Telemedicine for Outpatient Neurosurgical Oncology Care: Lessons Learned for the Future During the COVID-19 Pandemic

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■ BACKGROUND: **The coronavirus 2019 (COVD-19) pandemic has drastically disrupted the delivery of neurosurgical care, especially for the already at-risk neuro-oncology population. The sudden change to clinic visits has rapidly spurned the implementation of telemedicine. A recommendation care paradigm of neuro-oncologic patients limited by telemedicine has not been reported.**

■ METHODS: **A summary of a multi-institution experience detailing the potential benefits, pitfalls, and the necessary considerations to outpatient care of neurosurgical oncology patients.**

■ RESULTS: **There are limitations and advantages to incorporating telemedicine into the outpatient care of neuro-oncology patients. Telemedicine-specific considerations for each step and stakeholder of the appointment (physician, patient, scheduling, previsit, imaging, and physical examination) are examined.**

■ CONCLUSIONS: **Telemedicine, pushed to prominence during this COVID-19 pandemic, is a powerful and possibly preferential tool for the future of outpatient neuro-oncologic care.**

INTRODUCTION

The emergence of the novel coronavirus disease 2019 (COVID-19) has drastically impacted the delivery of medical care worldwide. Its long incubation period, high transmission rate, and estimated 3% mortality has quickly made it a global pandemic.[1,2] As physical distancing measures take hold and medical resources are directed toward COVID-19, the traditional patient–physician visit has been revisited with the rapid acceleration of telemedicine.

TELEMEDICINE DURING THE COVID-19 PANDEMIC

An emerging technology for more than 25 years, telemedicine uses electronic and digital platforms to exchange medical information for improved consumer health. Widespread use had been restricted, in part, by limitations in reimbursement,[2-5] which curtailed the adoption for clinic visits. The abrupt disruption of in-person medical care by COVID-19, however, has forced the Centers for Medicare & Medicaid Services to provide an emergency waiver for telemedicine as billable consultations. Codes 99201–99215 for outpatient telemedicine visits were approved into Medicare within days of the federal state of emergency announcement.[6] In addition to established patients, the waiver allows for new patient consultations to be billed with these codes. Historically resistant, but currently mobilized by the COVID-19 pandemic, some of the largest health insurance providers (Aetna, Cigna, and Humana) have announced telehealth

Key words
- Brain tumor
- Coronavirus
- COVID-19
- Neuro-oncology
- Telehealth
- Telemedicine

Abbreviations and Acronyms
COVID-19: Coronavirus disease 2019
EHR: Electronic health record

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Citation: World Neurosurg. (2020). https://doi.org/10.1016/j.wneu.2020.05.140

*Journal homepage: **www.journals.elsevier.com/world-neurosurgery***

*Available online: **www.sciencedirect.com***

1878-8750/$ - see front matter

reimbursement to parallel the evolving Centers for Medicare & Medicaid Services reimbursement structure.[7] The reimbursement structure of private insurances still vary on a state level, and local guidelines should be reviewed by practitioners. Before this, neurosurgical use of telemedicine has been limited, albeit extremely successfully, to telestroke programs.[8] Its use in neurosurgical oncology has been limited to institutional collaborations, rehabilitation, and psychological support.[9-12] This knowledge gap poses a challenge to optimal delivery of outpatient care, particularly in the current pandemic. Given our institutions' early adoption of telemedicine, we summarize the necessary capabilities and recommendations for the incorporation of telemedicine in outpatient surgical neuro-oncology sparked by the COVID-19 pandemic, with the expectation that this technology continues to be optimized and used beyond this period.

PATIENT-SPECIFIC ADVANTAGES OF TELEMEDICINE IN NEUROSURGICAL ONCOLOGY

The current recommendations for neuro-oncology during the COVID-19 pandemic have focused on disease prioritization, inpatient management, and health care worker protection.[13-16] Consensus regarding optimal evaluation of new patients and established follow-up has yet to be reached. In these rapidly changing times, approaches have included limiting visits to urgent patients only, incorporating telemedicine, and complete cancellation of outpatient neurosurgery clinics. With limited previous experience, lessons learned in telemedicine practices adopted during this pandemic will dictate protocols for neuro-oncology in the future.

