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Urologist Ownership of Ambulatory Surgery Centers and Urinary Stone Surgery Use

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ABSTRACT

Objective: To understand how physician ownership of ambulatory surgery centers (ASCs) relates to surgery use.

Data Source: Using the State Ambulatory Surgery Databases, we identified patients undergoing outpatient surgery for urinary stone disease in Florida (1998 – 2002).

Study Design: We empirically derived a measure of physician ownership and externally validated it through public data. We employed linear mixed models to examine the relationship between ownership status and surgery use. We measured how a urologist's surgery use varied by the penetration of owners within his local health care market.

Principal Findings: Owners performed a greater proportion of their surgeries in ASCs than non-owners (39.6% versus 8.0%, $P<0.001$), and their utilization rates were over twofold higher ($P<0.001$). After controlling for patient differences, an owner averaged 16.32 (95% CI, 10.98 – 21.67; $P<0.001$) more cases annually than did a non-owner. Further, for every 10% increase in the penetration of owners within a urologist's local health care market, his annual caseload increased by 3.32 (95% CI, 2.17 – 4.46; $P<0.001$).

Conclusions: These data demonstrate a significant association between physician ownership of ASCs and increased surgery use. While its interpretation is open to debate, one possibility relates to the financial incentives of ownership. Additional work is necessary to see if this is a specialty-specific phenomenon.

Key Words: Ownership; ambulatory surgery center, utilization; physicians' practice patterns

INTRODUCTION

Over the last two decades, escalating health care costs in the U.S. have led to sweeping reforms in reimbursement for physician services (The Omnibus Budget Reconciliation Act of 1989; Health Care Financing Administration 1991). The overall effect of these reforms has been to increase compensation for outpatient evaluation and management, while decreasing reimbursement for many surgical procedures (Goluboff and Olsson 1994; Litwin, Sacher, and Cohen 1993). These changes in reimbursement have compelled surgeons to seek alternative sources of revenue in order to maintain their income (Pham et al. 2004). Among urologists, lithotripsy for the treatment of urinary stones has served as one such economic resource (Lotan et al. 2004).

Technological advances have improved the efficiency and decreased the morbidity of stone surgery, allowing more and more procedures to be done in the outpatient setting (Pearle, Calhoun, and Curhan 2005). The profitability of lithotripsy stems, in part, from the unique financial structure of the freestanding ambulatory surgery centers (ASCs) and lithotripsy centers in which many stone surgeries are currently performed. As the provision of lithotripsy services is exempted from the federal statute prohibiting physician self-referral (American Lithotripsy Society et al. vs. Tommy G. Thompson 2002), urologists can refer and treat patients at an ASC or lithotripsy center in which they are invested. Physicians with ownership interest in these centers collect not only a professional fee for the services provided, but they also share in their facilities' profits. Indeed, over the last decade urologists' financial interests in ASCs have increased from 12% to 21%, and the proportion of U.S. urologists invested in a lithotripsy center has risen from 36% to an estimated 54% (Gee et al. 1998; O'Leary et al. 2002).

While there are data to support medical therapy and observation for many patients with urinary stones (Hollingsworth et al. 2006), a variety of clinical factors may influence a urologist's decision to perform surgery, and the ultimate decision for intervention is left to the discretion of the surgeon. Thus, the potential exists for the perversion of those incentives associated with physician ownership. Specifically, urologists with investment in an ASC may be driven by financial pressures to relax their indications for treatment, which would manifest as higher stone surgery rates (McGuire 2000; McGuire and Pauly 1991). With this in mind, we characterized use of stone surgery among urologists as they relate to their ownership status. The results of this analysis have relevance to the policy debate surrounding federal Anti-Kickback Statute safe harbors and Stark Law definitions that permit physician investment in ASCs.

METHODS

Subjects and databases. For this study, Florida data from the Healthcare Cost and Utilization Project's State Ambulatory Surgery Databases (SASD) were used. The SASD captures 100% of surgeries in a given year performed on the same day in which patients are admitted and released (Healthcare Cost and Utilization Project 2008). Its completeness has been validated through alternative sources of comparative data (Busch and Steiner 2007). Abstracted cases were restricted to years 1998 through 2002. After this time period, a change in the surgeon identifier supplied by the data source occurred, which did not conform to the documented pattern, and it was impossible to track physicians across years beyond 2002.

