

Impact of diagnosing urologists and hospitals on use of radical cystectomy

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Background

- Approximately 80,470 new cases and 17,670 deaths will be attributed to bladder cancer in the United States in 2019
- Only one out of five muscle-invasive bladder cancer patients receive radical cystectomy, a guideline-recommended treatment
- Prior research has shown improved survival outcomes and decreased complications when radical cystectomy is performed by higher-volume treating urologists

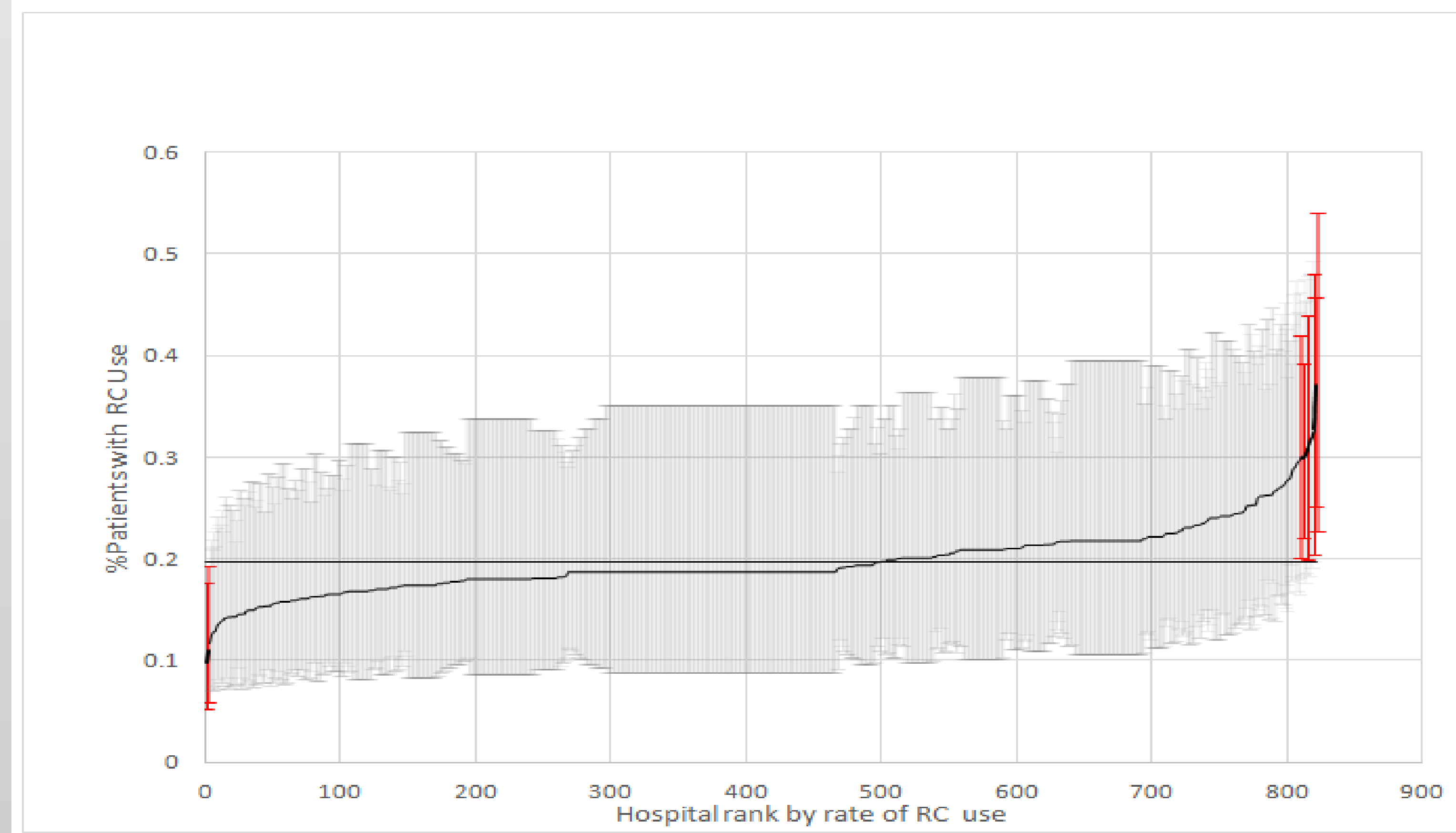
Objectives

- We sought to determine bladder cancer diagnosing physician and hospital characteristics associated with the use of radical cystectomy.

