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ORIGINAL ARTICLE

Forecasting Limited Access to Urology in Rural Communities: Analysis of the American Urological Association Census

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Abstract

Objective: To assess an aging subspecialty workforce and growing population that portends challenges in meeting patient care needs. We hypothesized that rural physicians are retiring at higher rates than their urban counterparts in the United States and that this represents a bellwether for workforce challenges at large.

Methods: We analyzed data from the 2014-2016 American Urological Association Census, a sample-weighted representative survey of urologists, as a case study for subspecialists. We compared urologists who work in rural regions to nonrural regions on available characteristics.

Results: In 2016, rural urologists accounted for 2.4% of 12,186 practicing urologists in the United States. General urology remained the focus of 90% of rural urologists, compared to 59% of nonrural urologists ($P = .03$). Alarmingly, 48% of rural physicians were >65 years old in 2016 compared to 29% in 2014, and 33% of rural urologists were solo practitioners compared to 9% of nonrural urologists ($P < .01$). The planned retirement age for rural physicians increased from 68 in 2014 to 73 in 2016 (P trend = .02). The percentage of rural practice urologists has remained stable since 2014.

Conclusions: Rural urologists are older and provide more general urological care than their nonrural counterparts. Rural urologists are postponing retirement. Although this might be due to personal desires and financial goals, it may also be due to a relative absence of potential junior partners. Given that almost 50% of rural urologists were older than 65 in 2016, this is not a sustainable solution to an impending shortage of physicians. Greater innovation in telemedicine or alternative care models will soon be needed.

Key words access to care, practice patterns, retirement, rural, workforce.

Patients and physicians alike are aging in the United States; the population over 65 is expected to nearly triple by 2030.[1] For subspecialists, this presents a unique opportunity to serve increasing numbers of patients. It is also well known that the subspecialty workforce has not expanded fast enough to meet growing demand for services, in particular urology.[2] Coupled with the fact that urologists represent one of the oldest surgical subspecialties in the United States, it may be challenging for active urologists to accommodate expected care needs in the near future.[3] As of 2016, there were 1,995 counties in the United States without a single urologist, so this burden is especially concentrated in rural areas.[4,5]

Rural America's population grew by about 0.3% from 2010 to 2015 and was estimated as 46.2 million residents in 2015.[6] These rural communities face unique challenges in terms of access to health care services. Average incomes, levels of education, and employment opportunities differ from urban and suburban environments and likely are key drivers of the social determinants of

health.[7-9] Rural hospitals are more likely to close and face economic pressures owing to consolidation of hospital systems.[10] Physicians out of training have been more inclined to practice in urban centers.[2]

Nonetheless, urologists provide vital care to rural Americans. They contribute to the health of community hospitals and provide essential genitourinary services for our aging population. The combination of an aging urology workforce and growing population portends challenges in meeting patient care needs in the future. How workforce and population changes would affect rural communities remains unknown. We hypothesize that rural urologists are retiring at higher rates than their urban counterparts in the United States. Should this be the case, we will face drastic workforce challenges in the field at large. Ultimately, this is an exploratory analysis comparing trends in demographic characteristics between rural and nonrural urologists. Our objective is to identify any pertinent differences between practices stratified by rurality to best inform policy makers, hospital administrators, and the future workforce.

Materials and Methods

Data were collected and analyzed from the 2014-2016 American Urological Association (AUA) Census.[4] This is a specialty-specific survey distributed to current board certified, working urologists throughout the United States, and individual responses are voluntary. Data are collected by self-report pertaining to individual urologists' demographic, education, and practice characteristics. The census data are collected annually in the summer of the publication year by convenience sample. In 2014, 2015, and 2016, 18.8%, 17.2%, and 18.9% of active urologists responded, respectively. Data are then survey-weighted to represent all of the active working urologists in the United States. Poststratification factors vary slightly by survey year, but include gender, location, and recertification status. These are adjusted by appropriate sample weight to create estimated population means or proportions for each variable as in prior work using this data.[2,11] This study was institutional review board exempt at the University of California-San Francisco.