Florida data were chosen primarily for three reasons. First, Florida was one of only four participating states in the SASD that captured data allowing us to follow individual physicians across discharges throughout the study interval. Second, Florida requires no Certificate of Need review prior to the establishment of an ASC (Health Council of South Florida 2008). Therefore, the competition between hospital-based surgery centers and freestanding ASCs is largely unregulated by the State. Third, Florida is located within the geographic region of the U.S. with the highest age-adjusted prevalence of urinary stones (Stamatelou et al. 2003), making it useful for assessing their surgical treatment.

The study cohort was identified from the SASD files using *Physicians' Current Procedural Terminology* codes for those surgical procedures used in the definitive treatment of urinary stones, including percutaneous nephrolithotomy (50080, 50081, 50130, or 50561), shockwave lithotripsy (50590), ureteroscopy (52320, 52325, 52330, 52335, 52336, 52337, 52351, 52352, or 52353), and conventional extraction (50060, 50065, 50070, 50075, 50610, 50620, or 50630). Ancillary procedures non-specific for stone therapy, including placement of a percutaneous nephrostomy tube (50040, 50398, or 52334) or a ureteral stent (52332), were also included if there was a concomitant diagnosis of urinary stone disease based on *International Classification of Disease, 9th Revision* diagnosis codes (270.0, 271.8, 274.11, 592.0, 592.1, or 592.9). By this algorithm, a total of 104,018 discharge records were abstracted, during 36.7% of which multiple stone surgeries were performed in the same setting. Using the SASD's surgeon identifier, we then aggregated across discharges and constructed an analytic file, in which the surgeon-year served as our unit of analysis (*n*=3,910).

<u>Ownership penetration.</u> Next, we determined which of the urologists in our cohort were invested in an ASC and which were not. One of the current safe harbors to the federal Anti-Kickback Statute applicable to ASCs requires physician owners to perform at least one third of their outpatient surgical cases at the center in which they are invested (Becker and Biala 2000; Health Care Financing Administration 1999). Therefore, we considered a urologist to be an

owner if he performed 30% or more of his ambulatory surgery cases in a year at a given ASC. This ownership definition, which is independent of the urologist's surgical volume, is similar to that which has been used in the literature on cardiac specialty hospitals (Mitchell 2005). The SASD maintains explicit codes, which allowed for us to distinguish between hospital-based surgery center discharges from those at freestanding ASCs, including lithotripsy centers.

Of the total 1,498 unique urologists in our cohort, the ownership status of 1,367 (91.3%)—172 owners and 1,195 non-owners—remained constant throughout the study interval. For the remaining 131 (8.7%) whose status changed at least once, a urologist was classified as an owner of an ASC if he met our ownership threshold (one third of his outpatient surgical cases within a year performed at the ASC) for 75% of the time in which he was a part of the study. Using this definition, we classified 35 and 96 additional urologists as owners and non-owners, respectively.

Subsequently, we constructed a variable to serve as a marker of local competition within a health care market. Based on the association between physician density and health care utilization (Paul-Shaheen, Clark, and Williams 1987; Folland and Stano 1990), we defined physician ownership penetration as the ratio of ASC owners to all urologists in a health care market. This ratio has values ranging from 0 to 1. The hospital referral region (HRR) boundaries for tertiary medical care (Wennberg 1996) were used to divide Florida up into 19 separate health care markets.

Those surgery centers where the urologists in our cohort operated were assigned to their corresponding HRR in one of two ways. For hospital-based surgery centers, our dataset could be linked to the 2003 American Hospital Association Annual Survey, which gives a hospital's HRR as a data element. For freestanding ASCs, we examined the frequency distribution of their patients' five-digit ZIP codes, and we ascribed each ASC to the ZIP code from which the majority of its patients emanated. We then cross-walked these facilities from their ZIP codes to their corresponding HRR using content from the Dartmouth Atlas (The Dartmouth Atlas Project 2007).

