



White paper

Establishing Telemedicine in an Academic Total Joint Arthroplasty Practice: Needs and Opportunities Highlighted by the COVID-19 Pandemic

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ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic has prompted rapid restructuring of the health-care system in an effort to stop the spread of the virus and to treat patients who are acutely ill with COVID-19, while continuing to provide outpatient care for the remainder of patients. To help control spread of this pandemic, many centers, including total joint arthroplasty clinics, have boosted telemedicine capability to care for patients who would typically be seen in person in outpatient settings. We review key components relevant to the establishment and effective use of telemedicine, focused on patient education, practice logistics, technological considerations, and sensitive patient health information–associated compliance factors, which are necessary to provide care remotely for total joint arthroplasty patients.

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Introduction

Telemedicine uses audiovisual technological aids to help care for patients [1] and has historically been used to provide care for patients in rural and low-resource settings [2,3]. Telemedicine involves a range of technologies, including “smartphones,” computer tablets, mobile applications, and video conferencing, to allow health-care providers to evaluate, diagnose, monitor, treat, and educate patients “virtually” [3,4]. Telemedicine is currently the fastest growing sector of health care [1,5]. Much of this growth is attributable to the benefits of telemedicine, including shorter wait times [6], avoidance of travel, and fewer missed appointments [7]. In addition, patients report better provider communication and access, better medication adherence [8], and overall high satisfaction scores with telemedicine clinical outcomes [9].

Although only half of US hospitals use telemedicine, primarily for radiology physician-to-physician communication [1], and only 4% of Medicare patients use telemedicine [10], many believe the expansion of telemedicine is inevitable [11]. Reimbursement of

remote clinical services is one barrier to implementation [1]. The current coronavirus disease 2019 (COVID-19) pandemic, which spreads via droplets and has a 1%–2% estimated mortality rate [12], presents an urgent need for expansion of telemedicine to minimize the risk of disease transmission by practicing social distancing [13]. Although many states have adopted “shelter-in-place” restrictions, exceptions are made for travel to and from medical appointments. The necessity of in-person visits deserves careful consideration and provides reason and opportunity to render care via telemedicine when appropriate.

Problem statement

To slow the spread of COVID-19, the US Centers for Disease Control and Prevention (CDC), in conjunction with state and local governments, has implemented social distancing and quarantine rules [14]. The CDC has also recommended changing outpatient practice patterns. Specifically, they advise to “reduce unnecessary health-care visits” and “explore alternatives to face-to-face triage and visits” [15]. A major challenge during this crisis is to keep patients and the health-care team safely distant while providing patients with effective and efficient care. Telemedicine is a logical solution to help address this challenge.

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Orthopaedic surgeons who primarily perform total joint arthroplasty (TJA) of the hip and knee treat a predominantly outpatient population that is at high risk for complications and death from COVID-19 [16–18]. Most patients of adult reconstruction clinics are older than 60 years, and many have comorbidities that put them at high risk of contracting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) if exposed [19]. Therefore, an effective and efficient TJA telemedicine practice may enable providers to continue delivering care while preventing unnecessary exposure of at-risk patients to the outpatient clinic during this pandemic.

Telemedicine presents challenges for providers and patients, necessitating a comprehensive analysis of a practice and its patients to determine the best way to implement a telemedicine workflow. Providers cite poor information technology (IT) platform design and “information overload” with regard to the chosen system as barriers to use [20]. Low levels of computer literacy and high patient expectations can lead to patient dissatisfaction with telemedicine encounters. Maintaining independence and autonomy are critical, particularly among elderly patients [21], so choosing an IT system that addresses these needs is essential. For organizations, effectiveness, efficiency, workflow, and implementation models are most often cited as considerations when implementing new technology [20]. Ultimately, when choosing a telemedicine platform for a TJA outpatient clinic, it is important to choose one that is simple and intuitive to use and easy to implement.

Proposed solution

It is vital to establish the goals and priorities of an outpatient telemedicine TJA clinic so that it can help care for patients during the COVID-19 pandemic while offering scalability to continue its use after the pandemic [5]. Before implementing a telemedicine program, however, certain factors must be considered.

