* expression, which suggests that *p21* might be a potential anti-cancer target for NB.

P4

Preop vs. Postop Penile Length Maintenance and Satisfaction Following AMS 700 LGX Inflatable Penile Prosthesis Implantation

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Introduction: Loss of penile length after IPP implantation is a concern for many patients with ED who choose surgical treatment. The purpose of the study was to evaluate the effectiveness of the American Medical Systems (Minnetonka, MN, now Boston Scientific) 700™ LGX™ cylinders in maintaining penile length post-IPP implantation in patients treated for ED utilizing a modified method of cylinder sizing during implantation and a max-inflate technique after implantation. Success was defined as the distal length of a patient's penis at 12 months post-implant being greater than the length of that patient's penis at baseline pre-implant.

Materials & Methods: A single armed, prospective, two-center study was conducted with patients selected from the existing population experiencing ED without previous prosthetic implantation. The patients were seen periodically between implant and the 24 month visit. The distal length of a patient's penis at 12 months post-implant as measured using a paper ruler calibrated to the nearest 0.5 cm. Patient satisfaction was also captured on the Penile Prosthesis Patient Satisfaction Survey (PPSS), and improvement in ED was measured using the International Index of Erectile Function (IIEF).

Results: All patients were implanted using the penoscrotal approach. Twenty-six patients, with a mean age of 60.3 ± 7.7 , were enrolled. Increases in the width and the circumferences were observed for all the subjects (22/22, 100%) at the 12 month visit. A decrease was seen in stretched penile length (12.5 cm to 11.2 cm, $p = 0.0028$). High or very high satisfaction was reported in 73% of the patients, 61.5% were satisfied with the length of their erection and 84.5% were satisfied with their ability to have intercourse. No surgical complications were reported.

Conclusions: The AMS LGX™ cylinders were able to maintain stretched penile length in 27.3% of patients with an increase in penile girth in 100% of patients. Defining a max-inflation protocol is essential for maintaining or increasing penile length. A scheduled max-inflation technique should be recommended to all patients soon after AMS LGX™ implantation to prevent loss of length.

P5

Association of PSA and Number of Cores Positive to Likelihood of Adverse Pathology at Radical Prostatectomy Based on a 17 Gene Expression Assay

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Introduction: The overtreatment of prostate cancer and underutilization of active surveillance (AS) in men with Gleason 6 (GS6) cancer on biopsy stems from the uncertainty with current risk instruments. Volume of GS6 tumor and PSA > 10 ng/mL are commonly thought to be correlated with risk and drive treatment decisions. The Genomic Prostate Score (GPS) is a 17-gene biopsy-based RT-PCR assay analytically and clinically validated as an independent predictor of adverse pathology at prostatectomy. We report on the impact of volume of GS 6 disease and PSA at biopsy on the biologic aggressiveness of the disease as measured by GPS.

Materials & Methods: 1,055 pathology reports received at the Genomic Health Inc. clinical lab were retrospectively reviewed to record submitted Gleason score, number of cores positive, and PSA (if available on path report). The GPS was calculated from a single specimen for each case with an associated path report using the validated algorithm of 12 cancer-related and 5 reference genes; median GPS was calculated for each sub-group (≤ 2 cores positive, > 4 cores positive, PSA < 4 ng/mL, PSA 4-10 ng/mL, PSA > 10 ng/mL).

Results: 803 cases (76%) were submitted as GS6. 66% of cases utilized standard 12 core biopsy, 4% of cases had less than 12 cores and 30% of cases had more than 12 cores. The median GPS for GS6 cases with ≤ 2 cores positive was 24 (IQR 16.5 to 30.5) compared to a median GPS of 26 (IQR 20 to 34) for 4 or more cores positive. After incorporating the GPS, risk refinement, a change in categorical risk assessment was seen in 24% of cases with ≤ 2 cores positive and 26% of cases with > 4 cores positive. 294 of cases with GS6 also reported a PSA value. 25% of GS6 cases had a PSA < 4, 67% were 4-10, and 8% were > 10 ng/mL. No significant correlation was seen between PSA and GPS. The median GPS values for cases with a PSA < 4, 4-10, and > 10 were 25 (IQR 16-31), 24 (IQR 17-32), and 25 (IQR 17-39), respectively. Risk refinement following GPS occurred in 48% of cases with a PSA < 10 and 23% with a PSA > 10.

Conclusions: The GPS results highlight the broad spectrum of tumor aggressiveness in a series of 803 biopsies containing GS6 independent of % cores positive and PSA. The degree of risk refinement among all GS6 cases independent of tumor volume or PSA highlight the utility of the GPS to provide predictive information beyond traditional clinical variables used for risk stratification in the management of men with GS 6 disease at the time of diagnosis.

P7

The Impact of 2012 United States Preventive Task Force Panel Update on PSA Screening Practices: A Nationwide and State by State Analysis

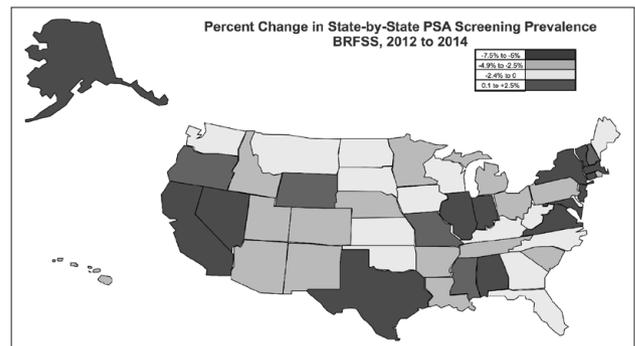
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Introduction: Prostate specific antigen (PSA) screening is a widely debated practice in the US, given the concerns regarding over-diagnosis and over-treatment. In this context, the draft 2011 (finalized in May 2012) USPSTF recommended against PSA screening in all men. Our aim was to address the impact of this recommendation on PSA screening practice in US at nationwide level, as well as at state-by-state level.

Materials & Methods: Survey responses from a cohort of 235,503 individuals aged ≥ 50 years (weighted population size of 50.324 million) who responded to the 2012 or 2014 Behavioral Risk Factor Surveillance System, were queried. Patients were asked if they had a PSA test in the 12 months prior to survey year, such that the BRFSS 2012 and 2014 reflected screening trends in the preceding year. A PSA test was considered as screening if it was performed without a history of prostate problem/cancer. Complex samples frequencies and logistic regression analyses were used to report outcomes.

Results: Among individuals aged ≥ 50 , 34.9% (95% CI: 34.4%-35.4%) reported a PSA screening in 2012 survey vs. 31.9% (95% CI: 31.4%-32.4%) in 2014 survey. When the same analyses were repeated at a state-by-state level, significant differences were observed between the states (figure). Specifically, Alabama and Alaska had the highest drop in PSA screening (7.5%), Utah and Vermont had virtually no change in PSA screening, while in few states there was a slight increase in PSA screening (0.1-2.5%). In multivariable analysis, year of survey (2014 vs. 2013 OR: 0.84, 95%CI: .80-.87) and State were independent predictors of PSA screening utilization after adjusting to age, race, education, income, health insurance, and marital status.

Conclusions: There was an overall drop in PSA screening practice after the USPSTF recommendation against its use at a nationwide level. However, the magnitude of this phenomenon is subject to significant state-by-state heterogeneity. While some states witnessed a significant drop, others showed no change or even a slight increase in PSA screening. The impact of these variations on prostate cancer outcomes are still to be verified in future studies.



P6

Renal Function Decline in Patients Undergoing Partial Nephrectomy

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Introduction: Both active surveillance (AS) and partial nephrectomy (PN) are being increasingly utilized in the clinical management of patients with small renal masses (SRM). Patients selected for AS are typically older and with significant comorbid conditions compared to patients undergoing PN. However, both patient groups experience a decline in renal function at follow-up that is related to increasing age, comorbid conditions and/or surgical resection. The aim of our study was to identify individual risk factors responsible for this decline in renal function, and to compare the impact of surgical and non-surgical risk factors on worsening CKD scores in the patient populations.

Materials & Methods: We retrospectively identified all patients with a small renal mass who underwent either PN or AS between 1999 to 2015 at our clinical center. Patients were excluded if they had multiple tumors or crossed over from AS to PN. Partial nephrectomies were performed under warm or cold ischemia based on surgeon discretion. As most cases were performed utilizing warm ischemia, a statistical comparison could not be performed. Univariate and multivariate analysis compared age, BMI, Charlson Comorbidity Index (CCI), Tumor Size, CKD stage and "worsening of CKD stage" based on an increase in British CKD stage category between initial diagnosis and the most recent follow up.

Results: 52 (13.3%) and 339 (86.7%) patients underwent AS or PN, respectively. Follow up times were 1.7 (0.8-2.8) and 1.5 (0.5-3.0) years for AS and PN patients, respectively ($p = 0.28$). While AS patients were older than their PN counterparts ($p = 0.004$) and had higher initial CKD stage ($p < 0.001$), there was no significant difference in CCI score between groups ($p = 0.195$). In multivariable analyses, age and PN were associated with a worsening of CKD stage ($p = 0.011$; 0.013). In multivariable analyses, patients aged > 65, CCI score, better initial renal function (CKD 1 or 2), and PN were associated with a worsening of CKD stage ($p = 0.027$, 0.010, 0.001, 0.029). Ischemia types [cold ($n = 44$), warm ($n = 231$), and no ischemia ($n = 64$)] did not predict CKD worsening on univariate and multivariate analysis. 7 patients declined by > 1 CKD stage; all underwent PN.

Conclusions: PN is a significant risk factor for a decline in renal function. Older patients with preserved renal function at baseline are at the highest risk for a post-PN decline in renal function.

Micro-RNA Expression Profiles in Upper Tract Urothelial Carcinoma Differentiate Stage and Tumor Progression: A Tool for Clinical Decision Making

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Introduction: Accurate clinical staging of upper tract urothelial carcinoma (UTUC) often proves challenging secondary to inadequate tissue sampling during endoscopic biopsy. Furthermore, accurate prediction of tumor biology would allow tailored treatment for patients who are not candidates for nephroureterectomy (NU) or who could benefit from less radical treatment. MicroRNAs (miRNAs) are promising cancer biomarkers measurable in tissue, serum and urine; however, miRNA profiling of UTUC tumors remains largely unexplored. We aimed to identify miRNA expression profiles with potential to differentiate invasive and non-invasive UTUC and that may identify tumors that will progress following NU.

Materials & Methods: Total RNA was extracted from formalin-fixed, paraffin-embedded NU samples from 2005 to 2013 under an IRB-approved study. Thirty-six unique tumors with diverse pathologies were profiled in the screening cohort using RT-qPCR array for 752 unique miRNA. Subsequently, evaluation of 27 differentially expressed miRNA was performed on a validation cohort of 123 additional NU tissue specimens, including 54 samples from a unique patient population at a collaborating institution.

Results: The miRNA profile of the screening cohort identified 31 miRNA differentially expressed between invasive and non-invasive tumors ($p < 0.05$). Twelve were up-regulated and 19 were down-regulated in the invasive specimens. Predicted probabilities from logistic regression analysis of the screening cohort revealed four miRNA with AUC ≥ 0.8 and an additional six with an AUC ≥ 0.7 (Table 1). Testing of selected miRNA on the validation cohort confirmed differential expression of 14 miRNA in invasive tumors. Clinical follow up data for progression following surgery also showed miRNA that correlate with progression of disease. Complete logistical regression modeling is currently in process for the validation cohort.

Conclusions: UTUC miRNA profiles of NU specimens can discriminate invasive versus non-invasive disease as well as predict patients who will display tumor progression following surgery. Thus miRNA could instruct decision making for follow up or adjuvant therapy pathways based on likelihood of progression. Furthermore, we are prospectively analyzing these miRNA in urine to develop a non-invasive assay for detection, surveillance, and risk stratification of UTUC. miRNA expression profiles may also aid in personalizing treatment decisions based on UTUC tumor biology.

Table 1. Results from logistic regression for detecting invasive UTUC: screening cohort

Target miRNA	Sensitivity	Specificity	AUC
146b-5p	78.9	88.2	0.88
29b-2-5p	78.9	76.5	0.88
let-7a-5p	78.9	64.7	0.80
29c-5p	78.9	70.6	0.80
29c-3p	73.7	64.7	0.76
200a-3p	78.9	64.7	0.75
18a-5p	68.4	58.8	0.75
142-3p	73.7	64.7	0.73
26b-3p	73.7	41.2	0.70
29b-3p	73.7	64.7	0.70

Sphingosine Kinase-2 Inhibition Enhances Macrophage Polarization toward the M2 Phenotype

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Introduction: Metabolites of the sphingolipids, primarily ceramide and sphingosine-1-phosphate (S1P), are bioactive lipids that initiate signal transduction cascades to control cellular functions critical to inflammation and inflammatory disorders. S1P is the product of phosphorylation of sphingosine by either of two closely related sphingosine kinases, SphK1 or SphK2. Both isoforms are significantly active at baseline and are responsible for maintaining intracellular and circulating S1P levels. S1P released extracellularly has been shown to trigger downstream signaling via the S1PR1 receptors to polarize macrophages toward a pro-healing M2 phenotype. In the present study using genetic and pharmacological manipulation we demonstrate that deletion or inhibition of sphingosine kinase 2 enhances the polarization of macrophages toward the M2 phenotype.

Materials & Methods: Two cohorts of 6 to 7 week old male mice, consisting of: 1) untreated WT and SphK2 knockout animals or 2) WT mice treated with the novel SK2 inhibitor [SK2i, (S)-2-[3-(4-octylphenyl)-1,2,4-oxadiazol-5-yl] pyrrolidine-1-carboximidamide, 3 mg/kg dose] or vehicle control, were subjected to complete unilateral ureteral obstruction. Obstructed and unobstructed kidneys from control, knockout and inhibitor treated cohorts were harvested at day 3 post surgery and kidney cells isolated by collagenase digestion. Immune cell profiles of the isolated cells were analyzed by flow cytometry using inflammatory markers including specific markers of M2 macrophages such as CD301 and CD206. Bone marrow cells isolated from SphK2^{-/-} and wild type mice were differentiated into macrophages in vitro by incubation in mCSF-containing medium and subsequently polarized to M1 macrophages with the addition of IFN γ or to the M2 phenotype with IL-4 or IL-13. Expression profiles of these populations were analyzed by RNAseq and confirmed by quantitative real-time polymerase chain reaction (QRT-PCR) analysis.

Results: Flow cytometry results indicated that the percentage of M2 macrophages (F4/80+ CD206+ or F4/80+ CD301+) was significantly increased in the kidneys of both SphK2^{-/-} and SK2i treated mice when compared to control animals, suggesting an overall pro-healing environment at the injury site. This observation was further supported by diminished expression of the pro-inflammatory cytokines MCP-1, TNF α , CXCL2 and IL-1 β . RNAseq and QRT-PCR data obtained from in vitro polarized bone marrow derived macrophages indicated that expression levels of genes specifically enriched in M2 macrophages, Arg1, Retnla, Mgl2 and Clec7a were increased 2-3 fold in the absence or inhibition of sphingosine kinase 2.

Conclusions: The results demonstrate that in a murine model of ureteropelvic junction obstruction, inhibition of sphingosine kinase-2 mitigates the pro-inflammatory environment in response to injury by promoting the polarization of pro-healing M2 phenotype macrophages. We hypothesize that the diminished renal injury and fibrosis that we observe in sphingosine kinase 2 knockout and SK2i treated mice may be due in part to an SK2-dependent enhancement of pro-healing M2 macrophage polarization. Therefore, inhibition of SK2 may present a novel therapeutic strategy to prevent or reduce renal injury.

Differential MicroRNA Expression Levels in Patients with Small Renal Masses: Predictors of Progression to Metastatic Disease

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Introduction: The increase in use of cross-sectional imaging has resulted in an increased incidence of incidentally discovered small renal masses (SRM) < 4 cm in size. Active surveillance for these lesions is becoming an accepted management strategy, but there is still a small risk of metastatic progression. Previous studies have shown microRNA (miRNA) profiles to differentiate between localized and metastatic clear cell renal cell carcinoma (ccRCC). Our objective was to identify a miRNA profile in SRMs predictive of metastases as a prognostic tool.

Materials & Methods: Total RNA was isolated from formalin fixed paraffin embedded partial or radical nephrectomy specimens from patients with pT1a ccRCC. 11 patients with eventual progression to metastatic disease and 14 patients with localized disease were analyzed. Expression levels of miRNA were determined by qRT-PCR.

Results: Expression levels of miRs 30b and 145 were significantly associated with time to recurrence comparing the localized and metastatic ccRCC groups. Levels of miRs 30b, 145, and 199 were significantly associated with cancer specific survival, and discriminated between localized and metastatic ccRCC (areas under the curve of 0.886, 0.860, and 0.851 respectively). Patient age and tumor size did not differ significantly between the two groups. MiRs 30b and 145 were downregulated in the metastatic group, while miR-199 was upregulated.

Conclusions: Tissue samples from patients with pT1a ccRCC showed significant differences in miRNA expression levels. The miRNA identifiers in this study are consistent with previously published literature concerning progression to metastatic disease in ccRCC. Our goal will be to expand the sample size and compare expression levels in serum of patients on active surveillance as a potential decision-making tool for patients diagnosed with SRMs.

P11

Determinants of PSA Screening among Black Men in the United States in the Contemporary Era

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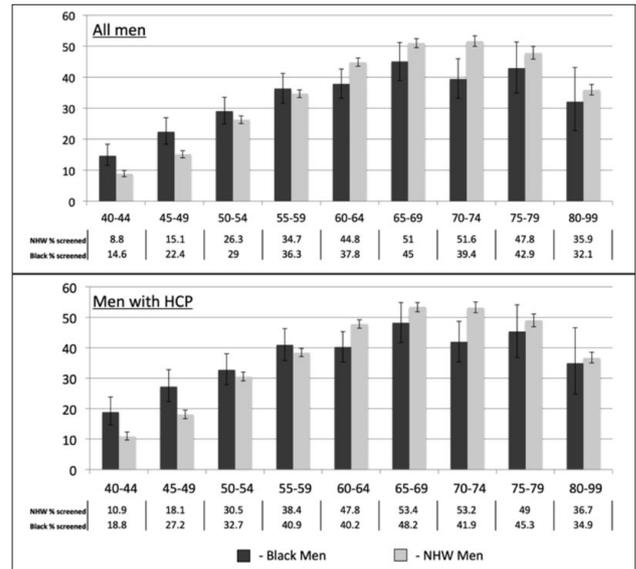
Introduction: Black men have a substantially higher PCa incidence than White men (~220 vs. 133 cases per 100,000 men) and a mortality rate that is more than twice their White counterparts. Early identification of PCa in Black males may therefore be of benefit in forestalling consequent morbidity and mortality. While guidelines issued by major professional bodies do identify Black men as high-risk population for PCa, significant uncertainty exists for patients and their HCPs alike. This uncertainty may be further compounded by the USPSTF recommendation against PSA screening in all men irrespective of age. The substantive questions surrounding PSA screening in Black vs. White males are reflected in previous reports showing contradictory findings. A contemporary analysis thus becomes imperative to provide a heuristic framework for identifying the baseline prevalence and predictors of PSA screening amongst Black men, not least because of its potential implications in healthcare policy.

Materials & Methods: We compared the rate of self-reported PSA screening in Black men relative to non-Hispanic Whites (NHW). The Behavioral Risk Factor Surveillance System (BRFSS) 2012 dataset was used to identify asymptomatic men (aged 40-99) who reported undergoing PSA screening in the past 12 months. Age, education, income, residence location, marital status, health insurance, regular access to health care provider (HCP) and HCP's recommendation to undergo screening were extracted. Subgroup analyses by race and age were performed using complex samples logistic regression models to assess the odds of undergoing PSA screening.

Results: In 2012, there were 122,309 survey respondents (weighted estimate 54.5 million) in the studied population; of these, 29% of Black and 32% of NHW men reported undergoing PSA screening. Younger black males had higher rates and odds of screening than similar-aged NHWs (1.66, 1.58 and 1.36 for men aged 45-49, 50-54 and 55-59 respectively). Among Black men, only higher education level (odds ratio [OR] = 2.12 for men who were graduates vs. not), regular access to HCP (OR = 2.05) and HCP's recommendation for screening (OR = 8.43) were independently associated with PSA screening. The association between race receipt of PSA screening was moderated by HCP recommendation, age, educational and insurance status (p for all interaction terms <0.05), but not by regular access to HCP (p=0.2).

