

Orthopaedic Group Practice Size Is Increasing



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Purpose: To analyze recent trends in orthopaedic surgery consolidation and quantify these changes temporally and geographically from 2012 to 2020. **Methods:** We performed a retrospective cross-sectional analysis of orthopaedic surgeon practice size in the United States using 2012 and 2020 data obtained from the Physician Compare database. **Results:** Although we observed an increase from 21,216 unique orthopaedic surgeons in 2012 to 21,553 in 2020 (1.6% increase), the number of practices experienced a large decrease from 7,299 practices in 2012 to 5,829 in 2020 (20.1% decrease). The proportion of orthopaedic surgeons working in solo practices decreased from 13.2% (2,790) in 2012 to 7.4% (1,595) in 2020, and the proportion of orthopaedic surgeons working in groups sized 2 to 24 decreased from 35.3% (7,482) in 2012 to 22.2% (4,775) in 2020. In contrast, groups sized 25 to 99 have grown from 20.7% (4,387) of all orthopaedic surgeons to 23.4% (5,048) in 2020. Groups sized 100 to 499 have increased from 16.9% (3,593) in 2012 to 24.1% (5,190) in 2020, whereas groups sized 500 or greater have grown from 14% (2,964) in 2012 to 22.9% (4,945) in 2020. The number of unique group practices showed a significant decrease in the number of solo groups, which comprised 43.8% (3,200) of the total number of individual practices in 2012, decreasing to 32% (1,886) in 2020. All other groups increased in number and proportionally from 2012 to 2020. **Conclusions:** This study shows that over the period from 2012 to 2020, there has been a substantial trend of orthopaedic surgeons shifting to increasing practice sizes, potentially indicating that more orthopaedic surgeons are working for large health care organizations rather than small independent practices. **Clinical Relevance:** The impact of these changes should be examined to determine large-scale effects on patient care, payment models, access, and outcomes, along with physician compensation, lifestyle, and satisfaction.

The financial landscape of orthopaedic surgery has been changing rapidly with the advent of the Affordable Care Act in 2010, the Medicare Access and CHIP Reauthorization Act of 2015, and alternative payment models such as the Merit Based Incentive Program.^{1,2} These political and financial guidelines have adjusted the assessment parameters and payment

models of the health care system, and many of these changes have been reported to disproportionately affect smaller practices.^{3,4} Further influencing these changes is the declining Medicare reimbursement for physicians among many specialties, including orthopaedic surgery.⁵⁻⁹ Nationally, the percentage of hospital-employed physicians increased by more than 70% from 2012 to 2018 according to the Physicians Advocacy Institute.¹⁰ From 2016 to 2018, an estimated 6,000 physician practices were acquired by hospitals, with the percentage of hospital-owned practices increasing by 5% in less than 2 years.¹⁰

The increased complexity, electronic medical record requirements, and high coordination of care prompted by the aforementioned changes could be influencing practice consolidation in orthopaedic surgery.¹¹ Recent studies have shown benefits and increased stability offered by larger physician practice groups.¹² Practice consolidation has been observed as a general trend among physicians across the United States, with an increasing number of physicians working for larger organizations over time. In addition, some of these changes are happening at a time when smaller orthopaedic groups are struggling during the COVID-19

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Table 1. Numbers and Percentages of Orthopaedic Surgeons and Unique Group Practices in 2012 and 2020

Practice Size	Unique Orthopaedic Surgeons*				Unique Group Practices*			
	2012		2020		2012		2020	
	n	%	n	%	n	%	n	%
1	2,790	13.2	1,595	7.4	3,200	43.8	1,886	32
2-24	7,482	35.3	4,775	22.2	2,659	36.4	2,249	38.2
25-99	4,387	20.7	5,048	23.4	814	11.2	908	15.4
100-499	3,593	16.9	5,190	24.1	498	6.8	623	10.6
≥500	2,964	14	4,945	22.9	128	1.8	226	3.8

* $P < .001$.

(coronavirus disease 2019) pandemic as a result of lower volumes for orthopaedic surgery and elective surgery cancellations.¹³ However, little is known about orthopaedic surgeons specifically.^{12,14} The purpose of this study was to analyze recent trends in orthopaedic surgery consolidation and quantify these changes temporally and geographically from 2012 to 2020. We hypothesized that the field of orthopaedic surgery would have experienced a growing number of surgeons working for larger practices, as well as a growing number of large orthopaedic surgery practices across all geographic locations.

