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Urologist practice structure and quality of prostate cancer care

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Abstract

Objective: To examine three aspects of urologist practice structure that may affect quality of prostate cancer care: practice size, ownership of an intensity modulated radiation therapy (IMRT) device, participation within a multi-specialty group (MSG). Health care reforms focused on improving quality are particularly relevant for prostate cancer given its prevalence and concerns for overdiagnosis and overtreatment.

Methods: Using data from the Surveillance, Epidemiology and End-Results (SEER)-Medicare linked registry, we examined quality of prostate cancer treatment according to each treating urologist's practice size, type (single-specialty vs. MSG) and ownership of IMRT. Mixed models were used to adjust for patient differences.

Results: We identified 22,412 men with newly diagnosed prostate cancer treated by 2,199 urologists during the study. We observed minimal differences for most quality metrics according to practice size, type, and ownership of IMRT. Adherence to all eligible quality metrics was better among MSGs compared to single specialty groups (20.0% adherence versus 18.2%, $p=0.01$) whereas there was no significant difference by ownership of IMRT (17.1% adherence in owners versus 18.9% non-owners, $p=0.09$).

Conclusion: Differences in quality across practice size, type and ownership of IMRT were modest, with substantial room for improvement regardless of practice structure.

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Keywords

prostate cancer; quality of care; value; radiation therapy

Introduction

Reducing overtreatment and focusing on the delivery of high quality prostate cancer care is increasingly relevant for urologists as payment reforms such as the Merit-based Incentive Payment System and other Alternative Payment Models continue to emphasize quality of care as a key component.^{1,2} Independently of these payment reforms, physicians across the U.S. are joining larger groups and more often integrating with hospitals.^{3,4} Emerging evidence suggests that how urologists organize themselves (i.e., practice structure) is associated with both the total spending and the choice of treatment for prostate cancer.^{5,6} While the movement of urologists to larger single-specialty group practices has been shown to increase spending and influence treatment selection in the traditional fee-for-service environment, little is known about how practice organization impacts the quality of care.⁷

Single-specialty urology groups may provide higher quality care as a result of prostate cancer specialization within the group and a higher volume of clinical care, which has been associated with better survival.⁸ Larger urology groups in particular may be more likely to offer integrated treatment (e.g., by purchasing treatment facilities such as Intensity Modulated Radiation Therapy [IMRT] vaults) which may facilitate care coordination and minimize delays. Alternatively, urologists employed by hospitals or practicing as part of multi-specialty groups (MSGs) may be best suited to achieve high quality care due to closer integration with primary care providers and medical and radiation oncologists, fewer volume-based productivity incentives, and increased participation in value-based purchasing programs.

Herein, we examine quality of prostate cancer care for Medicare patients as a function of urologist practice structure. We hypothesize that three elements of urologist practice structure may influence the quality of prostate cancer care delivered: urologist participation within a MSG, practice size among single-specialty urologist groups, and IMRT ownership within a practice.

Methods

Study population and data

We identified SEER-Medicare beneficiaries with newly diagnosed prostate cancer between 2010 and 2011 and at least 12 months of follow-up. We included beneficiaries who were eligible for both Medicare Part A and Part B throughout the study interval and excluded beneficiaries in Medicare managed care plans to ensure availability of complete claims. Patients were attributed to urologists using previously established methodology.⁹

Characterizing urologist practice organization

We used National Provider Identifier numbers to link urologists to the 2012 Healthcare Relational Spheres provider files (IMS Health). This dataset provides detailed information to characterize practice organization including aspects of urologist affiliation (e.g., practice name, associated National Provider Identifiers) and business details [e.g., practice type (single versus multi-specialty)] and has been used in other work to characterize physician practices.^{10,11} We divided practices into multi-specialty (a practice including primary care physicians) versus single-specialty groups, which were further categorized by size: 1 to 2 urologists (solo), 3 to 5 urologists (small), 6 to 9 urologists (medium) and 10 or more urologists (large). Urologist practices that were entirely employed by a hospital or an academic medical center were categorized as MSGs. In a validation cohort of 300 urologists of known practice status (from internet searches of practice websites), the IMS Health data showed excellent overall agreement for assessment of practice type (solo, single-specialty or MSG) at 92% (kappa=0.82), with sensitivities of 81.8%, 91.6% and 94.7%, and specificities of 99.7%, 96.5% and 92.0%, for MSG, single-specialty group and solo practice status, respectively. We further verified practice affiliation and determined the size of the single-specialty urology groups by performing a manual internet search. For single-specialty groups, we also characterized IMRT ownership using established methods.⁵ Briefly, practices either providing on-site IMRT or employing at least 1 radiation oncologist were considered IMRT owning practices. These two definitions of IMRT ownership were strongly correlated (kappa=0.72). In addition, ownership of IMRT by group size followed a plausible progression, with 0% of solo, 2% of small, 12% of medium and 64% of large practices identified as owners.

