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Effect of COVID-19 on Graduating Urology Resident Case Logs: Analysis of the Accreditation Council of Graduate Medical Education National Data Reports



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OBJECTIVE	To assess the national case logs of the first graduating urologic resident cohorts to have trained during the COVID-19 pandemic for effects on surgical volumes.
METHODS	The nationally aggregated Accreditation Council for Graduate Medical Education urology resident case logs were obtained for graduates of academic years (AYs) 2015-2016 through 2020-2021. Case volume differences for tracked index categories were compared between AYs with a 1-way analysis of variance. Data were then combined into pre-COVID and COVID-affected resident cohorts and differences in average cases logged were analyzed with 2-tailed student's t-tests.
RESULTS	Graduating urology residents logged an average of 1322 (SD 24.8) cases over their residency during the examined period. Total cases had multiple statistical differences between AYs but the only index category with a statistically significant decrease for a COVID-affected AY compared to pre-COVID AY was pediatric majors: AY 2020-2021 logged fewer cases than AY 2015-2016 (53.9 vs 63.0, $P = .004$) and AY 2018-2019 (53.9 vs 61.2, $P = .04$). When aggregated into pre- and COVID-affected cohorts, both pediatric minor (123.4 vs 117.5, $P = .049$) and pediatric major (61.4 vs 56.8, $P = .003$) case averages decreased for the COVID-affected cohort of residents, but no adult index category decreased.
CONCLUSION	National graduating urology resident surgical volume for adult index categories was maintained through the pandemic. Pediatric cases saw a statistical decrease in volume of questionable clinical significance. This does not eliminate concern that individuals may have experienced a detrimental impact on their resident education. UROLOGY 167: 24–29, 2022. © 2022 Elsevier Inc.

The emergence of the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the subsequent global pandemic from coronavirus disease 2019 (COVID-19) has roiled healthcare systems since December 2019. In March of 2020, the United States (US) reported the most cases in the world and the American College of Surgeons recommended limiting elective surgeries.¹ Hospitals prepared for an increase in COVID-19 patients by reallocating staff and preserving personal protective equipment through reduction of elective healthcare and operative volumes.² There has been

significant concern about the impact on medical training for all learners, including urology residents and fellows.³⁻⁵

Early in the pandemic, urology program directors were surveyed and reported decreased patient contact as well as residents being redeployed to new clinical responsibilities.³ They expressed concern that residents may not meet the required urology case minimums established by the Accreditation Council for Graduate Medical Education (ACGME). Programs transitioned to virtual didactics and surgical video narrations to attempt to compensate for decreased clinical experience.⁵ In a May 2020 survey, 83% of urology residents reported a decrease in case of volumes with a concomitant increase in anxiety over surgical competency upon graduation in heavily impacted regions.⁶

Since those initial months, there have been multiple waves and new virus variants that surged in different geographical regions despite the development of multiple vaccines and subsequent widespread vaccination efforts.^{7,8} The healthcare system continues to be afflicted

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with a staffing crisis that affects surgical capacity.⁹ Additionally, many patients were hesitant to enter healthcare facilities for routine care during the pandemic.¹⁰ These pressures have had an unknown impact on urologic trainees. We hypothesized that urologic residents graduating during the COVID pandemic would report lower case volumes than their prepandemic peers. The purpose of this study is to evaluate publicly available ACGME national case log data of urology residents for detrimental effects on surgical volume.

METHODS

Case log data for all US graduating urology residents was obtained from the ACGME for the available academic years (AYs) 2015-2016 through AY 2020-2021 after receiving an institutional review board oversight exemption. In this dataset, the final case logs for each AY's cohort of graduating urology residents are aggregated and presented as summary statistics available to the public. The data is categorized into index case categories of general urology, endourology/stone disease, reconstructive surgery, oncology, pediatric minor, and pediatric major cases. Minimally invasive surgical approaches (ie, laparoscopic and robotic) were not tracked or tracked variably over this time period preventing direct comparison, and were thus not included. The average, standard deviation, median, minimum, maximum, and percentiles are provided.

Case log data is self-reported and reviewed by the resident's program director on a biannual basis. For each case, the resident identifies one of 3 roles based on their involvement: "Surgeon," "Assistant," or "Teaching Surgeon." Data is provided for each role as well as a totaled "All Roles" category. The majority of cases were logged as "Surgeon" and there is likely inherent resident-to-resident variability in how they identify what role they served. Thus, the category "All Roles" was analyzed as a marker of total operative experience for each resident.