Methods

Our study methods were based on a well-conceived study performed by Rosenkrantz et al.,¹⁴ which analyzed practice size consolidation in radiology. Institutional review board approval was not required for this retrospective study because of the use of a publicly available data set without any patient-identifying information.

All data were obtained from the Physician Compare database.¹⁵ This data set was created by the Centers for Medicare & Medicaid Services in 2010 after enactment of the Affordable Care Act and is updated twice a month. Physicians are included in this data set if they have been registered into the Medicare Provider Enrollment, Chain, and Ownership System in the past 6 months or have billed Medicare for at least 1 fee-for-service reimbursement in the past 12 months. Specifically, data were obtained from the Physician Compare archive for September 2014, which contains data on the 2012 calendar year and the October 2020 update.^{15,16}

To identify physicians, we used National Provider Identifier numbers. Group practice affiliations are separated based on taxpayer identification numbers (TINs) and are only considered active if 2 or more physicians in the group have sent reimbursement through the group's TIN in the past 12 months. A physician may be associated with more than 1 practice, which is why a physician may show up more than once in the data set with different TINs. Only those whose primary specialty was listed as orthopaedic surgery were included. When analyzing individual orthopaedic

surgeons with multiple practice affiliations, we used the largest practice size when we de-duplicated the data by National Provider Identifier. A provider without a group affiliation was considered to be in an individual practice. Providers were then categorized into groups based on practice size (1, 2-24, 25-99, 100-499, and ≥500). For all comparisons, the Cochran-Armitage test for trend was used to determine whether the proportion of individuals or practices in each subset changed significantly between 2012 and 2020. The total number of orthopaedic surgeons and orthopaedic practices was calculated for 2012 and 2020, in addition to the percentage change in number of orthopaedic surgeons and practices.

We performed the same analysis to understand how the number of years in practice (0-10 years, 11-20 years, 21-30 years, and ≥31 years) could affect practice size. We stratified the data by number of years in practice according to the Medicare database designation for year graduated from medical school. For example, surgeons in the 2012 data set with a medical school graduation date of 1996 through 2005 were grouped in the category of 0 to 10 years in practice, and those with a graduation date between 1986 and 1995 were grouped in the category of 11 to 20 years in practice. This pattern was continued for category groupings of 21 to 30 years and 31 years or greater. Any physician with a medical school graduation date of 2006 through 2012 was assumed to be in training (either fellowship or residency) and was excluded ($n = 460$) from the 2012 data set to be more representative of practicing orthopaedic surgeons. We performed the same analysis on the 2020 data set, with graduation years of 2014 to 2020 being excluded ($n = 173$) and with graduation dates of 2003 to 2013 representing 0 to 10 years in practice.

Nationwide data were divided into 4 regions (Midwest, Northeast, South, and West) based on US Census divisions, and the aforementioned analysis calculating the number and percentage of providers and practices in each region was repeated.¹⁷ Trends were also analyzed for each region using the Cochran-Armitage test. All data and statistics were analyzed using R statistical software (R Foundation for Statistical Computing).