Outcomes

Our outcome of interest was adherence to quality measures developed by researchers at the Physician Consortium for Performance Improvement and RAND Health, shown in Table 1. Studies have confirmed the feasibility of using these measures in evaluating quality and the National Quality Forum has endorsed several of these measures for use in performance measurement.^{12–15} As previously described,^{16,17} for each quality measure the numerator was the count of eligible men whose care adhered to the performance measure; the denominator was the number of men to whom the measure applied (Supplemental Table 1). We also created an assessment of overall quality by evaluating adherence to all quality measures for which an individual patient was eligible.

Analysis

Characteristics of prostate cancer patients were compared across urologist practice type, size and ownership. Because quality could potentially vary according to region, we included several regional market variables, including urologist and radiation oncologist supply, number of hospital beds, and managed care penetration using the Area Resource File. Socioeconomic status was categorized using a composite measure defined by Diez-Roux.¹⁸ Comorbidities were identified using claims from the 12-months prior to prostate cancer diagnosis.¹⁹

We assessed quality measure adherence across physician practice structure (type, size and ownership) using hierarchical logistic regression models. To better isolate the effect of practice size among single-specialty urology groups, we only included single-specialty groups without IMRT ownership in models considering practice size. All models were adjusted for age, race, socioeconomic status, urban versus rural residence, regional market characteristics, and comorbidities. We accounted for clustering within hospital referral regions by including this variable as a random intercept. All analyses were performed using SAS statistical software version 9.4 (Cary, NC) and evaluated for two-sided significance by setting the probability of a type I error at 0.05. This study was deemed exempt by the University of Michigan Institutional Review Board.

Results

Patient Characteristics According to Practice Structure

We identified 22,412 men with newly diagnosed prostate cancer from 2010 to 2011 who were treated by 2,199 urologists. Patient age, race, and number of comorbidities varied according to the treating urologist's employment within a MSG, single-specialty group practice size or ownership of an IMRT vault (Table 2). Large, single-specialty practices and practices that owned an IMRT vault were more often located in urban areas with the highest concentration of urologists, radiation oncologists and hospital beds, and treated a greater proportion of patients from high socioeconomic status areas. Practice type was significantly associated with treatment patterns. Urologists in MSGs were more likely to provide surgery as a primary prostate cancer treatment than those in large single specialty groups (28% versus 18%, $p<0.001$) and were less likely to treat with external beam radiation (27% versus 38%, $p<0.001$).

Quality According to Practice Structure

Performance on quality measures (Figure 1) had an inconsistent relationship with urologist practice structure. We observed that single specialty groups performed better in some categories such as providing treatment by a high volume provider (76.5% versus 74.3%, $p=0.02$) and providing pre-treatment counseling by a urologist and radiation oncologist (69.8% versus 62.8%, $p<0.001$). However, MSGs performed better in avoiding genitourinary toxicity with treatment (49.1% versus 42.6%, $p<0.001$). Additionally, MSGs performed better than single specialty groups on overall adherence to all quality metrics that a patient is eligible for with 20.0% versus 18.2% adherence ($p<0.01$).

Performance on quality measures according to ownership of an IMRT vault (Figure 1) had similarly mixed results with owners excelling in some areas such as providing pre-treatment counseling by a urologist and radiation oncologist (72.7% versus 67.3%, $p<0.001$) and administration of androgen deprivation therapy for high risk patients undergoing external beam radiation therapy (88.8% versus 83.4%, $p=0.03$). However, non-owners were better at other measures, such as avoiding imaging in low risk patients (71.2% versus 64.9%, $p=0.002$).

Among single-specialty urology groups without IMRT ownership, we observed an association between practice size and performance on 4 out of 9 measures of quality: pretreatment counseling by a radiation oncologist and a urologist, avoiding imaging in low risk patients, treatment by a high volume provider, and avoiding GU toxicity. However, the direction of this association varied and no clear patterns of care emerged for quality measure adherence according to urology group practice size (Figure 2). On the comprehensive measure of meeting all eligible quality metrics, large single specialty groups (21.1%) performed better than medium (18.5%), small (18.5%), and solo (17.1%) groups ($p=0.02$). The full regression results for all models used in this analysis are presented in the Supplemental Materials (Supplemental Tables 2–29).