We defined a rural urologist based on AUA census definition of "rural or small-town."[2,4,11] This is determined using practice location, obtained from the National Provider Identifier public record. Next, the level of rurality was decided using ZIP Codes corresponding to rural-urban commuting area (RUCA) of the United States.[12] RUCAs are ultimately derived from US Census data and account for population density, urbanization, and volume of daily commuting.[12] Stratifying by year, we analyzed demographic and practice characteristics for practitioners working in rural communities versus nonrural communities. Specific demographic variables of interest included categorical age, race, ethnicity, gender, and AUA region. Characteristics such as number of clinical hours, planned retirement age, number of office locations, number of partners, type of practice (solo practice, single urology group, public hospital, multispecialty group, managed care, or academic setting), and subspecialty training and focus were also queried.

Complex survey design was adjusted using appropriate weights and strata for each year of data. Given different sampling weights for each year due to a unique cohort of responders, data were carefully merged using previously described methods for multiyear cross-sectional surveys.[13] Specifically, sampling groups and strata differ each year and this must be accounted for in proper trends analysis. Categorical variables across time were compared using 2-sample test of proportions, whereas continuous variables were analyzed using a Student *t*-test. Categorical variables within a single year of census responses were compared using Pearson's chi-square analysis. All tests were 2-sided and statistical significance defined as $P < .05$. Stata 15 (StataCorp, College Station, Texas) was utilized for the analysis.

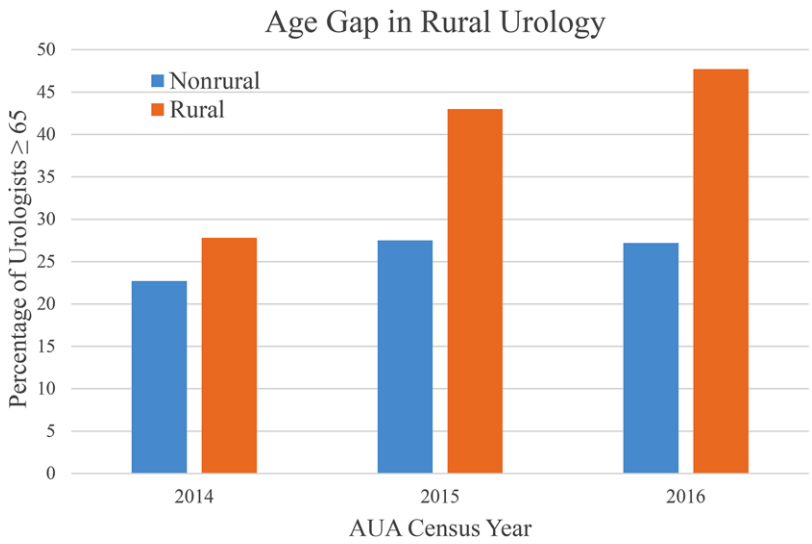
Results

There were an estimated 11,703, 11,990, and 12,186 practicing urologists in the United States in 2014, 2015, and 2016, respectively. On average, 2.3% of active urologists worked in rural communities from 2014-2016. In 2014, the proportion of rural urologists ≥65 years old was 29% compared to 48% in 2016 ($P = .11$). Strikingly, rural urologists were significantly older than their nonrural counterparts during the study period (Figure 1).

Practicing urologists in rural and nonrural communities had similar race, gender, and AUA region (Table 1). Over the 3 years of study, planned retirement age among rural urologists increased from 68 to 73 (P trend = .02). In 2016, rural urologists' planned retirement age was on average 4 years older than that for nonrural urologists ($P < .01$). In addition, rural urologists reported having worked 6 years longer than nonrural urologists ($P = .05$).

Urologists were more likely to be solo practitioners in a rural setting (Table 2). None of the rural urologists held any academic affiliations, compared to 26% of nonrural urologists. Most rural urologists practiced general urology, in contrast to a wide range of subspecialties practiced in more urban locations ($P = .03$). Rural urologists reported having fewer partners and offices than nonrural urologists: 3 versus 10 partners and 2 versus 4 offices, respectively (both $P < .01$).

