

Pediatric Shoulder Arthroscopy Case Volume Is Uniformly Low for Graduating Orthopaedic Residents



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Purpose: To evaluate shoulder arthroscopy case volume for graduating United States orthopaedic surgery residents. **Methods:** We used the Accreditation Council for Graduate Medical Education case log records to evaluate reports from academic years 2016 to 2020. Logs were queried for pediatric, adult, and total (pediatric and adult) cases. The 10th, 30th, 50th, and 90th percentiles of case volumes from 2016 to 2020 were presented to demonstrate case volume variability. **Results:** There was a significant increase in the average number of total (70.7 ± 35 vs 81.8 ± 45 ; $P < .001$), adult (69 ± 34 vs 79.7 ± 44 ; $P < .001$), and pediatric (1.8 ± 2 vs 2.2 ± 3 ; $P = .003$) shoulder arthroscopy cases performed by orthopaedic surgery residents between the academic year 2016 and 2020. Residents were involved in more than 36 times the number of adult cases compared with pediatric cases in 2020 (79.7 ± 44 vs 2.2 ± 3 ; $P < .001$). The 90th percentile of residents performed 6 pediatric cases in 2020, compared with zero cases in the 30th percentile and lower. **Conclusions:** Approximately one-third of orthopedic surgery residents graduate without having performed a pediatric shoulder arthroscopy. **Clinical Relevance:** The findings from this study could help guide the revision of current Accreditation Council for Graduate Medical Education guidelines for orthopaedic surgery residents.

The Accreditation Council for Graduate Medical Education (ACGME) mandates specific numbers of cases in each subspecialty area for graduating orthopaedic residents. The minimum numbers of cases required for residents are determined through an evaluation of national averages and standard deviations by a review committee.¹ Final case counts are derived based on collective expertise and professional decision-making on behalf of the committee.

Shoulder arthroscopy is one of the most important orthopaedic procedures for graduating orthopaedic surgery residents.²⁻⁴ Currently, the ACGME requires

that orthopaedic surgery residents perform a minimum of 20 shoulder arthroscopies.⁵

The ACGME, however, does not delineate requirements between adult and pediatric shoulder arthroscopies, even though the number of pediatric shoulder arthroscopies performed nationally is increasing each year.⁶ Pediatric shoulder arthroscopy is a particularly important skill because of the special considerations that are needed with regards to anatomy, especially with regards to the smaller joint size and neighboring growth plates.⁷

Hinds et al.⁸ investigated pediatric orthopaedic case volume among residents in 2018. Overall, they found that there was a significant increase in the number of pediatric orthopaedic cases among residents, particularly for upper-extremity procedures. However, in that study, the authors did not investigate pediatric shoulder arthroscopy cases, in particular. Sudah et al.⁹ recently investigated resident exposure to adult and pediatric knee arthroscopy from 2016 to 2020. The average number of adult knee arthroscopy cases performed each year far exceeded the ACGME case minimum requirement for knee arthroscopy, which similarly does not delineate requirements between adult and pediatric cases. Although a small but significant increase in pediatric knee arthroscopy case volume was present during this time, there was an 11-fold difference

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Table 1. The Demographics of Orthopaedic Surgery ACGME Case Log Respondents

Year	Total # of Residency Programs	Total # of Residents
2016	153	705
2017	156	709
2018	154	729
2019	154	725
2020	154	724

ACGME, Accreditation Council for Graduate Medical Education.

between the 10th and 90th percentiles of performing residents. The authors concluded that the wide variability in pediatric exposure is likely masked by the abundance of adult cases performed each year, which was found to be 5.7 times greater.

The purpose of this study was to evaluate shoulder arthroscopy case volume for graduating United States orthopaedic surgery residents. We hypothesized that dividing total shoulder arthroscopic cases into pediatric and adult populations would reveal large discrepancies in resident experience with the 2 patient populations.

Methods

This study was conducted using the ACGME case log reports from 2016 to 2020. Case logs were pulled for each resident's case logs for each academic year. Shoulder arthroscopy case logs were specifically queried for pediatric cases, adult cases, and total cases (pediatric and adult). There are 13 Current Procedural Terminology codes that are used to categorize a particular procedure as a shoulder arthroscopy. Case volumes were reported for the 10th, 30th, 50th, 70th, and 90th percentiles of residents for each year. Total mean case volume was also reported for graduating residents during 2016 and 2020.

Statistical Analysis

The mean case volumes were compared between the academic year 2016 and the academic year 2020 using a 2-tailed *t*-test for each category of cases: pediatric, adult, and total. Scatter plots were created to visualize trends in the data. The statistical significance level was designated as $P < .05$. Analyses were conducted using Excel software, version 16.0 (Microsoft Corp., Redmond, WA).