Conclusions: Against the backdrop of higher morbidity and mortality of PCa in Black men, and the possible benefit afforded by early PSA screening in alleviating these disparities, our study provides evidence of the increased prevalence and odds of PSA screening in young (aged 45-60) Black males. While all parameters of higher socioeconomic status

are predictive of screening behavior in Whites, only higher education, regular access to healthcare provider and physician recommendation were significantly associated with the likelihood of undergoing PSA screening in Black men. Future research to explore the complex gestalt of systemic factors (specifically, the association between race, socio-economic achievements and educational status in predicting screening behavior) may aid in optimizing PSA screening in this high-risk subpopulation.



P12

Limited Accuracy of Pre-Operative MRI for Evaluation of Extra-Prostatic Extension and Seminal Vesicle Invasion in Prostate Cancer Patients Undergoing Radical Prostatectomy
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Introduction: MRI is increasingly being used to stage patients with prostate cancer to better define disease state in patients deemed candidates for radical prostatectomy. We evaluated the accuracy and predictive value (NPV and PPV) of pre-operative MRI for extra-prostatic extension (EPE) and seminal vesicle invasion (SVI) based on post-operative pathology results in a sample of prostate cancer patients who underwent radical prostatectomy.

Materials & Methods: Between 2013 and 2015, 224 patients underwent robotic-assisted laparoscopic prostatectomy (RALP) at the University of Vermont Medical Center. Of those, 62 underwent a pre-operative dedicated prostate 3T MRI. Indications for MRI included both patients who met criteria for pre-operative staging imaging by NCCN guidelines and patients with a prior biopsy and persistently elevated or rising PSA. One patient was excluded, having had the MRI within 4 weeks of biopsy, as the evaluation of EPE could have been confounded by immediate post-biopsy changes. MRI reports were considered positive for EPE or SVI if findings were reported as suspicious or positive. EPE and SVI reported on whole-mount pathology reports were used to determine the negative predictive value and accuracy of MRI.

Results: Of the 61 patients, 9 were found to have EPE on MRI. Comparison with whole-mount specimens revealed a NPV of 38%, with a sensitivity of 18% and specificity of 90%. Accuracy of MRI for predicting EPE was calculated at 44%. Regarding SVI, the NPV was 69%, with a sensitivity of 30% and specificity of 95%. Although our sample of patients with positive EPE on MRI was small (n = 9), the PPV was 78%.

Conclusions: Our findings suggest that MRI prediction of EPE may not be as universally accurate as described in prior reports where NPV has been estimated as high as 95%. This may be related to the relatively recent adoption of PI RADS criteria and new protocols for prostate MR at our institution. While there may be a role for MRI in the diagnosis of significant prostate cancer, its role in the pre-operative evaluation of patients undergoing RALP warrants further investigation.

P13

MRI Targeted TRUS Guided Fusion Biopsy: Are Systematic Transrectal Ultrasound Biopsy Still Necessary Now that we Have Targeting Technology?

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Introduction: MRI imaging of prostate lesions have improved significantly in recent years. With computer aided drafting models we are now able to perform targeted biopsies of these lesions by overlaying MRI images on live ultrasound images. We assess whether adding systematic sampling to targeted biopsies increases our ability to diagnose prostate cancer.

Materials & Methods: This retrospective study of patient from a single large practice urology group who underwent MRI fused Ultrasound guided TRUS biopsy with no previous diagnosis of prostate between July 2015 and January 2016. All patients underwent multiparametric prostate MRI including T2 weighted, diffusion weighted, and dynamic contrast image sequencing. A single radiology group read all MRIs using PIRADs v2 to score lesions. To be included in this study each patient had the standard 12 core systematic biopsies and each targeted lesion must of had 1-2 cores

Results: There were 103 patient meeting inclusion criteria who underwent MRI fused Ultrasound guided TRUS biopsy with no previous diagnosis of prostate cancer between July 2015 and January 2016 (mean age 63.7 years, Average PSA 9.58 ng/mL, average ultrasound size 62 cm³). 85 patients had previous biopsies (PSA average 10.04 ng/mL range 0.7-75.4). Percent of patients where cancer was not found, only in systematic biopsies, only targeted lesions or both systematic and target lesion in 44.6%, 14.5%, 14.5% and 55.3% respectively.

Conclusion: Prostate cancer is found independently in both targeted biopsies and systematic biopsies. In our series, if systematic biopsies were not performed then 26.8% of men with prostate cancers would have gone undiagnosed.

P14

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Reversal of Castrate Resistant Prostate Cancer by Extracellular Vesicle Therapy
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Introduction: Castrate resistant prostate cancer (CRPC) is the second leading cause of cancer-related death in men in the developed world. While androgen deprivation therapy is effective at the onset of treatment, nearly all men develop castrate resistance. Several new therapies, including enzalutamide (Enz)-based chemotherapy, have improved outcomes for CRPC. However, resistance to Enz develops in over 40% of patients. New therapeutic regimens and rational targets are needed in order to continue to improve prostate cancer (PCa) patient survival. Tumor cells release extracellular vesicles (EV), which can alter the tumor microenvironment and promote disease progression. We have shown EV isolated from non-malignant cells can inhibit the malignant phenotype. We investigated the role of EV isolated from human mesenchymal stem cells (hMSC EV) reversing the malignant phenotype and Enz resistance and in PCa.

Materials & Methods: EV were isolated from human mesenchymal stem cells as reported. EVs were co-cultured with Enz sensitive or resistant cells after which: the induction or transfer of proteins was determined via mass spectrometry and Western blot analysis; and anchorage independent and tumor xenograft growth were assessed and sensitivity to Enz was monitored via MTT assay.

Results: We used Enz sensitive (C4-2B) and resistant (C4-2BR) PCa cells for our studies. hMSC EV treatment of C4-2BR cells restored sensitivity to Enz. Treatment of C4-2BR cells with hMSC EV resulted in PARP cleavage (a marker of apoptosis induction) and RKIP induction. hMSC EV were examined to determine if RKIP was part of the cargo. hMSC EV were isolated and fractionated into the exosome, microvesicle and total (EV) (exosome and microvesicle) compartments. RKIP was detected in the EV (I) fraction. We reported that RKIP inhibits STAT3 activation. STAT3 activation was measured by luciferase reporter assay and was inhibited by hMSC EV treatment. C4-2BR endogenous RKIP protein levels were diminished by RKIP siRNA and the cells treated with hMSC EV. hMSC EV treatment resulted in the inhibition of C4-2BR STAT3 reporter luciferase activity. This indicates that hMSC EV carry cargo, including RKIP, which can inhibit STAT3 oncogenic activity in C4-2BR cells. STAT3 activation was determined after IGF-1 stimulation and we found hMSC EV and H-RKIP transient transfection inhibited STAT3 stimulation and STAT3 phosphorylation. hMSC EV inhibited PCa cell line tumor xenograft growth, C4-2B/C4-2BR invasion and anchorage independent growth. Exosomes isolated from malignant cells can educate bone marrow cells and create a 'metastatic niche'. EV isolated from C4-2BR cells promote anchorage independent growth of non-malignant prostate cells. This is inhibited when non-malignant prostate cells were treated together with C4-2BR EV and hMSC EV. In addition, hMSC EV were able to inhibit the growth of PCa cells that had acquired a neuroendocrine phenotype.

Conclusions: hMSC EV can reverse the malignant 'education' of recipient cells and provide the promising basis to investigate the therapeutic utility of hMSC EV for the treatment of CRPC and further provide a novel platform for PCa.

Projecting the Supply of Practicing Urologists in the United States through 2030
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Introduction: We sought to provide an estimate of the current and future size of the nation's urologist workforce.

Materials & Methods: Self-reported planned retirement age was collected from the American Urological Association (AUA) 2014 Census. Planned retirement age increases as people age and thus cannot be directly used for predictions. Instead, we used a microsimulation model which controlled variance in planned retirement age as a way to address the observed discrepancy between stated and observed retirement age. This was used to project urologist supply from 2016 to 2030. The approach simulated the likely retirement decisions in each future year based on the adjusted planned retirement age for all 11,990 practicing urologists in 2015. Based on AUA's 2015-2019 resident match, about 320 residents were expected to graduate and join the workforce each year. We assumed this level of entry would remain consistent. The U.S. population projection by the US Census Bureau was used as a proxy measure of population demand for urologic care. Urologist-to-population ratios were calculated to reflect projected urologist demand.

Results: The number of practicing urologists in the United States was projected to decrease more rapidly from 2016 to 2020 because more than one-fourth of current practicing urologists are aged 65 or over. After this time frame, the number was projected to stay relatively flat as baby boomers move out of the workforce. Meanwhile, the U.S. population is projected to increase by 10.9% from 2016 to 2030 per the U.S. Census Bureau, resulting in a reduction of the urologist-to-population ratio from 3.42 per 100,000 population in 2016 to 2.81 in 2030. Two hundred additional urologists would need to be added to the workforce each year to keep up with future population growth.

Conclusions: The supply of urologists is projected to decrease from 2016 to 2030 - with a steep decline in the next few years due to retirement. These findings assume future urologists maintain similar work hours. As younger urologists who may work fewer hours than their predecessors enter the workforce, even more providers will be needed. To maintain the current care level, policies addressing the growing aging population are needed through either training more urologists or adopting a team approach with more physician extenders.

P15

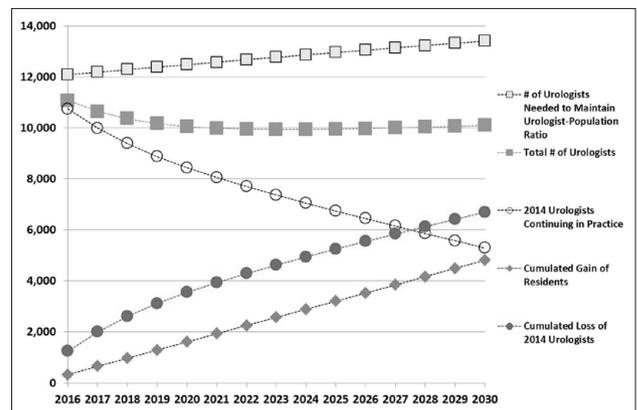
Evolving Pathologic Outcomes in a Contemporary Cohort of Patients Undergoing RALP at a Small Academic Institution
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Introduction: Robotic-assisted laparoscopic radical prostatectomy (RALP) is currently the standard surgical approach for the treatment of clinically localized prostate cancer. We sought to evaluate the resultant pathologic findings in patients undergoing RALP with focus on Gleason grade, positive surgical margins, and features of pathologically locally advanced disease including extra-prostatic extension (EPE or pT3a) or seminal vesicle invasion (SVI or pT3b) at our academic center.

Materials & Methods: An IRB approved retrospective review of 224 consecutive patients who underwent RALP at University of Vermont Medical Center (UVMCC) from 2013 to 2015 was completed examining both pre-operative biopsy and post-operative whole-mount pathologic specimen assessments.

Results: Post-operative pathologic review revealed that 58% (129/224) of patients had organ-confined disease (pT2A, pT2B, or pT2C), while 42% (95/224) of patients were staged as pT3A or pT3B. Two patients were excluded from Gleason grading because they received prior androgen deprivation therapy. Overall Gleason grading showed that 8% (19/222) had Gleason 6, 80% (177/222) had Gleason 7, 5% (11/222) had Gleason 8 and 7% (15/222) had Gleason 9 disease on final pathologic review. In comparison with pre-operative biopsy, a total of 40 patients were down-graded (23 from G8 to G7, 14 from G7 to G6, 2 from G9 to G8 and one from G10 to G9) and 22 were up-graded (14 from G6 to G7, 5 from G7 to G8, and 3 from G8 to G9). Among the entire cohort, 59 patients were found to have tertiary pattern 5 disease. Of the 42% of patients with features of locally advanced disease, 41% (39/95) had SVI and 83% (91/95) had EPE. Overall, 25% of patients were reported to have positive surgical margins. Only 8% of patients with organ-confined disease were found to have a positive surgical margin compared to 46% in patients with locally advanced disease.

Conclusions: Pathologic review of the past three years of patients undergoing RALP at UVMCC suggest a paradigm shift away from primary surgical treatment of patients with low risk disease, with 93% (206/222) of patients undergoing RALP meeting criteria for intermediate and high risk disease. This shift toward operating on higher risk patients does not appear to compromise our rates of surgical margin positivity when compared with previous reports ranging from 6.5%-32% in series with larger percentages of low risk patients.



Unprofessional Content on Social Media Among New England and U.S. Urology Residency Graduates
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Introduction: The AUA has encouraged social media engagement by urologists and published best practices for online professionalism. Facebook is a popular platform that was introduced to most current trainees prior to medical school and can now be accessed by anyone, including patients and employers. As trainees graduate to clinical practice, potentially unprofessional behavior on social media is a concern. This study characterizes the social media content of a national sample of urology residency graduates.

Materials & Methods: Facebook was queried in 7/2015 with the names of all 2015 U.S. urology residency graduates to identify public profiles accessible without being “friends.” Profiles were assessed for unprofessional (UP) or potentially-objectionable (PO) content using a rubric with 65 content categories based on guidelines by the ACGME, AMA, and AUA. We noted references to urology/urological organizations and determined whether UP/PO content was self-authored by the urologist or posted by another party. Assessments were conducted by two independent reviewers with excellent concordance (K>0.90). A subgroup analysis was conducted for graduates of programs in the New England Section of the AUA.

Results: Of 281 graduates, 223 (79%) were men and 267 (95%) held MDs. 201 (72%) had publicly-identifiable Facebook profiles. Of these, 81 profiles (40%) included unprofessional or potentially-objectionable content, including 27 profiles (13%) with explicitly UP behavior (Table). Common examples of UP content included images of and references to intoxication, images of being unprofessional at work, explicit profanity, and protected health information. PO content included images of possession or consumption of alcohol, images or posts about political, religious, or controversial topics, and references to sexual behavior. UP/PO content was self-authored in 82% of categories. 30% of profiles contained self-identification as urologists or had references to urological organizations like the AUA, but among these, 47% contained UP/PO content. Presence of UP/PO content did not differ significantly between sexes, MD vs. DO, allopathic vs. osteopathic/military residency programs, or with vs. without identifying as urologists (all p > 0.05). Among the 22 graduates of New England programs, 16 (73%) had publicly-identifiable profiles. Of these, seven (44%) contained self-authored UP/PO content. Seven profiles contained references to urology or identification as a urologist, and three of these (43%) contained UP/PO content. No statistical difference was found between New England vs. all U.S. residents with respect to having a publicly-identifiable profile, authoring UP/PO content, or self-identifying as a urologist with UP/PO content (all p > 0.05).

Conclusions: The majority of recent residency graduates had public Facebook profiles, and a substantial proportion contained self-authored, unprofessional content. Of those residents identifying as urologists, about half violated AUA guidelines on online professionalism. The social media behavior of graduates of New England programs was similar to their counterparts nationally. Greater awareness of trainees’ online identities is needed.

Unprofessional or Potentially Objectionable Content Among Publicly Identifiable Facebook Profiles I, image; T, text; P, page, link, or other posted content.			
Content Categories*	n = 201	%	
Unprofessional Content			
Any unprofessional content	27	13.4	
Uncensored profanity (T)	13	6.5	
References to alcohol intoxication to excess (T)	13	6.5	
Appearing intoxicated to excess (I)	8	4.0	
Unprofessional behavior at work or in a professional capacity (eg, conference) (I)	5	2.5	
Protected health information (I/T)	5	2.5	
Unlawful behavior (I/T)	3	1.5	
Offensive comments about colleagues at own hospital (T)	3	1.5	
Offensive comments about colleagues at other hospital (T)	1	0.5	
Offensive comments about a specific patient (T)	1	0.5	
			Excluding Profiles with Unprofessional Content
	Any Profile		
Potentially Objectionable Content			
Any potentially objectionable content	81	40.3	54 26.9
Holding alcohol (I)	28	13.9	14 7.0
Politics or content of a political nature (P)	21	10.4	17 8.5
Religion or content of a religious nature (P)	21	10.4	16 8.0
Inappropriate or offensive attire (I)	12	6.0	2 1.0
Comments about politics or of a political nature (T)	11	5.5	6 3.0
Comments about religion or of a religious nature (T)	11	5.5	7 3.5
Comments about controversial social topics (eg, gun control, abortion) (T)	4	2.0	2 1.0
Drinking alcohol (I)	9	4.5	2 1.0
Censored profanity (T)	8	4.0	3 1.5
References to sex or sexual behavior (T)	7	3.5	1 0.5
Appearing in sexually suggestive attire or circumstances (I)	5	2.5	0 0.0
Controversial social topics (P)	2	1.0	1 0.5

* Categories are not exclusive; totals may sum to greater than 100%.

Contemporary Perceptions of Human Papillomavirus and Penile Cancer - Perspectives from a National Survey

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Introduction: Penile cancer is a deadly yet rarely discussed genitourinary cancer with more than half of cases in the United States (US) associated with HPV (Human Papillomavirus). Our goal was to investigate contemporary knowledge of HPV and its association with penile cancer in a nationwide cohort from the US.

Materials & Methods: We utilized the 2014 Health Information National Trends Survey (HINTS), a cross-sectional telephone survey performed in the US initiated by the National Cancer Institute. Our primary endpoints included knowledge of HPV and its causal relationship to penile cancer. Baseline characteristics included sex, age, education, race & ethnicity, income, residency, personal or family history of cancer, health insurance status, and internet use. Adjusted analyses were used to identify predictors of HPV and penile cancer knowledge.

Results: An unweighted sample of 3,376 respondents was extracted from HINTS. Whereas 65.0% of respondents had heard of HPV, only 29.5% of these were aware that it could cause penile cancer. Men were significantly less likely to have heard of HPV than women (OR 0.32 95% CI 0.24-0.43). Older age; African-American, Asian, and “other race”; being married; from a lower education bracket; having a personal cancer history; and those without internet were significantly less likely to have heard of HPV. We did not identify any independent predictors for the knowledge of the association of penile cancer and HPV.

Conclusions: A large, nationally representative survey demonstrates that the majority of the American public is familiar with HPV but lack a meaningful understanding between this virus and penile cancer. Urologists and primary care providers should be encouraged to intensify counseling about this significant association as a primary preventive measure of this potentially fatal disease.

Survey Question	No	Yes	Unsure
Have you ever heard of HPV?	35.65	64.35	--
Do you think HPV can cause penile cancer?	15.34	29.47	55.18
Do you think HPV can cause cervical cancer?	0.97	77.99	21.04
Do you think HPV is a STD?	30.15	69.85	--
Do you think HPV needs medical treatment?	10.71	89.29	--

Survey answers are based on percentages from weighted estimates

Table 1. Baseline survey characteristics, health information national trends survey 4, cycle 4, 2014

Gender	---
Male	48.95
Female	51.05
Age	---
<65	82.55
>= 65	17.45
Race	---
White	66.63
Afr-Amer	11.31
Hispanic	15.14
Asian	4.78
Other	2.14
Marital Status	---
Married	53.72
Divorced, widowed, Separated	31.47
Single, Never Married	14.81
Children in Household	---
No children	64.04
>= 1 child	35.96
Education	---
Some High School	11.63
High School Graduate	18.19
Some College	30.03
College Graduate	40.15
Income (\$ USD)	---
<= 20,000	19.37
20,001-50,000	27.53
50,001-75,000	17.25
>= 75,000	35.85
Residency	---
Urban	85.59
Rural	14.41
Insurance Status	---
No	12.68
Yes	87.32
Personal History of Cancer	---
Yes	8.52
No	91.48
Family History of Cancer	---
Yes	70.94
No	29.06
Internet Access	---
Yes	83.41
No	16.59

Variable	OR (95% CI)	P-value
Gender	---	---
Male	1.11 (0.76-1.61)	0.606
Female	Ref.	-
Age	---	---
<65	Ref.	0.790
>= 65	0.93 (0.56-1.55)	---
Race	---	---
White	Ref.	-
Afr-Amer	0.93 (0.49-1.75)	0.824
Hispanic	0.88 (0.44-1.76)	0.726
Asian	1.09 (0.39-3.04)	0.876
Other	1.67 (0.59-4.69)	0.332
Marital Status	---	---
Married	1.06 (0.72-1.58)	0.760
Divorced, widowed, Separated	1.30 (0.78-2.18)	0.308
Single, Never Married	Ref.	-
Children in Household	---	---
No children	Ref.	0.052
>= 1 child	1.47 (1.00-2.17)	---
Education	---	---
Some High School	1.51 (0.51-4.41)	0.456
High School Graduate	1.03 (0.53-1.59)	0.921
Some College	1.17 (0.75-1.82)	0.487
College Graduate	Ref.	---
Income (\$ USD)	---	---
<= 20,000	Ref.	---
20,001-50,000	0.80 (0.39-1.65)	0.552
50,001-75,000	0.73 (0.33-1.59)	0.427
>= 75,000	0.51 (0.22-1.16)	0.107
Residency	---	---
Urban	0.90 (0.43-1.91)	0.787
Rural	Ref.	---
Insurance Status	---	---
No	Ref.	0.988
Yes	0.99 (0.48-2.06)	---
Personal History of Cancer	---	---
Yes	1.14 (0.64-2.03)	0.663
No	Ref.	---
Family History of Cancer	---	---
Yes	0.91 (0.62-1.35)	0.651
No	Ref.	---
Internet Access	---	---
Yes	Ref.	---
No	0.92 (0.46-1.83)	0.811

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The Unintended Consequences of Robotic Surgical Practice for Resident Surgical Capacity
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Introduction: Robotic surgery has seen rapid and pervasive expansion in Urological surgical work, with significant implications for the performance of core procedures such as prostatectomy, nephrectomy and partial nephrectomy. The implications of this technology for resident education are less well understood. Though many theory- and lab-driven efforts have been initiated to improve training in robotic surgery for medical residents, to date we do not have any empirical study of the ways in which residents learn (or fail to learn) how to operate with the daVinci system in the context of actual residency programs. Insights in this direction could help ground and improve efforts to maintain a healthy and growing base of qualified robotic surgeons.

