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National Trends in the Utilization of Partial Nephrectomy Before and After the Establishment of AUA guidelines for the Management of Renal Masses

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Abstract

Objective—To assess the impact of the American Urological Association guidelines advocating partial nephrectomy for T1 tumors guidelines on the likelihood of undergoing partial nephrectomy.

Materials and Methods—We analyzed the Nationwide Inpatient Sample, a dataset encompassing 20% of all United States inpatient hospitalizations, from 2007 through 2010. Our dependent variable was receipt of radical vs. partial nephrectomy (55.50, 55.51, 55.52, and 55.54 vs. 55.4) for a renal mass (ICD-9 code 189.0). The independent variable of interest was time of surgery (before or after the establishment of AUA guidelines); covariates included a diagnosis of chronic kidney disease (CKD), overall comorbidity, age, race, gender, geographic region, income, and hospital characteristics. Bivariate and multivariable adjusted logistic regression was used to determine the association between receipt of partial nephrectomy and time of guideline establishment.

Results—We identified 26,165 patients with renal tumors who underwent surgery. Prior to the guidelines, 4031 (27%) patients underwent partial nephrectomy compared to 3559 (32%) after. On multivariable analysis, undergoing surgery after the establishment of guidelines (OR 1.20 [95% Cl 1.08-1.32], p<0.01) was an independent predictor of partial nephrectomy. Other factors associated

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with partial nephrectomy were urban location, surgery at a teaching hospital, large hospital bed size, Northeast location, and Black race. Female gender and CKD were not associated with partial nephrectomy.

Conclusions—Although adoption of partial nephrectomy increased after establishment of new guidelines on renal masses, partial nephrectomy remains an underutilized procedure. Future research must focus on barriers to adoption of partial nephrectomy and how to overcome them.

Keywords

American Urological Association guideline; renal mass; partial nephrectomy

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Since the seminal report of Miller and cols stressing the underuse of PN in US [1], the subject has become of outmost interest in the urological community. The practice of PN has been associated to multiple factors among others type of hospital, gender and race, income, insurance status, regional distribution and surgeon's preferences and volume [2, 3].

Bjurlin and cols assess in the present issue, the influence of the AUA guidelines for the Management of Renal Masses on the national trend in utilization of PN. As others [4,5] they utilize the National Inpatient Sample database although theirs includes a more recent time frame, from 2007 to 2010. The selection of this narrow interval around the publication of the AUA guideline (April 2009) aims to minimize the effect of the rise of PN rates. Their results, as all the previous ones, support a steady and consistent increasing use of PN. Specifically, PN rate increased from 27% before AUA guideline publication to 32% afterwards, suggesting that this guideline might have had a positive effect in the use of PN.

Their data shows indeed an association between the increasing use of PN and the AUA guideline and a statistically significant increase in the likelihood of PN after AUA guideline publication. However association does not necessarily mean causality. In fact their study can neither rule-out the influence of other factors in the increasing use of PN nor exclude the logical implementation of a surgical technique. Furthermore, although statistically significant, the magnitude of the difference before and after AUA guideline publication is small and a net increment of 5% through 4 years might be considered marginally clinically relevant and similar to the increments described previously to the publication of the AUA guideline [3-5].

These reflections do not discredit the value of the AUA guidelines for the Management of Renal Masses and the effort of Bjurlin and cols. On the contrary, this excellent document is more than adequate to improve process and structure of care and the present report opens a line of future investigation. It is likely that a longer period of time will be necessary to measure its effects on patients health outcomes otherwise scarcely studied [6]. Multiple barriers modulate the adherence to guidelines and there is a high level of variation in effects across recommendations [7].

Guidelines on the other hand are not documents ahead of their time. More frequent than not, both technical implementation and development of comprehensive guidelines are parallel phenomena. Consequently a strong association is not strange but causality not necessarily inferred. At the same time other factors as awareness of the deleterious effect of RN, implementation of surgical armamentarium, introduction of effective haemostatic agents, expansion of Robotic surgery and installment of dedicated Uro-oncology fellowships among others might have influenced the increase in the use of PN and represent important confounders not taken into account in their analysis.

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Appendix

Appendix 1

ICD-9-CM diagnostic codes for etiologies of CKD.

