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## Urinary Diversion Practice Patterns Among Certifying American Urologists

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### Abstract

**Purpose**—To investigate trends in urinary diversion usage and surgeon characteristics in the utilization of incontinent and continent urinary diversions using data from American Board of Urology.

**Methods**—Annualized case log data for urinary diversions were obtained from the American Board of Urology for urologists certifying or recertifying, from 2002 to 2010. We evaluated the association between surgeon characteristics and the use of any urinary diversion or the type of urinary diversion.

**Results**—Of 5,096 certifying or recertifying urologist case logs examined, 37% (n=1,868) performed any urinary diversions. The median number was 4 per year (IQR 2–6), 4% (n=222) performed 10 per year. On multivariable analysis, younger urologists, those self-identified as oncologists or female urologists, certifying in more recent years, in larger practice areas, or outside of the Northeast region of the United States were more likely to perform any urinary diversions. Only 9% (n=471) of the total cohort performed any continent urinary diversions. The likelihood of performing any continent urinary diversions increased with the number of urinary diversions (p <0.0001), and as the volume of urinary diversions increased, the proportion of these made up by continent urinary diversions also increased (p <0.0005). Surgeons in private practice settings or located in the Northeast were less likely to perform continent urinary diversions.

**Conclusion**—A minority of urologists performs any urinary diversions, and continent urinary diversions are most frequently performed by high volume surgeons. The type of urinary diversion a patient receives may depend, in part, on the characteristics of their surgeon.

### Keywords

urinary diversion; physician's practice patterns; cystectomy; urinary bladder neoplasms

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**Data Source/IRB:** Data were acquired from the American Board of Urology. All data were de-identified, and therefore, IRB approval was not required. The authors are responsible for the content of this paper, and the presented views do not reflect endorsement by the ABU.

Authors' contributions: the study was conceived by SAP, JLS, and WTL. All authors were responsible for the overall study design. ACM conducted statistical analyses. All authors contributed to writing the manuscript and approved the final version.

## Introduction

**Urinary Diversions (UD)** are typically performed after cystectomy for the treatment of bladder cancer. Cystectomy necessitates the formation of a UD to collect and drain urine; these can broadly be classified into two groups, **incontinent UD (IUD) and continent UD (CUD)**. For IUD the ureters are anastomosed to a segment of bowel that drains in an incontinent fashion to the anterior abdominal wall. Alternatively for CUDs, a reservoir constructed from detubularized bowel is anastomosed to the urethra or attached to the anterior abdominal wall via catheterizable limb.

While the absolute contraindications to CUD are few, the type of UD chosen is a complex decision that is dependent on oncologic characteristics and patient-related factors including individual preferences, willingness or ability to catheterize, age, comorbidities, body habitus, and renal function.<sup>1</sup> National datasets suggest that CUD may be underutilized and surgeon preferences and characteristics may be critical in influencing when cystectomy and what type of UD are implemented.<sup>2</sup> We performed an analysis of annual case logs from certifying physicians in the United States, to determine the characteristics and practice patterns of urologists and how these may influence which urologists perform UD and the type of UD performed.

## Methods

### Study Cohort and Data Source

The ABU was incorporated in 1935 and its objective is to “to ensure high quality, safe, efficient, and ethical practice of urology by establishing and maintaining standards of certification for urologists.”<sup>3, 4</sup> Initial certification requires completion of an accredited urology residency and practice for a minimum of 16 months before application. Eligible urologists seeking initial certification must pass an examination and are required to submit case logs containing CPT codes for all procedures performed within a consecutive 6-month period.<sup>3</sup> Urologists must recertify every 10 years which also requires applicants to pass an examination and submit 6-month case logs.<sup>4</sup> All case logs are analyzed by proprietary software and reviewed by the ABU (Charlottesville, VA).<sup>5</sup>

Urologists are required to include information regarding age, gender, specialty, and practice characteristics. Urologists must choose no more than three full- or part-time practice types from 14 designated options. The size of the population area in which they practice is categorized as shown in table 1. The first two digits of urologists' zip codes and information on case log dates were also captured and provided by ABU.

For our study we obtained de-identified electronic case log data between 2002 and 2010 from the ABU. Certifying and recertifying urologists' annualized case numbers for each CPT code for UD were collected and grouped into IUD with or without cystectomy (codes 50820, 51590, 51595) and CUD with or without cystectomy (codes 50825, 51596).