Figure 1 Age Gap in Rural Urology.



Overall, rural urologists were similarly clinically busy to their urban counterparts at all time points (Table 3). Rural urologists accounted for 7.2% of urologists working fewer than 30 hours per week or part time. There was an increase in the proportion of rural doctors working part time between 2014 and 2016 (P trend = .01). There was no increase in the proportion of early career (age 44 or younger) urologists practicing in rural communities over time (P trend = .92). In 2014, 277 (2.4%) of urologists worked in rural communities compared to 286 (2.4%) in 2016 (P = .98).

Discussion

Our data portend stark workforce challenges ahead for rural communities. While we elected to study urology in detail, other subspecialty care in medicine and surgery may face similar challenges in the near future.[12,13] With almost 50% of urologists in rural communities being older than 65 years old, a wave of retirement is coming. Rural urologists have consistently postponed retirement age over the study period and the percent of rural urologists has remained steady. Rural urologists continue to be as clinically productive as more urban urologists on average, but the proportion pursuing part-time work has increased. The loss of rural workforce due to age is not a unique problem for urology, with similar trends observed for subspecialties such as orthopedics and general surgery.[14,15]

There are many possible reasons that rural subspecialists are postponing retirement. One can speculate that, without substantial numbers of graduating residents demonstrating interest and seeking positions in rural communities, subspecialists have been compelled to continue to practice and postpone retirement. This is likely multifactorial, but it may be motivated by dedication to their communities and patients they serve.[16] Other factors that may impact such decisions are financial realities, an overall trend of late retirement among physicians, a desire to stay clinically active, or pressure by market forces. On average, urban and rural urologists continue to work similar hours, but we found that the proportion of part-time workers in rural urology practice is increasing. Part-time retirement could be part of the solution of the impending crisis. This allows a pool of experienced surgeons to mentor less experienced workers while simultaneously minimizing overhead cost. Ultimately, more flexibility for part-time occupation may allow for more urologists to remain in the workforce longer.[17]

One challenge to recruiting newly trained urologists to rural communities may be the limited academic affiliation for rural urologists (0% in 2016). Whether due to distance, lack of interest, or financial factors, this limits resident exposure to rural practice. Medical students' career interests are at least partly motivated by exposure; therefore, a similar corollary may be applicable to residents selecting a career path.[18-20] On the postgraduate education level, there is no incentive program for urology resident recruitment into rural programs, to our knowledge. As the physician shortage in rural areas extends into a variety of medical specialties such as pediatrics, emergency medicine, gynecology, and internal medicine, a coordinated solution may be the most effective.[21,22] Medical school loan repayment programs or alternate payment models could be used to incentivize rural work.[3,23,24] Expansion and reform of the Health Professional Shortage

Table 1 Demographic Characteristics of 2016 Survey Respondents Stratified by Rurality Status[a]

	Rural 286 (2.4%)	Nonrural 11,899 (97.7%)	*P* value
Age, *n* (%)			.03
<34	22 (8)	468 (4)	
34-44	30 (11)	2,888 (24)	
45-54	45 (16)	2,557 (21)	
55-64	52 (18)	2,743 (23)	
≥65	136 (48)	3,244 (27)	
Race, *n* (%)			.46
White	201 (70)	9,512 (80)	
Asian	45 (16)	1,310 (11)	
Black	8 (3)	234 (2)	
Other/Multiple	0	132 (1)	
Not reported	32 (11)	712 (6)	
Hispanic, *n* (%)			.05
No	260 (91)	11,136 (94)	
Yes	4 (1)	447 (4)	
Not reported	23 (8)	317 (3)	
Gender, *n* (%)			.98
Male	262 (91)	10,891 (92)	
Female	24 (9)	1,008 (8)	
AUA[b] Region, *n* (%)			.48
New England	34 (12)	618 (5)	
Middle Atlantic	22 (8)	1,950 (16)	
East North Central	39 (14)	1,789 (15)	
West North Central	23 (8)	714 (6)	
South Atlantic	85 (30)	2,398 (20)	
East South Central	21 (7)	678 (6)	
West South Central	19 (7)	1,247 (10)	
Mountain	15 (5)	701 (6)	
Pacific	27 (9)	1,805 (15)	
Years Practiced, mean (95% CI)	27 (21.6-31.8)	21 (21.2-21.7)	.05
Planned age of Retirement, mean (95% CI)	73 (69.8-75.3)	69 (68.3-68.9)	< .01

[a]Survey weighted estimation applied.
[b]American Urologic Association.