Validation of ownership definition. We then performed a query of public records. The Agency for Health Care Administration (AHCA) maintains the FloridaHealthStat Web site (AHCA 2007), through which we identified those freestanding ASCs at which ten or more urologic surgeries were performed annually (*n*=60). Because every hospital's AHCA identifier is in the SASD files from Florida, we were able to determine which of these freestanding ASCs were also present in our study (*n*=51).

The Florida Department of State, Division of Corporation makes the ownership records of these facilities publicly available (Florida Department of State, Division of Corporations 2007), through which we could determine their non-profit status. Using the Florida Department of Health physician locator (Florida Department of Health 2007), we identified the specialty of each physician owner. Of the 49 for-profit facilities, ownership could be traced back to a urologist in 17 (35%). The physician locator was then used to find those urologists who practiced at the same address as the index owner. The total number of physicians with ownership interest in the facility was then determined, and this was compared to the number derived from our empirical definition.

While we are prohibited from identifying individual physicians and facilities, the SASD's data use agreement does permit us to report aggregate statistics. For those 17 facilities whose ownership was traced back to a urologist, we identified 88 actual physician owners, or 94.6% of the 93 owners predicted by our empirically derived measure. In addition, 19 of the 21 urologists at the two non-profit facilities were properly classified as non-owners.

Primary analyses. We arrived at our primary outcome measure by summing a urologist's procedural volumes for stone disease across all freestanding ASCs and hospital-based surgery centers in which he practiced during a calendar year. Our secondary outcome was the annual utilization rate of stone surgery within a given health care market measured at the urologist level. For this rate calculation, the numerator was a urologist's annual stone surgery count. The denominator represented the population of the HRR in which the urologist practiced. Total population counts for these HRRs were obtained from the Dartmouth Atlas (The Dartmouth Atlas Project 2007). These crude rates were then age-adjusted to the 2000 U.S. population using direct adjustment methods and are expressed per 100000 U.S. population.

To examine the association between ownership status and urologists' annual surgery use, we employed linear mixed models. The relationship between ownership penetration and annual caseloads was modeled in the same way. Use of the mixed models corrected our standard errors for the potential correlation of our observations (i.e., repeated measures of the same urologist over time). The surgeon's identifier and the HRR in which he operated were introduced into the mixed models as random effects. Patient age, gender, race, primary payer, socioeconomic status, and level of comorbidity, in addition to operative year, were then introduced into our models as fixed effects to adjust for potential differences in a urologist's patient population. To determine a patient's comorbidity status, we constructed indicator variables identifying those cases for which there were 0, 1, 2, 3, 4, or 5 comorbid conditions on the discharge record. Socioeconomic status was measured at the patient ZIP-code level using a summary measure as described by Diez Roux (Diez Roux et al. 2001).

Secondary analyses. Next, we performed several secondary analyses to evaluate the robustness of our findings. One threat to our study's validity stems from our choice of an outcome measure. Utilizing a urologist's annual count of ambulatory stone surgeries assumes that the procedures performed are relatively homogeneous. However, if this is untrue, then the count may obscure the use of more resource-intensive procedures with higher relative values. Therefore, we conducted subgroup analyses, fitting separate regression models for the five stone treatments examined: percutaneous nephrolithotomy, shockwave lithotripsy, ureteroscopy, conventional extraction, and those ancillary procedures non-specific for stone therapy. In addition to measuring annual volume counts for each procedure, we also assigned resource-based relative value units (RVUs) to the individual stone treatments based upon the surgery's complexity, as codified by *Physicians' Current Procedural Terminology* (Appendix A). We then tabulated a urologist's RVU total by procedure type.

We also recognized the possibility for design selection bias. Specifically, without a minimum annual caseload criterion, we may have included some urologists in our analysis who do not treat stone disease on a regular basis. If we designated these urologists as non-owners, then our results would be biased towards rejecting the null hypothesis. Therefore, we tested the sensitivity of our findings to the inclusion criteria used, first, by limiting our study population to those urologists who performed 20 or more stone surgeries annually and, second, by performing an outlier analysis estimating our models with and without the top and bottom deciles with respect to surgeon annual caseload. Despite the elimination of extremes in the data, the observed associations persisted.

