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Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jped surg.org

The financial implications of telemedicine practice patterns across pediatric surgical specialties[☆]

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ARTICLE INFO

Article history:

Received 14 February 2022

Revised 14 April 2022

Accepted 29 April 2022

Available online xxx

Keywords:

Telehealth

Telemedicine

COVID-19

ABSTRACT

Background: Telemedicine has played an increasingly important role in surgical care during the coronavirus disease 2019 (COVID-19) pandemic, yet little is known about its usage and correlation to cost both within and across surgical specialties during the pandemic.

Study Design: We collected data on telehealth encounters from April 2020 to June 2021 for all surgical specialties at a pediatric academic institution. The percent of total encounters that were telemedicine vs. in-person were analyzed over time. Data on charge and reimbursement were averaged for each encounter type, and the percent difference in average charge and reimbursement was calculated and compared between surgical specialties.

Results: Of the 147,007 surgical clinical visits identified, 6,566 encounters (4.5%) were telemedicine. Usage peaked in April and plateaued in June of 2020. The specialties with the highest total percentages of telemedicine visits were neurosurgery (23.2%) and cardiovascular-thoracic (11.9%). Orthopedics reported the lowest usage at 2%. Charges for in-person encounters were higher for nearly all specialties while reimbursements remained equal.

Conclusion: Our institutional trends reveal that conversion to telemedicine varied across surgical specialty during the COVID-19 pandemic. Charges for in-person encounters were higher than telehealth ones for nearly all specialties, but the reimbursements were fairly the same. Understanding trends in telemedicine volume instigated by and following the pandemic may better prepare pediatric institutions to navigate the accelerated adoption and influence policy changes. This is particularly relevant given the fluctuating impact of the pandemic on healthcare institutions as new strains of COVID-19 emerge.

EVIDENCE LEVEL: Level V

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1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic spurred rapid adoption of digital distribution of health-related services via telemedicine in order to limit transmission of the lethal virus [1–3]. Although utilization of telemedicine has exponentially grown, it has been a widely available tool in clinical practice for several decades with varying degrees of implementation across specialties [4]. In the realm of surgery, proponents argue both for and against its use [5–8]. Some authors criticize telemedicine for lower reimbursement compounded by longer working hours, yet others support its use in the postoperative setting, where telemedicine

has been shown to incur lower costs for both the patient and the healthcare system [5–8].

In response to the pandemic, telemedicine coverage and reimbursement was expanded to incentivize its use and mitigate the drop in the overall visit volume experienced in outpatient and emergency room settings [9,10]. On a national level, Center for Medicare and Medicaid Services (CMS) broadened access to telehealth services and provided beneficiaries with a wider range of services without having to travel [11]. Commercially, many insurers granted member cost-sharing waivers for in-network telemedicine visits and temporarily reimbursed telehealth visits to be on par with those of in person visits [12]. As a result, telehealth visits peaked in mid-April 2020, representing 69% of all visits [9]. As of June 2021, telehealth visits were still significantly higher than the percent of pre-pandemic visits (0.01%), however usage was less than half its peak during the pandemic (23%) [9,13].

Despite the ongoing disease burden of COVID-19, reasons for the relative decrease in telehealth visits remain unclear. Financial motives may be due to reduced payer reimbursement and

Abbreviations: CPT, Current Procedural Terminology.

[☆] Presented in part at the American College of Surgeons Clinical Congress 2021

Funding: No financial information to disclose.

Conflicts of Interest: No conflicts of interest to disclose.

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<https://doi.org/10.1016/j.jpedsurg.2022.04.022>

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Please cite this article as: E.S. Chwa, J.P. Weissman, S.A. Applebaum et al., The financial implications of telemedicine practice patterns across pediatric surgical specialties, Journal of Pediatric Surgery, <https://doi.org/10.1016/j.jpedsurg.2022.04.022>