Methods

- A total of 7,097 patients diagnosed with clinical stage T2-T4a bladder cancer from January 1, 2002 to December 31, 2011 from the Surveillance, Epidemiology, and End Results (SEER)-Medicare were analyzed
- Using the American Medical Association (AMA) Physician Masterfile, we linked 4,601 diagnosing urologists, 4,582 treating urologists and 822 hospitals to these patients.
- For each patient, a urologist who performed transurethral resection of bladder tumor was assigned as a diagnosing physician. The diagnosing physician was assigned to one hospital based on where he/she performed more than half of all urologic surgeries.
- Two-level hierarchical models (patients nested within hospitals) were constructed to determine the association of patient, physician and hospital characteristics with radical cystectomy use as a diagnosing physician.
- The diagnosing physician was assigned to one hospital based on where he/she performed more than half of all urologic surgeries.

Figure 1. Hospital Specific Rates of Radical Cystectomy Use by Hospital Rank



Rates of radical cystectomy use based on the 2-level hierarchical model. Rates of radical cystectomy use for 822 hospitals by rank from lowest to highest radical cystectomy use. The rates were calculated using hierarchical generalized linear models (2-level), adjusted for patient, diagnosing urologist and hospital characteristics. The horizontal line represents the overall mean rate of radical cystectomy use. Error bars represent 95% confidence intervals for the rates of individual hospital.

Table 1. Characteristics of the Diagnosing Urologists, Treating Urologists and Hospitals

	Diagnosing Urologist				Treating Urologist			
		Radical Cystectomy	No Curative Treatment	P-Value	Radical Cystectomy	No Curative Treatment	P-Value	
Age of physician, mean (SD)	N/A	51.7 (10.0)	52.6 (10.0)	0.002	N/A	51.7 (10.0)	52.6 (10.0)	0.002
Practice year, mean (SD)	N/A	24.8 (10.5)	25.7 (10.4)	0.001	N/A	24.8 (10.5)	25.7 (10.4)	0.001
Physician Gender								
Male	6438	1662 (88.5)	4776 (91.5)	0.001	6430	1654 (89.0)	4776 (91.5)	0.001
Female	659	216 (11.5)	443 (8.5)		647	204 (11.0)	443 (8.5)	
Employment								
Group	3858	1051 (56.0)	2807 (53.8)	0.304	3862	1055 (56.8)	2807 (53.8)	0.304
1-2 physicians	2078	515 (27.4)	1563 (30.0)		1974	411 (22.1)	1563 (30.0)	
Government	505	127 (6.8)	378 (7.2)		530	152 (8.2)	378 (7.2)	
Medical School	43	13 (0.7)	30 (0.6)		77	47 (2.5)	30 (0.6)	
Non-government	129	34 (1.8)	95 (1.8)		163	68 (3.7)	95 (1.8)	
Not Classified	484	138 (7.4)	346 (6.6)		471	125 (6.7)	346 (6.6)	
Surgeon Volume*								
0	3168	584 (31.1)	2584 (49.5)	<0.001	2935	351 (18.9)	2584 (49.5)	<0.001
1 to 5	1867	620 (33.0)	1247 (23.9)		1791	544 (29.3)	1247 (23.9)	
6 to 10	471	140 (7.5)	331 (6.3)		468	137 (7.4)	331 (6.3)	
10+	1591	534 (28.4)	1057 (20.1)		1883	826 (44.5)	1057 (20.1)	
Hospital Characteristics								
Type of Hospital								
Non-profit	5322	1391 (74.1)	3931 (75.3)	0.533	5281	1350 (72.7)	3931 (75.3)	0.533
Government	871	236 (12.6)	635 (12.2)		872	237 (12.8)	635 (12.2)	
Proprietary	904	251 (13.4)	653 (12.5)		924	271 (14.6)	653 (12.5)	
Cancer Center								
No	6615	1689 (90.0)	4926 (94.4)	<0.001	6595	1669 (89.8)	4926 (94.4)	<0.001
Clinical	141	44 (2.3)	97 (1.9)		141	44 (2.4)	97 (1.9)	
Comprehensive	341	145 (7.7)	196 (3.7)		341	145 (7.8)	196 (3.7)	
bed size, mean (SD)	N/A	373.9 (250.3)	347.5 (235.2)	<0.001	N/A	373.9 (250.3)	347.5 (235.2)	<0.001
Yes	3798	1060 (56.4)	2738 (52.5)	0.003	3535	1054 (56.7)	2481 (47.5)	0.002
No	3299	818 (43.6)	2481 (47.5)		3542	804 (43.3)	2738 (52.5)	
Rural or Urban								
Rural	818	186 (9.9)	632 (12.1)	0.01	811	179 (9.6)	632 (12.1)	0.004
Urban	6279	1692 (90.1)	4587 (87.9)		6266	1679 (90.4)	4587 (87.9)	
Hospital Volume*								
0	844	174 (9.3)	670 (12.8)	<0.001	831	161 (8.7)	670 (12.8)	<0.001
1 to 20	3640	893 (47.6)	2747 (52.6)		3634	887 (47.7)	2747 (52.6)	
21 to 40	1302	339 (18.1)	963 (18.5)		1301	338 (18.2)	963 (18.5)	
40+	1311	472 (25.1)	839 (16.1)		1311	472 (25.4)	839 (16.1)	