To assess for potential misclassification bias and measurement error, we varied the share of a surgeon's cases in a given year at an ASC to constitute ownership (i.e., 10%, 20%, 40%, and

50%) and repeated our analyses. Finally, to evaluate whether those urologists with several years of observations had an undue influence on our results, we constructed a separate dataset that included a randomly selected year of cases for those whose participation spanned multiple years, results from which remained consistent with our primary analyses. All tests were two-tailed and performed at a significance level of 0.05 using Stata version 9.0 (Stata Corp, College Station, Texas). In accordance with the Code of Federal Regulations Title 45 Subpart A Section 46.101 paragraph b subparagraph 4, Institutional Review Board approval was waived for this study.

RESULTS

Comparisons between the patient mix of owners and non-owners are shown in Table 1. Patients operated on by owners appeared to be healthier with 56.8% having no comorbid conditions compared to 45.3% of patients treated by non-owners ($P<0.001$). The patient population cared for by owners compared to non-owners was also more likely to be white (90.0% versus 81.0%, $P<0.001$). In addition, owners carried out a higher proportion of their cases at freestanding ASCs than non-owners (39.6% versus 8.0%, $P<0.001$), and they were less likely than non-owners to perform multiple procedures in the same setting (32.8% versus 38.0%, $P<0.001$).

Overall age-adjusted utilization rates were higher among owners versus non-owners (8.49 versus 3.32 cases per 100000 U.S. population, $P<0.001$). This difference persisted across our study interval and was mirrored by those trends for shockwave lithotripsy, ureteroscopy, and ancillary procedures (Figure 1). From our mixed models, a highly significant association was noted between physician ownership and a urologist's overall annual case volume [$\beta=22.92$; 95% confidence interval (CI), 19.11 – 26.74; $P<0.001$], and the magnitude of this association was attenuated little by adjustments for patient mix and time (adjusted β=16.32; 95% CI, 10.98 – 21.67; *P*<0.001). Moreover, this association persisted regardless of the threshold used to define physician ownership status (Table 2). Our adjusted models reveal that this caseload difference translates into higher annual utilization rates among ASC owners compared to non-owners by 3.57 cases per 100000 U.S. population (95% CI, 2.63 – 4.52; *P*<0.001).

Table 3 displays the results from our subgroup analyses in which we examined the annual volume counts and RVUs for each procedure as a function of physician ownership status. These data reveal that the difference between owners and non-owners with respect to their stone surgery use is largely driven by an increase in the use of shockwave lithotripsy by owners. These results also highlight increased use of ureteroscopy and ancillary procedures among owners. Data on the most resource-intensive surgeries—percutaneous nephrolithotmy and conventional extraction (Appendix A)—show no difference in utilization between owners and non-owners. Of note, these procedures were performed almost exclusively in hospital-based surgery centers (99.5% of percutaneous nephrolithotomies and 99.4% of conventional extractions) and accounted for only a small fraction (0.8% combined) of all ambulatory stone surgeries.

Finally, the results from our models on ownership penetration revealed higher surgeon annual caseloads associated with increasing health care market competition. For every 10% increase in the penetration of physician owners, we observed an increase in a urologist's annual volume of stone surgery by 5.36 cases (95% CI, 4.46 – 6.26; *P*<0.001). After adjustment, we observed that annual case volume would increase by 3.32 (95% CI, 2.17 – 4.46; *P*<0.001).

DISCUSSION

Our data demonstrate a significant association between physician ownership of ASCs and higher use of surgical services for the treatment of urinary stone disease. Further, surgeon annual caseloads were found to rise as the penetration of physician owners increased within a health care market. With the Centers for Medicare and Medicaid Services new prospective payment system for ASCs, reimbursement for several lithotripsy procedures is slated to increase (Centers for Medicare & Medicaid Services, HHS 2007). As such, the observed differences in stone surgery utilization may become even more pronounced, resulting in higher health care expenditures.