### Statistical Methods

Our aim was to describe the trends in UD among urologists submitting case logs for board certification by the ABU. Pediatric urologists (n=499) were omitted from our analysis, leaving 5,096 certifying and recertifying urologists in our cohort. Surgeon and practice characteristics and UD practice patterns are summarized in table 1. We compared urologists who did not perform UD to those who did. Urologists who performed UD were split into those who did not perform CUDs and those who did. Characteristics included age, gender, UD volume, year of case log, specialty, certification type, practice area size, practice type, and geographical region. Annual volume of UD was calculated by totaling the number of

procedures matching CPT codes for UD. Urologists in private practice were grouped together while all other urologists were considered non-private practice. Urologists who identified themselves as both private practice and non-private practice practitioners were designated as such. Practice regions were determined using the first digit of the urologists' zip codes. Zip codes that started with 0 or 1 were grouped as Northeast; 2, 3, and 7 as Southern; 4, 5, and 6 as the Midwest; 8 and 9 as Western; and all others were grouped together as Foreign/Other. To test for differences in surgeon characteristics by diversion practice patterns we used chi-square and two-sided t-tests (table 1).

Multivariable logistic regression models were used to evaluate the association between physician and practice factors and the likelihood of performing at least one UD (versus no UD) and at least one CUD (versus IUD only), adjusting for other factors. We compared surgeons with exclusively private practices to all others. Since the lowest proportion of urologists performing UD was in the Northeast, we elected to compare those with practices in the Northeast to all others. To test the hypothesis that higher-volume surgeons would perform CUD with greater relative frequency than lower-volume surgeons, the relationship between the percentage of CUD performed and total UD volume was evaluated using linear regression, adjusting for year. Volume was modeled using restricted cubic splines with knots at the tertiles to allow for a non-linear relationship with percent of CUD performed, and models were built separately by certification type. Statistical analyses were conducted using STATA 12.0 (StataCorp, College Station, TX).

## Results

In total, 5,096 non-pediatric urologists submitted case logs completed between 2002-2010 to the ABU for certification and recertification between 2004 and 2010. Table 1 shows characteristics of certifying and recertifying urologists divided by practice patterns. Approximately two-thirds (n=3,228, 63%) of certifying and recertifying urologic surgeons did not perform any UD, 27% (n=1,397) performed only IUD, and 9% (n=471) performed at least one CUD. Significant differences existed between urologists who performed any UD (n=1,868, 37%) and those who performed none (table 1). Multivariable analysis (table 2) demonstrated that urologists who performed any diversions were younger in age and certified or recertified in more recent years. Original certifiers were more likely to perform UD than first time recertifiers (figure 1). They were also more likely to self-identify as specialists in female urology or oncology, work in a location with a practice size greater than 100,000 persons and practice outside of the Northeast region of the US.

Differences also existed between urologists who performed IUD only, and those who performed any CUD. Multivariable analysis (table 2) demonstrated that surgeons with private practices and practices in the Northeast were less likely to perform CUD. Surgeons with a higher annual volume of UDs had a greater likelihood of performing at least one CUD. There was little evidence to suggest surgeon age, gender, specialty, year of certification, original vs recertification, or practice area size had an impact on diversion type. Figure 2 demonstrates graphically the relationship between UD volume and the probability of performing at least one CUD. As the volume of UD increases, the proportion of these made up by CUD also increases ( $p < 0.0005$ ). There was no evidence to suggest that certification type alters this relationship ( $p = 0.9$ ). On average, a surgeon who performed 6 UD a year performed CUD 15% of the time, while a surgeon who performed 30 UD a year performed CUD 31% of the time.

## Discussion

While the patient is the ultimate arbiter of their health care decisions, the practitioner plays a critical, though difficult to measure, role in determining which patients undergo a UD and the type of UD they receive. In this analysis we used data from the case logs of certifying and recertifying urologists to provide insight into the practice patterns of American urologists. We found that only about one third of these practitioners perform any UD and those who do perform UD perform a median of 4 per year. Urologists who perform more UDs are more likely to perform CUDs, and as the number of UDs increases, the proportion of CUD increases. We also demonstrated that variations exist in surgeon and practice characteristics of urologists who do or do not perform UD, and between those who perform only IUD and those who perform both IUD and CUD. Understanding these practice patterns may impact treatment options available to patients and their intervention.