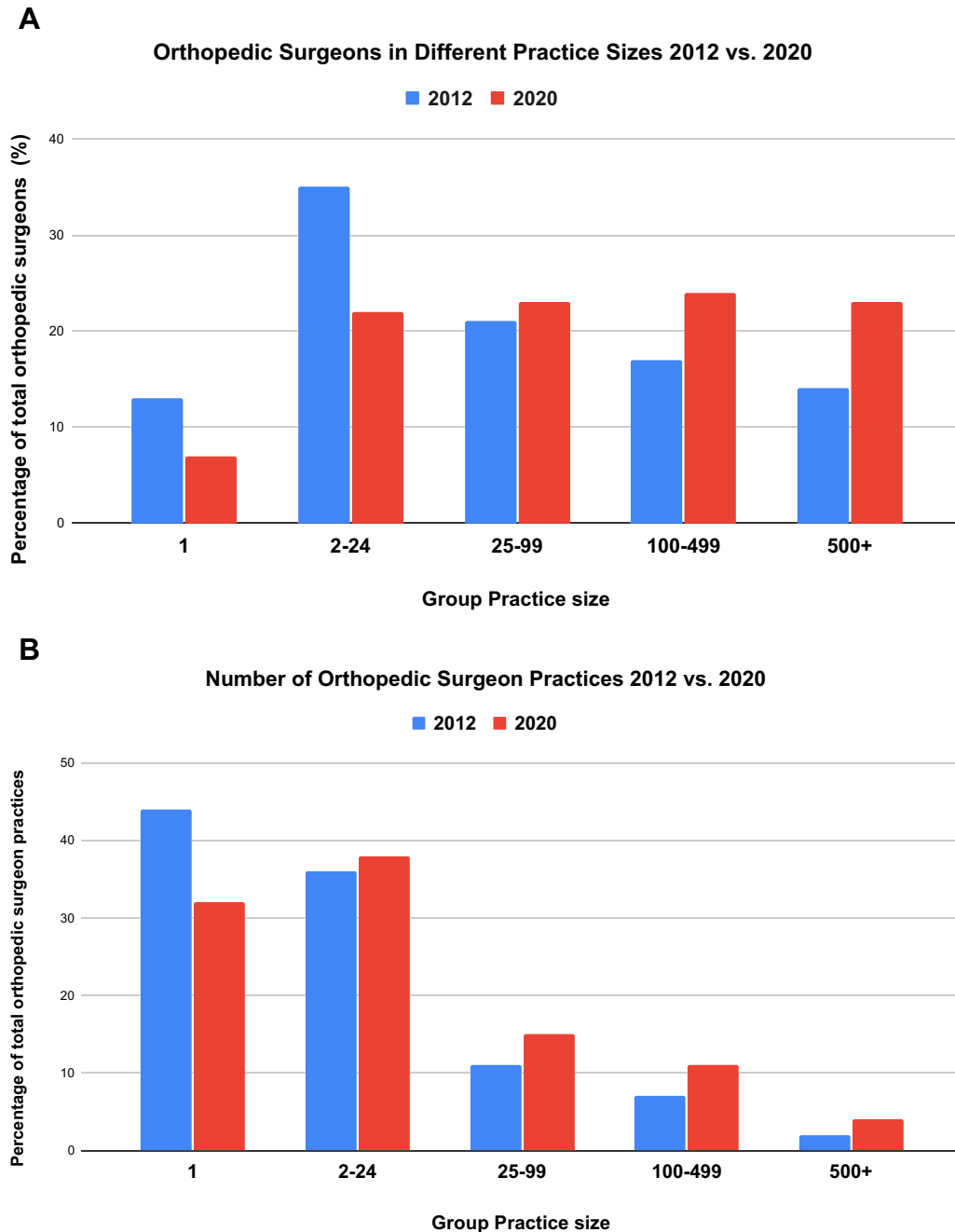


Fig 1. Bar plots showing number of individual orthopaedic surgeons in all practice groups (A) and number of practice groups (B) in each size category for 2012 and 2020.

Results

From 2012 to 2020, there was an increase in the number of unique orthopaedic surgeons from 21,216 in 2012 to 21,553 in 2020, representing a 1.6% increase. Conversely, the number of practices experienced a 20.1% decrease, from 7,299 to 5,829, during the same period. The proportion of orthopaedic surgeons working in solo practices decreased from 13.2% (2,790) in 2012 to 7.4% (1,595) in 2020, and the proportion of

orthopaedic surgeons working in groups sized 2 to 24 decreased from 35.3% (7,482) in 2012 to 22.2% (4,775) in 2020. The proportion of orthopaedic surgeons working in groups sized 25 to 99 grew from 20.7% (4,387) in 2012 to 23.4% (5,048) in 2020. The proportions of groups sized 100 to 499 and 500 or greater also increased between 2012 and 2020, from 16.9% (3,593) to 24.1% (5,190) and from 14.0% (2,964) to 22.9% (4,945), respectively.

Table 2. Numbers and Percentages of Orthopaedic Surgeons and Group Practices in 2012 and 2020 by Region

Practice Size	Unique Orthopaedic Surgeons*				P Value	Unique Group Practices*				P Value
	2012		2020			2012		2020		
	n	%	n	%		n	%	n	%	
Midwest					<.001					<.001
1	323	6.7	159	3.3		408	28.8	204	17.5	
2-24	1,495	31.1	778	16.3		568	40.1	427	36.6	
25-99	1,175	24.4	1,247	26.1		255	18	288	24.7	
100-499	939	19.5	1,248	26.1		142	10	180	15.4	
≥500	881	18.3	1,351	28.2		43	3	68	5.8	
Northeast					<.001					<.001
1	586	13.9	318	7.6		677	44.9	372	33.3	
2-24	1,580	37.4	929	22.2		521	34.6	396	35.5	
25-99	854	20.2	958	22.8		183	12.1	158	14.2	
100-499	672	15.9	969	23.1		103	6.8	142	12.7	
≥500	538	12.7	1,020	24.3		23	1.5	48	4.3	
South					<.001					<.001
1	978	13.1	554	7.2		1,083	42.5	647	31.3	
2-24	2,888	38.7	1,943	25.1		1,032	40.5	883	42.7	
25-99	1,624	21.7	1,885	24.4		240	9.4	291	14.1	
100-499	1,260	16.9	1,935	25		160	6.3	182	8.8	
≥500	722	9.7	1,418	18.3		34	1.3	67	3.2	
West					<.001					<.001
1	903	19.2	564	11.7		1,032	56.5	663	43.1	
2-24	1,519	32.3	1,125	23.2		538	29.4	543	35.3	
25-99	734	15.6	958	19.8		136	7.4	171	11.1	
100-499	722	15.4	1,038	21.4		93	5.1	119	7.7	
≥500	823	17.5	1,156	23.9		28	1.5	43	2.8	