Risk for renal impairment	ICD-9-CM Diagnostic Code
Diabetes	250
Hypertensive disease	401.x
	402.x
	403.00
	403.10
	403.90
	404.00
	404.01
	404.10
	404.11
	404.90
	404.91
	405.x
Chronic Kidney Disease	585.1
	585.2
	585.3
	585.4
	585.9
Nephrotic syndrome	581.x
Chronic glomerulonephritis	582.x
Nephritis and nephropathy, not specified as acute or chronic	583.x

Risk for renal impairment	ICD-9-CM Diagnostic Code
Cystic kidney disease	753.1
Atherosclerosis	440.1
Amyloidosis	277.3x
Sickle-cell disease	282.6x
Systemic lupus erythematosus	710.0
Arteritis/vasculitis unspecified	447.6
Lupus erythematosus	695.4
Tobacco use disorder	305.1
Vesicoureteral reflux	593.7x
Hyperplasia of prostate, unspecified, with urinary obstruction and other lower urinary tract symptoms	600.91
Hypertrophy (benign) of prostate with urinary obstruction and other lower urinary tract symptoms	600.01
Urinary tract infection, site not specified	599.0
Disorders resulting from impaired renal function	588.x
Small kidney of unknown cause	589.x
Infections of kidney	590.x
Acute glomerulonephritis	580.x
Renal agenesis and dysgenesis (Solitary kidney)	753.0
Renal sclerosis, unspecified	587

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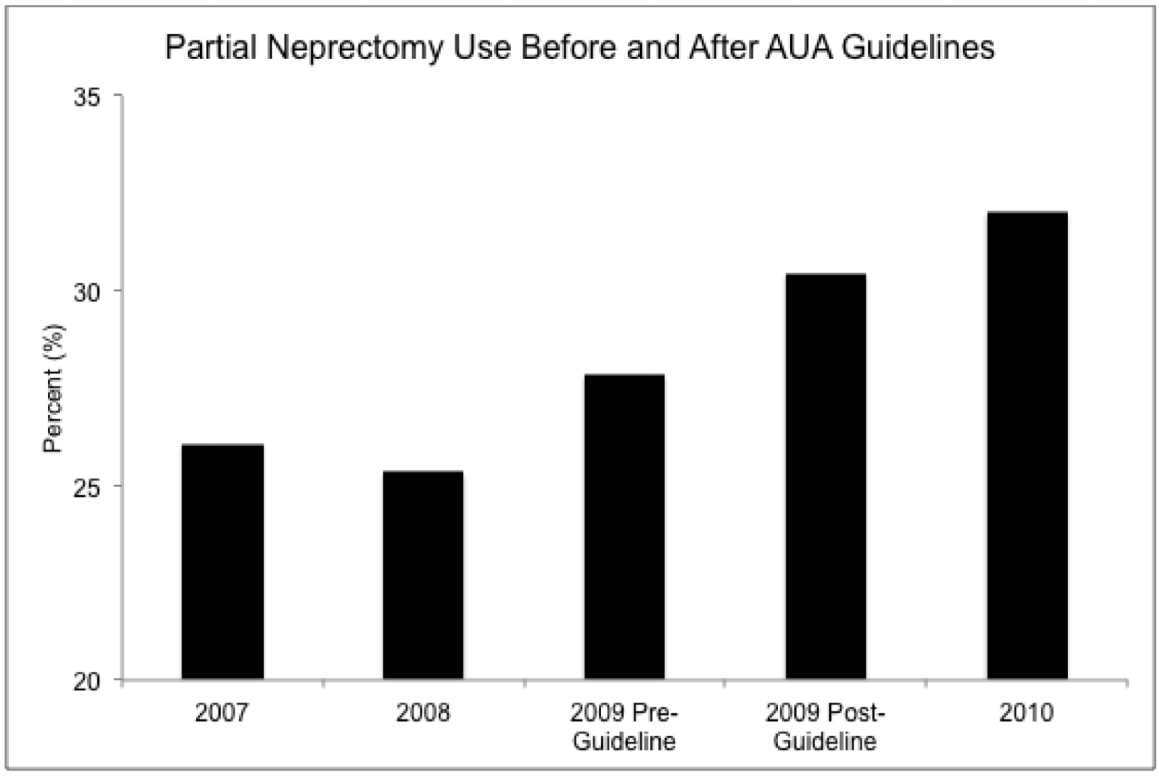

Figure 1.