Materials & Methods: The author took near-verbatim, time-stamped observational notes on over 150 open, laparoscopic and robotic urological procedures at four top-tier teaching institutions in the New England Section of the AUA. IRB restrictions mandate anonymity for all participants' and their institutions. He likewise recorded and transcribed interviews of attending surgeons, residents and surgical staff in urology programs at these institutions. Finally, he performed confidential interviews with attending surgeons and residents in urology programs at 15 additional top-tier teaching institutions throughout the United States. Each attending selected two residents to be interviewed - one that they assessed as learning robotic skills rapidly and extensively, and one that was average or below average in this regard. The researcher was blinded to this assessment until after resident interviews were complete. Standard techniques for analyzing qualitative data were applied to induce findings.

Results: Best-in-class robotic surgical practice greatly inhibits the effectiveness of traditional dwell-time focused methods for learning surgical technique (e.g., "see one, do one, teach one"). Residents typically get two four-month rotations of exposure to robotic surgical work, and in an average procedure get 10 to 20 times less time on surgical task as in the equivalent open procedure. Given their ability to perceive very minor quality deviations, top robotic attendings regularly reduce the learning value of this time through "helicopter teaching;" intervention and supervision so frequent that it significantly delimits opportunities for residents to struggle at the edge of their surgical capacity. All 18 residents assessed as exceptionally competent reported learning through three organizational processes: early exposure to robotic surgery (e.g., pre-residency research), extensive digital rehearsal (e.g., simulation, online video) and - most crucially - rotations at institutions with less robotic surgical expertise and profitability pressure (e.g., VA and community hospitals). Only two residents assessed as average highlighted these processes.

Conclusions: While adoption of robotic surgical technology has expanded the pool of surgeons willing to perform minimally-invasive procedures, current ge and instruction practices may be unduly constraining the flow of competent robotic surgeons into the profession. To the extent that this is accurate, institutions, the surgical profession and vendors should consider redesigning organizational processes, surgical practice and surgical systems themselves in order to better capitalize on the learning modalities evident in the everyday practices of top surgical students.

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Development of a Successful International Outreach Program: Project Health Cape Verde, a 501c3 Nonprofit

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Introduction: We present a model for a successful international outreach program developed at our institution over the last six years. We discuss the factors, some unique to our local circumstances, that helped initiate the program and how others may learn from our experience and start similar but unique rewarding experiences. Cape Verde is an island nation 350 miles from the West African coast. Since the country has only one urologist serving its entire population of half a million, the well to do get their care in Portugal and America while others have a difficult time receiving appropriate urologic care. A large immigrant community of Cape Verdeans exists in Massachusetts and their discussion of the lack of urologic care in Cape Verde led to our outreach program. Over time Project Health CV a 501c3 nonprofit has grown and addressed four objectives: 1) Expand access to urologic care 2) Train local providers in the treatment and prevention of urologic diseases 3) Establish a research platform to develop best-practices in urologic care for resource-limited settings 4) Expose surgical trainees to providing care in the global health setting.

Materials & Methods: Starting with an initial visit to provide urologic care, an expanding team now including urologists, gynecologists, general surgeons, anesthesiologists and medical interpreters from Beth Israel Deaconess Medical Center (BIDMC) in Boston, MA provided clinical care and training at two hospitals in Cape Verde on 8 visits from 2010-2015. Interviews were conducted with 9 clinical staff to elicit health delivery barriers specific to this setting. Surgical case logs were maintained to measure clinical productivity and training was performed for local providers in basic urologic care.

Results: Since 2010, BIDMC surgeons in partnership with Cape Verdean physicians have treated a total of 1654 patients and completed 77 operations, including the nation's first transurethral resection of the prostate. Three Cape Verdean surgeons have been trained in 15 procedures, and 3 of them have completed a surgical training course at BIDMC. Likewise, 14 surgeons from BIDMC have volunteered in Cape Verde and gained valuable training in operating within a resource-limited setting. During this time, outpatient urological visits in Cape Verde have increased by 56% from 2009-2013. The number of urological surgeries performed each year has decreased by 27% due to the focus on training local physicians. Project Health CV recently launched a new research platform to address on-going issues of access, affordability, and quality in Cape Verde addressing issues such as task-sharing, maintaining complex urologic equipment, and educating primary care physicians.

Conclusions: Project Health CV demonstrates how through creation of a 501c3 non-profit, members of an academic medical center can provide subspecialty surgical care in a resource-limited setting and simultaneously train local providers to sustain this type of care. Our outreach program provides valuable care and also fosters cooperation and goodwill between immigrant Cape Verdeans in the US and our AMC. Future efforts will expand urological training in Cape Verde, invest in urology infrastructure, and increase public health awareness about urological problems.

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Resident Fatigue: Home Call's Effect on Sleep and Fatigue on Urology Residents Over a Power Weekend

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Introduction: The Accreditation Council for Graduate Medical Education (ACGME) has mandated limited work-hours and required fatigue mitigation for all resident physicians (RP). Detailed guidelines exist for RP call in-hospital but few rules pertain to home call (HC), with no guidelines for fatigue detection or mitigation. A popular method of the HC system on the weekends is "Power Weekends" (PWs), where residents are the primary contact for 72-hours over the weekend. We tested an approach to record sleep during PWs and describe the relationship between sleep and a fatigue mitigation protocol.

Materials & Methods: PW duty rotates among 4 RPs. Our fatigue mitigation protocol requires RPs to report being "Not Fatigued" or "Fatigued" after a PW. If "Fatigued" the RP is dismissed at noon and the event is recorded. A wrist mounted accelerometer (FitBit) measured total time asleep (TTA) in minutes each 24-hours for all RPs over a 7-month period. De-identified data was stratified into 3 categories: not on call "Baseline" (B), and On-Call either "Not Fatigued" (N) or "Fatigued" (F). TTA was compared pairwise among the 3 call categories using 2-sided t-tests for each individual. The combined data was analyzed with a mixed model, fit with a fixed scenario effect using the 3 call categories. Random resident and resident/scenario effects were used to account for the correlation within each resident/scenario combination. The dependent variable was TTA on Friday, Saturday, Sunday, or the TTA for the weekend.

Results: All RP reported that the FitBit monitors were not an undue burden. Data was available for 86/120 total weekends over 4 RPs (55 B, 24 N, 6 F). Table 1 contains average TTA ± standard deviations. Table 2 contains the significance values for Baseline versus Not-Fatigued weekends for each individual, and significance values using the mixed model. Average TTA ± confidence intervals are in the figure. Overall, Baseline TTA was 1354 (±79) minutes. A call weekend was 1195 (±90) minutes for N and 1037 (±135) minutes for F. Using Friday, Saturday, and Sunday as the dependent variable, Sunday night was the only statistically significant night for Not Fatigued versus Fatigued.

Conclusions: TTA on a baseline weekend was higher than an On-Call weekend, and significant for 3 of 4 residents. Using a mixed model and accounting for individual resident variation, the TTA on a baseline weekend was higher than on an On-Call weekend. The average TTA for the fatigued weekends was lower than not-fatigued weekends, but was not statistically significant. Evaluating for the impact of individual nights, Sunday night is the strongest predictor of making a normal On-Call weekend convert into a Fatigued weekend (p = 0.0004).

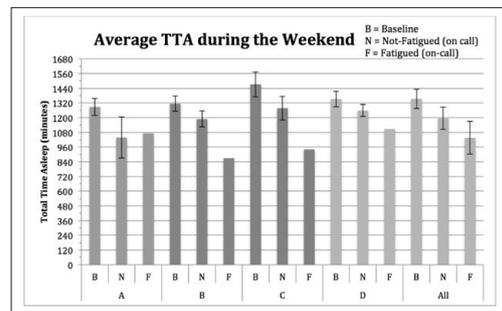


Table 1: Average Total Time Asleep (minutes) for each resident and All residents in 3 categories

Resident	Baseline +/- SD	Not Fatigued +/- SD	Fatigued +/- SD (where available)
A	1288 ± 93	1039 ± 192	1072
B	1315 ± 134	1189 ± 81	870
C	1473 ± 181	1278 ± 130	942
D	1352 ± 137	1258 ± 61	1109
All (model estimated)	1354 ± 79	1195 ± 90	1037 ± 135

Patient Outcomes Using an Enhanced Recovery Protocol After Radical Cystectomy: A Retrospective Cohort Study

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Introduction: The goal of the Enhanced Recovery after Surgery (ERAS) protocol is to reduce length of stay (LOS) and improve patient outcomes by decreasing ileus, surgical infections, and fluid overload. We evaluated our ERAS protocol for patients undergoing radical cystectomy, focusing on LOS, complication rates, and readmission.

Materials & Methods: From May to December 2015 an ERAS protocol was utilized in 62 patients who underwent open or robotic radical cystectomy and urinary diversion at our institution. 11 patients who underwent additional surgery were excluded from the study. The protocol focuses on avoidance of preoperative fasting and bowel preparation, opioid-minimizing multimodal pain management, goal-directed fluid therapy, and early postoperative feeding. Alvimopan, a peripherally acting μ -opioid antagonist, was given when available. Outcomes were compared to a cohort of patients who underwent radical cystectomy prior to instituting the ERAS protocol.

Results: A total of 51 patients with a median age of 66 years were analyzed and compared to a pre-ERAS cohort of 125 patients. The median LOS was 5 days compared to 6 days for the pre-ERAS patients. Only 4% (2 patients) of the ERAS cohort had a LOS longer than 7 days versus 32% (40 patients) of the pre-ERAS cohort. By postoperative day (POD) 3, 84% of the patients had passed flatus and 65% had a bowel movement. For the ERAS cohort, the 30-day minor and major complication rates were 55% and 12%, respectively. The most common minor complications were urinary tract infection (UTI) in 23.5% (12 patients), superficial wound infection in 16% (8 patients), and dehydration in 12% (6 patients). UTI and dehydration were the 2 most common reasons for readmission. The 30-day readmission rate was 39% (20 patients). The 39% of ERAS patients that received alvimopan had the same median LOS (5 days) as those that did not, but had an earlier median POD of flatus (2 days vs. 3 days) and bowel movement (2.5 days vs. 3 days).

Conclusion: Our ERAS protocol for radical cystectomy patients accelerates return of bowel function and decreases hospital length of stay compared to traditional management.

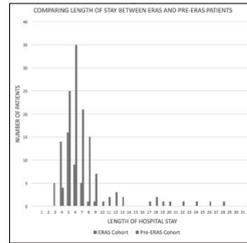


Table 1. Patient characteristics, postoperative milestones, and complications

Median age (range)	66	(38-82)
No. male (%)	36	(71)
No. female (%)	15	(29)
Race (%)		
White	46	(90)
Black	2	(4)
Other	3	(6)
Median kg/m ² body mass index (range)	29	(21-45)
No. Charlson comorbidity index (%)		
2 to 3	14	(27)
4 to 5	27	(53)
6 or greater	10	(20)
No. prior BCG (%)	17	(33)
No. prior neoadjuvant chemotherapy (%)	27	(53)
No. prior pelvic radiation (%)	2	(4)
No. prior abdominal surgery (%)	20	(39)
No. tumor stage (%)		
T2 or less	31	(61)
T3-4	20	(39)
No. nodal metastasis (%)	15	(29)
No. diversion type (%)		
Ileal conduit	40	(78)
Neobladder	10	(20)
Continent cutaneous diversion	1	(2)
No. modality (%)		
Open	40	(78)
Robotic cystectomy, open diversion	8	(16)
All robotic	3	(6)
Median postoperative day (range)		
Ambulation	1	(1-4)
Flatus	2	(1-5)
Bowel movement	3	(1-7)
Regular diet	3	(1-8)
Discharge	5	(3-8)
No. 30-day complication (%)	28	(55)
Minor (Clavien grade 1-2)	28	(55)
Major (Clavien grade 3-5)	6	(12)
No. 30-day readmission (%)	20	(39)
No. 30-day mortality (%)	0	(0)

Optimizing Percutaneous Nephrolithotomy (PCNL) Surgical Scheduling using Lean Methodology and Principles

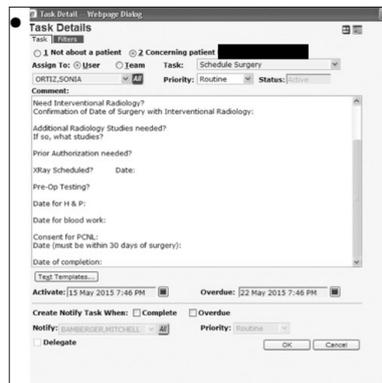
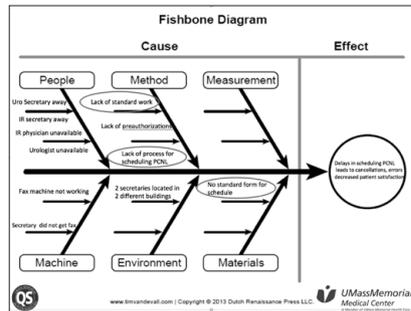
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Introduction: Percutaneous Nephrolithotomy (PCNL) scheduling is a labor intensive process requiring coordination amongst Urology (U), Anesthesia, and frequently Interventional Radiology (IR). This process can be cumbersome with frequent delays while each specialty has specific requirements before the scheduling can be completed. As a result, this inefficiency may cause delays and cancellations resulting in poor job satisfaction for both administrative and clinical staff, as well as patient dissatisfaction. By applying lean principles, the scheduling process can be improved with more efficiency, higher job satisfaction for staff, as well as improved patient satisfaction.

Materials & Methods: The process for scheduling PCNL surgery at UMass Memorial Medical Center was evaluated by a team of administrative and clinical staff. This consisted of U and IR schedulers along with IR and U clinicians. A survey of U schedulers was performed to assess the issues regarding coordination between services. Process mapping of the current condition and a root cause analysis (RCA) was undertaken to re-engineer this process.

Results: The current condition revealed there was a minimum of 9 steps to schedule a patient for PCNL surgery. IR requests for further diagnostic radiographic studies were required to be scheduled by U administrative staff. Additionally, U administrative staff were needed to obtain insurance prior authorization. One case required 21 emails between IR and U schedulers to coordinate a preoperative CT scan. Each U secretary had their individual method of scheduling surgery. A RCA was conducted to identify areas to be changed or eliminated. An electronic worksheet was created within the electronic health record that could be accessed by all staff involved with the scheduling process. This allowed for parallel processing to occur instead of a sequential process. IR staff were empowered to order and obtain all necessary preoperative imaging as requested by IR clinicians.

Conclusions: The RCA allowed for identification of an inconsistent method of booking surgery. In addition, creating parallel processing improved efficiency by allowing both IR and U administrative staff to work simultaneously instead of sequentially. As a result, overall scheduling improved, administrative and clinical job satisfaction rose, and patients were able to be scheduled in a more timely manner without any cancellations. Physicians and staff should be familiar with lean principles and methodology to enhance overall urologic office practice efficiency and job satisfaction.



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Survey Assessment of the Role of Stent Experience on Future Stone Treatments
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Introduction: Due to high recurrence rates, stone formers repeatedly confront the need to decide upon surgical intervention. Ureterscopy has emerged as the most commonly performed procedure for stones, and it was reported that most urologists place stents after ureteroscopy. While it is well recognized that ureteral stents can cause significant postoperative discomfort, the implications of their impact on quality of life have not been fully evaluated. In particular, it is unknown whether prior stent experience may effect decision making for the treatment of stones. To assess this, we developed a survey designed to both elucidate the effect of prior stent experience on future urinary tract stone treatment, and to determine the level of risk of readmission that patients are willing to assume to forgo future stent placement.

Materials & Methods: We designed a survey to assess the impact of ureteral stents on quality of life and subsequent treatment decisions. It was reviewed by survey experts, content experts, and then administered to a pilot group of respondents over the last week of February 2016. Internal consistency between questions relating to reported symptoms during stent placement and the question of whether the stent or the stone was worse was assessed with Cronbach's alpha. Internal consistency of the questions was assessed with Cronbach's alpha. Interviews were employed to assess face and content validity, and anticipated associations among responses were evaluated to assess construct validity in this pilot trial.

Results: Face and content validity were confirmed via interview of survey methodologists and endourologists, respectively. Of 24 eligible patients, responses were obtained from 17, yielding a 71% response rate. Responses were assessed and strong internal consistency was confirmed (alpha = 0.77). Thirteen answered questions about risk tradeoffs between stent omission and re-admission. 71% of the 7 respondents who felt the stent was worse than the stone (n = 5) would omit stent if there was a 7% readmission risk. This decreased to 43% (n = 3) if the risk of readmission increased to 20%. For respondents who felt the stent and the stone were the same (n = 3), 67% (n = 2) chose to omit the stent at a 7% readmission risk. This decreased to 33% (n = 1) for the 10% and 15% risk scenarios and none of these respondents were willing to omit the stent in the 20% risk scenario. Respondents who felt the stone was worse (n = 2) chose never to omit the stent. Furthermore, those reporting more severe stent-related symptoms were less likely to choose elective surgery for an asymptomatic stone whereas those with less severe symptoms were more likely to choose elective surgery. These findings suggest discriminant construct validity, although these differences were not statistically significant (p = 0.164).

Conclusions: Our initial evaluation confirms face and content validity of our survey instrument. Respondents reporting worse stent-related symptoms were less likely to choose elective surgical treatment of a future asymptomatic stone. Given internal consistency and suggestion of discriminant construct validity, this survey may be administered to larger cohorts to assess the role of stent experience in future treatment decisions.

Is Hydronephrosis on Ultrasound Predictive of Ureterolithiasis in Patients With Renal Colic?
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Introduction: Renal ultrasound (US) is commonly used for the evaluation of acute renal colic. While US accurately identifies the presence of hydronephrosis, it is less sensitive than computerized tomography (CT) for the detection of ureterolithiasis. This study investigated whether or not the presence of hydronephrosis on US was associated with a ureteral stone in patients who underwent both US and CT during the evaluation of acute renal colic.

Materials & Methods: A retrospective chart review of 3 institutions was conducted of patients who were evaluated for renal colic with both renal US and CT in either the emergency department or outpatient setting between 2012 and 2015. Patients were included if US and CT were performed on the same day. The presence of ureterolithiasis, stone location, and concomitant hydronephrosis were reviewed and compared between imaging modalities.