Few urologists perform UD, which may be preferable due to the technically complex nature of the operation and resulting morbidity coupled with frequent readmissions.<sup>6, 7</sup> UD should be performed by experienced, well-qualified practitioners; however, the lack of surgeons performing UD may contribute to low compliance with standard of care. Surveillance Epidemiology and End Results data demonstrated that only 21% of patients with muscle-invasive disease received cystectomy with UD.<sup>8</sup> One possible explanation for why few urologists perform UD may be the minimal exposure to UD many urologists have during training. Data from 2000 to 2004, has demonstrated that 10% of graduating urology residents performed 2 or fewer UDs and 50% performed less than 12 during training.<sup>9</sup> Urologists who identified themselves as having a subspecialty in the field of female urology or oncology were more likely to perform UD than those who did not. It is likely these physicians gained more familiarity with these procedures through subspecialty training, resulting in a greater probability of performing IUD. Interestingly urologists certifying or recertifying in more recent years, younger in age and in their initial certification (compared with first time recertifiers) were more likely to perform UDs. The reasons for this finding are speculative but may reflect efforts to improve urologic residency training in more recent years. Alternatively this pattern may in part be related to changes in individuals practice patterns overtime, with a greater enthusiasm for performing complex operations and complex post-operative care immediately following training that fades overtime.

Our data showed that among those who performed UD, the median number of UDs performed was only 4 per year. Only 4% (n=222) of the total cohort performed 10 or more in the year prior to certification. This is consistent with estimates from national Medicare samples.<sup>10</sup> The low median number is particularly noteworthy because low surgical volume has been associated with poor outcomes.<sup>11</sup> In one study, surgeons who performed more than 3.5 cystectomies per year had lower mortality rates than those performing fewer.<sup>10</sup> Another analysis demonstrated an inverse correlation between case volume and mortality, with at least 8 procedures per year required to achieve the lowest mortality rate.<sup>12</sup> In addition to impacting outcome, a surgeon's training and volume also influence patient selection for cystectomy and the quality of surgery.<sup>11, 13</sup>

Practitioner characteristics influence the type of UD performed. In both univariate and multivariate analyses, we found that as caseload of UD increases, the likelihood of performing any CUD increases. This is consistent with prior reports suggesting that UD type may be strongly influenced by the annual surgeon caseload.<sup>2</sup> Additionally, as the surgeon's volume of UD increases the proportion of CUDs also increases (fig 1). These findings are not unexpected, as CUDs are intricate operations that many urologists have little exposure to during their training.<sup>9</sup> Additionally, while absolute contraindications to CUD are few, relative contraindications are many and surgeons with greater experience may be willing to

perform CUD on more challenging surgical patients.<sup>14</sup> Also, patients may seek out surgeons who perform CUD regularly, thereby increasing these providers' case volume and the proportion of CUDs they performed.

Urologists in non-private practice settings were also more likely to perform CUD. CUD are not associated with greater rates of post-operative complications<sup>15</sup> but do require a greater time commitment (pre-, intra-, and post-operatively) and a more extensive support structure, such as ancillary staff to assist with care and teaching. Prior studies have similarly demonstrated that treatment at academic centers and NCI-designated cancer centers is associated with greater likelihood of CUD;<sup>2</sup> these institutions may lend themselves to CUD due to both their strong infrastructure and the presence of high volume surgeons. Referral patterns of private practice urologists differ from those of non-private practice urologists, and this may influence the type of UD performed. Importantly, while CUD is considered by many to be the preferred type of UD, this belief is far from uniform. To date, health-related quality-of-life instruments have not demonstrated superiority of one type of UD over another.<sup>16</sup> Differences in practitioners' use of CUD may reflect, in part, underlying philosophical differences.<sup>17</sup>

Our findings also demonstrate that urologists practicing in smaller communities and in certain geographic locations were less likely to perform any UD including CUD. This is consistent with prior data demonstrating that long travel distance to a surgeon is associated with decreased odds of receiving cystectomy.<sup>8</sup> Possible explanations include differences in facilities to care for complex patients, differences in patient mix, or philosophical differences on the preferred type of UD. Practice area size was not known for many of the urologists included in the study limiting the importance of this finding. Geographic findings may be influenced by regionalization of care due to economic pressures or centers of excellence.

