REVIEW ARTICLE

Telemedicine: Patient-Provider Clinical Engagement During the COVID-19 Pandemic and Beyond

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Abstract

Background The novel coronavirus pandemic has drastically affected healthcare organizations across the globe.

Methods We sought to summarize the current telemedicine environment in order to highlight the important changes triggered by the novel coronavirus pandemic, as well as highlight how the current crisis may inform the future of telemedicine.

Results At many institutions, the number of telemedicine visits dramatically increased within days following the institution of novel coronavirus pandemic restrictions on in-person clinical encounters. Prior to the pandemic, telemedicine utilization was weak throughout surgical specialties due to regulatory and reimbursement barriers. As part of the pandemic response, the USA government temporarily relaxed various telemedicine restrictions and provided additional telemedicine funding.

Discussion The post-pandemic role of telemedicine is dependent on permanent regulatory solutions. In the coming decade, telemedicine and telesurgery are anticipated to mature due to the proliferation of interconnected consumer health devices and high-speed 5G data connectivity.

Keywords Telemedicine · Telesurgery · COVID-19 · Novel coronavirus

Abbreviations

SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
COVID-19	Coronavirus disease of 2019
US	United States
HHS	Department of Health and Human Services
FCC	Federal Communications Commission
CMS	Centers for Medicare and Medicaid Services
HIPAA	Health Insurance Portability and Accountability Act
EMR	Electronic medical record
CPT	Current procedural terminology
wRVU	Work relative value unit

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Introduction

The first reported severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections in the USA occurred on January 20, 2020. The corresponding disease, known as coronavirus disease of 2019 (COVID-19), was soon reported in all 50 states necessitating drastic measures to reduce the rate of transmission. Most states responded by suspending large gatherings, closing non-essential businesses, and encouraging citizens to shelter in place. Hospitals adapted their workflow to comply with these recommendations, leading to unprecedented changes in the way healthcare was delivered. These changes involved conservation of personal protective equipment, a suspension of elective procedures, deferral of non-essential in-person clinic encounters, and a reduction in hospital-wide staffing. In turn, surgeons and other specialists who principally relied on in-person encounters were forced to find alternative ways to continue providing care while adhering to the new restrictions. To minimize interruption of crucial clinical services and the associated revenue, a rapid transition from in-person outpatient visits to telemedicine encounters was implemented by many academic medical centers and adopted by surgery departments throughout the country. Telemedicine has become an important tool for

surgeons during this period of restricted interaction, yet its place within surgical practices in the post-COVID period remains uncertain. We sought to summarize the current telemedicine environment in order to highlight the important changes triggered by the COVID-19 pandemic, as well as highlight how the current crisis may inform the future of telemedicine.

The Use of Telemedicine for Surgery Patients Prior to COVID-19

While telemedicine represents a spectrum of medical interactions, in most instances, telemedicine refers to a real-time audiovisual interaction between patient and provider. Prior to the COVID-19 pandemic, telemedicine was gradually penetrating surgical practices. Although the technology has been available for years, the growth of video visits has been gradual. In a report to the Congress in 2016, the United States (US) Department of Health and Human Services (HHS) estimated that more than 60% of hospitals in the USA used telehealth in some form.[1] There was a substantial increase in telemedicine use between 2004 and 2017. The vast majority of gains were attributable to increases in primary care and mental health services with other specialties demonstrating only a modestly higher utilization.[2, 3] Within general surgery, including gastrointestinal surgery, reports of telemedicine use were often single-institution pilot studies that involved post-discharge care.[4–6]

Prior to January 1, 2020, telehealth regulations were an inconsistent patchwork of rules that varied from state-to-state and among payers. These barriers constrained the utilization of telemedicine throughout the early 2010s. Telehealth options for Medicare Advantage patients markedly improved in January 2020 with the enactment of the 2018 Bipartisan Budget Act, which removed requirements with respect to the originating (patient) and distant (physician) sites. The rationale for these changes was tied to the forecast that telehealth for Medicare Advantage enrollees was to "produce $557 million in savings for enrollees over 10 years from reduced travel time to and from providers.[7]" In July 2019, the Federal Communications Commission (FCC) announced the Connected Care Pilot Program, a 3-year, $100 million program intended to connect health care providers to low-income patients and veterans with broadband-enabled telehealth services.[8] These important legislative changes laid the foundation for academic surgeons to build a more diverse clinical practice via telemedicine and helped pave the way for expanded use in surgical patients.