Discussion

While urology practice characteristics such as size, organization type, and IMRT ownership have been associated with treatment selection and spending for men with prostate cancer,^{5,6} their association with quality of prostate cancer care has not been defined. This study demonstrates the association between urologist group practice size, organization, and IMRT ownership with several measures of quality. While results differed among the various quality measures, MSGs achieved better results on an aggregate measure of all quality metrics than single specialty groups; among single specialty urology groups, large groups performed better than smaller groups.

Notably, overall performance on these quality measures was poor, with only approximately one fifth of prostate cancer patients meeting all eligible metrics, across practice types. While this study cannot identify reasons for this low level of performance, there are likely several explanations. First, this finding may indicate an opportunity for better quality care for prostate cancer patients (e.g. pre-treatment counseling by a urologist and radiation oncologist, avoiding imaging in low risk prostate cancer). Second, 100% performance may not be achievable on all quality measures (e.g. avoidance of GU and GI toxicity after treatment). Third, these quality measures may be inadequate, outdated, or controversial (e.g. adjuvant radiation after surgery for high risk prostate cancer). Finally, these measures do not all translate equally well to Medicare claims data and some may not be ideally suited to claims-based identification (e.g. treatment by high-volume provider). Ultimately, we chose measures that were generally accepted and endorsed by national organizations. However, our results may suggest the need for better quality measures aligned with contemporary practice. Additionally, with the incorporation of administrative claims-based measures of quality into value-based payment programs, there is a need for quality measures that can accurately be identified in claims data.

How physicians organize themselves has evolved over the last two decades. Whereas the autonomy assured with solo or small group practice was attractive in the past, the changing dynamics of healthcare delivery have promoted the development of large group practices.^{20,21} Large groups and multispecialty groups may be better equipped to handle the administrative burdens of performance measurement and quality improvement. MSGs in particular, should benefit from improved care coordination which most would agree inherently improves quality of care and value, even if improvements in spending and cost

of care are not immediately demonstrated.²² The absence of a clear signal of association between practice organization and quality of prostate cancer care should be reassuring for patients and physicians. That, on average, there were minimal differences on performance suggests that urology groups of all types can achieve similar performance on these quality measures and practice structure does not impose an insurmountable obstacle. These results do not suggest, however, that there are not differences in quality among urology practices – just that on average practice organization cannot consistently predict performance on these measures.

We found practices with IMRT ownership were most likely to utilize imaging in low risk cases, an indicator of low value care. However, these groups were also more likely to have high volume providers, and a number of studies have demonstrated improved outcomes associated with higher volume of radical prostatectomy or radiation for prostate cancer.^{8,23} Furthermore, groups with IMRT ownership were more likely to offer pre-treatment counseling with both a urologist and a radiation oncologist and had a higher rate of adjuvant androgen deprivation therapy use with radiation treatment. Prior work has suggested that groups with IMRT ownership provide more IMRT services⁵ and generate higher total spending.⁶ This study suggests that these higher spending and higher volume of IMRT services may also be associated with better quality care, especially when considering quality measures related to radiation therapy. However, the existing literature also suggests that these groups provide overtreatment, or treatment for men unlikely to benefit from therapy due to competing risks⁵ – an area of quality not included in the endorsed quality measures.

Our findings should be interpreted in the context of several limitations. First, the measures examined do not capture all important elements of quality, such as long-term cancer outcomes, or patient-reported outcomes. However, this set of measures has been developed by a panel of experts, and in some cases formally endorsed by the National Quality Forum (see Table 1). We demonstrate that adherence to even this narrow scope of quality measures remains low overall, with an opportunity to improve across practice settings. Despite the use of established quality measures, there remains some disagreement. For example, there is not consensus regarding the use of adjuvant radiotherapy for all men with high risk prostate cancer and early salvage radiotherapy after biochemical recurrence is often used instead. However, adjuvant radiation therapy is supported by 3 randomized controlled trials.^{24–26} Further, there is no evidence to suggest that the use of salvage versus adjuvant radiotherapy is correlated with group practice organization. Finally, our study cohorts were restricted to Medicare beneficiaries residing in SEER regions so findings may not be generalizable to patients younger than 65 years of age, with other forms of health insurance or those residing outside SEER regions. Nevertheless, the majority of new prostate cancer patients are Medicare enrollees and patients living in SEER regions are considered generally representative of the national population.