There was a decrease in the number of solo groups, which comprised 43.8% (3,200) of the total number of individual practices in 2012, decreasing to 32.0% (1,886) in 2020. The number of groups sized 2 to 24 increased slightly from 36.4% (2,659) of orthopaedic practices in 2012 to 38.2% (2,249) in 2020. Group practices sized 25 to 99, 100 to 499, and 500 or greater comprised 11.2% (814), 6.8% (498), and 1.8% (128) of the total number of practices, respectively, in 2012, increasing to 15.4% (908), 10.6% (623), and 3.8% (226), respectively, in 2020 (Table 1, Fig 1).

When the data were stratified based on geographic region, the general trend of increased participation in larger group practice sizes existed in all regions. Decreasing numbers of unique orthopaedic surgeons working in solo practices and practice sizes of 2 to 24 and a corresponding increase in the number of orthopaedic surgeons working in practices of 25 to 99, 100 to 499, and 500 or greater were observed in all regions. In addition, the number of solo practices in all regions decreased from 2012 to 2020 whereas the number of practices sized 25 to 99, 100 to 499, and 500 or greater increased from 2012 to 2020. The number of practices sized 2 to 24 decreased from 2012 to 2020 in the Midwest but increased in the South, West, and Northeast, indicating that the Midwest may have higher consolidation than the other regions (Table 2).

We also observed differences in the practice size and number of years in practice of orthopaedic surgeons. In

2012, most orthopaedic surgeons with 0 to 10 years in practice worked in group practices sized 2 to 24 (33.9%) and 25 to 99 (22.3%), whereas in 2020, most of these surgeons worked in group practices sized 100 to 499 (26.2%) and 500 or greater (30.2%). In 2012, most orthopaedic surgeons with 11 to 20 years in practice worked in group practices sized 2 to 24 (38.9%) and 25 to 99 (20.4%), whereas in 2020, most of these surgeons worked in group practices sized 25 to 99 (24.7%) and 100 to 499 (24.5%). In 2012, most orthopaedic surgeons with 21 to 30 years in practice worked in group practices sized 2 to 24 (35.3%) and 25 to 99 (20.6%), and these 2 categories were similar in 2020, with most of these surgeons working in group practices sized 2 to 24 (24.6%) and 25 to 99 (24.4%). In 2012, most orthopaedic surgeons with more than 30 years in practice worked in group practices sized 1 (26.4%) and 2 to 24 (32.8%), whereas in 2020, most of these surgeons worked in group practices sized 2 to 24 (23.7%) and 100 to 499 (21.4%) (Fig 2, Table 3).

Discussion

According to our analysis of the Centers for Medicare & Medicaid Services Physician Compare database from 2012 to 2020, we found significant evidence of practice consolidation among orthopaedic surgeons within this period. These trends can be observed through an increase in the number of orthopaedic surgeons affiliated with larger practices, as well as a decrease in the