Expansion of Telemedicine Services During the COVID-19 Pandemic

In response to the COVID-19 pandemic, federal agencies have promoted telehealth both through regulatory relaxation and increased funding. The Centers for Medicare and Medicaid Services (CMS) sought to decrease in-person medical visits by issuing a temporary and emergency relaxation of telemedicine rules via the 1135 waiver and the Coronavirus Preparedness and Response Supplemental Appropriations Act. Enacted on March 6, 2020, this act allowed Original Medicare enrollees the same telemedicine benefits that had been extended to Medicare Advantage enrollees in January 2020. This waiver also established equivalent reimbursement for video telemedicine visits and traditional in-person visits. Additionally, the HHS Office for Civil Rights relaxed enforcement of software-based violations of the Health Insurance Portability and Accountability Act (HIPAA). This announcement was accompanied by HHS guidance regarding the degree of HIPAA compliance afforded by specific telemedicine platforms (Table 1).[9] In addition, some individual states relaxed medical licensure laws pertaining to the care of patients outside state boundaries. These temporary waivers are expected to remain in effect for the duration of the COVID-19 Public Health Emergency. The federal government is also helping to fund the rapid COVID-related acquisition of increased broadband data capacity, webcams, and software via the FCC's COVID-19 Telehealth Program. This initiative approved the use of $200 million to fund projects aimed at increasing telemedicine access for low-income Americans.[10] These funds

Table 1 Acceptable telemedicine platforms during COVID-19 period of non-enforcement[9]

| Telemedicine platforms specified as HIPAA compliant with business associate arrangement	The COVID-19 period of non-enforcement affects the following HIPAA non-compliant telemedicine platforms	The following platforms should be avoided even under the period of COVID-19 non-enforcement
Skype for Business/Microsoft Teams	Apple FaceTime	Facebook Live
Updox	Facebook Messenger video chat	Twitch
VSee	Google Hangouts video	TikTok
Zoom for Healthcare	Zoom	Other similar public-facing video communication applications
Doxy.me	Skype	
Google G Suite Hangouts Meet		
Cisco Webex Meetings/Webex Teams		
Amazon Chime		
GoToMeeting		
Spruce Health Care Messenger		

will be used to provide both healthcare enterprises and patients with necessary telemedicine hardware and high-speed internet access. The distribution of monies will continue until the funding is exhausted or until the pandemic has ended. In addition, on March 13, 2020 the FCC funded the Rural Health Care Program that aims to make telemedicine services available to geographically remote patients.

The combination of these dramatic regulatory shifts, in response to the suspension of most in-person elective clinical encounters has driven an impressive increase in telemedicine utilization. Given the organizational density of most academic medical centers, rapid shifts of this magnitude are unusual. At our own institution, over the course of 1 week, the volume of telemedicine visits jumped from fewer than 100 encounters per day to well over 2200 per day (Fig. 1). Predictability, the transition has led to various technological, logistical, and procedural challenges. After securing necessary internet bandwidth, healthcare organizations must decide which telemedicine platform to select. Some electronic medical record (EMR) platforms offer telemedicine modules available for rapid deployment, while users of other EMRs must select from among third-party platforms. Implementing a telemedicine strategy requires considerable education involving a variety of stakeholders including patients, physicians, schedulers, nurses, and billing specialists. Sudden implementation of a telemedicine workflow is often associated with a temporary decrease in productivity and morale, as staff learns and integrates the new procedures. Distribution of text-based tip sheets and video-based instructional modules, deploying technical support technicians, and nominating clinician champions can help defuse these initial frustrations and contribute to the success of a telemedicine rollout. A successful surgeon-directed telemedicine tip sheet should include concise information regarding appropriate documentation and coding, and pearls for a successful video encounter (Table 2). Providers

and/or patients who are less technologically inclined may prefer to avoid video visits and utilize telephone-based telemedicine. However, telephone visits typically convey less information than video visits and are reimbursed at a fraction of a comparative video telehealth visit. For example, the highest billing level for a new telephone encounter has a work relative value unit of 0.75 versus 3.17 for the comparable new video encounter (Table 3).[11] Healthcare organizations implementing telemedicine should also verify the capacity to submit electronic prescriptions, including those for controlled substances.