Results: One hundred and forty-four (144) patients were evaluated with both US and CT on the same day, meeting inclusion criteria. Ureteral stones were present in 85 patients. US identified hydronephrosis in 89.8% of patients with reported hydronephrosis and identified a ureteral stone in 25.9% of all cases with a reported ureteral stone. CT identified hydronephrosis in 91.8% of patients with reported hydronephrosis and a ureteral stone in 98.8% of all cases with a reported ureteral stone. In 18 patients (12.5%), US and CT differed on the presence or absence of hydronephrosis. In 108 of the 144 (75.0%) patients, the presence or absence of hydronephrosis on US correctly predicted the presence or absence of a ureteral stone on CT (Table 1). Overall, hydronephrosis on ultrasound had a positive predictive value (PPV) of 0.77 for the presence of a ureteral stone and a negative predictive value (NPV) of 0.71 for the absence of a ureteral stone.

Conclusions: Hydronephrosis on ultrasound did not accurately predict the presence or absence of a ureteral stone on computed tomography in 25% of patients in this study. Ultrasound is an important tool in the evaluation of hydronephrosis associated with acute renal colic but patients may benefit from other studies to confirm the presence or absence of ureteral stones.

	Hydronephrosis Present- CT	Hydronephrosis Absent-CT	Ureteral Stone Present-CT	Ureteral Stone Absent-CT
Hydronephrosis Present-US N=88/144 (61.1%)	80/144 (55.6%)	8/144 (5.6%)	68/144 (47.2%)	20/144 (13.9%)
Hydronephrosis Absent-US N=56/144 (38.9%)	10/144 (6.9%)	46/144 (31.9%)	16/144 (11.1%)	40/144 (27.8%)

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Does Omission of Ureteral Stents After Ureterscopy Increase Risk of Unplanned Return Visit? A Systematic Review and Meta-Analysis
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Introduction: Ureteral stenting following ureteroscopy for nephrolithiasis is routinely performed despite increasing evidence that stent placement may be omitted after "uncomplicated" ureteroscopy. It has been hypothesized that many may place stents to obviate concerns of unplanned return visits, balancing risks of costly revisits due to postoperative obstruction, with increased procedural costs and concern regarding increased revisits in stented patients for pain and infection. Our objective was to systematically review and meta-analyze the body of literature comparing the risk of unplanned medical visits and other health outcomes following ureteroscopy for nephrolithiasis, according to whether a stent is placed.

Materials & Methods: We searched MEDLINE (1946-2015), CENTRAL (1898-2015), EMBASE (1947-2015), ClinicalTrials.gov (1997-2015), American Urological Association Annual Meeting abstracts (2011-2015), and reference lists using no limits or language restrictions. All searches were last updated in October 2015. We included randomized trials (RCT), non-randomized trials, before-after studies and cohorts comparing stent omission versus stent placement following ureteroscopy for nephrolithiasis in adults, and reporting unplanned visits at 30 days. Two reviewers, including a clinical expert, independently extracted data and assessed methodological quality using a standardized tool. We calculated pooled relative risks (RR), weighted mean differences (WMD), and standardized mean differences (SMD) using random effects models. We calculated Peto odds for our primary outcome using fixed effects; considered I² > 50% to indicate substantial heterogeneity; and evaluated reporting bias using funnel plots.

Results: Our initial search yielded 1,992 studies, of which 17 studies involving 1,943 participants met inclusion criteria. Symmetry of the funnel plot of included studies reflects low risk of publication bias. Overall, unstented patients were significantly more likely to have an unplanned medical visit compared to those who received a post-ureteroscopy stent (OR 1.63, 95% CI 1.15-2.30). A priori planned subgroup analysis of the 13 RCTs confirmed this increased risk of unplanned visit among unstented patients (OR 2.12, 95% CI 1.38-3.25). Within this subgroup, the absolute risk of unplanned visit was 8.4% among unstented patients compared with 4.1% among the stented. Conversely, unstented patients had shorter operative time (weighted mean difference -3.19 minutes, 95% CI -5.64 to -0.74) and were less likely to have dysuria (RR 0.39, 95% CI 0.25-0.62). Unstented patients were also less likely to have postoperative pain (RR 0.64, 95% CI 0.39-1.05) or infection (RR 0.89, 95% CI 0.59-1.33), and more likely to have postoperative obstruction (RR 2.24, 95% CI 0.66-7.66), although these were not statistically significant.

Conclusions: Stent omission following ureteroscopy is associated with an increased risk of unplanned medical visits, despite lower rates of dysuria compared to stented patients. These tradeoffs should be weighed by patients and physicians when considering post ureteroscopy stent placement.

Calcium Phosphate Nephrolithiasis in Patients with Cystinuria
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Introduction: Cystinuria is a rare autosomal recessive disorder characterized by decreased renal reabsorption of filtered cystine and resultant recurrent cystine nephrolithiasis. Standard treatment for cystinuria includes dietary modification, cystine-binding agents, and urinary alkalization in order to increase cystine solubility. However, urinary alkalization may theoretically predispose to calcium phosphate stone formation, as the solubility of calcium phosphate markedly decreases with increasing pH. Although many of the implications of cystinuria have been well studied, it is unknown whether treatment side effects may alter the actual type of stone formed. We sought to investigate the incidence of conversion to calcium phosphate stones in treated cystinurics.

Materials & Methods: We identified 16 patients with cystinuria that were followed for a mean 9.4 years (range 1-24 years). Data collected as part of routine clinical practice including periodic 24hr urinalysis, stone analysis, and procedural data were reviewed retrospectively with institutional IRB approval.

Results: Of the patients with cystinuria followed at our institution, 3 of 16 (18.8%) developed some component of calcium phosphate in their stones. One of the three developed a primary calcium phosphate stone (80% by composition) with no cystine component. Data from 24hr urinalyses were available for 14 of 16 patients. The mean pH assessed by 24hr urine collection occurring within 1 year of stone event in calcium phosphate stone formers was 7.117 vs. 6.817 in those without any calcium phosphate component (p = 0.42). There was no significant difference in stone events per year in the two populations (p = 0.901). Additionally, there was no significant difference in the cystine capacity measured via 24 hr urine collection in the two populations (p = .648).

Conclusions: We have identified an incidence of de novo calcium phosphate stone formation in treated cystinurics of 18.8%. Complete conversion to calcium phosphate, however, occurred in only 6.2%. Events precipitating the formation of calcium phosphate nephrolithiasis in patients with cystinuria are unclear. Although elevated pH was identified in this cohort, our small sample size did not allow us to identify statistical differences between these groups. Nevertheless, these findings confirm the utility of routine stone analysis, even in those with otherwise "predictable" cystine stones, as established treatment regimens may inadvertently induce stone formation. Early identification of these conversions may allow for treatment adjustments given that therapeutic algorithms for calcium phosphate stones in cystinurics are not as well defined as those for their primary cystinuria.

A Multi-Institutional Assessment of the Prevalence of Undiagnosed Diabetes Mellitus among Uric Acid Stone Formers.

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Introduction: The rate of uric acid stone formation has long been known to increase as a function of glucose control among diabetics and those with the metabolic syndrome. It is not known, however, if uric acid nephrolithiasis can also be a presenting sign of undiagnosed diabetes mellitus. In this multi-institutional pilot study, we seek to determine the prevalence of undiagnosed Diabetes and Pre-diabetes amongst uric acid stone formers.

Materials & Methods: Data from prospectively maintained clinical databases of stone formers were retrospectively acquired from 2008 onward by participating institutions. Patients forming > 50% uric acid stones were identified and charts were assessed for a diagnosis of diabetes at the time of initial urologic encounter for stones. Those non-diabetic patients who underwent Hemoglobin A1c testing within 24 months form the study group. Patients were categorized as Pre-diabetic or Diabetic based upon an A1c value of 5.7-6.4 or > 6.4 respectively.

Results: 78 Uric acid stone formers were identified, of which 44 were non-diabetic and 34 diabetic. 21 non-diabetic patients underwent Hemoglobin A1c testing within 24 months of their stone event with a mean value of 9.3 months (0-19; 6.4 range; stdev). Age was 58 years (31-84; 13.4), BMI was 31 kg/m² (21.4-45.7; 4.8) and A1c was 5.9%(4.6-7.5; 0.6). Of these, 12 (57%) were categorized as "Pre-diabetic" and 3 (14%) as "Diabetic" based upon A1c alone. Of this subgroup, 4 carried a diagnosis of gout; one was "Normal" and 3 were "Pre-Diabetic".

Conclusions: We identified a 71% rate of undiagnosed Pre-diabetes and Diabetes amongst a population of non-diabetic uric acid stone formers. Uric acid stone formation may be a harbinger of Diabetes Mellitus and further work is needed to determine if Hemoglobin A1c screening is appropriate in this population. The passage of a uric acid stone may be a critical opportunity for intervention and Diabetes prevention.

Can 24-Hour Urine Values Differentiate Between Patients Forming Calcium Phosphate (CaP) and Calcium Oxalate (CaOx) Stones?

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Introduction: Stone composition is often unknown or reported as "calcium based" by patients being evaluated for recurrent nephrolithiasis. Distinguishing between CaP and CaOx stones is clinically important as dietary and pharmacological preventative strategies differ. We investigated whether 24-h urine values and patient factors can be used to differentiate between patients forming CaP and CaOx stones.

Materials & Methods: A retrospective review was performed of patients who had 24-h urine values (Litholink, Chicago, IL) and associated stone analysis data from a single academic medical center. Patients whose stone composition was predominantly (> 50%) CaP or predominantly (> 50%) CaOx were identified. In those with urine studies within 3 months of the stone analysis, patient characteristics and 24-h urine values were compared between the groups forming CaP and CaOx stones using t tests for continuous variables and chi square tests for categorical variables. Multivariate logistic regression was used to determine which variables were independently associated with stone type.

Results: From 2006 to 2014, 2019 urine values were obtained from 1197 patients. Of these, 371 had a calcium based stone identified within 3 months of the urine collection (Table). 65 (18%) had a predominantly CaP stone; 44 (68%) of these were female. 306 (82%) had a predominantly CaOx stone; 121 (40%) of these were female. With multivariate logistic regression, CaP stones were more likely to occur in females (OR 2.25, 95% CI 1.19-4.26), with decreasing age (OR per 10 year decrease in age = 1.42, 95% CI 1.15-1.75), with decreasing urine citrate (OR per 100 unit decrease = 1.20, 95% CI 1.06-1.35), with increasing pH (OR per 1 unit increase = 3.24, 95% CI 1.71-6.13), or increasing Ca24/Cr24 (OR per 50 unit increase = 1.26, 95% CI 1.03-1.55). No differences were found between the stone types for BMI, 24-h urine volume or phosphate.

Conclusion: Female sex, decreasing age, increasing urine pH, and decreasing urine citrate were associated with predominantly CaP stones. This knowledge can be used to help differentiate between patients forming CaP and CaOx stones, may give insight into the etiology of CaP stone formation, and may help guide treatment for those whose stone composition is not known.

	CaP (n=65)		CaOx (n=306)		p-value	
	mean	SD	mean	SD		
Age	years	45	13	54	14	<0.0001
pH		6.36	0.49	6.03	0.51	<0.0001
Ox	mg/day	32	10	38	15	0.0003
Cit	mg/day	495	287	616	303	0.003
SSCaP		1.79	1.10	1.25	0.98	<0.0001
SSUA		0.63	0.81	0.98	0.90	0.004
Cr	mg/day	1492	442	1639	434	0.01

Table 1. Univariate analysis of 24-h urine values between CaP and CaOx stone formers.

Development of a Ray Tracing Method for Modeling Shock Wave Focusing in a Lithotripter

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Introduction: Shock wave lithotripsy has been used since 1980 to treat kidney and ureteral stones. Newer generation machines have been developed with higher peak pressures and smaller focal zones. The lithotripter produces high amplitude acoustic pulses (or shock waves) that are weakly non-linear. The focus of this research is to outline a computational modeling strategy, to calculate the impact of changes in body composition on shock wave degradation and shock wave focus, which can potentially be performed in real time.

Materials & Methods: A novel method for modeling shock waves in a shock wave lithotripter is developed using a ray tracing and a realistic 3D CAD human model. The 3D CAD model is a validated model that has the ability to represent actual tissue and organ density and impedance. During wave transmission, every individual ray undergoes refraction when crossing a triangulated boundary between two adjacent tissues with different impedances. The transmission angle is uniquely defined for 2-manifold tissue objects. As shock waves are transmitted through tissue and along rays, a nonlinear distortion of each shock pulse along the ray is taken into account using a simplified one-dimensional approach.

Results: Preliminary simulation results are reported and reveal a shift of the focal point in the focal plane. In addition, one can simulate the impact of body size and composition on shock wave propagation and pressure. The impact of tissue density and acoustic impedance on the focus of the lithotripter was determined to have a 4mm deviation when compared to a homogenous model (figure 1). The impact of increasing the overall fat distance traversed by a sample shockwave by 4 cm results in a corresponding decrease in the amplitude at the focal point of 5%.

Conclusions: This novel ray tracing computational model for shock wave lithotripsy can calculate the impact of body habitus on the wave. The model has shown that the acoustic tissue qualities may impact the actual focal point of the lithotripter. The model can also calculate impact of variations in patient skin to stone distance on shock wave energy based on the thickness and acoustic qualities of the layers of tissue that the shock wave traverses.

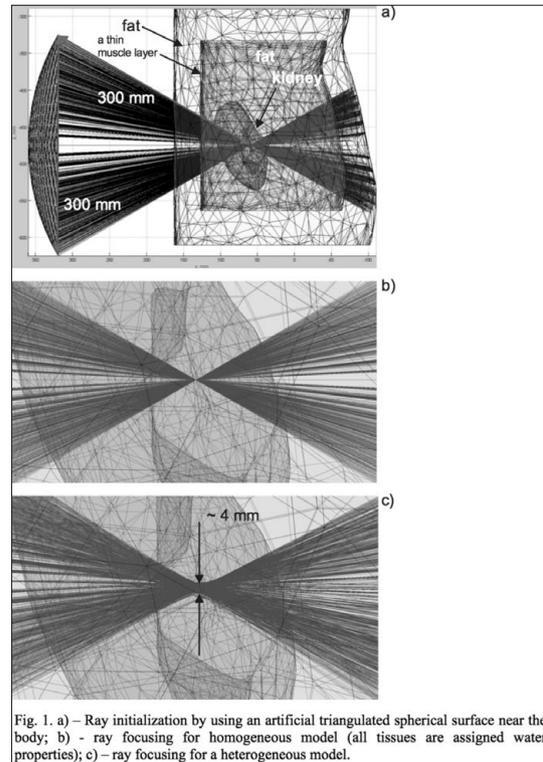


Fig. 1. a) – Ray initialization by using an artificial triangulated spherical surface near the body; b) – ray focusing for homogeneous model (all tissues are assigned water properties); c) – ray focusing for a heterogeneous model.

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Periureteral Density and Change in Serum Creatinine Predict Emergency Ureteroscopy Outcomes in Patients with Acute Symptomatic Ureterolithiasis
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Introduction: Patients that present to the emergency department with intractable symptoms from acute ureterolithiasis are admitted and administered a trial of medical expulsive therapy (MET). Failure of MET prompts surgical intervention. Definitive stone treatment is oftentimes deferred owing to concerns for diminished treatment efficacy and higher complication rates in the setting of acute ureteral inflammation. Pre-operative factors that may predict treatment success have not been clearly defined. We review our recent multi-institutional experience with emergency ureteroscopy (URS).

Materials & Methods: A retrospective review was performed of all patients that underwent inpatient URS from 2010 to 2015. Inclusion criteria were presentation to the Emergency Department with acute renal colic, age > 18, non-contrast CT (NCCT) with ureteral stone and no evidence of sepsis. Laboratory and radiographic data were analyzed. Statistical difference was assessed with Student's t-test.

Results: 187 of 223 patients (83.8%) were stone free. Two patients (0.8%) had an intraoperative complication (both with extravasation on retrograde pyelogram). Periureteral density (PUD) and rise in serum creatinine (Δ Cr) were statistically different between patients that were stone-free and those that were not (1.2 versus 19.9 HU, $p < 0.01$ and 0.20 versus 0.56 mg/dL, $p < 0.01$, respectively). Patients that received an alpha-blocker prior to surgery were more likely to have successful treatment (90% vs. 11%, $p < 0.01$). No difference in patient age, duration of pain prior to surgery, the number of visits to the emergency department or degree of leukocytosis was observed between those that were successfully treated and those that were not. Success rates were not different between surgeons with and without endourology fellowship training (84.7% vs. 83.2%, $p = 0.59$).

Conclusions: URS in the setting of acute renal colic for symptomatic ureterolithiasis is safe and effective. Treatment success does not appear to require advanced endourology training. Consideration of PUD and Δ Cr pre-operatively can facilitate identification of ideal candidates for definitive treatment.

Can Ultrasonography be Used to Guide the Diagnosis and Management of Nephrolithiasis?
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Introduction: Non-Contrast Computed Tomography (NCCT) has the highest sensitivity and specificity for detection of nephrolithiasis and the greatest accuracy for determination of stone size. Renal ultrasound (US) may have advantages over NCCT insofar as it is lower cost with no ionizing radiation. However, the ability to make judgments about endourologic intervention for stones based on US has not been proven. Herein we compare findings on NCCT and US which were obtained within 1 day of one another in order to evaluate the concordance between the two studies.

Materials & Methods: A retrospective review was conducted at three academic institutions of patients who were evaluated for flank pain with both renal US and NCCT from 2012-2015. Patients receiving both imaging modalities within 1 day were included. Imaging was obtained through both the emergency department and outpatient settings. Stone presence and size were reviewed and compared between imaging modalities. Stone size was determined by largest measured diameter. Stones were then grouped into 3 size categories (1-5 mm, 6-10 mm, and > 10 mm) based on NCCT measurement and compared with US. Statistical analysis was performed using 2-sided t-tests.

Results: 155 patients received an US and NCCT within a 1 day period and in 79 patients (51.0%), both US and CT identified a stone for size comparison. When comparing the average largest stone diameter for US (9.08 mm) vs. NCCT (6.92 mm), US overestimated stone size by 2.16 mm ($p < 0.001$). US overestimated stone size by 106.1% for stones 1-5 mm, 63.6% for stones 6-10 mm, and 27.3% for stones > 10 mm (Table 1).

Conclusions: Renal ultrasound significantly overestimated stone size when compared to Non-Contrast Computed Tomography. This was most pronounced in the evaluation of small (1-5 mm) and intermediate (6-10 mm) sized stones. While ultrasound offers a radiation free means of evaluating and monitoring nephrolithiasis, it may not always provide adequate information on stone size to correctly inform urologic management. The potential for systematic over-estimation of stone size with standard ultrasound techniques should be taken into consideration when evaluating treatment options.

NCCT Measured Stone Diameter (mm)	Average Diameter on NCCT (mm)	Average Diameter on US (mm)	Frequency US overestimate	Average US size overestimate (mm)
1-5 mm- n = 28	3.91	7.21	82.1% (23/28)	4.15 (106.1%)
5-10 mm- n = 38	6.98	8.90	52.6% (20/38)	4.44 (63.6%)
> 10 mm- n = 13	13.21	13.61	38.5% (5/13)	3.60 (27.3%)

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Transparenchymal Renal Surgery Decreases Kidney Function in Patients with Stones 4 cm and Stones in Multiple Locations
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Introduction: Percutaneous nephrolithotomy (PNL) is a transparenchymal procedure that leads to nephron loss during tract access, dilation and instrumentation. Previous studies have demonstrated no significant difference in renal function during uncomplicated PNL. These studies used the Modification of Diet in Renal Disease (MDRD) equation to estimate GFR. This equation is limited in its accuracy for patients with glomerular filtration rates (GFR) > 60 mL/min/1.73 m². The Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation provides an accurate estimation of renal function for patients with GFR both above and below 60. Here, we sought to examine factors that may influence changes in GFR as estimated by CKD-EPI.

Materials & Methods: The last 100 patients that underwent PNL at our institution were reviewed (2014-2015). Pre- and post-operative GFR was calculated based upon both the MDRD and CKD-EPI formulas. Clinical and radiographic parameters were assessed. Statistical difference was determined using Student's t-test.

