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Radiology Practices Employing Nurse Practitioners and Physician Assistants: Characteristics and Trends from Recent Years

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Disclosures

- Dr. Duszak's, Dr. Hughes', and Mr. Santavicca's efforts were supported in part by grants from the Harvey L. Neiman Health Policy Institute.
- Dr. Rosenkrantz receives salary support from the American Roentgen Ray Society for AJR editorship.
- Dr. Duszak, Dr. Hughes, Dr. Rosenkrantz, and Mr. Santavicca are non-partner employees of their respective organizations. Dr. Rubin is a partner employee of his organization.
- The authors declare that they had full access to all of the data in this study and take responsibility for the integrity of the data and the accuracy of the data analysis.
- This study was published online by the Journal of the American College of Radiology on March 4th.



Background

- Both the number and practice scope of non-physician practitioners (NPPs) have increased substantially across the United States in recent years [1-3]
- Most common among these professionals are nurse practitioners (NPs) and physician assistants (PAs) (together “NPPs”), whose numbers have now increased to approximately 205,000 and 95,000, respectively [4]
- Although NPPs can improve access to care in certain scenarios, concerns remain about potential reductions in quality as care is shifted to individuals with less education and training than physicians [5]



Background

- Both NPs and PAs have been used for many years by radiology practices in defined clinical settings, most notably in interventional radiology (IR) [4,6,7]
- Both have increasingly performed invasive procedures traditionally within the domains of interventional and other radiologists, with most notable increases in paracentesis and central venous access [8,9]
- And although the frequency with which NPs and PAs interpret diagnostic imaging examinations remains rare, that too is increasing (+14,711% from 36 in 1994 to 5,332 in 2015 per 100,000 Medicare Part B beneficiaries) [10]
- However, because traditional Medicare claims data do not identify whether such NPPs are employed by radiology or other specialty physician groups, the exact role of these individuals within radiology practices is unknown



Methods

Radiology Practice & Radiologist-Employed NPP Identification:

- Using publicly available CMS Doctors and Clinicians (formerly Physician Compare) databases that include all eligible Medicare-participating providers from 2017 through 2019, we extracted information about each individual provider in all identifiable group practices using the reported unique organizational identifier
- Those providers were then each individually mapped to their Medicare self-identified specialty or profession
- Organizations at which 100% of all affiliated physicians self-identified their primary specialty as diagnostic radiology, IR, or nuclear medicine (together “radiologists”) were categorized as “radiology practices”
- By isolating all self-identified NPPs affiliated with those practices, NPPs employed by radiology practices could then be uniquely identified and thus distinguished in a manner that was not possible in earlier studies of the broader set of all NPPs nationally rendering radiology services [8,10]



Methods

Radiologist Characterization:

- Number of years of clinical practice was estimated to begin 6 years after medical school graduation
 - We then grouped radiologists by career stages as ≤ 9 , 10 to 24, and ≥ 25 years in practice
- US census region was assigned based on the state of primary practice
- Primary practice location was additionally characterized as urban or rural using the census tract–based rural-urban commuting area (RUCA) classification scheme
- Using separate publicly available CMS Physician and Other Suppliers Public Use Files, in a manner previously validated for both private [11] and academic [12] practice radiologists and used in a variety of studies characterizing radiologists and their practices [13,14,15,16], we used National Provider Identifiers to identify all annual Part B Medicare claims for each radiologist and classified each radiologist as a subspecialist if at least 50% of the radiologist’s clinical work relative value effort mapped to a single subspecialty and otherwise as a generalist



Methods

Radiology Practice Characterization:

- Practices were characterized by size, geography, and radiologist characteristics
- For each practice, we computed the percentage of radiologists who (1) were identified by their billed claims work effort as IRs, (2) were identified by their billed claims work effort as other noninterventional subspecialists, and (3) self-identified as male
- The mean number of years of all radiologists' post-training clinical practice was calculated for each practice
- We additionally characterized practices by their size in terms of number of affiliated radiologists for a given year
 - Size categories were stratified as follows: small (1-25 radiologists), medium (26-50), and large (>50), which represented 44.8%, 30.5%, and 24.7% of all radiologists over the 3-year study period



Methods

We estimated odds ratios using a multivariate logistic regression model controlling for annual fixed effects for whether a given radiology practice was affiliated with an NPP to assess the likelihood of radiology practices employing NPPs and examine associations with independent demographic and geographic practice characteristics