The summary statistics provided were used for analysis. The average total cases for each AY was calculated by summing individual index categories. To evaluate if any AY was statistically different from another, 1-way analysis of variance (ANOVA) was performed for each index category and total cases. Significant findings between AY case averages were further analyzed using Tukey's method to assess specific differences between AYs.

Additionally, we were interested in evaluating the experience of pre-COVID residents versus those trained during the pandemic. The cases logged for "All Roles" of AY 2015-2016 through 2018-2019 and AY 2019-2020 through 2020-2021 were combined using Cochrane's formula into case averages for pre-COVID and COVID-affected cohorts, respectively. The 2 cohorts were then compared using two-sided student's t-tests with Welch's correction. This analysis was repeated with cases logged as "Surgeon" to assess if there was a decrease in resident-led cases during the pandemic. All statistical analyses were performed using GraphPad Prism version 9.3.1 with significance considered as $P \leq .05$.

RESULTS

The case logs of 1866 US graduating urology residents were evaluated from AY 2015-2016 to AY 2020-2021. During that time, urology residency programs expanded from 122 to 136 and the number of residents increased from 292 to 333 per year. The average number of urologic cases logged during residency by graduating residents in the period examined was 1322 (SD 24.8). The average number of total and index category cases per resident for each academic year is shown in Figure 1.

Averages for total, reconstruction, and pediatric major cases but not endourology/stone, oncology, or pediatric minor cases were statistically different across AYs (Fig. 2). Average total cases for AY 2018-2019 was statistically higher than the pre-COVID AY 2015-2016 (1357 vs 1295, $P = .003$) and AY 2016-2017 (1357 vs 1304, $P = .02$) and the COVID-affected AY 2019-2020 (1357 vs 1,306, $P = .03$). Additionally, the COVID-affected AY 2020-2021 had more logged cases than AY 2015-2016 (1345 vs 1295, $P = .04$).

A statistically significant increase was seen in reconstruction cases between the COVID-affected AY 2019-2020 and AY 2020-2021 (167.2 vs 180.8, $P = .03$) but there was no statistical difference between COVID-affected and pre-COVID AYs (Fig. 2). Pediatric major cases for the resident cohort affected by COVID for the longest duration, AY 2020-2021, were decreased compared to pre-COVID AY 2015-2016 (53.9 vs 63.0, $P = .004$) and AY 2018-2019 (53.9 vs 61.2, $P = .04$).

When urology residents were stratified into pre-COVID (AY 2015-2016 through AY 2018-2019) and COVID-affected cohorts (AY 2019-2020 and AY 2020-2021) there were 1206 and 660 residents per cohort, respectively. The average adult

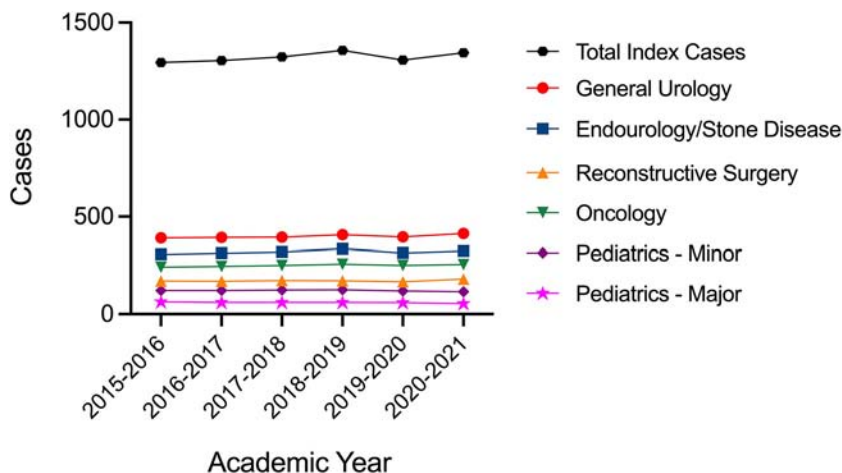


Figure 1. Average total and index category urology cases per academic year. (Color version available online.)