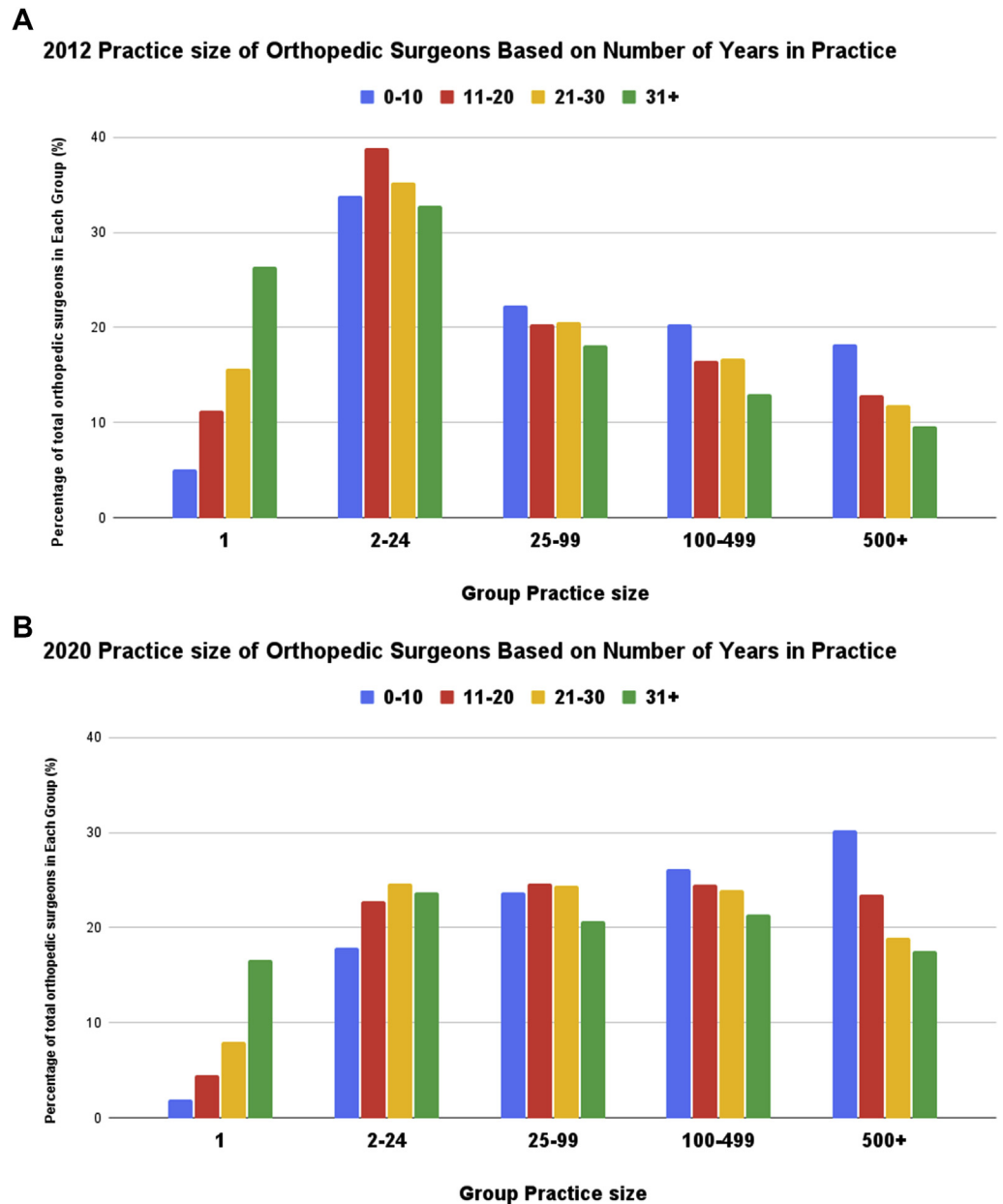


Fig 2. Bar plots showing number of orthopaedic surgeons working in all practice groups in 2012 (A) and 2020 (B) based on number of years in practice: 0 to 10 years (blue), 11 to 20 years (red), 21 to 30 years (yellow), and more than 30 years (green).

number of small practices. We found these trends across all regions of the United States. Additionally, orthopaedic surgeons with fewer years in practice preferentially worked in larger practices, with more than 80% of those with 0 to 10 years in practice working in practices of 25 or greater. In contrast, the percentage of physicians with 11 to 20, 21 to 30, and more than 30 years of experience working in practices of 25 or greater was 73%, 67%, and 60%, respectively. The findings in our study are largely in consensus with

the widespread trend of practice consolidation in medicine as a whole.^{14,18-22} It has been reported that 65% of all hospitals in the United States are part of larger health system networks.¹⁸ The same study reported that over 500 hospitals have merged into larger health systems from 2008 to 2018. Our study shows a similar pattern, with the number of practices declining from 7,299 in 2012 to 5,829 in 2020 (20.1% decrease).

The exact consequences of practice size are highly debated, and much of the literature remains unclear.