Patient readiness

It is important to confirm the readiness and willingness of patients to use telemedicine technology because success depends on active patient participation [22]. Providers should review their patients' demographic characteristics. The review should include, among other factors, age, socioeconomic and insurance status, health literacy, dependence on a caregiver, distance to travel to attend appointments, and pertinent cultural aspects, such as language barriers [9,20,22,23]. Elderly patients, in particular, may be apprehensive about computer-based services and concerned about privacy, so addressing these factors is imperative [24]. However, the desire for telemedicine among TJA patients is high, with approximately 70% of patients reporting that they are willing to use telemedicine for their care needs [25].

The COVID-19 pandemic is an extraordinary circumstance requiring immediate action to establish a telemedicine program. In an ideal situation in which telemedicine can be phased in over a longer period, patient attitudes and technological abilities can be assessed through focus group discussions [26] and/or surveys [27,28]. The purpose of such tools is to determine patient desires and motivations for their care, experience with telemedicine and technology, and health literacy levels. Areas of focus include reasons patients come to the clinic, barriers to traveling to the clinic, patient comfort with and access to technology, patient experience and/or comfort with telemedicine, and patient comfort and trust with receiving instructions through digital communications [23,27,29–33]. Patients with greater health literacy and engagement are more likely to embrace telemedicine [20,34]. Quantitative and

qualitative data can reveal areas where patient education and support are needed.

After readiness is confirmed, a patient's consent to receive care through telemedicine must be confirmed. Risks and benefits of and alternatives to receiving care through telemedicine should be addressed, as well as the patient's permission for the use of videos. Furthermore, consent should include consideration of billing and any other charges patients may incur through participation in telemedicine, including through telephone communication. Notably, during the COVID-19 pandemic, the Department of Health and Human Services (HHS) allows providers to reduce out-of-pocket payments for federal health-care programs.

After a TJA practice has confirmed willingness among its patients and received informed consent, implementation of a telemedicine program can proceed. In preparation, patient education and engagement should occur through several means [35]. Clinical staff must be trained to facilitate the workflow of a virtual clinic by helping patients prepare for telemedicine appointments. Additional means of education include patient messaging portals with step-by-step instructions on how to use the telemedicine technology [27] and informational fliers with troubleshooting guidance and answers to frequently asked questions. For patients who are seen in person, verbal and written communication can be used to inform them of the benefits of telemedicine for future encounters [35].

Synchronous vs asynchronous telemedicine

Care via telemedicine can be synchronous or asynchronous. Each mode has different IT infrastructure requirements. Synchronous telemedicine involves virtual encounters that occur in real time [1,36], typically involving one-on-one meetings using webcam-enabled teleconferencing. Alternately, telephone-only visits can be conducted. Synchronous sessions should be used when discussion is needed, such as during new patient consultations, preoperative counseling, postoperative evaluations, and follow-up visits.

Asynchronous (ie, “store-and-forward”) telemedicine involves the gathering, summarizing, storing, and sharing of data for a patient or, more often, another provider to review at a later time [36]. Medical record annotation, e-mail, and recorded video messages are means of asynchronous telemedicine [1], which is ideal for educating patients outside of an encounter. The differences between synchronous and asynchronous telemedicine encounters determine not only the necessary IT infrastructure but also the billing and coding options for the encounter.

Technology and equipment

Internet connection

A major consideration when implementing telemedicine is access to a broadband Internet connection, which is necessary for patients when using technology other than a telephone [5]. Poor connectivity and lack of adequate equipment can be barriers to delivering care [37]. A minimum download speed of 1–6 megabits/s is needed to support video-based communications on personal devices such as mobile phones, whereas a minimum speed of 25 megabits/s is needed to support the same communications on desktop or laptop computers [38]. An estimated 91% of the US population owns a mobile phone, and 61% of these phones have video capability. According to a 2016 report by the US Census Bureau, 89% of households own computers and 81% have broadband Internet subscriptions [39]. Although barriers to technology access exist, most patients have sufficient resources to support participation in telemedicine.