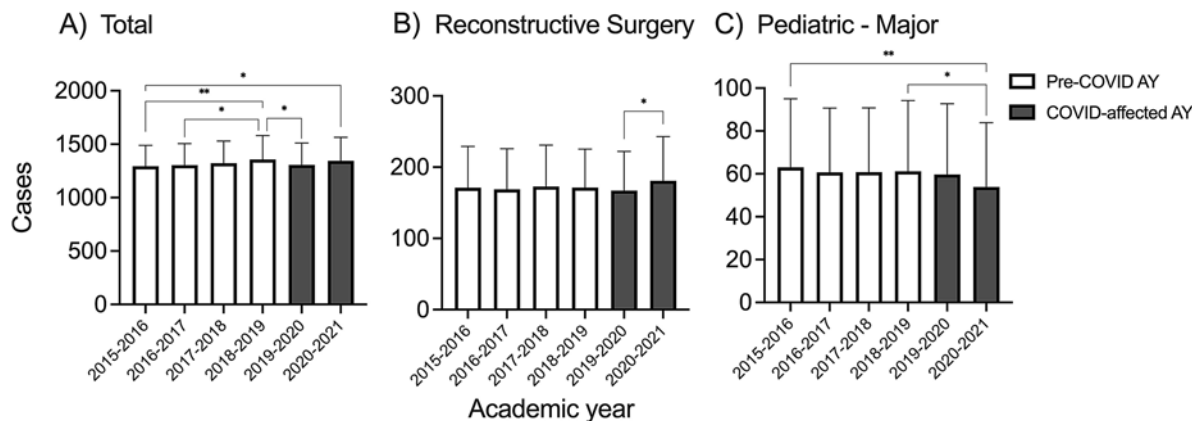


Figure 2. Index case categories with statistically different averages among academic years, with COVID-affected years in gray. (A) Total cases, (B) Reconstructive cases, (C) Pediatric – Major cases (* indicates $P < .05$, ** $P < .01$).

index cases for COVID-affected residents did not decrease (Table 1). Pediatric cases had a significant decrease during the pandemic for minor (123.4 vs 117.5, $P = .05$) and major case averages (61.4 vs 56.8, $P = .003$). The same analysis on cases logged as “Surgeon” revealed no decrease in any adult index category for COVID-affected residents and a significant decline among pediatric cases (data not shown), congruent with the “All Roles” findings.

DISCUSSION

The aggregate surgical case logs of the first 2 urologic resident cohorts to complete their training during the COVID-19 pandemic were largely similar to pre-COVID residents. Case volumes in all adult index categories did not decrease. Pediatric case volumes, particularly major cases, did show a statistically significant decline but this trend had been previously recognized by Silvestre et al prior to COVID-19.¹¹ A number of possible explanations were raised by the authors including increased cases going to fellows and changes in the treatment of ureteral reflux. Further, there has been the addition of new residency programs and additional residents to existing programs during this time period which may have had some unknown impact on average resident case numbers. It is difficult to assess what additional role the pandemic played, and the clinical significance of this finding is unclear given the small absolute difference. The resident averages remain well above ACGME Review Committee minimums of 30 minor and 15 major pediatric cases.¹² While urologic

training has evolved to meet pandemic pressures with increased telemedicine and virtual didactics, the major concern of broadly decreased surgical exposure was not supported by the resident case logs.^{3,13-15}

The initial shutdown in March 2020 drastically reduced overall US national urologic volumes but they rebounded quickly and persisted at 2019 levels through the subsequent fall COVID surge.¹⁶ There is little data available on how institutions dealt with surgical backlogs and returned to full capacity. Hospital systems adapted protective strategies including perioperative COVID testing to allow continuation of surgery during the pandemic.¹⁷ Surgical backlogs prompted some institutions to adapt surgical prioritization systems and increase available operating hours.^{18,19} The quick rebound aided by these interventions may have prevented significant effects to resident case logs.

In both our study and previous work, the vast majority of cases logged by residents are as “Surgeon” and analysis focused on “All Roles” to identify total surgical experience.^{20,21} That approach alone would not identify increased rates of double-scrubbing to make up for decreased volumes. During the initial outbreak, urology program directors reported a decrease in double-scrubbing to reduce resident exposure and preserve personal protective equipment, but what occurred for the remainder of the pandemic is not known.³ However, when we analyzed the data for a decrease in cases logged as “Surgeon” this data did not suggest higher rates of double-scrubbing to make up lost volume.