Results

There were 154 orthopaedic residency programs with a total of 724 residents in 2020 (Table 1). In comparison, there were 153 programs in 2016, with a total of 705 residents. The average total number of shoulder arthroscopy cases was 81.8 ± 45 in 2020, increasing from 70.7 ± 35 in 2016 ($P < .001$; Table 2).

The total number of cases for adult and pediatric shoulder arthroscopies per year is shown in Figure 1; in all years the number of adult cases was approximately 40 times greater than pediatric cases. The average total number of adult shoulder arthroscopy cases was 79.7 ± 44 in 2020, increasing from 69 ± 34 in 2016 ($P < .001$; Table 2). The average total number of pediatric shoulder arthroscopy cases was 2.2 ± 3 in 2020, increasing from 1.8 ± 2 in 2016 ($P = .003$; Table 2). Residents were involved in more than 36 times the number of adult cases compared with pediatric cases in 2020 (79.7 ± 44 vs 2.2 ± 3 ; $P < .001$).

Case trends—based on the percentile of cases per resident—are demonstrated in Table 3. In 2020, the total number of shoulder arthroscopy cases performed varied considerably based on percentile, ranging from 135 total cases for residents in the 90th percentile to 36 total cases in the 10th percentile. Residents in the 10th percentile and 30th percentile of pediatric shoulder arthroscopy had exposure to 0 cases in 2020. In the same year, the 90th percentile of residents were involved in 6 pediatric shoulder arthroscopy cases. The fold increase between the 90th and 50th percentile is shown in Figure 2, demonstrating a greater discrepancy between those percentiles for pediatric cases.

Discussion

Our study shows that resident exposure to pediatric shoulder arthroscopy remains limited and uniformly low. The mean number of pediatric shoulder arthroscopy cases for graduating residents was 2 cases, with approximately 30% of residents performing no cases. There has been little fluctuation in pediatric shoulder arthroscopy resident case volume since 2016. The findings from this study could help guide the revision of current ACGME guidelines for orthopaedic surgery residents.

Experience with shoulder arthroscopy is important for graduating orthopaedic surgery residents. A report from 2018 found that shoulder arthroscopy was the single most common procedure performed by early-

Table 2. Mean Number of Adult and Pediatric Shoulder Arthroscopy Procedures for Graduating Orthopedic Surgery Residents in 2016 and 2020

Demographic	2016	2020	% Change	<i>P</i> Value
Total	70.7 ± 35 (20-337)	81.8 ± 45 (19-315)	15.7	<.001
Adult	69 ± 34 (15-328)	79.7 ± 44 (18-315)	15.5	<.001
Pediatric	1.8 ± 2 (0-21)	2.2 ± 3 (0-30)	22	.003

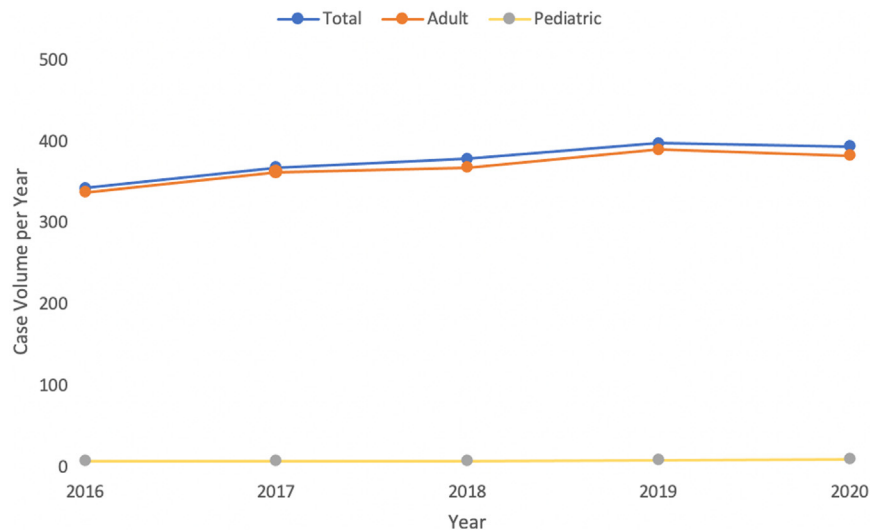


Fig 1. Total, adult, and pediatric shoulder arthroscopy case volumes by year, consistently demonstrating pediatric cases approximately 2% of the total.

practice orthopaedic surgeons.¹⁰ However, the authors reported a discrepancy between shoulder arthroscopies performed in residency and in practice. While shoulder arthroscopies were performed as 6.94% of all procedures during residency, as a practitioner, surgeons performed shoulder arthroscopies at a rate of 9.35%.