Beyond the intended decrease in viral transmission, once implemented, a telemedicine platform has a variety of potential benefits for both patients and healthcare organizations. Given the potential for equivalent quality of care, patients may prefer avoiding the inconvenience of travel, missing a day's wages, and enduring the stress of unfamiliar parking structures and buildings. For a significant proportion of patients, an in-person clinic appointment may require additional costs of transportation, meals, lodging, and child/elder care. These sacrifices can be particularly challenging for patients with disabilities. Expending these resources can also be frustrating for patients who are told that their cancer is inoperable during an in-person surgical consultation, only to refer the patient to a separate medical oncology appointment on a different day. Such conclusions can often be made by the surgeon based on review of clinical data without an in-person visit. In addition, patients may prefer that long-term routine surveillance visits, which typically involve review of imaging and laboratory values, may be performed remotely.[12]

Telemedicine encounters can also be attractive to healthcare organizations. Telemedicine allows the possibility to expand traditional geographic catchment areas relative to the medical center/hospital; in fact, telemedicine can facilitate an international reach to patients across the world. In addition, a telemedicine platform can expand clinical services even when local physical structures are constrained. From this perspective, increasing telemedicine visits can improve the time interval between patient referral and the first clinical encounter. For many patients, prompt initial surgical consultation is an important marker of high-quality care and satisfies both patients and referring physicians. Remote video visits may be particularly attractive to urban medical centers struggling with parking capacity and access to patient care facilities. Increasing telemedicine volume can reduce congestion for the patients who require in-person encounters. Telemedicine platforms are also being used to coordinate complex multidisciplinary care via a tumor board conference format among specialists that are geographically separated. The use of frequent, multi-disciplinary appointments can, in turn, lead to higher treatment compliance, increased satisfaction, and better outcomes.[13]
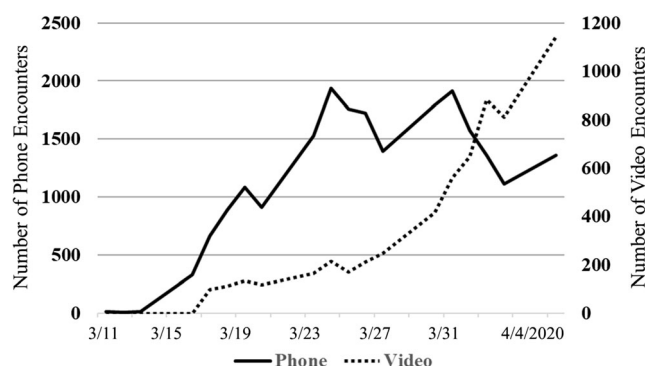
Fig. 1 Telemedicine use in response to the COVID-19 pandemic. In response to COVID-19, the use of telemedicine at a single academic institution increased from less than 100 visits per day to more than 2200 over a period over 24 days

Table 2 Frequently asked questions about telemedicine visits. *CPT* current procedural terminology

What are the keys to a high-quality telemedicine interaction?

• Dress professionally.

• Minimize ambient sounds. Make sure the physical surroundings are appropriate.

• Keep the webcam directly in front of the surgeon's face, at eye level. When the surgeon speaks to the patient, the surgeon should focus the line of sight directly into the webcam lens, rather than focusing on the patient's screen image.

• Clearly identify yourself by full name, professional title, and institutional affiliation. Verify the patient's full name and birth date as you begin the encounter.

• Speak clearly and pause frequently to address patient questions.

What documentation is required for a telemedicine visit?

• Include all the information you would typically include for an in-person visit.