Outcome variable

Practice affiliation with ≥ 1 NPP (dichotomous – 0 or 1)

Covariate measures

Continuous:

- Percentage of radiologists in the practice identified as IRs
- Percentage of non-interventional subspecialists
- Percentage of male radiologists
- Average radiologist post-training clinical practice years

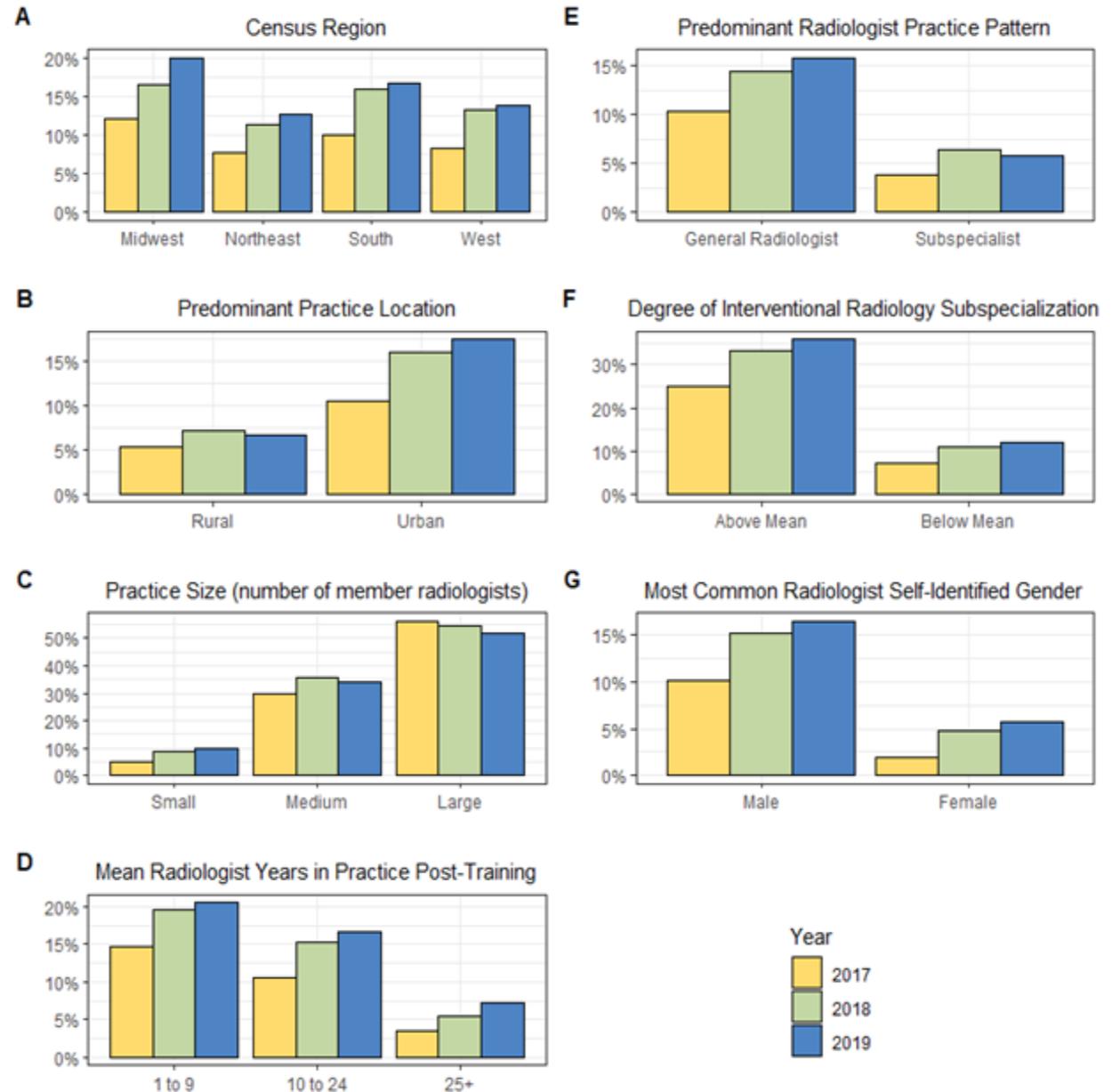
Categorical:

- Practice size
- Census region
- Urban vs. rural location



Results

- As the number of U.S. radiology practices declined by 36.5% (2,643 to 1,679) between 2017 and 2019, the number employing NPPs increased by 10.5% (228 [8.6%] to 252 [15.0%])
- The number of radiologists in NPP-employing practices increased by 10.4% (6,596 [35.1%] to 7,282 [40.0%]) as the number of radiology-employed NPPs increased by 17.5% (588 to 691)
- With the exception of large practices, the percentage of radiology practices with NPPs nationwide increased across all group characteristics between 2017 and 2019
- Increases were most pronounced for:
 - Small groups
 - Groups with primarily later-stage career radiologists
 - Groups with a female gender majority



Results

Unique radiology practices: 2,824 between 2017-2019

Practice-years: 5,841 included in the regression

Practices *more* likely to employ NPPs:

- Medium (odds ratio [OR]=1.31, p<.001) or large (OR=1.25, p=.007) in size
- Midwest (OR=1.39, p=.032) or urban located (OR=1.35, p=.003)
- As their percentages of IRs increased (OR=5.53 per percentage point, p<.001)

Practices *less* likely to employ NPPs:

- As mean radiologist years of experience increased (OR=0.99 per year) (p=.001)

	OR	95% CI	P Value
Practice radiologist characteristics			
Percent of interventional radiologists	5.53	(4.14, 7.39)	< .001
Percent of other subspecialists	0.96	(0.75, 1.23)	.752
Percent of male radiologists	1.21	(0.90, 1.63)	.197
Mean radiologists' years in practice	0.99	(0.98, 0.99)	.001
Practice size [reference: Small]			
Medium	1.31	(1.16, 1.48)	< .001
Large	1.25	(1.06, 1.46)	.007
Region [reference: West]			
Midwest	1.39	(1.03, 1.87)	.032
Northeast	0.72	(0.52, 1.01)	.054
South	1.04	(0.81, 1.34)	.758
Practice location [reference: Rural]			
Urban	1.35	(1.11, 1.63)	.003
Year [reference: 2017]			
2018	1.09	(1.05, 1.13)	< .001
2019	1.19	(1.15, 1.24)	< .001



Discussion

- In recent years, several teams have studied the influence of NPPs on radiology practices
- Examining outpatient visits in Medicare beneficiaries, Hughes et al. [17] reported that NPPs were approximately 30% more likely to order imaging than primary care physicians in similar clinical settings
- Studying two decades of imaging-guided procedures commonly performed by radiologists, Duszak et al. reported dramatic growth in the number of both invasive non-vascular [8] and venous access [9] services rendered by NPPs
- More recently, Makeeva et al. [10] studied imaging interpretation by NPPs across all 50 states over two decades and found that, while still uncommon, NPP interpretive services increased considerably, particularly for radiography
- Those investigations, however, were all limited by the inability to identify the specialty of physicians employing those NPPs using conventional Medicare claims data analytics



Discussion

Greater IR subspecialization

- Leaders in the IR community have long called for more longitudinal clinical care within the field [18]
- The use of NPPs to support such activities has been well described [4,6,19]. As such, we were not surprised to find that increasing IR subspecialization was strongly predictive of NPP employment

Larger practice size

- In recent years, radiology groups have consolidated considerably [13], in part to optimize practice finances and efficiencies [20,21]; as such, the finding of larger group size associated with a higher likelihood of NPP employment was also not unexpected



Discussion

Urban location

- Given reduced local access to both diagnostic and interventional radiologists in rural counties across the U.S. [22,23], we found it interesting that urban—rather than rural—radiology practices were much more likely to employ NPPs to meet their clinical service needs

Early-career radiologists

- Unexpected by us, given strong concerns raised by younger radiologists in a recent ACR membership survey [24], was the observation that groups with greater representation of earlier-career radiologists were more likely to hire NPPs
- Although our methods do not permit us to assert a definitive explanation for this apparent discordance, we believe it is possible that the strong opinions expressed by younger radiologists might be informed by actual exposure to NPPs in their day-to-day work



Take Home Points

- As the number of U.S. radiology practices declined by 36.5% between 2017 and 2019, the number employing NPPs increased by 10.5%
- During that time, the number of radiologists working in NPP-employing radiology practices increased 10.4% (from 35.1% to 40.0% of radiologists)
- Practices more likely to employ NPPs were urban located, larger in size, and more IR subspecialized
- Practices less likely to employ NPPs had more later-career radiologists and more non-IR subspecialists



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Thank you for your time! Please contact Stefan Santavicca with any questions.