

Endourology Society Summer Scholarship 2021

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The Role of Experience: How Surgeon Volume and Endourology Fellowship Training Impact Surgical Outcomes for Ureteroscopy

Introduction:

Prior studies have identified associations between surgical experience and surgical outcomes for urologic and non-urologic procedures.¹ Specifically, regarding urologic procedures, studies showed that greater surgical experience, as measured by a surgeon's procedure volume may be associated with improved outcome measure for complex oncologic procedures such as prostatectomy, cystectomy, and nephrectomy.²⁻⁵ These studies support the claim that cancer centers of excellence may provide the most optimal care for patients by providing the services of more experienced physicians.

While this phenomenon has been well documented for complex oncologic procedures, no study has identified a similar phenomenon for less complex urologic procedures such as ureteroscopy (URS) for nephrolithiasis treatment. Some studies have identified a "learning curve" which identifies the number of procedures a training physician needs to achieve before being considered proficient.⁶ However, these such studies tend to follow a single surgeon or a small cohort of surgeons as they improved during their training. This does not account for the effect of continued experience after proficiency has been reached. Additionally, no study has identified how fellowship training impacts surgical outcomes for URS.

Our study aimed to identify if URS surgical outcomes are correlated with a physician's level of experience for a large cohort of attending physicians at a major New York City hospital system. Surgical experience was measured based on surgical volume and endourology fellowship training, or lack thereof. In doing so, this study is the first to identify how URS surgical outcomes are impacted by surgeon volume and physician fellowship training for a significant cohort of attending urologists.

Methods:

Medical records from patients who underwent URS by a faculty physician at our institution between the years 2017-2019 were retrospectively reviewed. Preoperative stone size was recorded as an estimate of procedure complexity. Surgical outcomes included operative time (OPT), estimated blood loss (EBL), length of stay (LOS), stone free rate (SFR), perioperative complications, 30-day ED visits and hospital readmissions, and 90-day ED visits

and hospital readmissions. Surgeon volume was defined as the median number of URS procedures completed between 2017-2019. Physicians were grouped into three categories based on surgeon volume: <20 URS per year, 20-49 URS per year, and >50 URS per year. Physicians with less than 5 URS per year were excluded from analysis. Fellowship training was defined as having completed an endourology fellowship training. Physicians were grouped into two categories: those with endourology fellowship training, and those without endourology fellowship training. Surgical outcomes were then analyzed based on surgeon volume and fellowship training.

Statistical analysis was computed using GraphPad Prism. All data was determined to be non-parametric. Surgical outcomes based on surgeon volume were analyzed using the Kruskal-Wallis test with Dunn Post Hoc analysis for continuous variables and Fischer Exact tests for categorical variables. Surgical outcomes based on fellowship training were analyzed using Mann-Whitney U tests for continuous variables, and Fischer Exact tests for categorical variables. Significance for all tests was defined as $p < 0.05$.

Preliminary Results:

579 charts were reviewed from a cohort of 14 attending physicians at our institution. The <20 URS/year group was comprised of five physicians, the 20-49 URS/year group was comprised of six physicians, and the >50 URS/year group was comprised of three physicians. The endourology fellowship trained group was comprised of two physicians, and the non-endourology fellowship trained group was comprised of twelve physicians.

Surgeon Volume:

No difference in stone size was identified based on physician volume. Physicians with >50 URS/year had an increase in EBL ($p=0.001$, $p=0.001$) and LOS ($p=0.020$, $p<0.001$) compared to those with <20 URS/year and 20-49 URS/year respectively. Additionally, physicians with >50 URS/year had improved SFR compared to those with <20 URS/year ($p=0.004$) and those with 20-49 URS/year ($p<0.001$). Physicians in either the 20-49 or >50 URS/year groups had reduced perioperative complication rates compared to those in the <20 URS/year group ($p=0.049$, $p=0.029$) [Table 1].

Endourology Fellowship Training:

There was a significant difference in the stone size based on fellowship training. Endourology trained physicians operated on significantly larger stones compared to those without endourology training ($p=0.006$). They also showed an increase in OPT ($p=0.021$), EBL ($p=0.025$), and LOS ($p<0.001$). Postoperatively, endourology trained physicians showed improved SFR ($p<0.001$) compared to those without endourology training [Table 2].

Preliminary Discussion:

These data suggest a relationship between surgical experience and surgical outcomes for URS. Firstly, physicians that received endourology fellowship training operate on significantly larger stones, suggesting that these physicians take on more complex cases. Despite this, the trend seen in this study suggests that physicians that are endourology trained and those with a large surgeon volume have improved overall outcomes as measured by a

greater stone free rate and reduced perioperative complications. It is interesting to note that both the endourology trained group and the >50 URS/year group had significantly higher EBL, LOS, (and OPT for the endourology trained group). While on its surface this may seem counterintuitive, this may suggest a unique phenomenon. More experienced physicians are taking on more complex cases, which may lead to more bleeding, longer operations, and more need for recovery and thus longer lengths of stay. However, despite this, their patients are showing better stone free rates and lower perioperative complications. Therefore, more experienced physicians may be more suited to operate on more complex cases and still show improved outcomes compared to less experienced physicians.