These findings are important in the context of increasing pediatric musculoskeletal injuries¹¹ and the use of advancing arthroscopic techniques within this population.⁶ This trend is evident in a recent systematic review which advocates for the use of arthroscopic stabilization in adolescent patients with first-time instability events.¹² With pediatric sport injuries at an all-time high, there is great value in learning the nuances associated with pediatric shoulder arthroscopy.⁷

In this study, we identified that there was small variability in the number of pediatric arthroscopic procedures performed by graduating orthopedic residents. The reasons for the variation in the number of cases may be multifold. First, institutional resources to provide residents with adequate case volume likely differs considerably from institution to institution. For example, institutions with a dedicated pediatric hospital may provide more opportunities for residents to participate in pediatric orthopaedic procedures. Second, the duration of pediatric rotations likely differs substantially based on program, especially if senior residents have significant elective time.

Attending surgeons are often tasked with balancing resident education with patient safety. Importantly, evidence from the American College of Surgeons National Surgical Quality Improvement Program suggests that resident involvement in shoulder arthroscopy cases is not associated with increased risk of adverse events, operative time, or readmission within 30 days.¹³ In light of the results from that study, increasing resident

involvement in pediatric shoulder arthroscopy cases may also be educational, without risking patient safety.

Because current ACGME guidelines do not differ between pediatric and adult procedures, revision of case minimum requirements for specific procedures could be appropriate to maintain optimal training experience.

Limitations

There were several limitations to this study. First, the amount of surgical involvement that residents had for each case was not recorded. This variable is necessary to make an adequate determination of how well trained a resident is in performing a particular type of procedure, such as shoulder arthroscopy. Second, ACGME data reporting may not be completely accurate, and the degree to which actual resident case involvement differs from reported involvement has been called into

Table 3. Difference in Adult and Pediatric Shoulder Arthroscopy Procedures Between the 10th and 90th Percentiles of Residents

Demographic	Year	10th	30th	50th	70th	90th
Total	2016	34	51	64	80	114
	2017	35	53	67	85	128
	2018	36	55	71	91	126
	2019	37	57	74	96	134
	2020	36	57	73	93	135
Adults	2016	34	50	63	78	113
	2017	35	52	66	84	125
	2018	35	54	68	89	122
	2019	36	55	72	94	133
	2020	34	55	71	91	132
Pediatrics	2016	0	0	1	2	5
	2017	0	0	1	2	5
	2018	0	0	1	2	5
	2019	0	0	1	2	6
	2020	0	0	1	3	6

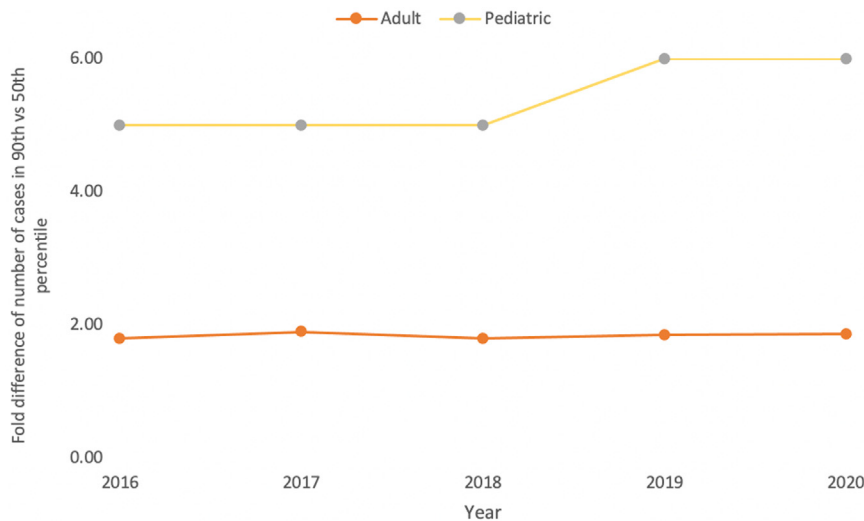


Fig 2. The fold differences between the 90th and 50th percentile of cases per year demonstrate a much larger variation for pediatric cases (with the 90th percentile doing 5- or 6-fold the number of cases compared with the 50th percentile) compared with adult (with about a factor of 2-fold greater cases for the 90th vs the 50th percentile).

question. In one study, among general surgery interns, an automated tracking system identified that ACGME cases logged tended to underestimate the number of cases where interns were involved (126 vs 177).¹⁴ In addition, because of the default of “adult” being inserted in the dropdown menus for tracking of adult versus pediatric cases, the number of pediatric cases may be underestimated by this system. Improved methods of entering case logs may yield more reliable data for future assessments of training.

Conclusions

Approximately one-third of orthopaedic surgery residents graduate without having performed a pediatric shoulder arthroscopy.

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