Especially critical during the COVID-19 pandemic, telemedicine visits reduce external exposure of these immunocompromised patients, family, care partners, and staff. For individuals with a neuro-oncologic diagnosis, challenges before the pandemic have included neurologic impairments—often requiring accompaniment by care partners—and long-distance travel for tertiary neurosurgical oncology care. Thus, the availability of telemedicine capabilities presents a clear advantage for these individuals, as it facilitates complete consultations and follow-up visits from the comfort of their homes. Although legislation does not currently allow multiple subspecialty practitioners to bill simultaneously for a visit, patient care-teams of various subspecialties may be consolidated into consecutive appointments to optimize patient-centered care. This reduces total time dedicated to the appointments as well as unnecessary wait times, which are frequently quoted as the worst components of a clinic visit.[17,18] In addition, telemedicine can decrease reliance on care partners. Current in-person appointments can present a unique cost to the patient and family though care partner loss of productivity during the appointment and external transport services.[17-19] Moreover, telemedicine offers unparalleled flexibility; care partners can be either at the patient's side or physically distant and easily be conferenced via voice or video into the visit.

LIMITATIONS OF TELEMEDICINE IN NEUROSURGICAL ONCOLOGY

Despite the clear advantages of telemedicine, concerns remain regarding adverse effects to patient privacy, physician–patient relationship, and completion of a thorough physical and neurologic examination. Telemedicine is an obstacle for those with limited access to telemedicine platforms and experience with Internet-based technologies. The proliferation of smartphone ownership, improved broadband coverage, and a technologically adapt population has broken down the traditional barriers to telemedicine. In the long run, the benefits of providing telemedicine services to neuro-oncology patients likely outweigh these limitations, but studying the effects on patient outcome and patient–provider satisfaction will be paramount. We encourage a thoughtful approach to the continuous evaluation of telemedicine in the neuro-oncology patient to ensure optimal patient care.

TELEMEDICINE PLATFORMS

Synchronous platforms allow for the patient and the neurosurgery team (physician, advanced practice clinician, nurse, resident, and/or fellow) to connect at the same time, whereas asynchronous platforms afford distant electronic communication and monitoring at different times. Asynchronous forms of telemedicine, including e-mail and secure messaging, have been increasingly used, but the rapid expansion of video conferencing capabilities and smartphones have paved the way for synchronous forms of telemedicine. The current platforms available range from simple telephone voice conferences to more immersive video conferencing. Although billing waivers allow for voice-only telephone visits, the inability to perform a neurologic examination and lack of direct patient–provider visualization is limiting. We feel these should be reserved for the most routine follow-up visits when alternative means are not feasible. Video conferencing affords improved communication, the ability to perform a reasonable neurologic examination, sharing of imaging directly with the patient, and likely leads to a better rapport and patient satisfaction.

We foresee a rapid rise of platforms as telemedicine becomes an established option. There are important criteria that each system must fulfill before enabling safe medical alternatives. Although relaxed regulations during the current COVID-19 pandemic allow non-Health Insurance Portability and Accountability Act–compliant interfaces (i.e., Facetime),[20] we strongly recommend the transitioning to a Health Insurance Portability and Accountability Act–compliant platform (i.e., OhMed, Doxy.me, American Well, Mend, VSee) for the continued use of telemedicine following the COVID-19 crisis.[21] Useful additional features offered include E-prescribing capabilities, billing capabilities, integration with internal electronic health records (EHRs), and digital patient intake. Blood work, medications, and imaging orders will remain similar to in-person visits; they will be ordered electronically via the EHR and communicated directly to the patient.