Admittedly, these data do not demonstrate a causal relationship between physician ownership and the provision of increased and/or non-beneficial patient care, and we acknowledge that there are multiple plausible explanations for our findings. For one, the higher surgery rates associated with ownership may reflect surgeon specialization. Physician owners may have clinical practices tailored towards treating patients with urinary stones—the majority of surgeries for which can be performed on an ambulatory basis. Whereas, non-owners may lack the caseloads needed to justify the cost of investment. As such, owners' utilization would be higher because of their skill set, not because they own facilities.

Another possible explanation for our findings, which is also unrelated to financial incentives, pertains to efficiencies in patient care. Proponents of ASCs have long argued that by focusing solely on one component of patient care, ASCs are more efficient in their care delivery (Davis 1987). Without the huge infrastructures and associated maintenance expenses that burden hospitals, ASCs can maintain low overheads, keeping costs to patients down (Wolfson, Walker, and Levin 1993). Physicians who see a large number of their patients treated more readily and for lower costs at ASCs may understandably make the decision to become owners themselves.

Alternatively, our findings may be related to differences between owners and non-owners with respect to their desire for financial gain. Profit motive works no less among non-owners as it does among owners, and non-owners maximize personal profits in the same way that owners do—by operating more. While most would agree that the majority of urologists do not practice medicine for monetary reasons alone, they do face a business reality, and it seems reasonable to assume that those urologists who are the most motivated by profit are also the most likely to invest in ASCs, given their unique incentive structure. By virtue of their profit preferences, some owners may be driven to the point of relaxing their indications for intervention and inducing demand (McGuire 2000; McGuire and Pauly 1991).

There are several limitations to our study that merit further discussion. To begin, we did not measure ownership directly, but rather derived it empirically relying on the safe harbor provisions (Becker and Biala 2000; Health Care Financing Administration 1999). Nonetheless, we externally validated our ownership definition, querying the public records of a meaningful subsample of facilities, and found good agreement. Moreover, based on the threshold used to constitute ownership status, we may have misclassified some urologists; however, we conducted secondary analyses, varying the share of a surgeon's cases needed to establish ownership, and demonstrated our results to be robust.

We also recognize that our primary outcome—a surgeon's annual caseload—is not ideal. Summing procedure codes assumes that the surgeries performed are homogeneous and that the amount of work required for each is about the same. Since this is unlikely to be the case, we performed subgroup analyses in which we examined the annual volume counts and RVUs for each procedure as a function of physician ownership status; and we found that the difference in stone surgery use between owners and non-owners is largely driven by owners' greater affinity for shockwave lithotripsy—a finding that is not surprising when considering that shockwave lithotripsy has one of the highest reimbursement rates per hour of service provided among common urologic procedures (Lotan et al. 2004).

Our secondary outcome has its shortcomings, as well. If we knew the number of patients with stone disease that each urologist saw, we would be able to determine if the proportion of patients referred for a lithotripsy procedure differed between owners and non-owners. Lacking these data, we used a urologist's annual utilization rate of stone surgery as a proxy for his frequency of surgery use. The problem with this measure is that the denominator for the rate calculation—the population of the HRR in which the urologist practices—overestimates the urologist's panel size. With population estimates for HRRs that range from several hundred thousand to over two million people (The Dartmouth Atlas Project 2007), the urologist's annual utilization rate surely underestimates his actual frequency of use. Consequently, the observed rate difference between owners and non-owners, which is small in absolute terms, may be misconstrued as having little clinical significance. Therefore, we caution the reader against interpreting these rates in isolation. They are best viewed in conjunction with the annual caseload difference between owners and non-owners.

Finally, we are limited by the granularity of the SASD. As such, we are unable to control for those clinical features (e.g., urinary stone size, location, patient symptom severity) known to influence treatment. Thus, we cannot comment of the appropriateness of the cases performed.