Table 1. Urologic index category case averages in pre-COVID vs COVID-affected resident cohorts

Index Category	Pre-COVID	COVID-Affected	P Value
General	396.6 (104.4)	404.4 (107.8)	.13
Endourology/ Stone Disease	319 (134.8)	319.6 (133.9)	.93
Reconstructive Surgery	171.1 (56.7)	174.1 (59)	.29
Oncology	248.9 (77.5)	253.3 (84)	.27
Pediatric Minor	123.4 (60.4)	117.5 (62.5)	.05
Pediatric Major	61.4 (31.3)	56.8 (31.6)	.003

Values in bold indicate statistically significant results

The available ACGME data is from graduating urology residents, thus the COVID-affected data is exclusively from senior residents who were in their last 2 years of their residency. This is commonly when they learn to perform the most complex oncology and reconstruction cases. We expected to see a decrease in those categories compared to pre-COVID AYs, especially for the AY 2019-2020. For those residents, the initial pandemic period of March-June comprised over 25% of their chief urology year and there were significant limitations placed upon surgeries across the US. The American College of Surgeons at that time recommended against performing elective cases to preserve personal protective equipment and maintain the healthcare system's ability to absorb COVID patients.¹ The previously mentioned system adaptations as well as the time-sensitive nature of many of these surgeries may have been mitigating.

This study does have a number of limitations. Resident case logs are individually maintained and require the resident to accurately log each case for a correct count upon graduation. The ACGME only provides aggregated data to protect the privacy of individuals and programs. The impact likely varied by region, institution, and phase of the pandemic which cannot be elucidated in this national data. There are minimal published reports, but a few institutions have reported significant declines in volume attributed to the pandemic. A residency program in Brazil reported a 50% decrease in resident case volume from March through May 2020, while a high-volume pelvic oncology center in the United Kingdom had 17.1% and 25.6% reductions in prostatectomies and cystectomies in 2020 compared to previous years.^{22,23} Historically, and also evident in this data given the large standard deviation, there is significant variance among residents.²⁰ Whether individual residents and US programs were significantly affected would require raw data from the ACGME, individual programs to self-report, or a multi-institutional effort.

Finally, there is a significant lag to the ACGME data as each year is a culmination of the previous 5-6 years of resident cases. COVID-related effects on general urology and endourology/stone disease, frequently performed by junior residents, may not be reflected in the data, particularly for programs where senior residents perform the majority of complex oncology and reconstructive surgery and do relatively little general urology. If follow-up studies show a decrease in those categories, it is reassuring that previous residents surveyed have felt comfortable with general urology surgeries at graduation and did not feel they needed more training in those areas. Residents frequently reported discomfort performing advanced minimally invasive procedures unsupervised, so it is critical that resident exposure to the most difficult surgical cases did not decrease during the pandemic.²⁴ Despite these limitations, our study provides a timely, comprehensive review of US residents self-reported case logs and provides insight during a tumultuous time for both medical education and the healthcare industry at large.

CONCLUSION

The ACGME national urology resident case log data show that surgical volume for adult index categories was broadly maintained through the pandemic. Pediatric cases saw a small decrease in volume that is of questionable clinical significance and consistent with a previously published pre-pandemic trend indicating the finding may not be related to the pandemic. While individual programs may have experienced a detrimental impact on their residents' surgical education, urology residents overall had similar surgical exposure as previous residents based on logged cases.

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pediatric major index cases for urology residents, although the minimum case volume requirements (30 minor, 15 major) were still being met and exceeded.¹

While it is reassuring that, for the most part, COVID did not adversely affect urology resident case log volumes, this is but one part of the educational content of residency training that was disrupted during the pandemic. Rosen et al demonstrated via a questionnaire study of urology program directors that multiple aspects of training were affected by COVID including patient contact time, redeployment into other areas of the hospital, didactics, and resident wellness.² While not a primary focus of this study, previous studies have questioned the relationship between case log minimum volumes and eventual surgical proficiency and competency. In a correlative study, Cruz et al demonstrated that ACGME minimum case log volumes do not guarantee surgical competency in independent surgical practice after training and may not reflect current urologic procedural demand.³ We are all striving to slowly recover from the profound effects of COVID and seek a return to normalcy, both in the world in general and specifically in this study, for urologic residency training. For those of us involved with graduate medical surgical training programs, we will need to carefully assess and balance not only volume-based case log requirements but also competency-based requirements, in order to ideally prepare graduates for eventual independent practice in the future.