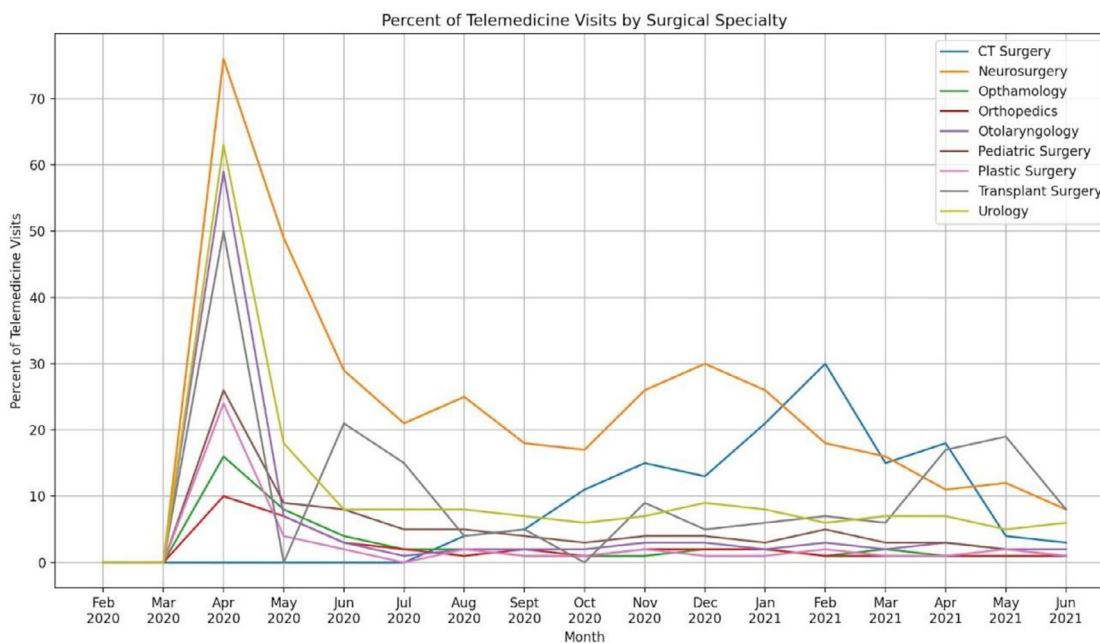


Fig. 1. Telemedicine usage across surgical specialties from February 2020 to June 2021.

expected revenue. Further, data pertaining to the effect of these trends on surgery-specific telehealth visits is lacking. To address these knowledge gaps, we analyzed telehealth usage trends and compared charge vs. reimbursement data for all available surgical specialties at a single institution. The results of our study will provide, for the first time, a comprehensive picture of telehealth usage and its relation to cost both within and across surgical specialties. As our nation faces ongoing challenges in the wake of the COVID-19 pandemic, we aim to provide insight into the most efficient use of telemedicine in surgery.

2. Methods

Data was collected from all available surgical specialties at our institution: cardiovascular-thoracic, neurosurgery, ophthalmology, orthopedic, pediatric, plastic, transplant, and urology. All patient visits were analyzed for each specialty from April 2020 - June 2021. The percentage of encounters that were telehealth by specialty was calculated for each month and averaged.

Charges and reimbursements were also analyzed. All patient encounters with Current Procedural Terminology codes 99,201-5 (new office/outpatient visit), 99,211-5 (established patient office/outpatient visit), and 99,241-5 (new/established patient consultation) were analyzed for each specialty from fiscal year September 1, 2020 - August 31, 2021 (FY 2021). Only fully-reimbursed encounters were included to ensure differences in value could not be attributed to differences in collection rates. Both values were averaged for telehealth and in-person encounters across all specialties for the 12-month period. These averages were compared, and the percent difference in average charge and reimbursement for telehealth vs. in-person encounters was calculated.

3. Results

A total of 147,007 encounters were identified across all surgical specialties for the 14-month period, and 6566 encounters (4.5%) were telemedicine. Fig. 1 shows the monthly percentage of telehealth appointments across all surgical specialties. In 2020, no telemedicine was used prior to April. Telehealth peaked in April

Table 1

Percent of telemedicine usage across surgical specialties from April 2020 to June 2021.

Specialty	Telehealth Appointments	Total Appointments	%
CT	62	519	11.9
Neurosurgery	1730	7469	23.2
Ophthalmology	513	25,431	2.0
Orthopedic	931	47,769	1.9
Otolaryngology	747	24,214	3.1
Pediatric	588	12,434	4.7
Plastic	130	6513	2.0
Transplant	28	287	9.8
Urology	1706	20,259	8.4

across all specialties, decreased in May, and remained fairly constant in June.

Table 1 lists the average percentage of telehealth appointments for each surgical specialty for the entire 14-month period. Neurosurgery utilized telemedicine the most (23.2%), followed by cardiovascular-thoracic (11.9%), transplant (9.8%) and urology (8.4%).