Results: 100 patients were included in the study. When using MDRD, 76 of 100 patients were unable to have GFR difference detected due as their GFR exceeded 60 mL/min/1.73 m². Pre- and postoperative GFR was able to be compared with all patients using CKD-EPI. The average change in GFR for the entire cohort was +3.39 mL/min/1.73 m². Patients with stones in three or more locations had a significant decrease in GFR compared with those in one or two locations (-5.7 versus +5.5 mL/min/1.73 m², $p < 0.001$). Similarly, patients with stones larger than 4 cm had an average decrease in GFR, while GFR was noted to increase in patients with stones smaller than 4 cm (-4.1 versus +5.5 mL/min/1.73 m², $p = 0.009$). No significant postoperative difference in GFR was identified between those with CKD and those without (+5.4 versus +3.1 mL/min/1.73 m², $p = 0.49$).

Conclusions: Overall, there was no significant change in GFR among patients that underwent PNL. However, treatment of stones in multiple locations and treatment of larger stones results in a significant decrease in GFR.

Increasing Stone Complexity Does Not Affect Fluoroscopy Time in Percutaneous Nephrolithotomy
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Introduction: It has been previously suggested that increasing stone complexity is associated with increasing fluoroscopy time (FT) and radiation exposure to patient and OR staff. However, with widespread adoption of the as low as reasonably achievable (ALARA) radiation protocols, radiation doses have decreased. We have adopted ALARA strategies and sought to assess whether stone complexity is still associated with increased intraoperative absorbed radiation dose.

Materials & Methods: We retrospectively reviewed records of 261 consecutive patients undergoing PCNL between February 2007 and October 2015. Of these, 203 had both preoperative CT for accurate staging and full intraoperative fluoroscopy and radiation dosimetry data available. Stone complexity was assessed using Guy's stone score (GSS), which has undergone prior internal and external validity testing. Correlation between FT, radiation exposure, and GSS was assessed in a univariate and multivariate fashion, including parameters such as age, sex, BMI, and number of accesses.

Results: Overall mean FT was 3.69 minutes (SD 2.77). Overall mean GSS was 2.5 (SD 1). There was a statistically significant correlation between operative time and FT ($r = 0.34$, $p < 0.0001$). There was a trend towards increasing operative time with increasing GSS ($r = 0.12$, $p = 0.08$), but no there was no statistically significant correlation. In addition, there was no correlation between FT and GSS ($r = 0.04$, $p = 0.55$). There was also no correlation between mGy and GSS ($r = 0.11$, $p = 0.13$). On multivariable regression, accounting for gender, BMI, age, and singular versus multiple accesses, there was no significant correlation between stone complexity and FT ($p = 0.893$).

Conclusions: In the setting of conscious efforts to reduce intraoperative radiation exposure, increasing stone complexity did not correlate with fluoroscopy time or radiation exposure on univariate or multivariate analysis. Thus, complex stones may be treated without concern of significant additional radiation risks to the patient or operating room staff. However, the routine practice of obtaining a mapping pyelogram, a fluoroscopic antegrade stent placement and a chest fluoroscopy, all of which likely cause similar amount of radiation to each patient, could potentially have diluted out the differences in radiation incurred by difficulty in obtaining access.

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HoLEP in Patients with Low Risk Prostate Cancer is Safe and Effective

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Introduction: When a man with otherwise surveillance-appropriate low risk prostate cancer has significantly bothersome BPH in a large gland, this typically tips the scales in favor of treatment with standard of care, either radical prostatectomy or radiation therapy. However this presumes the prostate cancer is the more threatening of his coexisting conditions. Incidentally discovered (T1a/b) prostate cancer following Holmium Laser Enucleation of the Prostate (HoLEP) is a well known phenomenon. However, performing HoLEP in the setting of a prostate cancer harboring gland has not yet been described. Herein, we describe outcomes of HoLEP in a select cohort of patients with significant lower urinary symptoms, and known low risk prostate cancer.

Materials & Methods: Data were collected retrospectively on patients undergoing HoLEP by a single surgeon. A select group of well informed patients with large symptomatic glands and low risk cancer were carefully counseled that HoLEP was an option to address the obstructive BPH, would unpredictably remove the cancer (all, part, or none), emphasizing they were not undergoing a cancer operation, and that HoLEP would be followed by continued surveillance. Pre- and post-operative clinical factors, and operative and hospital stay data were collected.

Results: In total, 7 men were included. All men had Gleason 3+3 cancer in at most 20% of at most 3 cores on biopsy. Other preoperative characteristics are described in Table 1. All men tolerated the procedure well without intraoperative complications. The mean amount of tissue removed was 48.8g. Mean pre- to post-op hematocrit drop was 3.8 points; no patients required transfusion or reoperation. Median length of hospital stay was 24.5 hours, and median length of catheterization was 19 hours. On final pathology, 3 of 7 of patients had cancer in the specimen, all of which were Gleason 3+3. Postoperatively patients recovered well. At postoperative visits, all flow rates improved, PVR improved or remained appropriately low, and PSA significantly decreased in all patients (Table 1). By the time of most recent follow-up, no patient had developed stricture, bladder neck contracture, urge or stress incontinence, or required reoperation. Median time from surgery to last follow-up was 4 months (range 4-24 months). Notably, 2 patients had prostate MRI within 2 years of HoLEP, neither of which showed suspicion for prostate cancer.

Conclusions: We have offered HoLEP judiciously to select patients on surveillance for low risk prostate cancer and significant symptomatic BPH, a complex and increasingly common scenario, with acceptable short term outcomes. Further investigations into long-term cancer-specific outcomes, as well as strategies for continued surveillance in these patients, will be crucial in order to further evaluate and refine this new approach.

Pre- and Post-operative Characteristics	
Factor	
Age in Years (median, [range])	64 [54-72]
Preop PSA (median, [range])	5.7 [4.1-10.9]
Post PSA Nadir (median, [range])	1.3 [0.7-2.6]
Preop TRUS Size (mean, [range])	94.5 [37-220]
Preop PVR (mean, [range])	176 [0-600]
Postop PVR (mean, [range])	26 [0-78]
Preop Flow Rate (mean, [range])	8.6 [1-11]
Postop Flow Rate (mean, [range])	17 [10-26]
Preop Retention Requiring Foley or CIC (n)	5

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Robotic Urethrosesal Anastomotic Simulator: Improvements to a Validated Model

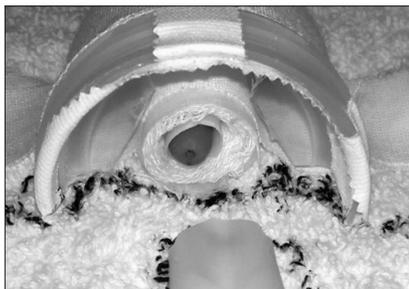
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Introduction: Resident training is shifting with the widespread use of robotics. Validated simulation tools must continually be improved in order to provide the most realistic training possible. Here we assess content and face validity of a modification to a urethrosesal anastomotic (UVA) simulator with established construct validity.

Materials & Methods: A UVA simulator was constructed with 1 inch and ½ inch penrose drains, surgical tape, a towel, and a 20 Fr council tip catheter. This simulator previously underwent face, content, and construct validity by our group. The modified simulator added a pubic arch (bisected specimen cup), and periurethral tissue (gauze and surgical tape wrapped around the ½ inch penrose). Residents completed both the unmodified, and subsequently the modified version of our UVA with a running Van Velthoven anastomosis using the daVinci Si robot. Participants completed a 5 point Likert scale survey assessing the usefulness, anatomic realism, and surgical steps for each model. Scores were compared using t-tests.

Results: 7 residents completed both models. Excluding the author, 5 completed the post-test survey. The mean anatomic realism was rated 3.2 vs. 4.4 (p = 0.035), surgical steps were rated 3.4 vs. 4.4 (p = 0.017), and usefulness was rated 3.8 vs. 4.6 (p = 0.008) for the unmodified and modified model respectively.

Conclusions: A simple, low cost, modification to a validated vesicourethral simulator provides significant improvements in usefulness, anatomic realism, and simulation of surgical steps.



P18

Tunica Vaginalis Flap for the Repair of Ruptured Testis

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Introduction: The standard management of testicular rupture is debridement of devitalized tissue and re-approximation of the tunica albuginea. In the setting of a large defect, primary closure may not be feasible without excision of viable testicular tissue. We describe our experience with a tunica vaginalis vascularized graft for coverage in the setting of a large defect in four patients.

Materials & Methods: In 4 patients, the defect in the tunica albuginea was too large for primary closure without debridement of viable testicular tissue. A vascularized tunica vaginalis graft was used to cover the defect, without debriding viable tissue. We review these 4 cases, 3 traumatic and 1 iatrogenic, of testicular rupture in adolescent males, all of whom had postoperative follow-up with scrotal ultrasound and/or physical examination.

Results: We present a series of four patients with testicular rupture with a large defect. In 3 patients, the cause of rupture was traumatic, in the 4th, it was iatrogenic. Intraoperative assessment in all 4 cases revealed a defect too large for primary closure without debridement of viable testicular tissue. In order to cover the defect, a vascularized tunica vaginalis graft was used in all patients. A viable testis with good flow and volume of 80% or greater than that of the contralateral testis on ultrasound was noted on follow up in 2 cases (Table 1). Two of the four patients did not follow-up for post-operative ultrasound evaluation, one of which did not have contralateral testis. Post-operative physical exam revealed normal appearance in 75% of patients, but one had a previously small, undescended testis, therefore was noted to have a small testis in good position on the affected side.

Conclusions: In the case of testicular rupture associated with large defects, the use of vascularized tunica vaginalis graft helps preserve testicular volume and normal physical appearance. This approach should be considered in cases of a large defect, especially with any compromise or absence of contralateral testis.

Table 1. Post-operative physical exam and ultrasound characteristics

Patient	Physical exam	Right testis	Left testis	US - Flow/scar
1	Normal appearance	4.5 x 1.9 x 3.0 (13.4 mL)	4.4 x 2.1 x 2.9 (14.0 mL)	Good flow/scar in fracture site 13 months postop
2	Normal appearance	4.5 x 2.5 x 2.6 (13.6 mL)	3.8 x 2.8 x 2.1 (11.7 mL)*	Normal flow - 2.5 months postop
3	Same size on physical examination and orchidometer assessment - 8 mos postop	No postop US performed	No postop US performed	N/A
4	Small testis in good position. Prior history of small undescended testis - 7 mos postop	Not present	No postop US performed	N/A

P19

So Long, Solo Urologists: Trends from 2014 AUA Census Data

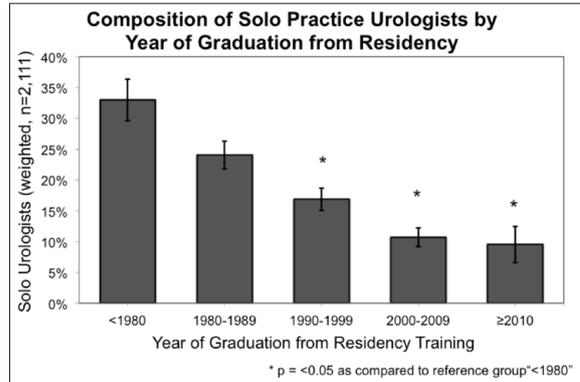
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Introduction: The rapidly changing landscape of health care in the United States has been associated with changes in practice structure among physicians nationwide. We analyzed the 2014 American Urological Association (AUA) Census data to assess the hypothesis that solo practitioners are a shrinking demographic in Urology.

Materials & Methods: We obtained data from the de-identified 2014 AUA Census Public Use Microdata File after receiving institutional review board exemption. This Census included questions regarding practice type thus allowing for a dichotomization of the study cohort into Solo or non-Solo Practice among urologists. We evaluated the study cohort with descriptive analyses as well as multivariable logistic regression models to assess for characteristics predictive of being a solo practitioner; we assessed explanatory variables including year of training, gender, race, geographic location of practice site and completion of fellowship training. Our analyses incorporated survey weights, which allow for a nationally representative estimation.

Results: We found that the year of completion of urologic residency training was highly predictive of solo practice ($p < 0.0001$). There was a progressive decline in solo practice from 33% among urologists completing training prior to 1980 down to 9.5% among those completing training 2010 (see Figure). Additional independent predictors of solo practice included not pursuing post-graduate fellowship training (OR 2.7, $p < 0.0001$) as well as practice in the South Atlantic (OR 2.36, $p = 0.01$), South Central (OR 2.05, $p = 0.036$), and Western (OR 2.22, $p = 0.02$), versus practice in New England. We did not find that race or ethnicity was associated with practice type.

Conclusions: The findings of the current study suggest that the urologic workforce is progressively shifting away from solo practice. Possible reasons include the increasing regulations and standards mandated by the government, rising numbers of integrated health care systems, and changes in reimbursement patterns. Future work is warranted to clarify the relationship between health care changes and the practice of urology.



P20

Dietary Zinc Intake and Male Reproductive Function in Young Men

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Introduction: Zinc is an essential mineral obtained solely from dietary intake and is involved in the activity of over 200 enzymes in the human body. Zinc is particularly important for spermatogenesis: it facilitates DNA replication, stabilizes chromatin, and regulates steroid receptor expression. Zinc concentration is very high in prostatic secretions and seminal plasma, and alterations in these concentrations have been associated with changes in semen parameters in men. The effect of dietary zinc intake on global testicular function, however, has not been reported in humans. We, therefore, sought to examine whether zinc intake is associated with reproductive hormones and semen parameters in young men.

Materials & Methods: Healthy male volunteers ages 18-22 ($n = 189$) recruited in 2009-2010 completed a validated 131-item food frequency questionnaire and provided serum and semen samples. Nutrient intakes were estimated by summing the nutrient contribution of all food and supplement items reported in the questionnaire. Serum reproductive hormones were measured using standard assays. Semen analyses were performed according to WHO guidelines. Linear regression was used to analyze the relation between zinc intake (in quartiles) and reproductive hormones and semen quality parameters adjusting for total calorie intake, body mass index, smoking status, physical activity, meat and dairy intake, overall dietary patterns, abstinence time (for semen parameters only), and time of blood sample collection (for serum samples only).

Results: Zinc intake was inversely associated with serum concentrations of sex hormone binding globulin (SHBG) (Table 1). On average, men in the highest quartile of zinc intake had SHBG levels that were 32% lower than men in the lowest quartile of intake (26.3 vs. 34.4 nmol/L, p for comparison = 0.03). Men in the highest quartile of zinc intake also had significantly lower concentrations of inhibin B and total testosterone in calorie-adjusted analyses compared to men in the lowest quartile of intake; however after multivariate adjustment, these associations did not reach statistical significance (p for trend across quartiles = 0.07 and 0.06, respectively). Zinc intake was not significantly associated with other reproductive hormones or semen parameters (Table 2).

Conclusions: Higher dietary zinc intake was associated with lower serum levels of SHBG and possibly lower levels of inhibin B and testosterone in healthy, young men. Zinc intake was not associated with any of the examined semen quality parameters. The testosterone findings should be interpreted with caution as we did not observe any association between zinc intake and calculated free testosterone, suggesting that differences in total testosterone could be solely attributable to the differences in SHBG. The inverse associations we observed between zinc intake and serum reproductive hormones may reflect altered function of zinc-containing enzymes involved in the regulation of steroid receptors and oxidative stress.

Table 1. Association between zinc consumption and hormone levels (energy adjusted value (95% CI)).

	Q1	Q2	Q3	Q4	p value
Zinc Intake (mean mg/d (SD))	9.64 (2.34)	15.42 (1.11)	20.64 (2.15)	37.26 (16.21)	
FSH (IU/L)	2.76 (2.26-3.27)	2.65 (2.23-3.08)	2.73 (2.30-3.16)	3.31 (2.82-3.81)	0.080
Inhibin B (pg/mL)	211.4 (190.1-232.7)	197.1 (179.6-215.2)	195.3 (177.3-213.4)	176.0 (155.1-196.9)	0.041
LH (IU/L)	3.92 (3.43-4.42)	3.51 (3.09-3.92)	3.67 (3.25-4.08)	3.73 (3.25-4.22)	0.937
Testosterone (nmol/L)	22.3 (19.9-24.7)	20.5 (18.5-22.5)	20.7 (18.7-22.7)	18.1 (15.7-20.4)	0.029
SHBG (nmol/L)	34.4 (30.3-38.5)	30.9 (27.4-34.3)	30.3 (26.8-33.7)	26.0 (22.0-30.0)	0.012
Free testosterone (nmol/L)	0.5 (0.4-0.5)	0.5 (0.4-0.5)	0.5 (0.4-0.5)	0.5 (0.4-0.5)	0.333
Estradiol (pmol/L)	94.7 (85.9-103.4)	95.3 (87.8-102.7)	91.2 (83.8-98.6)	83.9 (75.3-92.4)	0.069

Table 2. Zinc intake and semen quality parameters (energy adjusted mean (95% CI))

	Q1	Q2	Q3	Q4	p value
Zinc Intake (mean mg/d (SD))	9.64 (2.34)	15.42 (1.11)	20.64 (2.15)	37.26 (16.21)	
Abstinence time (hr (SD))	102.23 (106.3)	90.42 (68.37)	82.28 (38.99)	92.77 (65.65)	0.834
Concentration (10 ⁶ /ml)	71.7 (51.6-91.7)	66.6 (49.6-83.6)	76.5 (59.5-93.4)	56.0 (36.4-75.6)	0.265
Total Motility (% motile A+B+C)	62.0 (57.3-66.8)	63.0 (59.0-67.1)	64.9 (60.8-68.9)	61.1 (56.4-65.7)	0.598
Progressive Motility (% motile A+B)	57.3 (52.3-62.4)	58.7 (54.4-63.0)	60.6 (56.3-64.9)	56.9 (51.9-61.9)	0.698
Normal Morphology (%)	8.2 (6.6-9.8)	8.5 (7.1-9.8)	9.0 (7.6-10.3)	8.8 (7.3-10.4)	0.666

P21

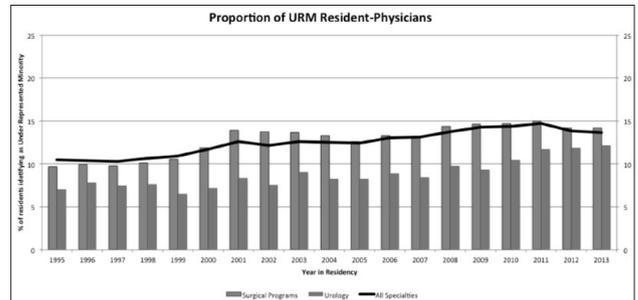
The Evolution of Racial and Ethnic Diversity in U.S. Urology Residency Programs
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Introduction: The U.S is becoming increasingly diverse. Underrepresented minorities (URMs), defined as African-American, Hispanic, and other (Native American and multi-racial) currently constitute 32.7% of the population and are predicted to exceed 50% by 2060. Increased racial/ethnic diversity in medicine has been associated with positive health outcomes attributed to increased access to healthcare for underserved communities, improved anticipation of patients needs, and acceleration of research. Our aim was to examine trends in racial/ethnic diversity among urology training programs in the U.S.

Materials & Methods: We obtained data from the US graduate medical education reports published in the Journal of the American Medical Association annually from 1995 to 2013. In addition, we queried the 2014 AUA Census Public Microdata file to evaluate the racial and ethnic makeup of the current urologic work force following residency training. We used descriptive statistics to evaluate trends in racial/ethnic diversity by calculating the change in the proportion of trainees from underrepresented groups over time, and we used these data to compare urology to other surgical and medical residencies. A logistic regression model was developed to evaluate the relationship between URM and practice in an academic setting.

Results: We found less racial/ethnic diversity among urology trainees over the past 20 years compared to other specialties. Although the proportion of URMs in urology increased from 7.03% in 1995 to 12.1% in 2013 (Figure 1), urology consistently trailed behind other surgical and medical specialties. The gap in URM representation did narrow, however, by the end of the study. Our adjusted model showed that URM graduates of urology training programs were far less likely to work in an academic practice (adjusted OR: 0.18, 95% CI: 0.08 to 0.42, p < 0.0001).

Conclusions: While some gains have been made since 1990 concerning racial/ethnic diversity in Urology, there continues to be fewer URMs in urology residency programs compared to other disciplines. This disparity may be aggravated by the absence of mentorship due to the limited number of URM urologists in academics. With the anticipated changes in the demographics of the U.S, further investigation is needed to understand the barriers for URMs to enter the field of Urology.