CONCLUSIONS

In summary, our data demonstrate a significant association between physician ownership of ASCs and higher use of surgical services for the treatment of urinary stone disease. The interpretation of this association is debatable, though a likely possibility relates to the perversion of financial incentives among physician owners. While it is naïve to believe that ridding the landscape of physician-owned ASCs would effectively address the problem of overutilization in our health care system, these data suggest that such relationships may contribute to rising expenditures. Further work is necessary to elucidate the extent to which misaligned incentives drive the use of discretionary surgery.

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FIGURE LEGEND

Figure 1. Age-Adjusted Rates of Urinary Stone Surgery Stratified by Physician Ownership Status and Procedure Type

Footnote: Rates expressed per 100000 U.S. population. Bars represent the mean utilization rates for physician owners (black) and non-owners (white). Error bars represent the standard deviation around the point estimates. Ancillary procedures include placement of a percutaneous nephrostomy tube or a ureteral stent.

Table 1. Comparing the Patient Mix Between Owners and Non-Owners.

Patient Characteristic	Non-Owner (n=79,511)	Owner (n=24,507)	P-Value
Age ± standard deviation (years)	53.3 ± 16.4	53.8 ± 16.3	<0.001
Female (%)	37.0	36.4	0.065
Race (%)			<0.001
White	81.0	90.0	
Black	4.7	5.0	
Hispanic	11.6	3.4	
Asian	0.4	0.5	
Other	2.3	1.1	
Payer (%)			<0.001
Medicare	27.3	29.7	
Medicaid	3.6	3.6	
Private	62.3	59.2	
Self-pay	2.8	3.3	
Other	4.0	4.2	
Socioeconomic status (%)			<0.001
Low	33.1	35.1	
Medium	33.1	34.2	
High	33.8	30.7	
Number of diagnoses (%)			<0.001
0	45.3	56.8	
1	22.2	19.7	
2	13.9	10.1	
3	8.7	6.2	
4	8.3	6.3	
5	1.6	0.9	

Table 2. Linear Mixed Model Output, Examining the Association between Ownership Status and Annual Case Volume

% of Annual Surgical Volume at an ASC for Ownership	B-Coefficient for Ownership Status*			
	Unadjusted	95% CI	Adjusted**	95% CI
10%	24.55	21.46 – 27.65	20.74	16.31 – 25.17
20%	23.68	20.20 – 27.15	18.54	13.60 – 23.49
30%	**22.92**	**19.11 – 26.74**	**16.32**	**10.98 – 21.67**
40%	20.21	15.94 – 24.48	13.41	7.50 – 19.32
50%	14.36	9.53 – 19.19	8.03	1.52 – 14.54

Abbreviations: ASC, ambulatory surgery center; CI, confidence interval.

*Interpretation of model output: The annual case volume for stone surgery, on average, is expected to be higher among owners of an ASC compared to non-owners by the amount of the coefficient.

**Models adjusted for patient age, gender, race, payer mix, socioeconomic status, level of comorbidity, and operative year.

Table 3. The Association between Ownership Status and Annual Case Volume and Relative Value Units Stratified by Procedure Type

