Contemporary Surgical Trends in the Management of Upper Tract Calculi

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Abbreviations and Acronyms

ABU = American Board of Urology

PCNL = percutaneous nephrolithotomy

SWL = shock wave lithotripsy

URS = ureteroscopy

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Purpose: Upper tract nephrolithiasis is a common surgical condition that is treated with multiple surgical techniques, including shock wave lithotripsy, ureteroscopy and percutaneous nephrolithotomy. We analyzed case logs submitted to the ABU by candidates for initial certification and recertification to help elucidate the trends in management of upper tract urinary calculi.

Materials and Methods: Annualized case logs from 2003 to 2012 were analyzed. We used logistic regression models to assess how surgeon specific attributes affected the way that upper tract stones were treated. Cases were identified by the CPT code of the corresponding procedure.

Results: A total of 6,620 urologists in 3 certification groups recorded case logs, including 2,275 for initial certification, 2,381 for first recertification and 1,964 for second recertification. A total of 441,162 procedures were logged, of which 54.2% were ureteroscopy, 41.3% were shock wave lithotripsy and 4.5% were percutaneous nephrolithotomy. From 2003 to 2013 there was an increase in ureteroscopy from 40.9% to 59.6% and a corresponding decrease in shock wave lithotripsy from 54% to 36.3%. For new urologists ureteroscopy increased from 47.6% to 70.9% of all stones cases logged and for senior clinicians ureteroscopy increased from 40% to 55%. Endourologists performed a significantly higher proportion of percutaneous nephrolithotomies than nonendourologists (10.6% vs 3.69%, $p < 0.0001$) and a significantly smaller proportion of shock wave lithotripsies (34.2% vs 42.2%, $p = 0.001$).

Conclusions: Junior and senior clinicians showed a dramatic adoption of endoscopic techniques. Treatment of upper tract calculi is an evolving field and provider specific attributes affect how these stones are treated.

Key Words: urolithiasis; physician's practice patterns; ureteroscopy; lithotripsy; nephrostomy, percutaneous

In the last 30 years the management of urinary tract stone disease has undergone tremendous changes prompted by the adoption of new technological and treatment advances.[1–4] In the current era open surgery has been almost entirely replaced by the minimally invasive techniques of URS, extracorporeal SWL and PCNL. As more treatment modalities become available to treat upper tract calculi, there is a corollary increase in the complexity of decision making in the management of these stones. Urologists are often faced with surgical scenarios in which several treatment modalities may be acceptable. Several studies

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have confirmed that there is considerable variation in the practice patterns of urologists today.[5–7] The advent of this increasingly complex clinical decision making led us to investigate contemporary surgical trends in upper tract stone management.

Beginning in 2003 the ABU initiated the practice of requiring detailed electronic surgical operative logs for all candidates at initial certification as well as at each subsequent recertification.[8] These case logs serve as a unique source of the documented clinical practices of American urologists. We used these ABU surgical case logs to determine the current practice patterns of upper tract calculi treatment of urologists in the United States.

MATERIALS AND METHODS

The ABU was started in 1934 to serve as a surgical specialty board to improve standards, promote competency and encourage education in the practice of urology. Urologists may be granted certification by the ABU by completing basic training, thereby demonstrating they have attained the level of knowledge and expertise required for the care of patients with urological disease. If certified before 1985, recertification is not mandatory but for all urologists certified after 1985 mandatory recertification must be performed every 10 years.

A significant portion of certification is the completion of surgical operative logs describing a consecutive 6-month period before application submission. These logs characterize patient demographics, including age and gender, and surgeon characteristics, including age, certification group and clinical practice location. In addition, surgeons report self-appointed subspecialization in 1 of 5 areas (endourology, oncology, pediatrics, andrology and female urology). Diagnoses are logged according to ICD-9 code and surgical procedures are coded using CPT codes.

We analyzed annualized case logs from 2003 to 2012 for trends and used logistic regression models to assess how surgeon specific attributes affected the treatment of upper tract stones. Cases were identified using CPT codes as the search criteria. They included SWL (50590), URS (52336—URS with removal of stone, 52337—URS with lithotripsy, 52352—cystourethroscopy with URS and/or pyeloscopy/with removal or manipulation of calculus and 52353—cystourethroscopy with URS and/or pyeloscopy, laser lithotripsy) and PCNL (50080—stone burden less than 2 cm and 50081—stone burden greater than 2 cm). The Northwestern University Feinberg School of Medicine institutional review board granted this study exempt status.

We determined trends in the surgical management of upper tract urinary calculi among urologists who submitted case logs for ABU certification. We hypothesized that younger urologists (candidates) would be more likely to manage stones endoscopically than older (recertifying) urologists. In addition, we hypothesized that surgeons who specialized in endourology would perform an increased number of PCNLs relative to nonendourologists. Finally, we assessed surgeon and practice characteristics associated with nephrolithiasis surgery. Results were considered statistically significant at 2-sided $\alpha < 0.05$. We used multivariate logistic regression when appropriate to evaluate surgeon factors and practice factors associated with nephrolithiasis surgery.

RESULTS

A total of 6,620 urologists recorded case logs during this 9-year period from 2003 to 2012. A total of 2,275 urologists with a mean age of 34 years comprised the candidate certification cohort. In the 2 recertification cohorts we identified 2,381 and 1,964 individuals with a mean age of 43 and 53 years, respectively.

A total of 441,162 total procedures for upper tract urinary calculi were performed, of which 54.2% were URS, 41.3% were SWL and 4.5% were PCNL (see table). We observed an overall increase in URS from 40.9% of all stone procedures in 2003 to 59.6% in 2012 (fig. 1). There was a corresponding decrease in SWL from 54% to 36.3%. PCNL remained stable, accounting for 4% to 5% of all surgeries during this period ($p = 0.81$, fig. 1). New urologists showed an increase in URS during this period from 47.6% to 70.9%, representing a 23% increase. More senior surgeons (those undergoing first or second recertification) similarly showed an increase in URS from 40% in 2003 to 55% in 2012, representing a 15% increase (fig. 2).

Figure 3 shows differences in treatment modality use by endourology specialists vs nonendourologists. Endourologists performed a significantly higher proportion of PCNL than nonendourologists (10.6% vs 3.69%, OR 2.87, $p < 0.0001$) and a significantly smaller proportion of SWL (34.2% vs 42.2%, OR 0.8102 $p = 0.001$).

Additional statistical analysis was done to assess differences in stone surgery based on clinical practice location as defined by state. Although the Southeast logged the highest number of total stone surgeries, there was no statistically significant difference in stone surgery type when stratified by the population of each region in the United States. Although small individual differences existed among states, a consistent trend was noted toward increased URS in each geographic region.

Procedures by cohort from 2003 to 2012

	No. SWL	No. PCNL	No. URS	Total No.
New certification	40,850	8,784	92,026	141,660
1st Recertification	76,074	6,730	84,650	167,454
2nd Recertification	66,534	3,396	62,118	132,048
Totals	183,458	18,910	238,794	441,162