• To facilitate accurate billing, indicate whether your telemedicine encounter was completed by phone or video.

• Since a detailed physical examination is generally not feasible for surgical video visits, most telemedicine visits will be coded using time-based billing. Clearly state how many minutes the surgeon independently spent on the encounter, and what percentage of this time was spent counseling the patient regarding the diagnosis and treatment plan. The time spent should include the surgeon's review of clinical data (imaging, laboratory values, pathology, etc.), communicating with other providers, documenting the encounter, and placing new orders.

• Video visits are coded using standard evaluation and management codes for new and established patients (CPT 99201-99205 and 99211-99215, respectively) with the addition of the "GT" modifier. For all visits within the global surgical period, typically use CPT 99024 + GT modifier whether it is performed utilizing phone or video.

Can an attending bill for a telemedicine encounter if a resident performed the telemedicine encounter but the attending was present?

• If a resident calls and speaks with the patient independently, the telemedicine encounter should not be charged.

• The teaching physician must be present via video and listen to the key and critical portions of the encounter in order to bill for the service. A standard teaching physician statement is also required for documentation.

• If the teaching physician participates in the visit and reiterates the information discussed by the resident, this also supports a billable service. A standard teaching physician statement is required for this encounter as well.

Are telemedicine visits permissible if the surgeon and patient are physically located in different states?

• This is subject to individual state regulation. As part of the novel coronavirus response, many states liberalized their policies, but be sure to verify with individual state medical boards.

Telemedicine Post-COVID-19 Pandemic

While there has been considerable progress, important challenges remain with respect to how the telemedicine platform will be implemented in the post-COVID-19 regulatory environment. To this point, the ability to complete a telehealth encounter is dependent upon a reliable data connection. A 2015 study from The Pew Research Center reported, however, that 15% of households did not report having any type of internet access; in particular, African Americans were 12% less likely to have high-speed broadband service than whites.[14] Of note, race-based disparities in access to internet services have decreased over the last 15 years, yet discrepancies based on age and income level persist. Specifically, only 54% of senior citizens reported internet use, whereas households with annual incomes less than $30,000 usage had internet utilization of 74% versus 97% among households with incomes greater than $75,000 per year.[15] In a separate study from 2014, the US Department of Education noted that older adults generally scored in the lower one-third for six proficiency measures related to problem solving in technology-rich environments.[16] Comfort level when interacting with technology and general health literacy are important factors that must be considered in strategies to increase telehealth utilization post-COVID-19. In addition to the provisions of the FCC's COVID-19 Telehealth Program, the FCC has taken initial

Table 3 Telemedicine billing codes. (CPT: current procedural terminology, wRVU: work relative value unit)

Code to bill		Modifier	Description	wRVU
New and established telephone encounter	Medicare only: G2012	N/A	Medicare only: 5–10 min	0.25
	99441		5–10 min	0.25
	99442		11–20 min	0.50
	99443		21–30 min	0.75
Established patient video visit	Regular E&M Codes 99211-99215	GT	Select level of service based on time or medical decision making	Same as in-person
New patient video visit	Regular E&M Codes 99201-99205	GT	Select level of service based on time or medical decision making	Same as in-person

steps to address disparities in access to broadband internet service. Specifically, the FCC has granted 33 wireless internet service providers located in rural communities increased access to additional broadband spectrum. Similar initiatives should focus on urban, inner city populations who are within range of wireless internet options, yet often do not have the economic means to pay for these services. In addition, next generation 5G high-speed wireless internet technology uses higher frequency signals that cannot travel as far as 4G signals, mandating closer placement of 5G antennas for a robust signal. As a result, access to 5G connections in rural communities will likely lag behind those in urban areas. Software platforms that allow for multiple simultaneous users will also need to be adapted to provide real-time professional medical translation for patients and providers with language barriers.