Results

- A total of 7,097 patients were diagnosed by 4,601 physicians who were affiliated with 822 hospitals
- Overall, the radical cystectomy utilization rate was 26.5%. Only 4.3% of the variation in radical cystectomy was attributed to the hospital level.
- Higher radical cystectomy volume by diagnosing urologists (5+ vs. 0-1 surgeries: odds ratio [OR], 1.27; 95% confidence interval [CI], 1.00-1.62) and hospitals (5+ vs. 0-4 surgeries: OR, 1.48; 95% CI, 1.14-1.93) was associated with increased use of radical cystectomy.
- Patients diagnosed by female rather than male urologists were more likely to undergo radical cystectomy (OR, 1.32; 95% CI, 1.07-1.62).

Conclusions

- We found 4.3% variation in use of radical cystectomy was attributed to the hospital level leaving 95.7% variation in use unexplained. This study showed that the use of radical cystectomy was largely attributed to urologist surgical volume after controlling for patient and hospital characteristics.
- We identified significantly increased use among higher volume and female diagnosing urologists.
- These findings support further investigation into measures beyond hospital volume that largely impact radical cystectomy utilization.

Table 2. Multilevel Model for Radical Cystectomy Utilization by Diagnosing and Treating Urologist Characteristics

	Diagnosing Urologist	Treating Urologist
	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Age group, yr		
66-69	ref	ref
70-74	0.80 (0.66-0.98)	0.84 (0.69-1.03)
75-79	0.57 (0.47-0.69)	0.61 (0.50-0.74)
80-85	0.19 (0.15-0.23)	0.19 (0.15-0.23)
Sex		
Male	ref	ref
Female	1.62 (1.41-1.86)	1.58 (1.37-1.83)
Race		
White	ref	ref
Black	0.58 (0.43-0.79)	0.60 (0.44-0.83)
Hispanic	1.39 (0.97-2.00)	1.54 (1.05-2.26)
Other	0.95 (0.71-1.27)	0.96 (0.71-1.30)
Marital Status		
Married	ref	ref
Single	0.62 (0.51-0.74)	0.62 (0.51-0.75)
Unknown	0.62 (0.53-0.73)	0.63 (0.54-0.74)
Census Region		
West	ref	ref
Northeast	0.93 (0.75-1.15)	0.94 (0.75-1.17)
Midwest	0.82 (0.63-1.08)	0.78 (0.59-1.04)
South	0.87 (0.71-1.08)	0.84 (0.67-1.05)