Table 2 provides the average charge and reimbursement for both telehealth and in-person encounters across all specialties during FY 2021. All specialties except cardiovascular-thoracic and transplant surgery had higher charges for in-person visits than telehealth. Although the in-person charges tended to be higher, the reimbursements for both in-person and telehealth encounters remained similar.

Table 3 quantifies the percent difference of charges and reimbursements for the transition from in-person to telehealth encounters. Positive values reflect a percent increase in charge/reimbursement when the encounter was telehealth, and negative values signify the opposite. Ophthalmology experienced the largest percent decrease in charges (-35.7%) when encounters were telehealth, while transplant surgery experienced the largest increase in charges (24.0%) when encounters were telehealth. Pediatric surgery experienced the largest percent decrease in reimbursements (-12.5%) when encounters were telehealth, while

Table 2
Average charge and reimbursement for telehealth and in-person encounters across surgical specialties from April 2020 to June 2021.

Surgical Specialty	Average Charge	Average Reimbursement
CT		
Telemedicine	\$763.90	\$380.88
In-Person	\$667.11	\$266.11
Neurosurgery		
Telemedicine	\$413.12	\$165.84
In-Person	\$477.72	\$170.39
Ophthalmology		
Telemedicine	\$352.34	\$171.69
In-Person	\$547.93	\$179.20
Orthopedic		
Telemedicine	\$351.26	\$137.79
In-Person	\$453.50	\$147.98
Otolaryngology		
Telemedicine	\$408.99	\$148.35
In-Person	\$467.52	\$157.39
Plastic		
Telemedicine	\$425.33	\$198.23
In-Person	\$501.92	\$176.41
Pediatric		
Telemedicine	\$438.87	\$146.68
In-Person	\$533.95	\$165.46
Transplant		
Telemedicine	\$662.23	\$271.84
In-Person	\$533.95	\$215.83
Urology		
Telemedicine	\$443.44	\$203.19
In-Person	\$515.42	\$192.64

Table 3
Percent difference in average charge and reimbursement when converting to telehealth across surgical specialties from April 2020 to June 2021.

Surgical Specialty	Change in Charge (%)	Change in Reimbursement (%)
CT	14.5	43.1
Neurosurgery	-13.5	-2.7
Ophthalmology	-35.7	-4.2
Orthopedic	-22.5	-6.9
Otolaryngology	-5.7	-5.7
Pediatric	-15.3	-12.4
Plastic	-17.8	-11.4
Transplant	24.0	26.0
Urology	-14.0	4.8

cardiovascular-thoracic surgery experienced the largest increase in charges (43.1%) when encounters were telehealth.

4. Discussion

4.1. Usage

Our results show a steep increase in telemedicine use in March 2020 at the start of the COVID-19 pandemic. The following month, all surgical specialties that utilized telehealth experienced a sharp decline in its use, and then started to plateau in June 2020. These findings were not only mirrored in a state-wide analysis of surgical providers in Michigan, but also in an analysis of telemedicine in non-surgical specialties [14–16]. This decrease in telemedicine usage can be attributed to the reopening of outpatient clinics, patients who previously delayed treatment until in-person care was available again, and the general perception that telehealth was a temporary solution to comply with pandemic restrictions.

Neurosurgery, cardiovascular-thoracic, transplant, and urology experienced the highest conversion to telehealth encounters, with neurosurgery and urology was also demonstrated in the Michigan study [14]. More so than other specialties, both neurosurgery and urology rely on imaging for diagnosis, which may make it easier to perform telehealth consultations for new patients and surveil-

lance for existing patients. Neurosurgery, in particular, may have had a smoother transition to telemedicine due to the existing networks for teleneurology throughout the United States [17]. Another reason for the successful adoption of telemedicine in neurosurgery may be attributed to the finding that the majority of neurosurgeons were not concerned with the limitations imposed by telemedicine on conducting a physical examination virtually [18]. Urology may have had more telehealth encounters in view of higher baseline use prior to the pandemic. A 2018 survey showed that urologists were more likely to use telehealth platforms than general surgeons, ophthalmologists, otolaryngologists, and orthopedic surgeons [19].

Cardiovascular-thoracic and transplant had the lowest volume of total encounters out of all surgical specialties, so having a few telehealth encounters each month produced a conversion rate comparable to neurosurgery and urology. These specialties may have been able to utilize telemedicine more to provide pre- and post-operative supplementary care since the patients are primarily followed by cardiology or the specialty of the transplanted organ.