These limitations notwithstanding our findings have important implications for patients, physicians, and policymakers. For patients, this data may provide some reassurance that there are not large consistent differences in the quality provided by different types of urology practices. While prior work has suggested that IMRT-owning practices provide more

low-value imaging and are more likely to generate higher costs, this study finds that these groups may also be facilitating higher quality care in some domains. For policymakers, current models of health care reform, including provisions in the Affordable Care Act and Medicare Access & CHIP Reauthorization Act (MACRA), emphasize quality of care and link reimbursement to achieving this quality.²⁷ As such, it is important to identify and propagate accurate and contemporary measures of quality that are achievable for urologists in various practice settings. For physicians not participating in an alternative payment model, the Merit based Incentive Payment System will dictate payment adjustments largely based on adherence to quality measures. Therefore, physicians will need to consider the ability of their practices to make changes leading to improved performance on quality measures. The reforms embedded in MACRA will put increasing pressure on physicians to improve value, maintaining or improving quality while reducing cost.²⁸

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Adjusted probability of adherence to prostate cancer quality measures among Medicare beneficiaries (n=22,412) stratified by urologist practice type (multi-specialty group versus single-specialty group) and ownership of an intensity modulated radiation therapy (IMRT) facility (labeled as owners versus non-owners) according to phase of care: A) Pre-treatment, B) Peri-treatment, C) Post-treatment (*p<0.05). For the high volume provider measure for urologist practice ownership of IMRT (panel B), results presented as the crude percent of patients adherent due to failure of the mixed model to converge.

Figure 2.

Adjusted probability of adherence to prostate cancer quality measures among Medicare beneficiaries managed by single specialty groups without ownership interest in an IMRT vault (n=14,138) stratified by urologist practice size (solo, 1–2 urologists; small, 3–5; medium, 6–9; large 10+) according to phase of care: **A)** Pre-treatment, **B)** Peri-treatment, **C)** Post-treatment (*p<0.05). For the high volume provider measure (panel B), results presented as the crude percent of patients adherent due to failure of the mixed model to converge.

Table 1.

Measures of prostate cancer quality

Timing relative to primary treatment	Measure	Endorsing Organization
Pre-treatment	Received pretreatment counseling by a urologist and radiation oncologist	RAND
	Avoided imaging in patients with low risk prostate cancer	PCPI, NQF
	Obtained imaging in patients with high risk prostate cancer	PCPI, NQF
Peri-treatment	Treated by a high volume provider	-
	Received ADT with radiation for high risk prostate cancer	PCPI, NQF
	Received adjuvant radiation after surgery for high risk prostate cancer	RAND
Post-treatment	At least 2 follow-up visits with treating provider after treatment	RAND
	Avoided GI toxicity related to treatment	RAND
	Avoided GU toxicity related to treatment	RAND

PCPI Physician Consortium for Performance Improvement, NQF: National Quality Forum

Table 2.

SEER-Medicare patient characteristics by practice size, affiliation and IMRT ownership.