Vital to neuro-oncologic disease evaluation, neuroimaging needs to be available for comprehensive care. Current standard practice is in-system imaging before a clinic visit. Although varied by region, the COVID-19 pandemic has likely decreased overall neurosurgical oncology visits and has limited access to timely imaging. Patient triage is being performed on a case-by-case basis, and those requiring urgent imaging evaluation have not been delayed. Noncritical, benign surveillance imaging, however, has been rescheduled for patient safety and optimization of resource use. Patients also may obtain imaging at centers closer and more

convenient to their homes and transfer the images to their physician before the appointment. This is most often completed via mail, but cloud-based secure imaging systems are becoming more commonplace. In addition, incorporation of imaging onto a shared screen during the appointment, offered by many platforms, improves patient satisfaction and understanding of the pathology and plan.

BEST PRACTICES: RECOMMENDATIONS FROM THE COVID-19 PANDEMIC

The following best practices discussed in this section are also shown in Table 1.

Scheduling

New consultations and transitioning patients to telemedicine visits should be contacted by office staff to confirm willingness to participate in a virtual visit and that the patient's software and hardware meet the necessary requirements for the proposed platform. Patients are notified that these visits are billable to insurance and they will incur a co-pay similar to an in-person visit. Patients who are unable to complete a video-based visit and require wound evaluation should be instructed to provide digital pictures, if possible. Patients with concerning neurologic or imaging findings should be referred to the medical staff for an additional screening. Those with urgent clinical or imaging findings (hydrocephalus, hemorrhagic lesions causing significant acute mass effect, signs of decreased arousal or concern for airway protection) should be directed for urgent evaluation. Thus, telemedicine encounters should be thoroughly screened for patients who can be managed remotely.

Table 1. Checklist for Optimized Outpatient Neuro-Oncology Telemedicine Visits

Previsit	
Previsit forms, imaging, and outside medical records are available for review	
Review imaging for high-risk, unstable patients	
Use telephone appointments as a last resort	
Setting	
Provider	**Patient**
Professional, clean, and well-lit office	Well-lit and large setting
No background noises	No background noises
Secure setting	If needed, care partner or family present
Physical examination and imaging (Table 2)	
Pay attention to red flags (decreased arousal, unsecure airway, significant/disproportionate mass effect, and hydrocephalus)	
Visit	
Confirm patient consent for telemedicine visit	
Build rapport	
Focused clinical history	
Focused physical examination	
Imaging review with patient	
Plan of care/surgery	
Documentation and billing	
Limitations	
Detailed physical examination	
Lack of telemedicine accessibility	
Patient preference	

Previsit Preparation

Before the appointment, all backend administrative procedures should be completed by the appropriate office staff. All patient imaging and documentation should be available and reviewed by the physician. Selecting cloud-based imaging and intake platforms that readily integrate with native EHRs and hospital technologies would enable the most optimal workflow. These steps are aimed at preventing unnecessary technical delays and affording appropriate time during the televisit.

Provider/Patient Setting

The role of the provider is to offer a professional, safe, and private environment to discuss potentially serious and life-altering pathology. The provider should select a well-lit and clean office for the appointment with minimal external noise or distractions.

In turn, the patient should do likewise in terms of lighting and noise. The patient also can plan space for actions that would replace a traditional physical examination. Care partners and/or family also should be available if needed/wanted to streamline the appointment. If the patient has underlying neurologic issues that limit their understanding or ability for self-care, a care partner is necessary during the visit. Translators from home, or traditional translator services, can be incorporated as necessary. These instructions can be provided to the patient during scheduling.

Physical Examination

A potential weakness of telemedicine is the neurologic examination. The provider is limited to observable actions such as coordination, gait, tremor, and gross elicitable actions. Several studies, however, have validated the neurologic examination in telemedicine.[22,23] The National Institutes of Health Stroke Scale is a standardized and replicable neurologic examination (Table 2) and satisfies many of the relevant neurologic examinations for a neuro-oncology patient.[24-27] For skull-base tumors, a more elicitable cranial nerve examination is recommended. Anisocoria can be seen with a close-up of the patient's eyes, whereas reaction could be crudely examined via the care partner's assistance with a flashlight, but a detailed pupillary evaluation is limited. If critical for decision-making, the patient should be requested to have an in-person visit. For preoperative patients, a thorough examination should be documented before surgery on the day of surgery. For spinal oncology patients, a more thorough examination may necessitate an in-person evaluation or assistance from a caregiver/family member. When limited to portions of the National Institutes of Health Stroke Scale or observable tasks, telemedicine can provide the basic elements of a neurologic examination.