The strength of this study is that the data represent trends in the contemporary experience of urologists from all geographic locations and practice types in the United States and our methodological approach has been previously established to evaluate urologists' practice patterns.<sup>18, 19</sup> However, the study is not without limitations. Most notably, while we are able to measure differences in surgeon characteristics, our data set does not contain information about case mix or indications for UD. Six month surgeon case log data was annualized for the purposes of this study, and may not fully represent a surgeon's practice. Approximately 5,000 urologists were board certified before 1985 and not required to submit case logs for recertification, this senior group of urologists is not captured.<sup>5</sup>

## Conclusions

This study demonstrates that the majority of urologists perform few if any UDs. Significant variations exist between providers who do or do not perform UD and the types of diversions they perform. While patient's preferences are important in determining the type of UD they receive, these data suggest that surgeon characteristics and practice patterns may also impact the type of diversion they receive.

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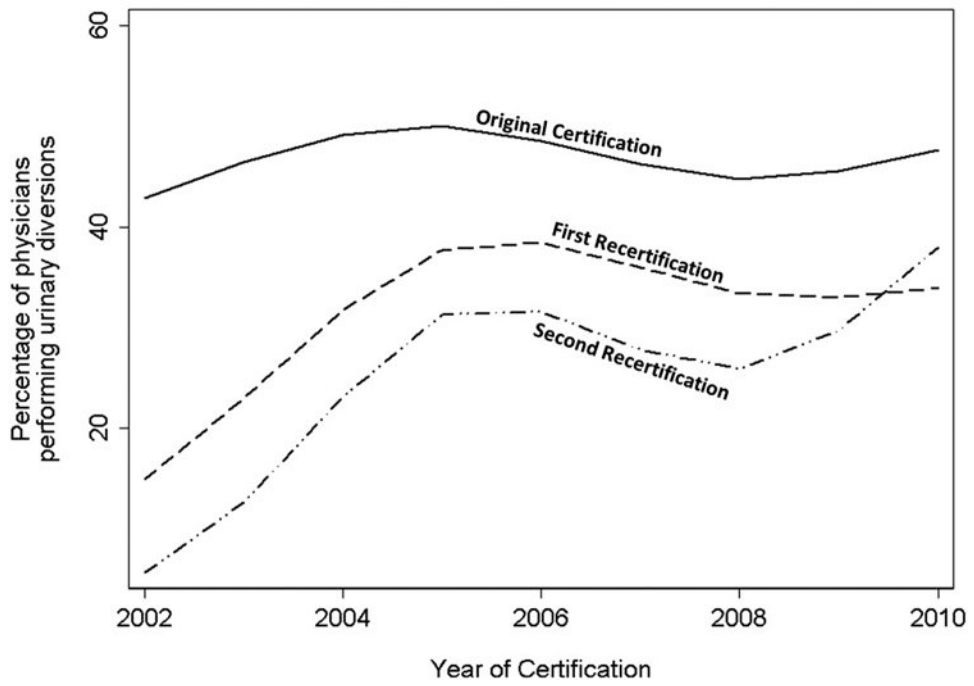
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## Abbreviations

<b>UD</b>	urinary diversion
<b>RC</b>	radical cystectomy
<b>IUD</b>	incontinent diversion
<b>CUD</b>	continent urinary diversion
<b>ABU</b>	American Board of Urology