Characteristics	Group Size/Affiliation					P-value	IMRT Ownership		P-value
	Solo	Small	Med	Large	MSG		No	Yes	
Patients n=22,412	6754	3376	1738	4555	5989	-	20033	2379	-
Urologists n=2,199	646	304	165	424	660	-	1951	248	-
Age, years						<0.001			0.99
66–69	1697 (25)	970 (29)	492 (28)	1323 (29)	1956 (33)		5758 (29)	680 (29)	
70–74	2186 (32)	1123 (33)	597 (34)	1537 (34)	2036 (34)		6678 (33)	801 (34)	
75–79	1562 (23)	756 (22)	386 (22)	1005 (22)	1244 (21)		4423 (22)	530 (22)	
80–84	902 (13)	357 (11)	192 (11)	491 (11)	523 (9)		2208 (11)	257 (11)	
85+	407 (6)	170 (5)	71 (4)	199 (4)	230 (4)		966 (5)	111 (5)	
Race/ethnicity						<0.001			<0.001
White	5485 (81)	2898 (86)	1486 (86)	3693 (81)	5094 (85)		16766 (84)	1890 (79)	
Black	574 (8)	283 (8)	139 (8)	604 (13)	500 (8)		1754 (9)	346 (15)	
Other/unknown	695 (10)	195 (6)	113 (7)	258 (6)	395 (7)		1513 (8)	143 (6)	
Initial Management						<0.001			<0.001
Radiation Therapy	2244 (33)	1100 (33)	514 (30)	1720 (38)	1624 (27)		6087 (30)	1115 (47)	
Brachytherapy	1010 (15)	417 (12)	239 (14)	511 (11)	629 (11)		2673 (13)	133 (6)	
Surgery	1021 (15)	684 (20)	359 (21)	803 (18)	1653 (28)		4160 (21)	360 (15)	
Other (conservative management, hormone therapy, cryotherapy)	2479 (37)	1175 (35)	626 (36)	1521 (33)	2083 (35)		7113 (36)	771 (32)	
Comorbidity						<0.001			0.16
0	3812 (56)	1952 (58)	1075 (62)	2624 (58)	3747 (63)		11844 (59)	1366 (57)	
1	1611 (24)	836 (25)	409 (24)	1093 (24)	1356 (23)		4742 (24)	563 (24)	
2	737 (11)	303 (9)	128 (7)	474 (10)	504 (8)		1891 (9)	255 (11)	
3+	594 (9)	285 (8)	126 (7)	364 (8)	382 (6)		1556 (8)	195 (8)	
D'Amico Risk (no PSA)						<0.001			0.09
Low	2461 (36)	1155 (34)	655 (38)	1595 (35)	2080 (35)		7054 (35)	892 (37)	
Intermediate	2628 (39)	1371 (41)	653 (38)	1934 (42)	2316 (39)		7982 (40)	920 (39)	
High	1665 (25)	850 (25)	430 (25)	1026 (23)	1593 (27)		4997 (25)	567 (24)	
Socioeconomic status						<0.001			<0.001
Low	2714 (40)	1087 (32)	476 (27)	1300 (29)	1797 (30)		6750 (34)	624 (26)	
Medium	2116 (31)	1164 (34)	562 (32)	1358 (30)	2106 (35)		6645 (33)	661 (28)	
High	1924 (28)	1125 (33)	700 (40)	1897 (42)	2086 (35)		6638 (33)	1094 (46)	
Residing in urban area						<0.001			<0.001
Non-urban	1310 (19)	331 (10)	224 (13)	287 (6)	1043 (17)		3086 (15)	109 (5)	
Urban	5444 (81)	3045 (90)	1514 (87)	4268 (94)	4946 (83)		16947 (85)	2270 (95)	
Urologists per 100,000						<0.001			<0.001
Low (< 41)	2605 (39)	1271 (38)	493 (28)	1108 (24)	2015 (34)		7129 (36)	363 (15)	

Characteristics	Group Size/Affiliation					P-value	IMRT Ownership		P-value
	Solo	Small	Med	Large	MSG		No	Yes	
Intermediate	2648 (39)	1001 (30)	700 (40)	1554 (34)	2317 (39)		7303 (36)	917 (39)	
High (72)	1501 (22)	1104 (33)	545 (31)	1893 (42)	1657 (28)		5601 (28)	1099 (46)	
Radiation oncologists per 100,000						<0.001			<0.001
Low (19)	2462 (36)	1157 (34)	483 (28)	1417 (31)	2009 (34)		7007 (35)	521 (22)	
Intermediate	2931 (43)	1457 (43)	588 (34)	1439 (32)	2398 (40)		7993 (40)	820 (34)	
High (32)	1361 (20)	762 (23)	667 (38)	1699 (37)	1582 (26)		5033 (25)	1038 (44)	
Hospital beds per 100,000						<0.001			<0.001
Low (4028)	2826 (42)	1305 (39)	683 (39)	1095 (24)	2151 (36)		7693 (38)	367 (15)	
Intermediate	2408 (36)	1010 (30)	403 (23)	1507 (33)	1885 (31)		6250 (31)	963 (40)	
High (5683)	1520 (23)	1061 (31)	652 (38)	1953 (43)	1953 (33)		6090 (30)	1049 (44)	
Medicare Managed Care penetration						<0.001			<0.001
Low (15.2%)	2562 (38)	1348 (40)	628 (36)	1414 (31)	1595 (27)		6303 (31)	1244 (52)	
Intermediate	1662 (25)	920 (27)	595 (34)	2275 (50)	1961 (33)		6836 (34)	577 (24)	
High (27.1%)	2530 (37)	1108 (33)	515 (30)	866 (19)	2433 (41)		6894 (34)	558 (23)	