Tumor Stage		
II	ref	ref
III	3.59 (3.07-4.19)	3.59 (3.05-4.22)
IV	1.63 (1.41-1.88)	1.66 (1.43-1.93)
Tumor Grade		
Low	ref	ref
High	1.96 (1.48-2.60)	1.92 (1.44-2.57)
Unknown	0.79 (0.51-1.22)	0.81 (0.52-1.27)
Comorbidity		
0	ref	ref
1	0.82 (0.71-0.95)	0.81 (0.70-0.95)
2	0.59 (0.49-0.72)	0.60 (0.48-0.73)
3+	0.38 (0.3-0.47)	0.39 (0.31-0.49)
Education		
≤20.58	ref	ref
20.59-27.36	1.04 (0.87-1.24)	1.06 (0.88-1.27)
27.37-34.83	0.82 (0.68-0.99)	0.83 (0.68-1.02)
≥34.84	0.98 (0.79-1.21)	1.00 (0.81-1.25)
Year of Diagnosis		
2002	1.08 (0.81-1.43)	1.22 (0.91-1.65)
2003	1.15 (0.86-1.53)	1.31 (0.97-1.76)
2004	1.23 (0.93-1.63)	1.45 (1.08-1.94)
2005	1.32 (1.00-1.74)	1.48 (1.11-1.98)
2006	1.12 (0.85-1.49)	1.29 (0.96-1.74)
2007	1.07 (0.80-1.43)	1.15 (0.85-1.55)
2008	1.14 (0.85-1.51)	1.15 (0.85-1.55)
2009	0.97 (0.72-1.31)	1.00 (0.74-1.37)
2010	1.09 (0.82-1.46)	1.08 (0.80-1.46)
2011	ref	ref
Provider		
Physician Age	1.00 (0.98-1.03)	1.00 (0.97-1.03)
Practice year	0.99 (0.97-1.02)	0.99 (0.97-1.02)
Physician Gender		
Male	ref	ref
Female	1.62 (1.31-2.01)	1.85 (1.47-2.31)
Employment		
Group	ref	ref
1-2 physicians	1.03 (0.89-1.20)	0.95 (0.80-1.12)
Government	0.71 (0.55-0.92)	0.84 (0.65-1.07)
Medical School	0.91 (0.42-1.98)	3.22 (1.81-5.73)
Non-government	1.01 (0.63-1.63)	2.01 (1.33-3.04)
Not Classified	1.00 (0.78-1.29)	0.97 (0.74-1.27)
Surgeon Volume*		
0	ref	ref
1 to 5	2.38 (2.04-2.78)	3.52 (2.96-4.19)
6 to 10	2.08 (1.61-2.69)	3.44 (2.63-4.52)
10+	2.18 (1.83-2.60)	6.38 (5.31-7.67)
Hospital		
Bed size		
No	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Clinical	0.79 (0.46-1.34)	0.56 (0.32-0.98)
Comprehensive	1.26 (0.85-1.85)	1.01 (0.68-1.52)
Setting		
Non-profit	ref	ref
Government	1.06 (0.85-1.32)	0.93 (0.73-1.17)
Proprietary	1.17 (0.94-1.45)	0.99 (0.79-1.24)
Teaching hospital		
Yes	0.98 (0.82-1.16)	0.94 (0.78-1.13)
No	ref	ref
Rural/Urban Status		
Rural	0.90 (0.70-1.16)	0.85 (0.65-1.11)
Urban	ref	ref
Hospital Volume*		
0	ref	ref
1 to 20	1.14 (0.90-1.45)	1.06 (0.82-1.37)
21 to 40	1.16 (0.86-1.56)	1.02 (0.74-1.39)
40+	1.62 (1.13-2.32)	1.30 (0.89-1.90)