Table 1

Bivariate analysis of radical and partial nephrectomy use among patients undergoing kidney surgery for kidney cancer

	Radical Nephrectomy (%)	Partial Nephrectomy (%)	p value
CKD			
No	5806 (31)	2544 (34)	
Yes	12769 (69)	5046 (66)	<0.01
Guidelines			
Pre	11050 (59)	4031 (53)	<0.01
Post	7527 (41)	3559 (47)	
Year			<0.01
2007	4303 (23)	1574 (21)	
2008	5169 (28)	1826 (24)	
2009	4669 (25)	2027 (27)	
2010	4434 (24)	2163 (28)	
Age			
18-44	2025 (11)	1158 (15)	<0.01
45-64	6177 (33)	2852 (38)	
65-74	7297 (39)	2917 (38)	
75+	3061 (17)	651 (9)	
Race			
White	11699 (78)	4797 (77)	<0.01
Black	1282 (9)	630 (10)	
Other	2013 (13)	806 (13)	
Gender			
Female	7166 (39)	2919 (39)	0.92
Male	11352 (61)	4638 (61)	
Comorbidities			
0	4225 (23)	1910 (25)	<0.01
1-2	11101 (60)	4554 (60)	
3+	3249 (17)	1126 (15)	
Household Income			
$63K+	4675 (26)	2257 (31)	
$1-38,999	4274 (24)	1575 (21)	<0.01
$39K-47,999	4620 (25)	1721 (23)	
$48K-62,999	4617 (25)	1839 (25)	
Insurance			
Public	9061 (49)	3033 (40)	<0.01
Private	8497 (46)	4160 (55)	
Other	978 (5)	381 (5)	
Hospital location			
Rural	1292 (7)	329 (4)	<0.01

	Radical Nephrectomy (%)	Partial Nephrectomy (%)	p value
Urban	17101 (93)	7175 (96)	
Teaching status			
Teaching	11121 (60)	5659 (75)	<0.01
Non-teaching	7272 (40)	1845 (25)	
Bed Size			
Small	1827 (10)	644 (9)	<0.01
Medium	3902 (21)	1279 (17)	
Large	12664 (69)	5581 (74)	
Region			
South	6049 (33)	2166 (29)	
Northeast	3590 (19)	2056 (27)	<0.01
Midwest	4687 (25)	1909 (25)	
West	4249 (23)	1459 (19)	

Table 2

Multivariable logistic regression to determine the association between time period of surgery and likelihood of partial nephrectomy among patients undergoing surgery for kidney cancer

	Odds Ratio (95% CI)	p value
CKD		
No	1.00	Ref
Yes	0.95 (0.88-1.02)	0.16
Guidelines		
Pre	1.00	Ref
Post	1.20 (1.08-1.32)	<0.01
Year	1.04 (0.99-1.09)	0.93
Age		
18-44	1.00	Ref
45-64	0.83 (0.76-0.91)	<0.01
65-74	0.73 (0.67-0.80)	<0.01
75+	0.40 (0.35-0.44)	<0.01
Race		
White	1.00	Ref
Black	1.13 (1.02-1.25)	0.026
Other	0.93 (0.85-1.03)	0.15
Gender		
Female	1.00	Ref
Male	1.03 (0.98 -1.10)	0.25
Comorbidities		
0	1.00	Ref
1-2	0.99 (0.91-1.07)	0.79
3+	0.88 (0.79-0.97)	0.014
Household		
Income		
$63K+	1.00	Ref
$1-38,999	0.82 (0.75-0.89)	<0.01
$39K-47,999	0.83 (0.77-0.91)	<0.01
$48K-62,999	0.87 (0.80 -0.94)	<0.01
Hospital location		
Rural	1.00	Ref
Urban	1.32 (1.16 1.51)	<0.01
Teaching status		
Teaching	1.00	Ref
Non-teaching	1.80 (1.69-1.92)	<0.01
Bed Size		
Small	1.00	Ref
Medium	1.33 (1.21-1.47)	<0.01

	Odds Ratio (95% CI)	p value
Large	1.02 (0.91-1.14)	0.77
Region		
South	1.00	Ref
Northeast	1.40 (1.30-1.51)	<0.01
Midwest	1.08 (1.00-1.17)	0.045
West	0.98 (0.91-1.07)	0.67

Table 3

The interaction between time period of surgery and chronic kidney disease and its association withlikelihood of partial nephrectomy among patients undergoing surgery for kidney cancer.

Variable	Odds Ratio (95% Cl)	p value
Surgery Date ± CKD*		
Pre-guidelines+No CKD	1.00	Ref
Post guidelines+No CKD	1.19 (1.05-1.35)	<0.01
Pre-guidelines+CKD	1.05 (0.96-1.15)	0.30
Post guidelines+CKD	1.20 (1.08-1.34)	<0.01

*Adjusted for year of surgery, age, race, gender, household income, insurance, hospital location, hospital teaching status, bed size, and region.