P22

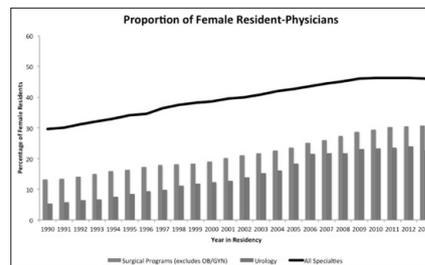
Trends in the Gender Distribution of U.S. Urology Residency Programs Compared to Other Surgical Specialties
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Introduction: In the United States, urology, like many other surgical specialties, has historically been a male dominated field. However, this is quickly changing. In the last quarter century, multiple medical and surgical specialties have observed a rise in women within the field of medicine. Thus, we set out to examine this trend within the field of urology.

Materials & Methods: Applicants, trainees, and graduates of urology residency programs were stratified by gender. Data was obtained from the American Urological Association (AUA) match statistics from 1996 to 2015 for applicants, annual U.S. graduate medical education reports published in the Journal of the American Medical Association from 1990 to 2013 for trainees, and the 2014 AUA Census Public Microdata file for graduates. We evaluated gender trends using descriptive statistics by calculating the change in the proportion of females over time for each phase of training. Among graduates, crude and adjusted logistic regression models were developed to evaluate the relationship between gender and likelihood of entering fellowship training and academic practice.

Results: The proportion of female applicants in urology increased between 1996 and 2015 (13.6% to 25.9%), but the overall match rate for males (68%) and females (67%) were similar when averaged over the study period (p = 0.58). Among trainees, the proportion of female urology residents rose from 5.3% to 22.7%, for a relative percent increase of 429%. Excluding obstetrics and gynecology, urology had the greatest annual percent increase in female trainees when compared to all other surgical specialties (Figure 1). Among graduates, women had a higher likelihood of entering fellowships and practice in academic settings when compared to men (ORs 2.10 and 1.77, respectively; p values < 0.001 and < 0.012).

Conclusions: While urology remains a male dominated field, there has been a dramatic rise in the proportion of women over the last 25 years. This trend may in part be explained by a disproportionate number of women entering fellowships and academic practice, allowing them to serve as role models and mentors for female trainees. Further investigation should be directed at determining how this change in the demographic composition of the urologic workforce will continue to impact the delivery of health care in the United States.



P23

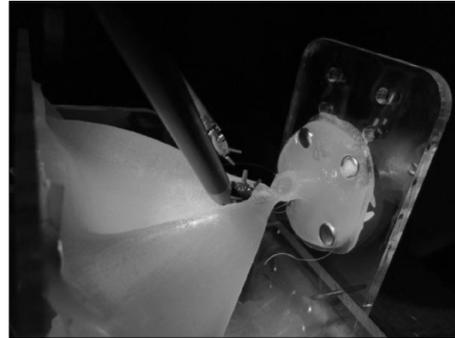
Development and Validation of an Ex Vivo Trainer for Robotic Vesicourethral Anastomosis
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Introduction: The vesicourethral anastomosis (VUA) in robotic prostatectomy is a challenging task for novices due to delicate tissues and difficult suturing angles. Though digital simulation is useful for developing certain robotic skills, there are no viable digital models for anastomotic suturing. We developed and validated a 3D-printed model of the VUA for ex vivo training.

Materials & Methods: *VUA Model:* A dome-shaped shell (12 × 12 × 5.5 cm) with a tapered opening for the bladder neck (2 cm) and urethral cylinder (0.5 cm thick, 1 cm protrusion, on a 5 cm base) were developed. The models were molded with Smooth-On Ecoflex Supersoft two-part silicone using 2-part inverse ABS plastic molds designed on SolidWorks and printed with the Stratasys Mojo Desktop 3D printer. The bladder shell and urethra were attached to a rigid but adjustable acrylic/polycarbonate frame (Figure). *Subjects:* Ten junior surgical residents (PGY 1-3) naive to robotic surgery were enrolled. Five completed a curriculum on the da Vinci simulator and five did not, matched by PGY. Four faculty fellowship-trained in robotic uro-oncology were enrolled. All subjects attempted a VUA on the model. Non-simulator trained subjects were given a 10-minute practice period to familiarize with the robotic controls. Percentage completion of the anastomosis within 15 minutes was recorded. Integrity of the anastomosis was graded (excellent, moderate, or poor). Face (realism) and content (training utility) validity were assessed via 1-10 scoring by subjects. Construct validity (differentiation in performance) was assessed by comparison of scores between groups.

Results: Mean (range) percentage completion of the anastomosis was 20% (10%-30%), 54% (40%-70%), and 96% (85%-100%) by non-simulator-trained, simulator-trained, and expert surgeons, respectively (p < 0.05). Integrity was similar between groups with one "poor" grade in the non-simulator-trained group. Face validity was rated 8 by all expert surgeons. Content validity was rated 10 by all subjects.

Conclusions: We demonstrated face, content, and construct validity of a 3D-printed model for the VUA. Digital simulation significantly improved trainees' performance on the ex vivo model. While digital simulation is likely to become more sophisticated, ex vivo models can be realistic and useful training tools for novice robotic surgeons prior to in vivo performance.



P24

Mary E Child MacGregor and Her Mentorship of Dr. Pickett: Paving the Way for Women in Urology
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Introduction: The first female American Urologist was Dr. Mary E. Childs MacGregor. At a time when American society had not fully accepted women into advanced professions, Dr. MacGregor persevered and paved the way for women in Urology.

Materials & Methods: Historical and contemporary articles highlighting the role of women in Urology, and a biographical article written about Dr. MacGregor by Dr. Elisabeth Pickett (1958) were examined.

Results: Dr. MacGregor trained in urology at the New York Infirmary in 1928. She ultimately went on to found the urology service and became the first Chair of Urology at the same institution. She later contributed to opening fellowships to women in Urology, such as Dr. Pickett, whom she greatly influenced. Dr. Pickett trained as a general surgery resident at the New York Infirmary from 1946 until 1948, and later became the first board certified female Urologist in 1962. Given the increasing numbers of women in medicine, in 1954 the AUA approved opening of membership to women, but it took 21 more years until the first female was elected to AUA membership (Mary Louise Gannon in 1975). Recent studies show that the proportion of women in urology has increased from less than 0.5% in 1981 to 10%, and 33% of students matching in urology are now female.

Conclusions: As the numbers of female urologists and women in leadership positions in the field are increasing, reflection on the origins of women in urology is needed. Dr. MacGregor merits recognition for her legacy in introducing women to the field of Urology.

P25

Can a Stone Obstructing the Ureter Cease to Cause Pain?
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Introduction: Follow-up imaging is recommended as follow up for patients who present to the emergency department with ureteral stones and colic, but it often omitted if patients report cessation of pain. The purpose of this study was to evaluate how often a patient's ureteral colic will cease despite still having a stone obstructing the ureter.

Materials & Methods: Thirty-six patients evaluated in an emergency department for ureteral colic and diagnosed with an obstructing ureteral stone who subsequently had follow-up in the urology clinic were retrospective evaluated. Patients who described the cessation of pain 72 hours prior to their office visit and who had follow up imaging were included in the study.

Results: Thirty-six (36) patients were included in the study. Mean patient age was 44.7 years (SD 15.7), gender distribution was 19.4% female: 80.6% male, and mean time between visits was 40.1 days (SD 41.6). All patients (100%) reported having no pain for at least 72 hours prior to follow-up appointment, while 31% still demonstrated an obstructing ureteral stone on follow up imaging. Mean stone axial and coronal diameter was not different for patients who had passed their stones versus those who had not (axial diameter = 3.5 mm versus 3.8 mm respectively, coronal diameter = 4.1 mm versus 4.6 mm, p = NS for both).

Conclusions: In this small pilot study, nearly 1/3 of patients with ureteral stones whose pain completely ceased still had obstructing stones lodged in the ureter. We feel that cessation of pain alone does not demonstrated proof of stone passage and recommend some form of follow-up imaging for these patients unless they observe stone passage per urethra.

P26

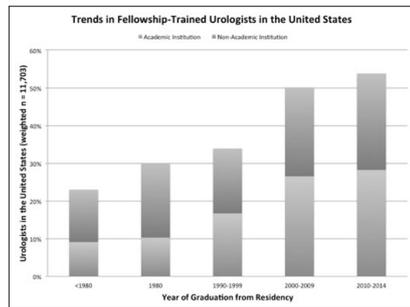
The Costs and Benefits of Fellowship Training: Analysis of the 2014 AUA Census
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Introduction: For urology residents, pursuing fellowship training requires making early decisions that can have a dramatic impact on long-term job satisfaction. Therefore, it is important to characterize the clinical profiles of fellowship-trained (FT) and non-fellowship-trained (NFT) urologists.

Materials & Methods: We performed a weighted analysis of the 2014 AUA Annual Census Dataset. The cohort was divided into FT and NFT urologists and further divided into 5 groups based on the year in which they graduated from residency (< 1980, 1980s, 1990s, 2000s, 2010-2014). We evaluated, with descriptive statistics and regression analysis, outcomes including: primary practice setting, clinical hours, non-clinical hours, total work hours, number of patient visits, region of employment, and rurality of practice location.

Results: The survey was completed by 2,204 urologists representing 11,703 practicing urologists in the U.S. The percentage of FT urologists has increased with every decade of residency graduation with over 50% of graduates after 2010 entering fellowship training; approximately half of FT urologists practice in academic institutions (Figure). Compared to NFT, FT urologists work equal clinical hours (45.3 vs. 44.4, $p = 0.320$), see fewer patients per week (87.2 vs. 98.1, $p = 0.002$), have longer non-clinical hours (10.9 vs. 6.8, $p < 0.001$) and longer total hours (56.9 vs. 52.0, $p < 0.001$). FT urologists are less likely to practice in a rural setting (OR 0.38, $p = 0.037$), but more likely to practice in New England (OR 1.77, $p = 0.012$).

Conclusions: Urology residents are increasingly pursuing fellowships with over half of residents electing this option. Approximately half of FT urologists practice in a non-academic setting and they have a modestly smaller effort in patient care. Additional studies are necessary to clarify the impact of different types of fellowship training and the potential impact of changes in health care on the clinical profile of FT urologists.



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Are Men and Women Really that Different? An Analysis of Gender Differences among Urological Providers in the AUA Census
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 Dartmouth Hitchcock Medical Center, Lebanon, NH

Introduction: The proportion of female urologists in training has steadily increased in recent years, reflecting cultural changes in the discipline and surgery overall. Background and practice differences between male and female urologists, however, are not well characterized. In this study, we sought to characterize the backgrounds and practices of female urologists and compare them with male peers within the 2014 AUA Census, a large representative sample of practicing urologists in the United States.

Materials & Methods: Using 2014 AUA Census data, providers were stratified based on gender. Bivariate analysis was used to assess differences in clinical and practice characteristics. Multivariable analysis was conducted using *a priori* variables hypothesized to differ by gender. In all analyses, post-stratification weights provided with the Census data were used to calculate national estimates (SAS 9.4, Cary, NC).

Results: There were 2204 survey respondents representing 11,703 practicing urologists. Almost 8% were female. There were no differences in race, country of origin, or practice setting (metropolitan vs. rural) based on gender. Female urologists had more often completed a fellowship (55% vs. 37%, $p = 0.0003$) and had fewer years in practice (68% practicing < 10 years vs. 28% of men, $p < 0.0001$). Female urologists reported treating a lower proportion of male patients (< 25% male patients reported in 23% of women vs. 4% of men, $p < 0.0001$). Women more frequently reported specializing in Female Pelvic Reconstruction and Transplant/Laparoscopic (24% vs. 3%, $p < 0.0001$ and 12% vs. 5%, $p = 0.0044$, respectively). Men more often reported practicing General Urology (65% vs. 45%, $p < 0.0001$) and Male Sexual Health/Reproduction (5.7% vs. 5.6%, $p < 0.0001$). When analyzing clinic hours per week, women were more often noted to work < 40 hours ($p = 0.0088$), however total work hours were not different between men and women. There was no difference in other practice characteristics such as practice setting and ownership interests. On multivariable logistic regression, female gender was associated with fewer years in practice, female pelvic/reconstruction or transplant/laparoscopic as a specialty area, and lower proportion of male patients seen ($p < 0.05$). Female gender was not associated with fewer work hours on multivariable analysis.

Conclusions: While female urologists are growing in proportion, they still represent a small percentage of active providers. As female physicians increasingly enter urology and older urologists retire, this proportion will certainly grow. While we report expected differences in practice based on gender (e.g. focus in pelvic medicine), it is notable that female urologists are working equal hours to their male peers. As our field evolves, further study of training and practice differences will help us understand how to improve the diversity of our providers and ensure provider satisfaction over time.

P28

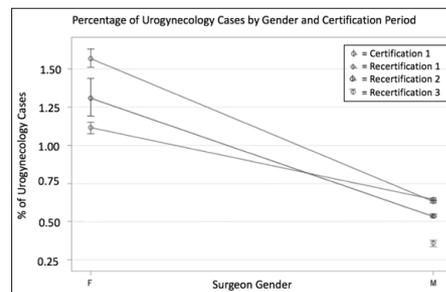
What's Gender Got to Do With It? Differences in the Proportion of Traditionally Female Cases Performed By General Urologists of Each Gender
 Katherine Rotker, MD¹, Sarah Iosifescu, BSc², Simone Thavaseelan, MD¹, Kathleen Hwang, MD¹
¹Brown University, Providence, RI, ²Alpert Medical School, Providence, RI

Introduction: To examine surgical case volume characteristics in certifying urologists associated with common female urologic procedures to evaluate practice patterns, given the long-standing understanding but unproven hypothesis that non-fellowship trained female general urologists perform more common female urologic procedures compared to their equally trained male general urology counterparts.

Materials & Methods: Case log data from certifying and recertifying urologists from 2000 to 2015 was obtained from the American Board of Urology. 37 CPT codes were chosen to represent traditionally urogynecologic cases. Logistic regression analysis models were used to determine the percentage of total CPT codes logged during certification period made up by traditionally urogynecology cases. Male and female non-fellowship trained, self-described general urologists were compared.

Results: The case logs of 4,032 non-fellowship trained, general urologists were reviewed from 2000-2015, 297 of whom were female and 3,735 of whom were male. Urogynecology cases made up 1.27% of the total CPT codes logged by female urologist and 0.59% of those codes logged by male urologists ($p < 0.001$). In fact, females performed 2.2 times more urogynecology cases than their male counterparts ($p < 0.001$). When sorted by certification period, within each certification period, urogynecology cases represented a statistically significantly higher percentage of the total codes logged for females than for males. For the 198 females undergoing initial certification, 1.11% of their logged codes were urogynecologic compared to 0.65% in the 1,133 males undergoing initial certification. Urogynecology cases represented 1.57% of codes logged by the 98 females in their initial recertification and 1.31% of those logged by the 30 males in their second recertification. For their 1,479 male counterparts performing initial recertification and 1,472 performing second recertification, the percentages were statistically significantly lower at 0.63% and 0.54% respectively ($p < 0.001$). For the 255 male surgeons recertifying for the third time, 0.36% of codes logged were urogynecologic. No females were in their third recertification period. When the data was evaluated by age of surgeon, the percentage of urogynecology cases increased with age for female general urologists and decreased with age for male general urologists. Trends were also seen by region, practice size and practice type.

Conclusions: Traditional urogynecology cases represented a significantly greater percentage of the total cases logged by certifying non-fellowship trained female general urologists when compared to their non-fellowship trained, generalist male colleagues. Although this supports a belief that patient populations differ for male and female general urologists, the percentage of total urogynecologic cases performed by both is very small and may not be significant enough to sway career decisions.



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Tobias Goodman and the New England Origins of Ureteroscopy
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Introduction: Ureteroscopy is one of the most commonly performed procedures in current urologic practice, although rigid ureteroscopy was unheard of until the very recent past. Its origins highlight the creative spark that is critical to advance in medical science and has direct New England ties. Although the first documented "ureteroscopy" is attributed to Hugh Hampton Young who performed inadvertent endoscopy of the ureter in a 2 month old child with posterior urethral valves, this 1929 report was essentially relegated to anecdote that lacked any practical application. However, 50 years later in a small New England town, diagnostic and therapeutic ureteroscopy were born with the first planned rigid ureteroscopy and the introduction of ureteroscopic-guided intervention.

Materials & Methods: A comprehensive search of Medline was undertaken to assess all published articles describing ureteroscopy prior to 1980. References of identified papers were also reviewed to identify the earliest published accounts of rigid ureteroscopy. Upon identifying the initial reported ureteroscopy, the author was interviewed to better understand the context surrounding the inception of ureteroscopy.

Results: The first report of planned rigid ureteroscopy was in 1977. The procedure was performed by Dr. Tobias M. Goodman at Westerly Hospital. Dr. Goodman attended Browne and Nichols school in Cambridge, MA, then matriculated at Harvard College where he was an accomplished scholar in Classic Languages. He was in fact selected to deliver the Latin Oration at his 1962 commencement. After graduating from residency at Boston Medical Center, he started solo practice in Westerly, Rhode Island. At the time, blind stone-basketting was standard practice, but he recoils in unease with the imprecise nature of blind manipulation. Thirty years prior to the AUA recommendation against blind-basketting, he proposed to several patients an improved, directly visualized approach to management of ureteral pathology. With a reputation as a physician who "knew how to stay out of trouble," his patients eagerly agreed. Using a pediatric cystoscope with a standard bridge and an 11Fr sheath, he accessed, visualized and fulgurated a distal ureteral tumor. He developed techniques for diagnostic ureteroscopy and stone extraction, publishing the first series of rigid ureteroscopy in 1977. He subsequently developed patents for a ureteroscope, a 3-way endoscopic valve and Uroshiol for treatment of bladder cancer. He remained in Westerly for his entire career, and since retirement has authored 2 non-medical books: *Out of the Attic and Ancient purple*. He still resides in Westerly, RI where he is a guest columnist for the Westerly Sun.

Conclusions: Dr. Tobias Goodman is a urologic pioneer who serves as an example of the creative thinking that has allowed the dramatic progress we continue to enjoy. Dr. Goodman's contributions point to the very beginning of endourology, years before the term had even been coined.

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Ureteroscopic Laser Endopyelotomy: A Minimally Invasive Option for Short-Segment UPJ Stricture Following Pediatric Pyeloplasty
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Introduction: Dismembered pyeloplasty by open, robotic, or laparoscopic approaches is a highly effective procedure for treatment of ureteropelvic junction (UPJ) obstruction in children. Recurrent or persistent UPJ obstruction following pyeloplasty is an uncommon event, for which reoperative pyeloplasty is generally considered the gold standard treatment. We reviewed our experience with retrograde ureteroscopic laser endopyelotomy as a minimally invasive treatment for failed pediatric dismembered pyeloplasty in selected patients.

Materials & Methods: We identified all pediatric patients undergoing retrograde ureteroscopic laser endopyelotomy for treatment of failed dismembered pyeloplasty at our institution between January 2006 and June 2015. Patient demographic, operative, radiographic, and clinical data were abstracted from the medical record. Successful endopyelotomy was defined by absence of clinical or radiographic evidence of recurrent or persistent obstruction at last follow up with a minimum duration of 12 months follow up after endopyelotomy.

Results: Five patients who underwent retrograde ureteroscopic holmium laser endopyelotomy met inclusion criteria (Table). The initial pyeloplasty was performed by an open (1), robotic (3), or laparoscopic (1) approach. The primary pyeloplasty was performed at a median age of 17 months (IQR = 65). The median interval between primary pyeloplasty and laser endopyelotomy was 11 months (IQR = 33). Endopyelotomy was performed by deep posteriolateral laser incision to the level of peripelvic fat followed by balloon dilation to 12Fr in all patients. An internalized ureteral stent was left in place for an average 61 days following endopyelotomy. Three patients showed no evidence of recurrent obstruction at mean follow up of 42 months. All patients with successful endoscopic treatment were found to have normal orientation of the UPJ and short segment (< 2mm) stenosis at the time of endopyelotomy. Of the patients who failed endopyelotomy, one was noted to have a malrotated kidney and the other was noted to have an abnormal insertion of the ureter into the UPJ that resulted in a kinking phenomenon. Patients who failed endoscopic management were subsequently treated with reoperative pyeloplasty.