**CPT** current procedural terminology  
**NCI** National Cancer Institute



**Figure 1.** Physicians who performed UD by log year and certification type.



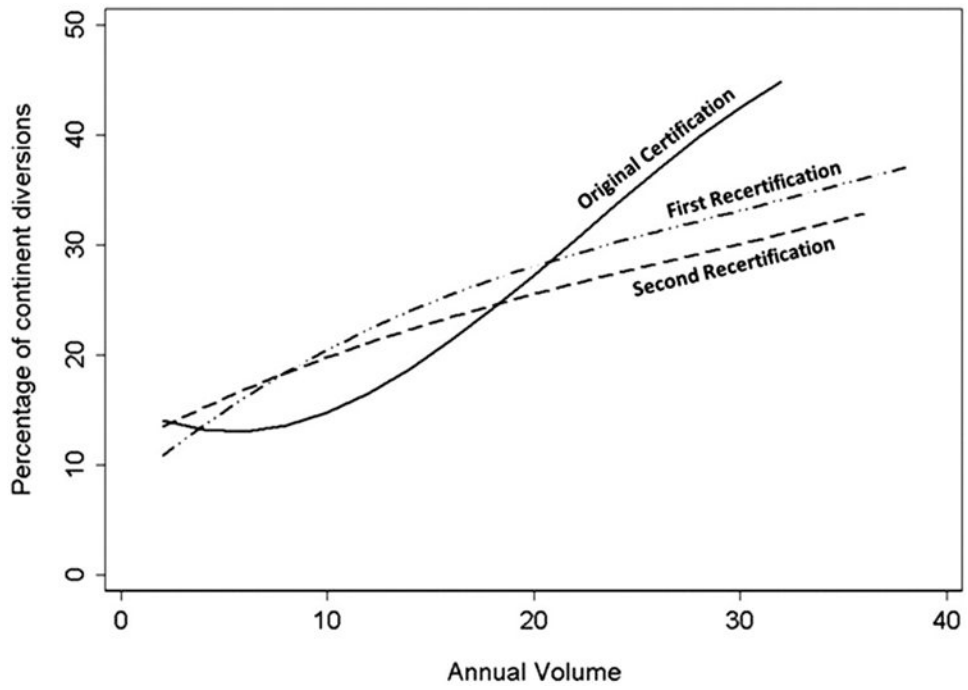


Figure 2. CUD by annual volume of any UD and certification

**Table 1**

Characteristics of certifying and recertifying urologists (n=5,096) who did not perform urinary diversion versus those who did, divided into two groups: those performing continent diversions and those who do not. Data presented as No. (%), where percentages run horizontally.

	All Urologists (n=5,096)			Only Urologists Who Performed Diversions (n=1,868)		
	No UDs Diversions n=3,228 (63%)	I UD diversion n=1,868 (37%)	p Value	No CUDs diversions n=1,397 (75%)	I CUD Diversion n=471 (25%)	p Value
<b>Median Age Years (IQR)</b>	44 (39, 51)	42 (35, 49)	0.0005	42 (35, 49)	42 (35, 48)	0.4
<b>Med Volume UD (IQR)</b>	0 (0, 0)	4 (2, 6)		4 (2, 4)	6 (4, 12)	<0.0005
<b>Male</b>	2,989 (63%)	1,726 (37%)	0.8	1,293 (75%)	433 (25%)	0.7
<b>Female</b>	239 (63%)	142 (37%)		104 (73%)	38 (27%)	
<b>Year of case logs</b>			0.023			0.061
2002	5 (45%)	6 (55%)		6 (100%)	0 (0%)	
2003	371 (71%)	149 (29%)		133 (89%)	16 (11%)	
2004	378 (67%)	190 (33%)		150 (79%)	40 (21%)	
2005	350 (58%)	253 (42%)		176 (70%)	77 (30%)	
2006	431 (61%)	273 (39%)		194 (71%)	79 (29%)	
2007	410 (63%)	243 (37%)		182 (75%)	61 (25%)	
2008	423 (66%)	220 (34%)		148 (67%)	72 (33%)	
2009	419 (62%)	255 (38%)		197 (77%)	58 (23%)	
2010	441 (61%)	279 (39%)		211 (76%)	68 (24%)	
<b>Specialty</b>			0.0005			<0.0005
General	2,777 (66%)	1,420 (34%)		1,126 (79%)	294 (21%)	
Andrology	61 (81%)	14 (19%)		13 (93%)	1 (7%)	
Endourology	146 (61%)	92 (39%)		70 (76%)	22 (24%)	
Female	84 (52%)	77 (48%)		56 (73%)	21 (27%)	
Oncology	111 (32%)	240 (68%)		114 (48%)	126 (53%)	
Urolithiasis	47 (65%)	25 (35%)		18 (72%)	7 (28%)	
Infertility	2 (100%)	0 (0%)		0 (NA)	0 (NA)	
<b>Certification</b>			0.0005			0.9
Original certification	907 (53%)	813 (47%)		605 (74%)	208 (26%)	
1st recertification	1,227 (66%)	620 (34%)		463 (75%)	157 (25%)	