Centers of excellence such as cancer centers offer the services of highly experienced surgeons for oncologic procedures. The goal of such centers is to provide care from surgeons with greater experience which has been shown to significantly impacts surgical outcomes. While this association has been reported in the literature, there is some contrary evidence suggesting that centers of excellence do not offer improved outcomes for certain procedures and that they can create other unforeseeable issues in healthcare.⁷⁻¹⁰

There is a growing rate of kidney stone centers of excellence nationwide and the future of medicine may soon rely heavily on specialized centers of excellence. Many patients with simple and complex stones prefer to be operated on by physicians at centers of excellence, potentially due to the assumption that greater experience is correlated with improved outcomes for all procedures including URS. This association, however, has never been fully identified in the literature. Our data supports the claim that those physicians with greater experience can take on more complex cases and nonetheless report improved stone free rates and less surgical complications.

Preliminary Conclusions:

These data suggest that surgical experience as defined by both surgeon volume and endourology fellowship training has a significant impact on the complexity of stone cases operated on, and the surgical outcomes of URS. Physicians with more experience operated on significantly more complex cases, yet, despite this, showed improved stone free rates and reduced perioperative outcomes. This suggests that greater surgeon volume and endourology fellowship training may be associated with overall improvements in URS outcomes.

Future Directions:

While the reported results are preliminary, the large sample size in this study successfully identified important surgical outcomes of URS and how they are impacted by surgeon experience. As we continue to analyze more data, we aim to include data from a larger cohort of endourology fellowship trained physicians, and to include stone location information to better estimate stone complexity. Additionally, we look forward to expanding the scope of this study to identify whether similar trends are found for other nephrolithiasis treatment options such as percutaneous nephrolithotomy (PCNL) and extracorporeal shock wave lithotripsy (ESWL).

References:

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Tables:

Table 1. Effect of Surgeon Volume (Median URS/Year) on Surgical Outcomes for URS							
	Median URS/Year			Primary Analysis	Post Hoc Analysis		
	<20 (n=5)	20-49 (n=6)	> 50 (n=3)	p-value	<20 vs 20-49	<20 vs >50	20-49 vs >50
Stone Size (cm)	0.88	0.90	0.88	0.3132	-	-	-
Operative Time (minutes)	66.47	65.63	66.34	0.913	-	-	-
Estimated Blood Loss (mL)	16.37	14.18	23.07	<0.001	0.999	0.001	0.001
Length of Stay (days)	0.22	0.15	0.43	<0.001	0.289	0.020	<0.001
Stone Free Rate (%)	43.59	37.71	62.94	<0.001	0.385	0.004	<0.001
Peri-Op Complications (%)	13.79	6.94	6.50	0.044	0.049	0.029	0.855
30 Day ED Visits (%)	7.76	7.87	4.47	0.264	-	-	-
90 Day ED Visits (%)	0.00	2.31	1.22	0.218	-	-	-
30 Day Readmissions (%)	8.62	5.02	3.25	0.092	-	-	-
90 Day Readmissions (%)	7.76	3.70	2.85	0.084	-	-	-

p-values based on Kruskal-Wallis with Dunn Post Hoc for continuous variables, Fischer Exact for categorical variables. Significance of p<0.05 (**Bolded For Reference**)

Table 1: Effect of surgeon volume (defined as median URS performed per year across 2017-2019) on surgical outcomes of URS. Surgeon volume categorized as <20 URS/year, 20-49 URS/year, and >50 URS/year.

Table 2. Effect of Endourology Fellowship Training on Surgical Outcomes for URS			
	Fellowship Training		p-value
	Endourology Fellowship (n=2)	No-Endourology Fellowship (n=12)	
Stone Size (cm)	1.15	0.89	0.006
Operative Time (minutes)	74.23	63.40	0.021
Estimated Blood Loss (mL)	23.33	15.94	0.025
Length of Stay (days)	0.64	0.17	<0.001
Stone Free Rate (%)	77.36	41.58	<0.001
Peri-Op Complications (%)	7.91	8.20	0.999
30 Day ED Visits (%)	7.19	6.15	0.691
90 Day ED Visits (%)	0.00	1.82	0.209
30 Day Readmissions (%)	4.32	5.69	0.668
90 Day Readmissions (%)	2.16	4.78	0.226

p-values based on Mann-Whitney for continuous variables, Fischer Exact for categorical variables. Significance of p<0.05 (**Bolded for Reference**)

Table 2: Effect of endourology fellowship training on surgical outcomes for URS. Fellowship training was compared between those physicians who completed endourology fellowship training and those who completed a non-endourology fellowship training or did not complete a fellowship training.