There has also been increased mainstream adoption of interconnected health devices such as smart watches, which can record continuous cardiac telemetry, as well as smart insulin pumps, which can record and transmit glucose levels. These smart devices will benefit from 5G data transfer rates that are anticipated to be about 100 times faster than current 4G technology. In March 2020, the HHS passed the twenty-first Century Cures Act that aims to provide patients increased access to their health data. Specifically, electronic health companies are mandated to maintain data security while removing barriers that previously limited the ability of smartphone applications to be used to access patient data.[17] The rule is anticipated to result in an increase in the number and availability of applications connecting patients to their electronic health information, including telemedicine platforms. Surgeons will likely be called upon to integrate data from these and other such devices and apps into clinical recommendations. Internationally, a form of population-level telemedicine via smartphones has already been implemented in efforts to limit SARS-CoV-2 transmission. For example, citizens in China, Israel, Iran, and Great Britain use a government phone application that tracks their location and alerts individual citizens when a close contact has contracted the novel coronavirus.[18] In some countries, use of this application is compulsory, but in other nations such as Great Britain it is voluntary.[19] There are no conclusive data to indicate whether this tracking strategy is effective in controlling the COVID-19 pandemic. Adoption of a similar strategy in the United States is unlikely due to individual privacy concerns.

Perhaps the greatest telemedicine advances in the next decade will be with respect to telesurgery. Telesurgery denotes an operation in which the surgeon and patient are remotely and separately situated, often with the aid of an operating robot. Improvements in data transfer speed and reduced signal latency associated with 5G will help facilitate telesurgery. Latency, which is the perceived delay between surgeons input and the anticipated motion has to date been a shortcoming of telesurgery contributing to delayed reaction to intraoperative events. The increased performance of 5G data streams may also introduce an effective solution to the lack of haptic feedback in robotic surgery.[20] In a preliminary series of 12 patients undergoing robotic spinal telesurgery, as well as a case series of two patients undergoing remote robotic proctectomy, surgeons reported favorable outcomes using 5G data transmission.[21] While a surgeon may be able to perform a complex operation on a patient located hundreds of miles away, important logistical concerns remain. Specifically, contingency plans regarding unanticipated conversions to an open approach necessitating proximate and immediate surgical expertise need to be considered. As telemedicine and telesurgery penetrate the mainstream, academic medical centers will also need to integrate these approaches into the trainee curriculum. For example, video platforms that allow for multiple, simultaneous video streams for residents to interact with patients under the live supervision of a remotely located teaching physician are emerging.

Conclusion

The unprecedented shift to telemedicine is likely to have a durable effect on surgical specialties post-COVID-19. Prior to the novel coronavirus pandemic, the market penetration of real-time video visits was limited due to numerous regulatory restrictions.[6, 22] While barriers such as reduced reimbursement and stringent HIPAA regulations have been removed during COVID-19, these changes are likely temporary. In order for telemedicine to remain a prominent part of the clinical enterprise, CMS would need to permanently expand the improvements in Medicare Advantage coverage for all beneficiaries; private payers also need to adopt models for reimbursement of telemedicine services that closely approximate in-person visits.

Emerging evidence supports the benefit of telemedicine services for surgical patients. The COVID-19 pandemic is an opportunity for healthcare organizations to embrace the crucial role telemedicine plays in the clinical mission. The coming decade is likely to usher in a proliferation of health-related connected devices and smartphone applications, along with the maturation of telesurgery due to improvements in 5G data transmission. In an effort to increase access to healthcare and expert surgical care, surgeons will need to embrace telemedicine technologies using data-driven guidelines for greater implementation into routine clinical practice.

Compliance with Ethical Standards

Conflict of Interest   The authors declare that they have no conflict of interest.

References

1. Report to Congress: E-health and Telemedicine. In: Services USDoHaH, ed.; 2016.

2. Barnett ML, Ray KN, Souza J, Mehrotra A. Trends in Telemedicine Use in a Large Commercially Insured Population, 2005-2017. Jama. 2018 Nov 27;320(20):2147-9.

3. Mehrotra A, Jena AB, Busch AB, Souza J, Uscher-Pines L, Landon BE. Utilization of Telemedicine Among Rural Medicare Beneficiaries. Jama. 2016 May 10;315(18):2015-6.