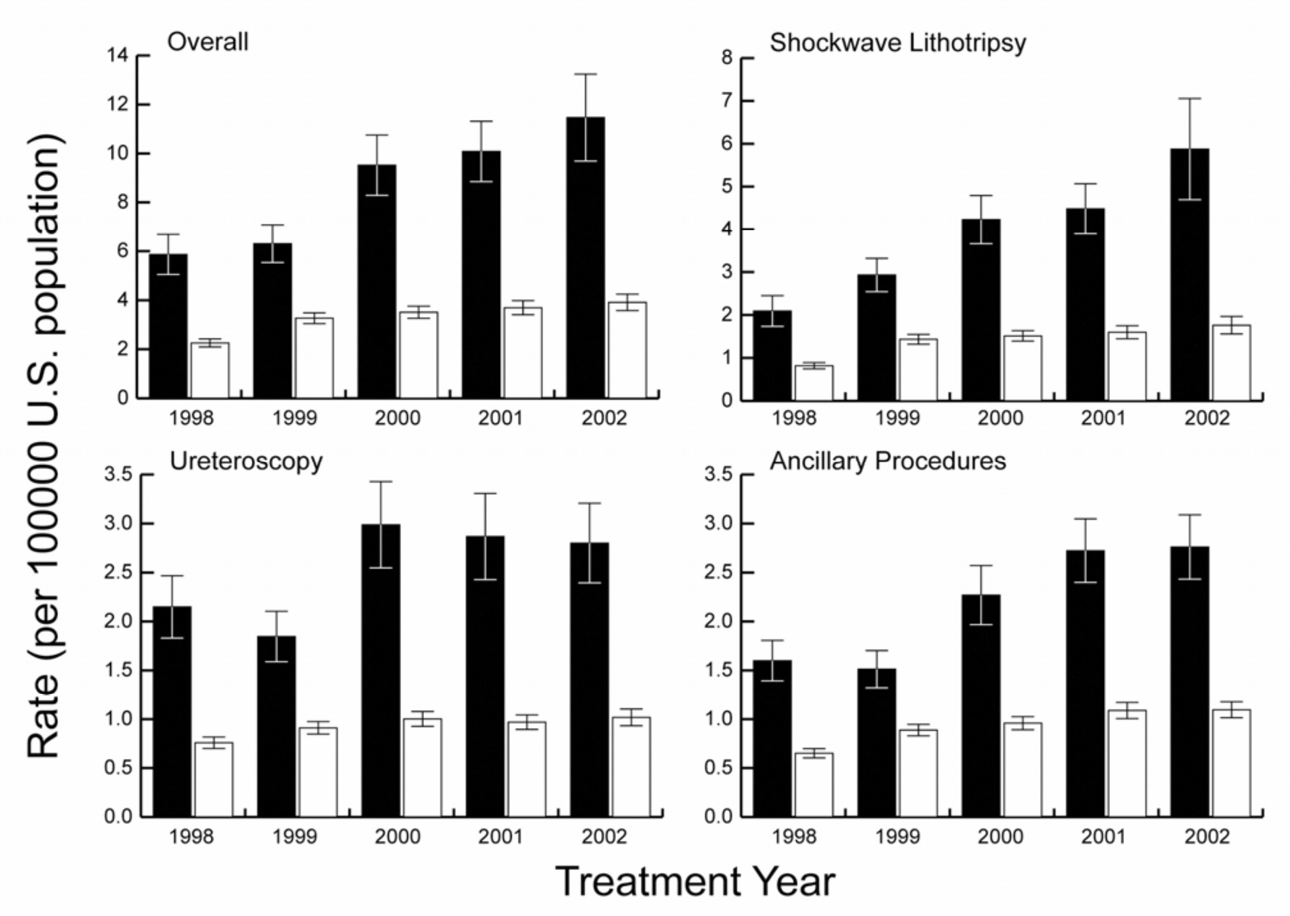
	Annual Case Volume			
	Raw Count		Relative Value Units	
	Adjusted β*	95% CI	Adjusted β*	95% CI
Overall	16.32	10.98 – 21.67	110.33	74.19 – 146.46
Percutaneous Nephrolithotomy	-0.11	-0.25 – 0.3	-1.81	-3.93 – 0.32
Shockwave Lithotripsy	7.45	4.91 – 9.99	67.71	44.59 – 90.82
Ureteroscopy	5.25	3.55 – 6.96	34.64	23.16 – 46.12
Conventional Extraction	-0.02	-0.05 – 0.01	-0.41	-1.01 – 0.19
Ancillary Procedures**	3.99	2.34 – 5.64	11.16	6.48 – 15.84

Abbreviations: CI, confidence interval.

*Models adjusted for patient age, gender, race, payer mix, socioeconomic status, level of comorbidity, and operative year.

**Ancillary procedures include placement of a percutaneous nephrostomy tube or a ureteral stent.

Figure 1.



Overall
Shockwave Lithotripsy
Ureteroscopy
Ancillary Procedures
Rate (per 100000 U.S. population)
Treatment Year
14
12
10
8
6
4
2
0
7
5
3
1
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1998
1999
2000
2001
2002