Specialties with the lowest adoption of telemedicine were orthopedic surgery, ophthalmology, plastic surgery, and otolaryngology. Although otolaryngology experienced a sharp increase in telehealth visits that was similar to urology at the start of the pandemic, usage in otolaryngology quickly declined in May 2020 and remained low through June 2021. The Michigan study also found the lowest acceptance of telemedicine in orthopedic surgery, ophthalmology, and otolaryngology [14]. One explanation for this finding is that these specialties may rely on in-person physical examinations and the use of specialty-specific equipment, thereby making them more susceptible to the limitations imposed by telemedicine. Further study may help elucidate additional specific contributors to the heterogeneity of telehealth adoption across pediatric medical specialties. However, this research may be affected by the institution- and departmental leadership-specific influences on daily practice.

A comparison of telehealth usage between surgical and non-surgical specialties reveals less usage across surgical specialties both before and during the pandemic [19]. In 2018, prior to the pandemic, a cross-sectional study found that telemedicine accounted for 11.4% of all surgical encounters, whereas it accounted for 12.7% of primary care and 39.5% of radiology encounters. Similarly, during the pandemic, a survey of Medicare Advantage patient data identified that surgical specialties used telemedicine the least [10]. Specialties that engaged with telemedicine the most were endocrinology, gastroenterology, neurology, pain management, psychiatry, and cardiology.

4.2. Finance

In the present study, the percentage change in charges for telehealth as compared to in-person encounters across the fiscal year revealed all surgical specialties except transplant and cardiovascular-thoracic had higher charges for in-person visits than for telehealth. Specific reasons for the decreased charges may largely be attributable to differences in Current Procedural Terminology (CPT) codes and the inability to perform procedures that can only be done in-person. Under the previous coding framework, providers were not permitted to code for a new patient consultation, regardless of complexity, if a comprehensive in-person physical examination was not performed [20]. During the initial stages of the pandemic, this coding framework may have resulted in providers caring for complex patients virtually, and therefore being unable to code for the usual corresponding visit type due to the absence of a physical examination. It has also been shown that telehealth appointments are associated with lower complexity

visits and subsequent lower visit charges relative to in-person encounters [21]. Nonetheless, in January 2021, CMS announced that providers could code based on either medical decision making alone or total encounter time [20].

Our institutional data show that ophthalmology, orthopedic surgery, and plastic surgery were met with the most severe reduction in average charges for telehealth visits as compared to in-person visits. These patterns may be due to the lack of opportunity for additional procedures that may be performed in an in-person setting, like physical exam or use of specialty equipment as discussed above. Ophthalmology and orthopedic surgery experienced the lowest telehealth usage paired with the largest decrease in charges when converting to telemedicine.

All surgical specialties except cardiothoracic, transplant, and urology had decreased reimbursements for telemedicine appointments. However, reimbursements were reduced at a sizably smaller rate compared to charges. This is expected with the insurance coverage parity during the pandemic.

One element to consider in this discussion is unpaid claims rate across the included surgical fields. In a study published just prior to the pandemic, Lin et al. found that 15% of telehealth claims were denied at first billing [22]. This indicates there is likely a steep learning curve to telehealth billing, and it is essential to implement the proper training and support to monitor unpaid claims.

Overall, the COVID-19 pandemic has substantially augmented the usage of telemedicine for healthcare as a whole. The majority of surgical fields have seen a large decline in average charges during the fiscal year. Challenges in telehealth adoption, proper coding, and policy level barriers regarding reimbursement for telemedicine after the pandemic remain important upcoming challenges. A 2020 survey revealed 76% of surgeons felt severe concerns regarding telehealth reimbursement after the pandemic [23].

4.3. Limitations

The overarching limitation of this study is how it only synthesizes data from a single institution. In addition to restrictions posed by the nature of the specialty, telemedicine usage may be altered based on the general telehealth practice patterns unique to each surgical division or even individual surgeon. However, the institution serves a diverse patient population with high volume across all surgical specialties that may mitigate inter-surgeon variability in telemedicine usage.

Another limitation is how the study spans practice patterns over 14 months during which access to in-person care drastically changed. Since telehealth usage was reduced in the latter months, the financial data was based on a smaller volume of encounters that may introduce more variability. However, the financial data was averaged over the entire period during which no changes to reimbursement policy were made and only included encounters fully reimbursed.