4. Huang EY, Knight S, Guetter CR, et al. Telemedicine and telementoring in the surgical specialties: A narrative review. American journal of surgery. 2019 Oct;218(4):760-6.

5. Gunter RL, Chouinard S, Fernandes-Taylor S, et al. Current Use of Telemedicine for Post-Discharge Surgical Care: A Systematic Review. Journal of the American College of Surgeons. 2016 May;222(5):915-27.

6. Asiri A, AlBishi S, AlMadani W, ElMetwally A, Househ M. The Use of Telemedicine in Surgical Care: a Systematic Review. Acta informatica medica: AIM: journal of the Society for Medical Informatics of Bosnia & Herzegovina: casopis Drustva za medicinsku informatiku BiH. 2018 Oct;26(3):201-6.

7. Medicare and Medicaid Programs; Policy and Technical Changes to the Medicare Advantage, Medicare Prescription Drug Benefit, Programs of All-Inclusive Care for the Elderly (PACE), Medicaid Fee-For-Service, and Medicaid Managed Care Programs for Years 2020 and 2021. In: Services TDoHaH, ed.; 2019. p. 15680-844.

8. Promoting Telehealth for Low-Income Consumers; COVID-19 Telehealth Program. In: Commission FC, ed.; 2020.

9. Notification of Enforcement Discretion for Telehealth Remote Communications During the COVID-19 Nationwide Public Health Emergency. In: (OCR) OfCR, ed.; 2020.

10. Promoting Telehealth for Low-Income Consumers. In: Commission FC, ed.; 2020. p. 1-93.

11. Revisions to Payment Policies under the Medicare Physician Fee Schedule, Quality Payment Program and Other Revisions to Part B for CY 2020. Available at: https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/PhysicianFeeSched/PFS-Federal-Regulation-Notices-Items/CMS-1715-F. Accessed April 15, 2020.

12. Onuma AE, Palmer Kelly E, Chakedis J, et al. Patient preferences on the use of technology in cancer surveillance after curative surgery: A cross-sectional analysis. Surgery. 2019 Apr;165(4):782-8.

13. Coldebella B, Armfield NR, Bambling M, Hansen J, Edirippulige S. The use of telemedicine for delivering healthcare to bariatric surgery patients: A literature review. Journal of telemedicine and telecare. 2018 Dec;24(10):651-60.

14. Smith A. American Americans and Technology Use: The Pew Research Center; 2014.

15. Perrin A. D, M. Americans' Internet Access: 2000-2015. **Available at:** https://www.pewresearch.org/internet/2015/06/26/americans-internet-access-2000-2015/. Accessed April 15, 2020.

16. Rampey BD, Finnegan, R., Goodman, M., Mohadjer, L., Krenzke, T., Hogan, J., and Provasnik, S. Skills of U.S. Unemployed, Young, and Older Adults in Sharper Focus: Results From the Program for the International Assessment of Adult Competencies (PIAAC) 2012/2014: First Look (NCES 2016-039rev): National Center for Education Statistics; 2016.

17. 21st Century Cures Act: Interoperability, Information Blocking, and the ONC Health IT Certification Program. In: Services TDoHaH, ed. p. 1-1244.

18. Doffman Z. Coronavirus Spy Apps: Israel Joins Iran And China Tracking Citizens' Smartphones To Fight COVID-19. Forbes; March 14, 2020.

19. Valentino-DeVries J. Translating a Surveillance Tool into a Virus Tracker for Democracies. The New York Times; March 19, 2020.

20. Boabang FG, R; Elbiaze, H; Belqami, F; Alfandi, O. A Framework for Predicting Haptic Feedback in Needle Insertion in 5G Remote Robotic Surgery. 2020 IEEE 17th Annual Consumer Communications & Networking Conference (CCNC). 2020:1-6.

21. Lacy AM, Bravo R, Otero-Pineiro AM, et al. 5G-assisted telementored surgery. The British journal of surgery. 2019 Nov;106(12):1576-9.

22. Cain SM, Moore R, Sturm L, et al. Clinical assessment and management of general surgery patients via synchronous telehealth. Journal of telemedicine and telecare. 2017 Feb;23(2):371-5.