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EDITORIAL COMMENT



The COVID-19 pandemic has affected many aspects of our lives, both big and small, over the past 2+ years. During the initial wave of worldwide infections prior to a vaccine becoming available, most, if not all, hospitals in the United States temporarily halted all elective, nonemergent surgical procedures for several months. This included the teaching hospitals of Accreditation Counsel for Graduate Medical Education (ACGME)-accredited surgical residencies and presumably may have had an effect on total surgical index case volumes for trainees during this time period. In this timely study by Daily et al, the authors obtained case log data for graduating urology residents in the US before and during the COVID pandemic to compare total volumes in order to objectively assess the possible impact of the virus on trainees' surgical experience. Their results showed that there were no statistically-significant decreases in case volumes for all adult index categories and pediatric minor cases; there was a decrease in the case volumes for pediatric major index cases during COVID as compared to before COVID. It is unclear, however, whether this decline in pediatric major index cases was either clinically-significant or a direct result of COVID, since the absolute numerical differences were only in the single-digits: minor cases (6 fewer cases on average) and major cases (4 fewer cases). As the authors acknowledge, one study published a year prior to COVID had already shown a decrease in overall

EDITORIAL COMMENT



The COVID-19 pandemic has been an unprecedented event in the modern world with ramifications felt throughout healthcare, economies, global relations, and society in general. The effect on healthcare cannot be understated. Within our relatively small world of urology resident education the anxiety was palpable as many hospitals reduced the number of operations, sometimes completely stopping all elective surgeries. In some hard-hit areas, urology residents were pulled to cover other services in need of help.

Thankfully, Daily et al have demonstrated that in adult urology there was no significant difference in surgical volume for graduating urology residents before vs during the COVID-19

pandemic. This was done by analyzing the case logs of 1866 US graduating residents from academic year (AY) 2015-2016 through AY 2020-2021. Logs were aggregated as “pre-COVID” (AY 2015-16 through AY 2018-19) and “COVID affected” (AY 2019-20 and 2020-21) and compared. While there was no significant difference in the number of adult index cases logged, there was a statistically significant decrease in pediatric cases.

Whether this statistically significant decrease in both pediatric major and minor cases is clinically significant (with an absolute difference of about 6 minor cases and 5 major cases between the groups) is open for debate. As mentioned by the authors, a decline in pediatric cases has been described previously before the pandemic by Silvestre et al.¹ Even with these case reductions the graduating residents are averaging well above the ACGME minimums for graduation (though this data is in aggregate).

I commend the authors on a well-written paper. It tackles a subject that has been in the minds of many in surgical resident training. Despite no significant difference in the number of cases done it remains to be seen how graduating residents feel subjectively about their training and how it was affected by COVID.

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selected post graduate year appropriate cases. It provides residents with a tool to estimate their readiness for practice.

That being said, excellent urologists are not exclusively trained in the operating room. The pandemic has had profound effects on urology training in clinic, consult services, didactics, in-person hands-on training events, and sectional and national meetings. Residency program directors voiced concern that these elements of training would be negatively affected by the pandemic.³ However, efforts by committed resident educators likely helped ameliorate some of the potential damage. For example, the decision to hold the national and sectional American Urologic Association (AUA) meetings online increased access for residents. Another valuable addition has been the Urology Collaborative Online Video Didactics (COViD), which brought national and international experts together to deliver broadly available remote lectures tailored to residents.

The effects of the pandemic are evident not only in training but also in trainees. Survey data from across the globe early in the pandemic showed increased anxiety, stress and, depression related to the pandemic and scarcity of personal protective equipment.⁴ Adaptations to the pandemic helped to mitigate these effects somewhat. Retrospective data from Europe and the United States, accumulated after the initial COVID-19 waves, note improvement across multiple quality of life domains related to pandemic work hour modifications and availability of remote training.⁵

The pandemic has uprooted urologic residency across the full spectrum of training elements. While operative volume appears well-preserved based on graduating ACGME case logs, there have been unmeasured, possibly deleterious, effects on training outside of the operating room. Moving forward, we should aim to keep the best elements of pandemic adaptations, to provide excellent training in and outside the operating room while optimizing resident quality of life.

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AUTHOR REPLY



The consistency of the aggregate surgical index case volume data for graduating United States urology residents from the Accreditation Council for Graduate Medical Education (ACGME) is reassuring. There were no significant changes in index case volumes, except for pediatric cases. The decreases in pediatric cases were quite small and factors outside the pandemic likely had some influence on this change.¹ We agree, case volume alone does not ensure or equate to competency. Directed feedback to residents over the course of residency should address the gap that can exist between repetition and proficiency, and there are initiatives underway to improve the quality and consistency of this feedback. Eighteen urology programs are now participating in the Society for Improving Medical Professional Learning (SIMPL) Competency-Based Medical Education (CBLE) Pilot project, with an open invitation to additional interested programs.² The objective is to provide high quality feedback for