Table 2. Neurologic Examination Components Assessable During Telemedicine Visit

Mentation	Extremities
Level of consciousness	Gross strength (antigravity/drift)
Memory assessment	Sensation (with care partner/family)
Ability to follow tasks	Muscle bulk*
Face examination	Tremor*
Extraocular movements	Gait*
Visual fields and anisocoria (with care partner/family)	
Facial palsy	Coordination
Hearing (with care partner/family or phone)	Dysdiadochokinesia*
Shoulder shrug*	Heel-to-knee or finger-to-nose (with care partner/family)*
Tongue movement*	Walk-on-toes*
Language	Walk-on-heel*
Aphasia	Romberg test (with care partner/family)*
Dysarthria	

The components were tabulated from relevant National Institutes of Health Stroke Scale (NIHSS) tests and observable tests.

*The components are observable tests not included in the NIHSS. The test should be used as necessary for the particular pathology.

Ultimately, provider discretion is required to determine when a more detailed face-to-face examination is warranted.

Documentation and Billing

Telehealth visits require the physician document patient consent to the virtual appointment and billing, date of the visit, the location of the provider and the patient, and the amount of time spent face-to-face. Currently, codes 99201–99205 allows for new outpatient visits, whereas 99211–99215 apply for established patient visits. Care should be taken to ensure the appropriate focused documentation to facilitate unambiguous billing and reimbursement. For voice-only televisits, time documentation is required. For visits with the addition of video, standard evaluation and management coding requirement should be followed.

PLANNING FOR THE FUTURE

The current pandemic will end, and we need to ensure appropriate measures are taken for continued growth of telemedicine. We believe that as the country opens up, we will begin to see a cohort of patients who have relatively late tumor presentation secondary to a variety of factors at play during the pandemic, including limited primary care and emergency department visits, reluctance to pursue medical evaluation for insidious symptoms, and concerns regarding finances and family safety. The permanent establishment of current temporary waivers will be critical for the sustained adoption of telemedicine. Beyond Medicare/Medicaid, private insurances will need to reimburse these codes for widespread adoption. The natural evolution of technology hastened by the pandemic-induced focus on remote connectivity will continue the proliferation of high-speed Internet, smart devices, and patient familiarity. To this end, many hospital systems and practices have begun devoting substantial effort to get patients "up to speed" regarding telemedicine. Although telemedicine will never be appropriate for all patients and all conditions, we believe it will continue to play a significant role in neurosurgical oncology long after the virus is gone.

CONCLUSIONS

The COVID-19 crisis has forced all of medicine, including neurosurgery, to rapidly incorporate telemedicine into standard clinical care. Rushed to adoption, there are benefits and limitations in neuro-oncologic patients that a neurosurgeon must understand. We believe that telemedicine will remain integral to the care of neuro-oncology patients, well past the COVID-19 pandemic. It is vital that the current waiver allowing telemedicine reimbursements should continue unhindered. There is no doubt that telemedicine will play an expanding role in the outpatient management of neuro-oncology patients, with in-person appointments limited to pathology requiring detailed physical examination and in persons who lack telemedicine accessibility.

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Conflict of interest statement: The authors declare that the article content was composed in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Received 13 May 2020; accepted 15 May 2020

Citation: World Neurosurg. (2020). https://doi.org/10.1016/j.wneu.2020.05.140

Journal homepage: ***www.journals.elsevier.com/world-neurosurgery***

Available online: ***www.sciencedirect.com***