Table 2 Practice Characteristics of 2016 Survey Respondents Stratified by Rurality Status[a]

	Rural 286 (2.4%)	Nonrural 11,899 (97.7%)	*P* value
Employment, n (%)			<.01
Solo	79 (28)	1,222 (10)	
Partner	16 (6)	3,907 (33)	
Employed	191 (67)	6,486 (55)	
Combo	0	283 (2)	
Practice Setting, n (%)			<.01
Academic	0	3m111(26)	
Community Health/HMO/ Managed Care Org	15 (5)	338 (3)	
Multispecialty Group	23 (8)	1,861 (16)	
Public or Private Hospital	102 (36)	1,264 (11)	
Other Settings	12 (4)	1,49 (1)	
Single Urologist	40 (14)	4 074 (34)	
Solo Practice	95 (33)	1,103 (9)	
Any Fellowship training, n (%)	61 (21)	4,644 (39)	.05
Primary Subspecialty Practiced, n (%)			.03
Oncology	4 (1)	1,344 (11)	
Endourology/Stones	0	593 (5)	
Female Pelvic Medicine and Reconstruction	6 (2)	581 (5)	
Erectile Dysfunction	9 (3)	250 (2)	
General	258 (90)	7,001 (59)	
Transplant/Laparoscopic	0	124 (1)	
Genitourinary Reconstruction	0	262 (2)	
Infertility	0	310 (3)	
Pediatrics	0	965 (8)	
Robotics	8 (3)	469 (4)	
Minutes Spent with Patients, mean (95% CI)	16.8 (13.9-19.7)	15.8 (15.5-16.1)	.509
# Patient Encounters per Week, mean (95% CI)	66.5 (54.2-78.9)	72.6 (71-74.3)	.337
Number of Partners, mean (95% CI)	3.3 (1.1-5.5)	9.6 (9.1-10.1)	<.01
Number of Offices, mean (95% CI)	2.2 (1.5-2.8)	4.2 (3.8-4.6)	<.01
Clinical Hours per Week, mean (95% CI)	43.8 (35.9-51.6)	46.6 (45.8-47.3)	.484
Nonclinical Hours per Week, mean (95% CI)	3.7 (2.4-5.1)	9.1 (8.7-9.6)	< .01
Weeks of Vacation, mean (95% CI)	6.6 (2.6-10.5)	4.7(4.5-5.0)	.362
Number of Female Patients, mean (95% CI)	38.4 (35.9-51.6)	31.9 (31.3-32.7)	<.01

[a]Survey weighted estimation applied

Area Physician Bonus Program through Medicare could provide further financial incentive for physicians to work in underserved communities.[25] In selecting a practice location, young urologists are motivated by factors as diverse as climate, flexible schedules, and liberal paid time off policies.[26] Ultimately, governing bodies should propose bold new policy such as incentive pay or subsidized housing to entice younger physicians to serve rural communities. Indeed, loan repayment and direct financial incentive programs have been proven effective in some circumstances.[27,28]

Physician extenders may play a key role in providing adequate care in the future. Indeed, in 2016, there were 991 physician assistants working within urology.[29] Dramatic growth in urology procedural care as performed by advanced practice providers such as nurse practitioners or physician assistants has been increasingly noted over the prior decade.[30] Due to varied scope of practice regulations, care extender expansion into rural areas is slow.[31] Patients are satisfied when advance care

Table 3 Selected Trends in Rural Practice 2014-2016[a]