	All Urologists (n=5,096)		Only Urologists Who Performed Diversions (n=1,868)		p Value
	No UDs Diversions n=3,228 (63%)	1 UD diversion n=1,868 (37%)	No CUDs diversions n=1,397 (75%)	1 CUD Diversion n=471 (25%)	
2nd recertification	1,094 (72%)	435 (28%)	329 (76%)	106 (24%)	0.002
<b>Practice area size</b>					0.0005
Less than 100,000	363 (75%)	124 (25%)	98 (79%)	26 (21%)	
100,000 - 250,000	380 (65%)	209 (35%)	166 (79%)	43 (21%)	
250,001 - 500,000	311 (62%)	192 (38%)	153 (80%)	39 (20%)	
500,001 - 1,000,000	298 (59%)	208 (41%)	151 (73%)	57 (27%)	
Over 1,000,000	701 (58%)	499 (42%)	339 (68%)	160 (32%)	
Unknown	1,175 (65%)	636 (35%)	490 (77%)	146 (23%)	
<b>Practice type</b>					<0.0005
Private practice	2,116 (67%)	1,060 (33%)	865 (82%)	195 (18%)	
Non-private practice	868 (57%)	656 (43%)	432 (66%)	224 (34%)	
Both	244 (62%)	152 (38%)	100 (66%)	52 (34%)	
<b>Region</b>					0.7
Northeast	768 (68%)	356 (32%)	277 (78%)	79 (22%)	
South	1,202 (66%)	623 (34%)	457 (73%)	166 (27%)	
Midwest	596 (55%)	493 (45%)	369 (75%)	124 (25%)	
West	655 (63%)	388 (37%)	288 (74%)	100 (26%)	
Foreign/other	7 (47%)	8 (53%)	6 (75%)	2 (25%)	

Abbreviations: UD = urinary diversions, CUD = continent urinary diversions, IQR = interquartile range, Private practice = urologist in group, solo or managed care, Non-private practice = Military/Govt, Academic Faculty, Medical Admin, Salaried Hosp/Clinic, Vet Admin Prac, Employed by Industry, State/Local Govt, NA= not applicable

**Table 2**

Multivariable logistic regression models with probability of performing any urinary diversions or any continent urinary diversions as the outcome.

	At Least One Urinary Diversion (n=5,096)		At Least One Continent Urinary Diversion (n=1,868)			
	OR	95% CI	p Value	OR	95% CI	p Value
<b>Age in years</b>	0.96	0.95, 0.98	<0.0005	1.03	0.99, 1.07	0.16
<b>Volume of UD</b>		not applicable		1.20	1.16, 1.24	<0.0005
<b>Year of certification</b>	1.05	1.01, 1.10	0.018	1.02	0.94, 1.11	0.6
<b>Specialty</b>						
General		reference			reference	
Andrology	0.42	0.23, 0.77	0.005	0.35	0.04, 2.70	0.3
Endourology	1.00	0.76, 1.32	>0.9	1.27	0.75, 2.14	0.4
Female	1.44	1.04, 2.00	0.029	1.02	0.57, 1.83	0.9
Oncology	3.89	3.04, 4.99	<0.0005	1.36	0.94, 1.96	0.11
Urolithiasis	1.10	0.67, 1.81	0.7	1.56	0.63, 3.85	0.3
<b>Certification</b>						
Original certification		reference			reference	
1st recertification	0.80	0.64, 1.00	0.05	0.81	0.52, 1.27	0.4
2nd recertification	0.92	0.63, 1.36	0.7	0.62	0.28, 1.37	0.2
<b>Practice area size</b>						
Less than 100,000		reference			reference	
100,000 - 250,000	1.50	1.15, 1.97	0.003	0.76	0.42, 1.37	0.4
250,001 - 500,000	1.70	1.29, 2.25	<0.0005	0.84	0.47, 1.51	0.6
500,001 - 1,000,000	1.75	1.33, 2.31	<0.0005	0.90	0.51, 1.59	0.7
Over 1,000,000	1.69	1.32, 2.15	<0.0005	1.01	0.61, 1.68	>0.9
Unknown	1.62	1.22, 2.14	0.0008	0.70	0.39, 1.26	0.2
<b>Practice type</b>						
Private vs non-private practice	0.91	0.79, 1.04	0.16	0.60	0.46, 0.78	<0.0005
<b>Region</b>						
Northeast vs other regions	0.71	0.61, 0.82	<0.0005	0.71	0.52, 0.97	0.033

Abbreviations: OR = odds ratio, CI = confidence interval