Table 3. Numbers and Percentages of Orthopaedic Surgeons in 2012 and 2020 Based on Number of Years in Practice

Practice Size	Unique Orthopaedic Surgeons*			
	2012		2020	
	n	%	n	%
Orthopaedic surgeons with 0-10 yr in practice				
1	295	5.1	109	1.9
2-24	1,977	33.9	1,003	17.9
25-99	1,297	22.3	1,331	23.7
100-499	1,191	20.4	1,468	26.2
≥500	1,068	18.3	1,696	30.2
Orthopaedic surgeons with 11-20 yr in practice				
1	644	11.2	254	4.5
2-24	2,228	38.9	1,294	22.8
25-99	1,172	20.4	1,402	24.7
100-499	947	16.5	1,393	24.5
≥500	742	12.9	1,335	23.5
Orthopaedic surgeons with 21-30 yr in practice				
1	860	15.7	429	8
2-24	1,927	35.3	1,321	24.6
25-99	1,123	20.6	1,311	24.4
100-499	910	16.7	1,291	24
≥500	642	11.8	1,024	19
Orthopaedic surgeons with ≥31 yr in practice				
1	987	26.4	785	16.6
2-24	1,225	32.8	1,122	23.7
25-99	677	18.1	977	20.7
100-499	486	13	1,014	21.4
≥500	358	9.6	831	17.6

* $P < .001$.

Many studies have claimed that increased practice size may hold advantages for both physicians and patients. For example, the findings of a study that examined Medicare beneficiaries reported significantly better outcomes, lower costs, and increased coordination of care for patients in larger practices compared with smaller practices.²³ A second study yielded similar results, showing a significant positive correlation between clinical processes and clinical outcomes with larger practices; however, this same study suggested that smaller practices had increased patient satisfaction and patient-reported access.^{24,25} Staff members of large practices reportedly have more positive perceptions of the practice work environment and lower burnout ratings when compared with those of smaller or independently owned practices.²⁶ Consolidation of medical practices can also potentially increase the stability and organization of physician networks.¹² Moreover, large practices with increased patient volumes benefit from increased economies of scale to improve patient outcomes, reduce financial overhead costs, and obtain higher bargaining power for contract terms and reimbursement rates.²⁷⁻³⁰

Practice size consolidation among orthopaedic surgeons also has its downfalls, as many studies have claimed substantial benefits of solo and small practices. It has been reported that smaller practices have a

shorter consultation length and reduced practice performance when compared with larger practices.²⁵ Other studies have reported that larger physician practices spend more per patient and have higher readmission rates than smaller practices. Specifically, practices with more than 100 physicians spend on average \$1,870 more annually per high-need Medicare beneficiary and incur a 1.64 times higher readmission rate than practices with 1 or 2 physicians.³¹

Increasing practice size could cause substantial growth of health care costs as well. A study examining physician fees paid by private insurers showed that increases in group practice size resulted in increased physician fees paid by private insurers.³² A study examining the economic impact of health care consolidation in orthopaedic surgery estimated a 7% increase in health insurance premiums for patients in a 10-year period because of increased consolidation.³² The authors proposed that this rise in price could result from the increased ability of surgeons to negotiate higher payments from payers owing to dominant market control and less competition.^{32,33} Increasing consolidation of physician practices also raises antitrust concerns, which is difficult to counteract because the consolidation results from numerous small transactions rather than large transactions, limiting the ability of federal authorities to counteract consolidation.¹⁹

As barriers to health care, such as socioeconomic status, gender, and race, are an important focus in health care today, the impact of practice size consolidation on these efforts should be considered. Our study shows that physicians are increasingly working for larger practices. However, it is the smaller practices that are more likely to be located in a rural setting and serving underserved patients.³⁴ A recent study examining differences in the treatment of patients with acute myocardial infarction by solo physicians versus physicians in larger practices suggested that physician practice size directly affects clinical practice patterns.³⁵ Because African American and Hispanic physicians are more likely to practice in small or solo practices, these groups are disproportionately affected by a decrease in smaller practices.³⁴ Finally, with the recent COVID-19 pandemic, medical practices have been exposed to great financial risks, particularly solo and small orthopaedic groups with limited capital owing to severely limited office visits and cancelled elective surgical procedures.^{36,37} Although the causes of practice size consolidation remain unclear, future studies should examine the impact of practice consolidation on patient outcomes, physician happiness, costs, and socioeconomic and racial disparities.