	2014	2015	2016	*P* value
Physicians ≥ 65, %	29	43	48	.11
Planned Retirement Age	68	71	73	.02
Patients seen/week	75	63	67	.35
Number of offices	1.4	1.8	2.2	.04
Any fellowship training, %	19.3	18.1	21.2	.86
Solo Practice, %	36.4	33.4	33.2	.80
Employed by others, %	75.0	67.0	66.8	.43
Mean Weekly Hours	48.9	43.8	47.5	.77
Work <30 H a week, %	15.0	21.0	21.6	.01

[a]Survey-weighted estimation applied.

practitioners are involved in their care.[30] In some practices, common procedures such as urodynamic testing, cystoscopies, and even prostate biopsies are increasingly performed by such personnel.[30] While some urologists remain uncomfortable with the idea of allowing nonurologists to perform these procedures, the growing realities of increasing clinical demand coupled with fewer physicians may make this argument moot. Similar trends are suspected in other procedural subspecialties.[31]

Telemedicine may soon enable subspecialists such as urologists to extend their reach into communities with a lack of care. Patients are willing to participate in telemedicine, especially if they travel large distances to see their physician, which is particularly germane to rural areas.[32] Virtual consultation, teleconferenced follow-up care, and remote rounds may be increasingly incorporated into clinical practice thereby broadening the geographic footprint of a practice.[33,34] Reimbursement for telemedicine, Health Insurance Portability and Accountability Act (HIPAA) compliance, technical challenges particularly in rural communities, health literacy, and lack of ability to perform procedures must be overcome prior to widespread adoption.[35,36] There is already evidence that the rural patients most likely to benefit from telemedicine are not those participating.[37] A realignment of patient education, financial incentives, and friendly legal environment may be required to increase use.

Nonetheless, potential benefits of telehealth including timely, cost-effective communication to a rural patient and their primary physician have already been demonstrated in varied subspecialties, such as gastroenterology and urology.[38,39] Postoperative visits, and initial hematuria evaluations in particular, are ripe for innovation using telemedicine.[40,41] Some innovative groups go so far as to propose that registered nurses could perform "tele-cystoscopies" interpreted real time by board-certified urologists; the feasibility, safety, and legal implications of this approach are unknown and it remains an area of research.[42] Telesurgery may reduce geographic disparities to complex care in the far future, but legal, financial, and security concerns need to be addressed as well as making such a system palatable to a patient.[43] Where technology cannot penetrate, certainly outreach to rural environments in the form of a visiting consultant clinic may be of benefit in rural areas.[44]

Limitations

This study should be viewed in the context of its limitations. The data are cross-sectional, so trends among individual urologists cannot be studied. Rural urologists make up a small proportion of the sampled population, and these small numbers lead to greater potential for sampling errors. The variability in response rate from year to year may explain some variability in the data. Most of the data are self-reported and mischaracterization could be possible. Moreover, voluntary response bias may disproportionally affect urologists who work in rural settings, limiting the generalizability of our findings. Advance care providers may already be expanding care into rural areas as has been the case in disciplines such as emergency medicine, but the AUA survey does not query the advanced practitioner population.[45] We could not address potentially key variables pertinent to access to care in rural communities such as presence of robotics, advanced endoscopic stone procedures, or wait times in rural versus urban environments. Moreover, we do not know if access to care is mitigated by patient travel to urologists in urban centers. Likewise, we could not assess to what degree more urban physicians staff outreach clinics in more rural locations. Similarly, no data were collected regarding participation in telemedicine. There is also no detailed data on physician training locations. While practice ZIP codes were used to define rurality, they may not alone determine the amount of medical service provided to rural populations.

Conclusion

A high percentage of urologists in rural communities is approaching retirement age without signs of impending replacement with younger workers. Simultaneously, dramatic increases in the number of older Americans seeking health care are forthcoming. Policy makers should take note of an impending crisis in rural subspecialty care, in particular within urology. Solutions may include realigning financial incentives for rural recruitment, incorporating advance care practitioners and telemedicine into practices, and increasing the opportunity for residency training.

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