Conclusions: Because recurrent obstruction following pediatric pyeloplasty is uncommon, the optimal management of these patients remains unclear. Advances in holmium laser and endourologic equipment have made retrograde ureteroscopic laser endopyelotomy a technically feasible option for treatment of the failed pediatric pyeloplasty. We show that retrograde ureteroscopic laser endopyelotomy may be a successful treatment option for the failed pyeloplasty in selected patients with short segment UPJ stricture and otherwise normal UPJ configuration.

Table	Age at initial pyeloplasty (months)	Operative side	Initial pyeloplasty approach	Months between initial pyeloplasty and endopyelotomy	Operative findings at endopyelotomy		Ureter catheter		Stent type	Duration (days)	Laser endopyelotomy successful	Definitive procedure	Duration of follow-up from endopyelotomy	
					Length of narrowed segment (cm)	Orientation of collecting system or ureteral configuration	Access	No.						Access
1	18	L	Robotic	11	short segment stenosis	normal	3	9	6.4	4.79x30	50	No	Open reoperative pyeloplasty	17
2	8	L	Open	12	short segment stenosis	normal	1	10	30	4.79x30	60	Yes		15
3	7	R	Robotic	6	None	normal	1	10	10	4.79x30	60	Yes		18
4	176	R	Robotic	7	short segment stenosis	malrotated	2	10	20	6Fr/30	50	No	Robotic reoperative pyeloplasty	0
5	17	L	Laparoscopic	68	None	normal	0.5	6	2.0	3.79x30	61	Yes		72

Bladder Debris on Renal and Bladder Ultrasound: A Poor Predictor of Positive Urine Cultures
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Introduction: Renal and bladder ultrasound (RBUS) is recommended in the evaluation of children after an initial, febrile urinary tract infection. While it is not uncommon to observe debris within the bladder lumen on sonography, the significance of this finding is uncertain. In some cases, debris is interpreted as an indication of ongoing infection, but there have been no studies to date demonstrating this association. The aim of this study is to evaluate the association of bladder debris noted at time of RBUS with positive urine culture results from a catheterized specimen, among patients undergoing RBUS and voiding cystourethrogram (VCUG) on the same day.

Materials & Methods: A total of 3995 patients were identified with RBUS and VCUG performed on the same day. RBUS reports were reviewed for the presence of bladder debris, and analysis was limited to patients under 60 months of age with a catheterized urine specimen sent for culture at the time of the studies. Those with prior postnatal imaging or a diagnosis of prenatal hydronephrosis were excluded. 33 subjects with bladder debris on RBUS were identified and matched to 153 controls based upon age, gender, circumcision status, and presence of hydronephrosis. A positive urine culture was defined as > 50,000 colony forming units per mL of at least one organism. A conditional logistic regression model was used to evaluate the association between debris on RBUS and positive urine culture results.

Results: The median age of the cohort was 17 months (IQR = 5-34) and 68.8% were female. No statistically significant association between debris on RBUS and positive urine culture result was detected (OR = 2.03, 95% CI: 0.42-9.79, p = 0.3791). In a multivariate model adjusting for age, presence of debris on RBUS was still not significantly associated with positive urine culture; however, age had a significant association with positive urine cultures, with odds of a positive urine culture decreasing by 77% for every 1-month increase in age (OR = 0.23, 95% CI: 0.07, 0.80, p = 0.0208).

Conclusions: The presence of bladder debris on RBUS is not predictive of a positive urine culture at time of evaluation for an initial urinary tract infection. Whether these conclusions may be applied more broadly to all children, including those presenting with clinical signs or symptoms of urinary tract infection, remains to be determined. However, this is the only study to date to consider the predictive value of echogenic bladder debris on ultrasound.

Figure 1.
Urine Culture Results for Patients with and without Bladder Debris on Ultrasound (p=0.3791)

		Bladder Debris (n=33)	No Bladder Debris (n=153)
Urine Culture	Positive	5 (15.2%)	20 (13.1%)
	Negative	28 (84.9%)	133 (86.9%)

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Secondarily Ascended Testes Following Inguinal Surgery: An Under Recognized and Preventable Complication?
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Introduction: Secondarily ascended testes occurs in up to 1.3% of cases following previous inguinal surgery. This has generally been attributed to scarring in the inguinal area, however, has not been investigated in detail. As such, we hypothesize that this scarring is the major cause of secondarily ascended testis.

Materials & Methods: By database query 1607 inguinal orchiopexies were identified which were performed at our institution between 1/1997 to 12/2015. We included all procedures done for the indication of undescended testes (UDT). Excluding all orchiopexies which were first or second stage Fowler-Stephens or contralateral orchiopexies in the finding of a testicular nubbin, 1399 unilateral orchidopexies were identified and operative notes were reviewed to determine (1) presence and location of inguinal scarring, (2) position of previously ligated hernia sac, and (3) presence and patency of processus vaginalis.

Results: We identified 88 orchidopexies performed for a secondarily ascended testis following inguinal surgery, 6.3% of the total. The median age at primary inguinal surgery was 11.5 months. The average time between initial surgery and orchidopexy was 5.1 years. Scarring of the spermatic cord, primarily at the external ring and inguinal canal, was noted in 80% of orchidopexies. 12.5% of cases required further proximal dissection to free a previously ligated hernia sac, and 26% had an intact processus vaginalis.

Conclusions: Our results indicate that scarring is the major cause of secondarily ascended testes, however, a distal ligation of the hernia sac or incomplete dissection of the processus vaginalis may also contribute to secondary ascent of testes following inguinal surgery. Thus it is essential to determine the status of the processus vaginalis, regardless of the documentation of the previous operative note. Moreover, secondary ascension occurs on average 5 years after initial surgery. This latency period far exceeds the follow up time for studies documenting complications following inguinal surgery. As such, secondary ascent is likely more common than reported in the literature.

The Disappearing Surgical Ureteral Reimplant: National Data from 2003-2013
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Introduction: Substantial changes have occurred in management of vesicoureteral reflux over time, as diagnostic recommendations have changed, knowledge has developed about the spontaneous resolution of the condition, and endoscopic alternatives have been popularized. The trends in use of the gold-standard therapy, ureteral reimplantation, have yet to be investigated on a national scale with annual data. We hypothesized that the number of cases of primary vesicoureteral reflux managed by ureteral reimplantation has fallen nationally over the last decade.

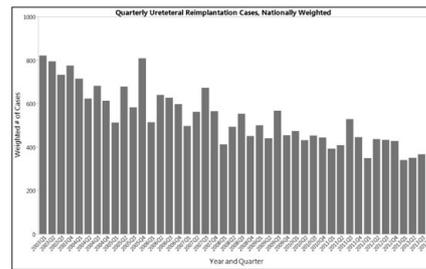
Materials & Methods: The Premier Hospital Database (Premier, Inc., Charlotte, NC, USA) is an inpatient dataset created for national quality and utilization benchmarking and includes approximately 20% of inpatient discharges from nonfederal hospitals in the United States. We extracted hospital discharge data for pediatric patients (age <= 18 years) with an International Classification of Diseases, Ninth Revision (ICD-9-CM) procedure code for ureteroneocystostomy (ICD-9 56.74) between January 1, 2003 and December 31, 2013. From these, we selected patients with ICD-9 diagnosis codes for VUR (593.7), and excluded patients with diagnosis codes indicative of secondary VUR. We analyzed our results with descriptive statistics; the presence of a temporal trend in reimplantation was examined via regression using generalized estimating equations (including clustering of the data within hospital and within a physician). A nominal p<0.05 was used to define the threshold of significance.

Results: Initial criteria including patients without diagnoses consistent with secondary causes of VUR undergoing ureteral reimplant between 2003-2013 (inclusive) yielded 6,973 reimplants, corresponding to 40,916 weighted cases. We removed 2423 cases (15,903 weighted) who were over age 18, and then 249 (weighted 1411) cases without a diagnosis of VUR, leaving 4,301 cases (23,602 weighted). There was a substantial decrease in the number of ureteral reimplants performed during the study period, with an estimated decline in the rate of 0.239 cases per attending for each quarter (p = 0.006). Average patient age declined 0.9 months in each quarter (p < 0.0001). Investigating this further, the decline in age was driven by a sharp decline in reimplants in those over age 2, which fell by 0.15 reimplants per attending per quarter (p = 0.025); we did not detect a change in reimplantation for children under age 2 (p = 0.15). There was no difference between rates of decline in reimplantation for children with and without reflux nephropathy (p = 0.21).

Conclusions: Nationally there has been a marked decrease in the incidence of ureteral reimplantation among children with primary VUR. The potential factors contributing to this are broad, including changes in diagnostic patterns, treatment recommendations, or the rise of endoscopic intervention. Regardless of the cause, this has a great impact on the patients treated, and on the practice and training of pediatric urologists.

Table 1 – Demographics of cohort with primary VUR (n=4,301 – weighted 23,602)

Age, median [IQR]	4 [2,6] years
Gender, n(%)	
Female	3,261 (75.8%)
Male	1,040 (24.2%)
Race & Ethnicity	
White	3378 (78.5%)
Black	165 (3.8%)
Hispanic	201 (4.7%)
Other	557 (13.0)
Insurance Provider	
Public	1487 (34.5%)
Private	2709 (63.0%)
Charity / Self-Pay	33 (0.8%)
Other / Unknown	72 (1.7%)
VUR classification, n (%)	
VUR with unilateral nephropathy	311 (7.2%)
VUR with bilateral nephropathy	408 (9.5%)
VUR without nephropathy	3,582 (83.3%)



Milestone Assessment of Minimally Invasive Surgery in Pediatric Urology Fellowship Programs
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Introduction: In the past decade, minimally invasive surgery (MIS) has become an important aspect of Pediatric Urology fellowship training. In 2014, the ACGME published the Pediatric Urology Milestone project as a metric for fellow proficiency in multiple facets of training, with specific categorization in robotic/laparoscopic procedures (Figure). A Milestone score of 4 is designed as the graduation target. Our study assessed trends in MIS training, and utilization of the Milestones.

Materials & Methods: With permission from the Society of Pediatric Urology (SPU), we surveyed Pediatric Urology program directors (PD) and fellows who completed their clinical year in 2015. We queried familiarity with the Milestone project, utilization of the Milestones, robotic/laparoscopic case volume and training experience, and perceived competency with robotic/laparoscopic surgery at the start and end of the fellowship clinical year. Responses were accepted between August and November 2015. Surveys were excluded if incomplete or if the responder did not identify as a PD or post-clinical year fellow.

Results: Surveys were distributed via e-mail to 35 fellows and 30 program directors. Sixteen fellows (46%) and 14 (47%) program directors responded. All fellows reported some robotic experience prior to fellowship and 69% performed greater than 50 robotic/laparoscopic surgeries during residency. Fellow robotic/laparoscopic case volume varied: 3 had 1-10 cases (19%), 4 had 11-20 cases (25%), and 9 had greater than 20 cases (56%). Supplementary or robotics training modalities included simulation (9), animal models (6), surgical videos (7), and courses (2). Comparison of beginning and end of fellowship robotic/laparoscopic Milestone assessment revealed scores of less than 3 in 10 (62%) fellow self-assessments and 10 (75%) program director assessments at the start of training. End of training Milestone scores greater than four were seen in 12 (75%) fellow self-assessments and 8 (57%) of program director assessments. All PD Milestone scores increased throughout the clinical year. All PDs utilized the Milestones to provide feedback to the fellow.

Conclusions: In our study, Milestone assessment demonstrated improvement in fellow's MIS skills during their training. However, 43% of PDs did not rate their fellow at the graduation target for MIS skills. We saw wide variation in supplemental training modalities. We must critically consider the best ways to teach MIS in Pediatric Urology fellowship training.

Figure: Robotic/Laparoscopic Milestones

Level 1	Level 2	Level 3	Level 4	Level 5
Accurately describes patient and equipment positioning for laparoscopic procedures	Assists on all laparoscopic/robotic procedures	Acquires laparoscopic/robotic access in complex situations (e.g. access in infants and obese children)	Performs moderately complex laparoscopic/robotic procedures with minimal supervision (e.g., pyeloplasty/ureteroureterotomy, heminephrectomy, ureteral reimplantation)	Performs the most complex laparoscopic/robotic procedures with mastery (e.g., retroperitoneal lymph node dissection, reconstruction for neurogenic bladder)
Places additional trocars under direct supervision	Acquires laparoscopic/robotic access in children (e.g., Veress and Hasson techniques)	Performs routine laparoscopic procedures, with attention to tissue handling and equipment selection/safety	Recognizes and manages unforeseen events during laparoscopic procedures (e.g., identifies and manages bowel or vascular injury)	Demonstrates capacity to perform moderately complex surgical procedures independently, and performs the most complex cases with supervision (e.g., redo pyeloplasty)
	Performs basic laparoscopic maneuvers, with attention to tissue handling and equipment selection/safety in a young child (e.g., mobilize colon for pyeloplasty in a two-year-old)	selection/safety (e.g., orchiopexy, nephrectomy)	Capably directs bedside assistant on robotic-assisted cases	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Combined Parameter Surveillance Protocol for High Grade Congenital Hydronephrosis
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Introduction: The optimal management algorithm for congenital high grade hydronephrosis is still unclear. We present a surveillance protocol for patients with high grade unilateral congenital hydronephrosis that uses a combination of clinical and radiologic parameters.

Materials & Methods: Since 2012, patients at our institution with congenital unilateral hydronephrosis have been managed according to a protocol that includes both periodic renal ultrasounds and a mercaptoacetyltriglycine (MAG-3) renal scan obtained at baseline, as well as urine protein/creatinine ratios, serum creatinine and blood pressure measurements. Repeat MAG-3 was obtained after 12 months if SFU grade 3 or higher hydronephrosis persisted. Pyeloplasty was indicated if there were evidence of deterioration on MAG-3 of more than 10% and/or high grade obstruction indicated by a drainage time of greater than 20 minutes on either the initial or followup MAG-3, with the presence of at least one of the following: hypertension, elevated serum creatinine, failure of growth of the ipsilateral kidney, or proteinuria. For our purposes, only infants with SFU grade 3 or 4 were included.

Results: A total of 31 infants were included in the study, with a mean follow up of 14 months. 12 patients (39%) presented with SFU grade 4, 18 (58%) with SFU grade 3, and one with SFU grade 2 that then increased to grade 4. 25 patients underwent baseline MAG-3, with five patients' hydronephrosis resolving before the initial MAG-3, and one family declining any MAG-3, despite persistent SFU grade 3 hydronephrosis at over 3 years of follow up. Out of these 25, 9 patients underwent repeat MAG-3 scan (with a mean time between MAG-3 scans of 15 months), 8 experienced lessening of hydronephrosis to SFU grade II or less in the interval, 6 patients with high grade hydronephrosis are awaiting repeat MAG-3 and 2 others were lost to follow up. 13 patients presented with high grade obstruction on initial MAG-3, with another patient having a T1/2 of 19 subsequently increasing to 26 on follow up MAG-3. Eight then underwent at least one follow up MAG-3 scan due to persistent high grade hydronephrosis (Table 1), with obstruction persisting in seven (including the one patient that developed obstruction on follow up renal scan) and resolving in one. No obstructed kidney experienced a drop in differential function greater than 5.6% on repeat scan, and average change in the affected kidney in this group was -1%. 12 patients had a non-obstructive pattern on initial renal scan (though one was subsequently reclassified to obstructed), and eight were followed for more than 8 months, with all 8 experiencing lessening of the hydronephrosis to SFU Grade II or less. No child fulfilled criteria for surgical intervention, and one child underwent pyeloplasty due to parental desire.

Conclusions: Although larger numbers of patients are needed to confirm, even highly obstructed kidneys do not appear to lose significant function early in life, and most unobstructed kidneys experience eventual improvement of hydronephrosis.

Table 1. Initial and follow up renal scans for obstructed kidneys

	Initial % Function / T 1/2	Final % Function/ T 1/2	Time between scans (days)
Patient 1	47% / 33 min	53% / 58 min	154
Patient 2	49% / 31 min	44.5% / 42 min	1096
Patient 3	53% / 19 min	55% / 26 min	261
Patient 4	53% / 20 min	50.4% / 50 min	482
Patient 5	52% / 31 min	53.6% / 10 min	511
Patient 6	47.5% / 72 min	45.3% / 24 min	402
Patient 7	29% / 84 min	26.3% / 45 min	411
Patient 8	55% / 28 min	49.4% / 33 min	366

Impact of Urodynamic Testing in the First Year of Life on Management of Posterior Urethral Valve
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Introduction: Abnormal and often hostile bladder function is well documented in patients with posterior urethral valve (PUV). Early management of the lower urinary tract is considered a critical component in the management of these patients to prevent ongoing renal injury during a time of rapid renal development. However, optimal timing for assessment of the lower urinary tract with urodynamics in patients with PUV remains unclear. We report the impact of urodynamic testing in the first year of life on clinical management in patients with PUV at our center.

Materials & Methods: At our institution, initial urodynamic testing is routinely performed within the first year of life for patients with PUV. A retrospective review was performed for patients with PUV undergoing initial urodynamic evaluation within the first year of life between 2007 and 2015. Urodynamic findings were documented, including bladder capacity, compliance, detrusor overactivity, voiding pattern, postvoid residual volume, and fluoroscopic findings. Clinical decision making based on urodynamic findings was assessed by review of clinician notes.

Results: After excluding patients with complicating factors or without one-year follow-up data, nine patients with PUV (Table) were identified who underwent initial urodynamic testing within the first year of life at a mean age of 5.8 months (SD ± 3.15). Urodynamic findings were notable for detrusor overactivity in six patients, impaired bladder capacity in one patient, and a non-compliant bladder in one patient. No patients were observed to have an elevated post-void residual volume. Anticholinergic medication was started in three patients due to urodynamic findings of high amplitude detrusor overactivity, impaired compliance, and small capacity bladder. The remaining six patients were recommended for continued clinical and radiographic surveillance. No other pharmaceutical or surgical interventions were prompted by urodynamic findings.

Conclusions: Establishing a safe lower urinary tract is a critical element in management of PUV. Routine use of early urodynamic evaluation is useful in defining the baseline lower urinary tract function in patients with PUV. Despite our limited sample size, we observed that clinical management changed as the result of findings on early urodynamic evaluation in nearly one-third of patients.

Table:	Number of patients	%
Hydronephrosis	9	100%
Severe	8 (bilateral)	88.8%
Mild	1 (bilateral)	11.2%
Anticholinergics prior to UDS	1	11.2%
Reflux		
Unilateral	4 (High grade)	44.4%
Bilateral	1 (High grade)	11.2%
Avg. creatinine prior to valve ablation	1.03mg/dL (SD=0.65)	
Avg. nadir creatinine at 1 year	0.5mg/dL (SD=0.27)	

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A Contemporary Analysis of UPJ Obstruction Repair Reveals the Incidence of Crossing Vessels Increases After Age 4
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Introduction: Ureteropelvic junction obstruction (UPJO) presents in patients at all ages. UPJ obstruction may be associated with crossing vessels. The literature suggests that an intrinsic cause without lower pole vessel crossing is more likely to be present in those diagnosed with prenatal hydronephrosis. We hypothesize that younger patients are more likely to have an intraoperative finding of an intrinsic cause of UPJO without a crossing vessel compared to older patients.

Materials & Methods: Our database was queried for patients undergoing pyeloplasty (CPT 50400, 50405, 50544) between 6/1/2002 to 3/10/2016. We excluded all patients with anatomic abnormalities, including horseshoe kidneys and pelvic kidneys, as well as patients undergoing surgery for upper tract tumor. We reviewed hospital records to determine the anatomy of the UPJ obstruction and the nature of presentation; hydronephrosis on imaging or symptoms including pain or nausea. Data was analyzed in excel using t-tests and linear regressions.

Results: 178 pts underwent pyeloplasty between 6/18/2002 to 3/10/2016. Median age was 10.5 years, ranging from 2 mo to 79 years. 43% were right sided, 35% were female. Of the 178 patients, 57 (32%) patients had crossing vessels found at the time of repair. Incidence of crossing vessels increased at 5 years of age. 4/65 (6%) of patients < 5 years had evidence of a crossing vessel compared to 53/113 (47%) of patients ≥ 5 years of age (p < 0.05). There was no trend in increasing incidence of crossing vessels by either date of surgery (R² = 0.05) or age of patient at surgery (if age > 5, R² = 0.02). The incidence of crossing vessels was the same regardless of side of obstruction (p = 0.46) or gender (p = 0.20). Of the 65 patients < 5 years of age, cause of presentation was identified in 55. 53 presented with prenatally diagnosed hydronephrosis of which 3 (6%) had crossing vessels identified at time of surgery. Additionally, one patient aged 3 presented with pain, no crossing vessels identified, and one patient aged one had an incidental finding on trauma work up with crossing vessels identified. Among patients ≥ 5 the cause of presentation was identified in 101 patients. 88/101 (85%) presented with pain, of which 46 (53%) had crossing vessels present. 13 presented with an incidental finding on imaging of which 31% had crossing vessels present (p = 0.17). Surgical approach was open in 99 cases, laparoscopic in 24 cases and robotic in 55 cases. The first robotic case was in 12/2007 and the last laparoscopic case was completed in 6/2013.