Limitations

Our study has several limitations. First, the use of the Medicare database excludes a small number of orthopaedic surgeons who might not participate in Medicare, such as pediatric orthopaedic surgeons. Another limitation is the limited period of available Medicare data related to physician practice size, which only spans from 2012 to 2020. Despite these limitations, we believe this methodology gives the best possible analysis of practicing orthopaedic surgeons, and this methodology has been applied in other studies using the Physician Compare database.^{38,39}

Conclusions

This study shows that over the period from 2012 to 2020, there has been a substantial trend of orthopaedic surgeons shifting to increasing practice sizes, potentially indicating that more orthopaedic surgeons are working for large health care organizations rather than small independent practices.

References

1. Saleh KJ, Shaffer WO. Understanding value-based reimbursement models and trends in orthopaedic health policy: An introduction to the Medicare Access and CHIP Reauthorization Act (MACRA) of 2015. *J Am Acad Orthop Surg* 2016;24:e136.
2. Centers for Medicare & Medicaid Services. MACRA: MIPS & APMs. <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Value-Based-Programs/MACRA-MIPS-and-APMs/MACRA-MIPS-and-APMs>. Accessed January 31, 2020.
3. RevCycleIntelligence. Rural. small practice MIPS performance lagged behind large peers. <https://revcycleintelligence.com/news/rural-small-practice-mips-performance-lagged-behind-large-peers>. Published January 22, 2019. Accessed March 29, 2021.
4. O'Connor M. MIPS metrics hurt general radiologists, favor large practices and subspecialties. <https://www.healthimaging.com/topics/healthcare-economics/mips-metrics-hurt-general-radiologists-favor-large-practices-and>. Accessed July 14, 2020.
5. Pollock JR, Bollig TR, Haglin JM, Sandefur BJ, Rappaport DE, Lindor RA. Medicare reimbursement to physicians decreased for common emergency medicine services from 2000 to 2020. *Ann Emerg Med* 2020;76:615-620.
6. Haglin J, Eltorai AE, Richter K, Jogerst K, Daniels A. Medicare reimbursement for general surgery procedures: 2000 to 2018. *Ann Surg* 2020;271:17-22.
7. Haglin JM, Lott A, Kugelman DN, Konda SR, Egol KA. Declining Medicare reimbursement in orthopaedic trauma surgery: 2000-2020. *J Orthop Trauma* 2021;35:79-85.
8. Moore ML, Pollock JR, Haglin JM, et al. A comprehensive analysis of Medicare reimbursement to physicians for common arthroscopy procedures: Adjusted reimbursement has fallen nearly 30% from 2000 to 2019. *Arthroscopy* 2020;37:e1632-e1638.
9. Malik AT, Kopechek KJ, Bishop JY, Cvetanovich GL, Khan SN, Neviasser AS. Declining trends in Medicare physician reimbursements for shoulder surgery from 2002 to 2018. *J Shoulder Elbow Surg* 2020;29:e451-e461.
10. Physician Employment Trends Study. <http://www.physiciansadvocacyinstitute.org/Portals/0/assets/docs/021919-Avalere-PAI-Physician-Employment-Trends-Study-2018-Update.pdf?ver=2019-02-19-162735-117>. Accessed July 30, 2021.
11. Hunt LM, Bell HS, Baker AM, Howard HA. Electronic health records and the disappearing patient. *Med Anthropol Q* 2017;31:403-421.
12. O'Hanlon CE, Whaley CM, Freund D. Medical practice consolidation and physician shared patient network size, strength, and stability. *Med Care* 2019;57:680-687.
13. Vaccaro AR, Getz CL, Cohen BE, Cole BJ, Donnally CJ. Practice management during the COVID-19 pandemic. *J Am Acad Orthop Surg* 2020;28:464-470.
14. Rosenkrantz AB, Fleishon HB, Silva E III, Bender CE, Duszak R Jr. Radiology practice consolidation: Fewer but bigger groups over time. *J Am Coll Radiol* 2020;17:340-348.
15. Centers for Medicare & Medicaid Services. Physician compare national downloadable file. <https://data.medicare.gov/Physician-Compare/Physician-Compare-National-Downloadable-File/mj5m-pzi6>. Accessed July 12, 2020.
16. Centers for Medicare & Medicaid Services. Archived datasets. <https://data.medicare.gov/data/archives/physician-compare>. Accessed July 12, 2020.
17. US Census Bureau. 2010 Census regions and divisions of the United States. <https://www.census.gov/geographies/reference-maps/2010/geo/2010-census-regions-and-divisions-of-the-united-states.html>. Accessed December 12, 2020.