Lastly, the encounters analyzed in this study were visits for new or established patients typically conducted in an office or outpatient setting. Anecdotally, relatively acute presentations may have lent themselves to being scheduled as in-person more than telehealth depending on provider or patient concern. However, the factors driving whether an appointment was in-person versus virtual appointment was extremely multi-factorial given the institutional and personal stresses imposed by the COVID-19 pandemic and varied by specialty due to differences in department operation. Future study of a broader scope of CPT codes can elucidate on how the acuity of the visit may impact telehealth usage to inform what setting in which access to virtual versus in-person healthcare may be the most useful.

5. Conclusions

The COVID-19 pandemic catalyzed the introduction of telemedicine as a platform for healthcare. The federal government has instituted a series of temporary policy adjustments under the COVID-19 emergency declaration to increase access and coverage of telehealth services, ranging from lifting geographic restrictions to modifications of HIPAA compliance [24]. Some improvements to rural health and expanding access have already been made permanent [25], but the future of many telehealth flexibilities is still uncertain.

With increasing efforts for social distancing, the financial longevity of surgical practices has been strained during the COVID-19 pandemic. To address these growing concerns, CMS also expanded telehealth coverage for its beneficiaries with the aim to have similar reimbursement for telehealth and in-person visits [11].

Current literature focuses on how wide-scale telehealth adoption increases healthcare accessibility and may mitigate the looming physician shortage [26–29]. It also focuses on the disadvantages, like exacerbation of disparities in resources and quality of patient care [26,27,30]. By conducting an analysis across all surgical subspecialties, this study elucidates the practice-specific considerations regarding wide-scale adoption of telemedicine. Specialties that heavily rely on performing the traditional patient examination or specialty equipment like orthopedic surgery or ophthalmology, respectively, may face more limitations. Surgical specialties as a whole have not converted as much of their practice to telemedicine as non-procedural specialties have, and policy-level changes and projections of their impacts should account for the heterogeneity within the surgical specialties that introduce additional limitations to how much telemedicine can be adopted [14]. Considering our findings that there is not a significant financial downside to the adoption of telehealth in surgical practices, this is the optimal time for surgical specialties to evaluate how their practice efficiency and delivery of patient care can be improved through incorporation of telehealth. In determining the optimal use for telehealth, surgeons should consider taking a patient-centric approach rather than a physician-centric approach and evaluate the downsides of in-person visits for specific time points in patient care. For example, pre-surgical visits for patients known to the surgeon may be just as effectively completed by telehealth, as much of this visit is focused on patient teaching rather than on comprehensive physical examination. Postoperative visits for routine patient care may also be just as effectively delivered by telehealth; should the surgeon or patient feel uncomfortable with wound healing, the patient can always schedule an in-person visit. From a patient perspective, telehealth visits substantially reduce time lost from work or school, transportation costs, and parking fees.

Given its proven benefits to the provider, patient, and healthcare system, telemedicine will likely remain a common option after the resolution of the pandemic; however, it is unclear how charge patterns will change or how visits will be reimbursed on a long-term basis as we continue to experience how the conversion to telemedicine forces adjustments on our practice. One of the most important considerations is distinction between specialties, as certain fields may lend itself better to a more integrated telehealth model. For example, surgical procedures with low severe complication rates such as umbilical hernia repair and thyroidectomy have been found to be particularly beneficial for postoperative telemedicine given the reduced need for in-person evaluation [5].

There remains an unclear future of insurance reimbursement as the pandemic continues to instigate policy changes regarding office visit billing and coding. Understanding the implications of

the changes in charges and reimbursements when transitioning to telehealth is integral to predicting its impact on the “bottom line.” Therefore, evaluating the financial implications of telehealth across many surgical specialties would encapsulate a clearer picture to the future of its usage and long-term financial impacts. Regardless of the status of telehealth visits, evaluating the indications for incorporating telehealth visits into one’s practice and the financial impact of doing so is particularly relevant given the fluctuating infectivity of COVID-19 as new strains of the virus emerge. During periods of high infectivity, institutions may mandate visits to be converted to telehealth; it behooves both the institutions and the practicing surgeons to understand when such transitions make sense in consideration of both financial impact and optimal patient care.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.jpedsurg.2022.04.022](https://doi.org/10.1016/j.jpedsurg.2022.04.022).

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