Conclusions: Patients less than 5 years old who underwent pyeloplasty were less likely to have an associated crossing vessel found at the time of UPJ repair. There was no trend to increasing incidence of crossing vessels if patient was older than 4 years. Patients who present with incidental finding of hydronephrosis are less likely to have a crossing vessel present, however this was not statistically significant in the older age group.

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Emerging Data Regarding Trends in Surgical Education and Research Financial Relationships between Device Manufacturers and Prosthetic Urologists
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¹Dartmouth-Hitchcock Medical Center/Dartmouth-Hitchcock Keene, Keene, NH, ²Regional Urology, Shreveport, LA

Introduction: The Affordable Care Act mandates manufacturer reporting of financial relationships with physicians and hospitals. The first year of data regarding Open Payments for 2014 is available via the Center for Medicare and Medicaid Services (CMS) website. We explored the financial relationships between the primary prosthetic urology device manufacturers, American Medical Systems (now Boston Scientific) and Coloplast, and the male health urologic surgeons with whom they have financial relationships specific to payments for surgical education and research.

Materials & Methods: A review of the CMS Open Payments data was performed. Payment information was separated into general payments and research payments. The top 25 surgeons were compiled from each of the two device manufacturers. Surgeons who primarily implant female devices were removed from the list as other device manufacturers also provide these products. We then selected the male health urologic surgeons (i.e. high-volume implanters of inflatable penile prostheses, male slings, and artificial urinary sphincters) for further detailed analysis.

Results: AMS distributed approximately \$2,588,908 in general payments to the top 25 prosthetic urologists on its list, \$1,852,715 to 19 male health surgeons. Coloplast distributed approximately \$2,702,278 in general payments to the top 25 prosthetic urologists on its list, \$1,988,184 to 16 male health surgeons. AMS distributed a total of \$333,371 in research payments, with \$167,163 towards male health-related clinical trials. Coloplast distributed \$246,278 in research payments, with \$18,787 towards male health-related clinical trials. The top five male health surgeons for AMS accrued a total of \$920,974 in payments (mean \$184,194). The top five male health surgeons for Coloplast accrued a total of \$1,522,302 in payments (mean \$304,460). Four surgeons were in the top 25 for both manufacturers, with one in the top ten for both.

Conclusions: CMS Open Payments data allow for a transparent view of the financial relationships between prosthetic urologists and industry. Coloplast has a smaller market share in inflatable penile prostheses and male continence devices than AMS, but they distribute more money to prosthetic urologists for surgical education. AMS research funding appears to be directed towards IPP-related clinical trials, while Coloplast funding is directed towards male sling trials. There is a top-heavy distribution of payments by Coloplast, with the first five surgeons receiving substantially more funding on average than those for AMS.

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Urethroplasty after Transurethral Resections of the Prostate: A Multi-Institutional Report
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Introduction: Urethral strictures after transurethral resection of the prostate (TURP) occur in up to 10% of patients. Large-scale studies regarding optimal reconstructive management are lacking. We performed a multi-institutional evaluation of urethral stricture location and reconstructive outcomes for post-TURP strictures.

Materials & Methods: A retrospective review of a multi-institutional, prospectively maintained reconstructive urologic database was performed from 2008-2014 to identify patients with post-TURP urethral strictures who underwent subsequent urethroplasty. The ability to pass a 17-F cystoscope defined operative success. Subjective quality of life questionnaires were recorded.

Results: We identified 43 patients from 7 surgeons who underwent urethral reconstructions after TURP. 33 had complete follow-up data. Mean age and stricture length were 62.3 years and 4.27 cm (range 1 to 20 cm). Stricture location was as follows: membranous or bulbomembranous (27%); bulbar (21%); bulbopendulous (18%); penile (24%); fossa navicularis (3%); panurethral (6%). Repair type varied on location and included substitution with buccal graft, excision and primary anastomosis (EPA) and fasciocutaneous flap. 28 patients (85%) had success with a mean follow up of 10.9 months. 5 failures were reported and included three ventral only, one dorsal only and one EPA repair. There were no reported changes in the IPSS, CLSS, SHIM, MSHQ scores or continence status (p > 0.05).

Conclusions: Successful reconstruction of post-TURP urethral strictures requires a variety of techniques depending on stricture location. Continence seems to be preserved in patients with bulbomembranous strictures. Further studies will be necessary to determine the optimal approach for these strictures.

Stricture Location	Mean Length	Operative Repair
Bulbomembranous (n = 9, 27%)	2.72 cm (range 1 to 4 cm)	Substitution urethroplasty with ventral only (n = 5) Excision and primary anastomosis (n = 4)
Bulbar (n = 7, 21%)	1.97 cm (range 1 to 4 cm)	Substitution urethroplasty with ventral only (n = 3) Excision and primary anastomosis (n = 3) Augmented dorsal anastomotic repair (n = 1)
Bulbopendulous (n = 6, 18%)	5.13 cm (range 1.75 to 13 cm)	Substitution urethroplasty with dorsal only (n = 4) Substitution urethroplasty with ventral only (n = 1) Excision and primary anastomosis (n = 1)
Penile (n = 8, 24%)	4.66 cm (range 1.5 to 12 cm)	Fasciocutaneous flap (n = 4) Substitution urethroplasty with dorsal only (n = 2) Substitution urethroplasty with ventral only (n = 1) Augmented dorsal anastomotic repair (n = 1)
Fossa navicularis (n = 1, 3%)	1.5 cm	Fasciocutaneous flap (n = 1)
Panurethral (n = 2, 6%)	16.5 cm (range 13 to 20 cm)	Substitution urethroplasty with dorsal only (n = 1) Two staged repair (n = 1)

Table 1. Stricture locations, lengths and repair type

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The Impact of Age on Transecting vs. Non-Transecting Bulbar Urethroplasty
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Introduction: A successful transecting bulbar urethroplasty by excision and primary anastomosis (EPA) depends on collateral blood flow. A successful non-transecting bulbar urethroplasty by ventral or dorsal buccal mucosa graft augmentation (BMG) likewise depends on neovascularization of the BMG. Older patients have increased incidence of comorbid conditions including peripheral vascular disease that are associated with reduced penile blood flow. We sought to determine the effect of age on bulbar urethroplasty success in general and, specifically, in transecting vs. non-transecting.

Materials & Methods: Bulbar urethroplasties were retrospectively reviewed from 11 institutions that collaborate on a multi-institutional reconstructive urology database (TURN5). We limited patients to those with at least 12 months of follow-up after transecting EPA or non-transecting BMG. Our primary outcome was any procedure for re-stricture (dilation, urethrotomy or urethroplasty); our secondary outcome was anatomic success defined by urethral caliber greater than 17 F confirmed by cystoscopy. We compared results stratified by age.

Results: In total, 322 patients were included, with 258 patients younger than 60 years and 64 patients older than 60 years. Median follow-up was 1.8 years; there was no difference in follow-up time between the two groups. The following were not statistically significantly different between groups: stricture length, location of stricture, smoking status, number of previous dilations/urethrotomies, and type of urethroplasty. The following comorbidities were statistically significantly more common in the age > 60 group: diabetes, hypertension, hyperlipidemia, coronary artery and peripheral vascular disease, chronic obstructive pulmonary disease, and cancer. There was no statistically significant difference between age groups with regard to receipt of repeat procedures or anatomic recurrence, both overall and when stratified by urethroplasty type (Table 1).

Conclusions: Both transecting and non-transecting bulbar urethroplasty can be performed with high success rates regardless of age. This is despite a higher incidence of diabetes, cardiovascular and peripheral vascular disease in the elderly.

Preoperative Evaluation Protocol for Genitourinary Vascularized Composite Allotransplantation

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Introduction: Genitourinary vascularized composite allotransplantation (GUVCA) potentially represents the next step in improving both urinary and sexual function as well as cosmetic appearance following genitourinary tissue loss. The preoperative evaluation of donors and recipients is multi-modal and multi-disciplinary. Many factors need to be considered including recipient eligibility from a medical and anatomic standpoint as well as appropriate donor selection. To date, the literature that discusses the preoperative considerations of GUVCA is limited. At our institution, we have developed a pre-operative evaluation protocol for potential GUVCA recipients including pre-operative imaging, donor selection, and consultation with multi-disciplinary team. We also describe the critical neurovascular anatomy for allotransplantation with our cadaveric experience

Materials & Methods: We constructed a multidisciplinary GUVCA team composed of transplant surgeon, urologists, plastic surgeons, psychiatrists, transplant coordinators, nurses, social workers, dietitians, and financial coordinators. Evaluation of the recipient begins with education and informed consent. Laboratory testing was obtained including routine CBC, chemistries, LFTs, coagulation panel, blood typing, as well as infectious disease screening and panel reactive antibody for HLA. Routine chest X-ray and EKG are obtained. The patient then undergoes our preoperative imaging protocol: high-resolution computed tomography angiography (CTA), diagnostic angiography, and pelvic and penile magnetic resonance imaging (MRI). From the donor perspective, we worked closely with the New England Organ Bank for recipient listing, donor selection, and donor procurement planning. Using anatomic dissections, we identified the appropriate vascularized pedicles from freshly deceased donor pelvic specimens.

Results: In our pilot experience, we evaluated two potential recipients that underwent the preoperative evaluation protocol. Our imaging protocol assessed for adequacy of recipient anatomy for implantation of the GUVCA graft. Using MRI with high-resolution isotropic sequences, we identified neural bundles alongside the internal pudendal artery in the region immediately posterior to the pubic symphysis. MRI with contrast suggested corporal body viability. CTA with volumetric and multiplanar analysis of arterial vasculature was critical for assessing vessel adequacy. CTA 3-dimensional rendering was performed for enhanced spatial assessment [figure 1]. Diagnostic angiography held advantage over CTA in situations with suboptimal characterization of smaller vessels, e.g. dorsal penile arteries [figure 2]. From our dissection experience, we identified all critical nerves and vessels necessary for anastomosis including the superficial and deep dorsal penile veins, dorsal penile arteries, dorsal penile nerves, cavernosal arteries, and external pudendal vessels [figures 3 and 4].

Conclusions: The preoperative protocol presented in this study represents an essential roadmap to surgical planning for GUVCA.

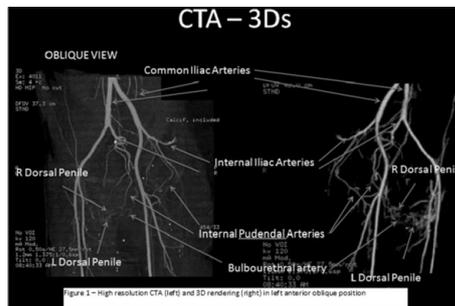


Figure 1 – High resolution CTA (left) and 3D rendering (right) in left anterior oblique position

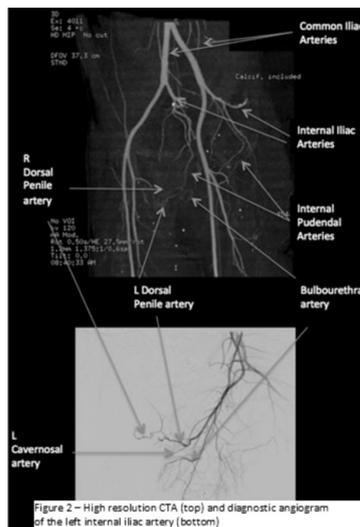


Figure 2 – High resolution CTA (top) and diagnostic angiogram of the left internal iliac artery (bottom)

Critical Analysis of Bulbospongiosus Sparing Bulbar Urethroplasty on Ejaculatory Function and Post-Void Dribbling

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Introduction: Traditional bulbar urethroplasty techniques call for splitting of the bulbospongiosus muscle to gain access to the strictured segment of urethra. Bulbar urethroplasty outcomes studies have shown low but significant rates of post-void dribbling (PVD) and ejaculatory dysfunction, and because the bulbospongiosus muscle is involved with expulsion of seminal fluid and urine from the bulbar urethra, we hypothesized that performing urethroplasty utilizing a technique that does not split the muscle may result in better post-operative patient reported ejaculatory function (EF) and less PVD.

Materials & Methods: Beginning in 2014 a bulbospongiosus sparing (BS) technique was implemented in all primary bulbar urethroplasties by two surgeons from different academic institutions. To analyze the effectiveness of BS on preservation of EF and avoidance of PVD, we performed a matched, case-control analysis comparing men who underwent the BS technique to men that had undergone the traditional non-bulbospongiosus sparing (NBS) immediately before the switch in technique was made. Pre- and post-operatively (3-12 months) EF was assessed using the 4 ejaculatory questions of the Male Sexual Health Questionnaire (MSHQ) short form, as well as with a patient perception questionnaire. Post-void dribbling was assessed using a validated urethroplasty questionnaire.

Results: We compared 16 BS and 16 NBS patients that were matched by total pre-operative MSHQ score, age and performance of EPA. Median time of post-operative questionnaire completion was 4.26 months, which was similar between the two groups (p = 0.76). Comorbidity rates and stricture length were similar between each group. BS and NBS groups had similar post-operative total MSHQ scores (14.25 vs. 15.06 respectively, p = 0.53) and there were no significant post-operative MSHQ changes in either group (BS; 14.25 to 14.69, p = 0.65; NBS; 13.37 vs. 15.81, p = 0.59). Individual MSHQ questions were analyzed between groups and not found to have a statistically significant difference. Rates of post-operative PVD and perception of EF were similar between the two groups (table).

Conclusions: Sparing the bulbospongiosus muscle during urethroplasty does not seem to have a significant impact on patient reported EF or PVD compared with non-bulbospongiosus sparing urethroplasty at early follow up.

Patient Perception of Ejaculation	BS	NBS	p-value
Improved ejaculation	3	3	0.93
No change in ejaculation	7	6	0.93
Worse ejaculation	6	7	0.93

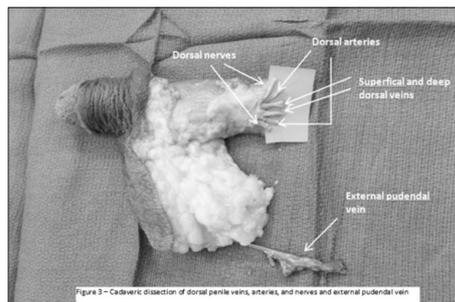


Figure 3 – Cadaveric dissection of dorsal penile veins, arteries, and nerves and external pudendal vein



Figure 4 – Cadaveric dissection of cavernosal arteries

Urethral Stricture Outcomes after AUS Cuff Erosion: Results from a Multicenter Retrospective Analysis

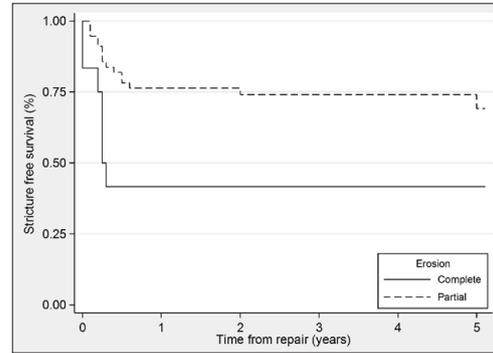
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Introduction: There are few studies in the literature regarding patient outcomes after AUS cuff erosion. In this review, seven surgeons from six high-volume male continence centers compiled a comprehensive database of post-erosion patients. The goal was to evaluate the influence of both repair type and degree of cuff erosion on post-operative urethral stricture rate.

Materials & Methods: This is a retrospective multi-institution study of 80 patients who had AUS cuff erosions and underwent subsequent treatment. Seventy-eight patients had specific information regarding post-cuff erosion urethral strictures. Patients underwent one of three types of repair: catheter only, single-layer capsule to capsule repair (urethrorrhaphy), and formal urethroplasty. Patients' operative notes and charts were extensively reviewed to collect study data.

Results: Twenty-five of 78 patients had a urethral stricture after AUS cuff erosion (32.1%). More strictures occurred among patients who underwent urethrorrhaphy repair (39.5% vs. 28.6% for catheter only and 14.3% for urethroplasty), but stricture rates did not vary significantly by repair type ($p = 0.2$). Strictures occurred significantly more frequently in patients with complete cuff erosions (58.3%) as compared to patients with partial erosions (25%, $p = 0.037$, see Figure 1). Patients with partial erosions were more likely to undergo urethrorrhaphy repair (60%, $p = 0.002$). There was no difference in repair type performed on patients with complete erosion. A trend was seen regarding increased percentage of erosion and increased stricture rate, but it did not reach significance ($p = 0.057$). Although only 12 patients had a complete erosion, strictures occurred more frequently among patients with complete erosion that underwent either catheter only repair or urethrorrhaphy (75%), compared to patients that underwent urethroplasty (25%). However, Fisher's exact p-value for this finding was not significant ($p = 0.222$).

Conclusions: Urethral stricture was more likely to occur after complete cuff erosion as opposed to partial erosion in this multi-center retrospective population. Repair type, whether catheter only, urethrorrhaphy, or formal urethroplasty, did not appear to influence post-operative stricture rate.



Erectile Function after Bulbar Urethroplasty: Does Surgical Approach Matter?

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Introduction: While urethroplasty has proven to be a durable solution to urethral strictures, the effect on sexual function following excision and primary anastomosis (EPA) for bulbar urethral strictures remains controversial. Some reports suggest that sexual function following EPA is diminished compared to buccal mucosa graft (BMG) onlay urethroplasty, and some have advocated avoiding EPA to prevent postoperative sexual dysfunction. The objective of our study is to explore the effect of stricture location and urethroplasty type on postoperative erectile function.

Materials & Methods: Bulbar urethroplasties were retrospectively reviewed from 12 institutions that collaborate in a prospective, multi-institutional reconstructive urology database. Sexual function was measured via pre- and post-operative SHIM (Sexual Health Inventory for Men) questionnaire, with max score 25. Patients filled post-operative questionnaires at follow-up visits and the most recent post-op SHIM was used in this study. Patients with bulbar or bulbomembranous urethral strictures who underwent BMG urethroplasty via dorsal, lateral or ventral onlay or EPA were included. Patients were excluded if they had previously undergone urethroplasty, had a pelvic fracture urethral injury, had a radiation-related stricture, or were missing a pre- or post-operative SHIM score. The Kruskal-Wallis or t-tests were used for ranked and non-ranked comparisons as appropriate with significance set at the $p = 0.05$ level.

Results: In total, 211 patients were included (EPA 141, onlay 70). Median stricture length was 2 cm vs. 4 cm in the EPA vs. BMG group respectively ($p < 0.001$). Men in each group were of similar age (42 vs. 44 years, $p = 0.41$), and had similar prevalence of coronary artery disease, diabetes, smoking history, peripheral vascular disease, and hyperlipidemia. At a median follow up of 8 months, there was no statistical difference in change from pre- to post-operative SHIM score comparing EPA to onlay procedures (0.03 vs. 0.27, $p = 0.82$). There were also no significant differences in change in SHIM score for EPA patients based on proximal location of stricture (Table 1, $p = 0.43$).

Conclusions: This multi-institutional study demonstrates that men undergoing EPA or onlay BMG urethroplasty do not have different postoperative erectile function compared to preoperative SHIM scores. Men undergoing EPA did not demonstrate a change in erectile function compared to onlay BMG urethroplasty. Both EPA and onlay urethroplasty appear to be viable options for urethroplasty with no difference in expected postoperative erectile function regardless of stricture location.

Table 1. Change in SHIM scores from pre- to post-operative by stricture location in EPA patients ($p = 0.43$)

Most Proximal Stricture Location	Median Change in SHIM	Mean Change in SHIM
Bulbomembranous Urethra	1	1.5
Proximal Bulbar Urethra	0	-0.2
Mid-bulbar Urethra	0	-0.3
Distal Bulbar Urethra	0	-0.5