18. Swearingen J. Market report: Trends in EM practice consolidation. <https://epmonthly.com/article/market-report-trends-in-em-practice-consolidation/>. Accessed June 1, 2020.
19. Capps C, Dranove D, Ody C. Physician practice consolidation driven by small acquisitions, so antitrust agencies have few tools to intervene. *Health Aff (Millwood)* 2017;36:1556-1563.
20. Carr Riggs, CPAs Ingram, Advisors. Medical practice consolidation. <https://www.cricpa.com/medical-practice-consolidation/>. Accessed December 9, 2020. Published December 13, 2018.
21. Swearingen J. Orthopaedic practice consolidation jumps 45% in 2018. Orthopaedics This Week. <https://ryortho.com/2018/10/orthopaedic-practice-consolidation-jumps-45-in-2018/>. Accessed December 9, 2020.
22. Thomas C, Brown J, Werling KA, Walker BC, Burgdorfer RJ, Shields JJ. Current trends in hospital mergers and acquisitions: Healthcare reform will result in more consolidation and integration among hospitals, reversing a recent trend in which hospitals tended to stay away from such transactions. Healthcare Financial Management. <https://link.galegroup.com/apps/doc/A286114649/AONE?sid=lms>. Accessed January 14, 2020. Published March 1, 2012.
23. Weeks WB, Gottlieb DJ, Nyweide DJ, et al. Higher health care quality and bigger savings found at large multi-specialty medical groups. *Health Aff (Millwood)* 2010;29:991-997.
24. Ng CWL, Ng KP. Does practice size matter? Review of effects on quality of care in primary care. *Br J Gen Pract* 2013;63:e604-e610.
25. Campbell JL, Ramsay J, Green J. Practice size: Impact on consultation length, workload, and patient assessment of care. *Br J Gen Pract* 2001;51:644-650.
26. Cuellar A, Krist AH, Nichols LM, Kuzel AJ. Effect of practice ownership on work environment, learning culture, psychological safety, and burnout. *Ann Fam Med* 2018;16:S44-S51 (suppl 1).
27. Go RS, Bartley AC, Crowson CS, et al. Association between treatment facility volume and mortality of patients with multiple myeloma. *J Clin Oncol* 2016;35:598-604.
28. Go RS, Al-Hamadani M, Shah ND, Crowson CS, Holton SJ, Habermann EB. Influence of the treatment facility volume on the survival of patients with non-Hodgkin lymphoma. *Cancer* 2016;122:2552-2559.
29. Bernet PM, Singh S. Economies of scale in the production of public health services: An analysis of local health districts in Florida. *Am J Public Health* 2015;105:S260-S267 (suppl 2).
30. Pope GC, Burge RT. Economies of scale in physician practice. *Med Care Res Rev* 1996;53:417-440.
31. The Commonwealth Fund. Do larger physician practices provide better care at lower cost?. <https://www.commonwealthfund.org/publications/journal-article/2018/aug/larger-physician-practices-better-care-lower-cost>. Accessed December 9, 2020.
32. Sun E, Baker LC. Concentration in orthopaedic markets was associated with a 7 percent increase in physician fees for total knee replacements. *Health Aff (Millwood)* 2015;34:916-921.
33. Dafny L, Duggan M, Ramanarayanan S. Paying a premium on your premium? Consolidation in the US health insurance industry. *Am Econ Rev* 2012;102:1161-1185.
34. Liaw WR, Jetty A, Petterson SM, Peterson LE, Bazemore AW. Solo and small practices: A vital, diverse part of primary care. *Ann Fam Med* 2016;14:8-15.
35. Ketcham JD, Baker LC, MacIsaac D. Physician practice size and variations in treatments and outcomes: Evidence from Medicare patients with AMI. *Health Aff (Millwood)* 2007;26:195-205.
36. Anoushiravani AA, O'Connor CM, DiCaprio MR, Iorio R. Economic impacts of the COVID-19 crisis. *J Bone Joint Surg Am* 2020;102:937-941.
37. Warner JJP, Ticker JB, Navarro RA, Haas DA, Dremel E, Roop JA. The business of orthopaedics: Post-pandemic challenges and opportunities—A Codman Shoulder Society discussion [published online October 20, 2020]. *J Orthop Exp Innov*.
38. Rosenkrantz AB, Fleishon HB, Hudgins PA, Bender CE, Duszak R. Characteristics of radiologists' clinical practice patterns by career stage. *Acad Radiol* 2020;27:262-268.
39. Pena NMDL, Richter KR, Haglin JM, Pollock JR, Richter RA, Kouloumberis PE. Differences by practice year in numbers of U.S. female neurosurgeons. *World Neurosurg* 2021;145:363-367.