System type

The choice of the telemedicine system is crucial to the success of a telemedicine practice. Choice of a “closed” vs an “open” telemedicine system can depend on a practice’s existing software and electronic medical record type. Closed systems (eg, Praxis; InforMed Inc., San Francisco, CA) include all necessary hardware and software but do not integrate with components from other manufacturers or with existing technology systems. In contrast, open systems (eg, Zoom; Zoom Video Communications, San Jose, CA and Polycom; Plantronics, Inc., Santa Cruz, CA) can be integrated piecemeal into existing electronic medical record and telemedicine systems [5].

Technical support

Selecting and implementing a product with an IT platform that provides accessible and capable technical support staff can help ensure adequate training and active support as long as the telemedicine platform is in use. The practice’s own IT staff should also be trained to support users of the system. Physician “champions” who are facile with technology are good targets for initial rollout and can provide “at-the-elbow” support to facilitate and encourage adoption of telemedicine among their peers. IT support should be available “on demand,” if possible [5].

Training

All individuals who will interact with patients through the telemedicine portal must be trained. Insufficient training and unfamiliarity with the technology are major barriers to adoption and application of telemedicine [40,41]. In response to the growing utility and complexity of telemedicine, medical education curricula have begun integrating telemedicine training concepts early during medical training, which may increase trainees’ familiarity with telemedicine systems in the future [42].

One approach to streamlining the training process is to focus first on training “communities of practice,” meaning groups of employees who work in the same care setting, managing the same patients. A community of practice may include medical office coordinators, medical assistants, nurses, advanced practice providers, and physicians. This approach is effective in workplace training because it increases the group’s comfort with and knowledge of the technology [43–45]. Important considerations during training are data and information sharing and collaboration between the communities of practice [42].

Given the limited use of telemedicine among TJA providers, it is typically necessary to train them not only on the technology but also on the business and interpersonal aspects of managing a telemedicine practice and caring for patients remotely. Slovinsky et al. [46] proposed that training should include skills related to digital communication, technology literacy, business and billing, regulatory and compliance issues, and deploying products and services. Because these factors are integral to managing a traditional TJA practice (without telemedicine), TJA providers may be well prepared for the transition to delivering safe, effective, and compliant care via telemedicine [47,48]. Furthermore, most TJA providers are familiar with other technological practice tools, such as computer-assisted surgery and robotics.

Insurance reimbursement and compliance

Despite the fact that telemedicine decreases wait times, reduces or eliminates travel, and lowers costs for patients undergoing TJA, it has not been universally adopted [49–51]. Obstacles to widespread

use include the costs of implementation and the lack of reimbursement for telemedicine [20].

Before the modifications of Medicare and Medicaid rules during the current pandemic, government-funded insurance plans had various approaches to reimbursing physicians for telemedicine. Under Medicare Part B, physician reimbursement for telemedicine services was strictly regulated. Requirements for reimbursement included that the patient be located in a designated “rural health professional–shortage area,” a county not part of metropolitan area, or a facility participating in a Federal telemedicine demonstration project [52]. Low-resource or underfunded institutions outside such areas did not qualify for telemedicine reimbursement [53]. These limitations prevented the use of telemedicine for most patients. In contrast, the Veterans Health Administration operates the nation’s largest telemedicine program and offers free telemedicine to all patients enrolled in their insurance program [54]. Medicaid reimbursement for telemedicine varies by state, with some states providing full reimbursement with no restrictions and others imposing restrictions similar to those of Medicare [55,56]. Private insurers have various reimbursement plans, based on local coverage determinations for a given payer. State mandates for private insurance reimbursement for telemedicine services, in some cases irrespective of rural or nonrural setting, have resulted in expansion of telemedicine coverage [56].

In response to the COVID-19 pandemic and in accordance with CDC guidance, many practices have implemented telemedicine to avoid in-person contact between providers and patients. Federal and state reimbursement laws have evolved rapidly to accommodate this change, with the most liberating adjustments coming through the Coronavirus Preparedness and Response Supplemental Appropriations Act, which was passed on March 6, 2020. This act has provided emergency funding, estimated at \$500 million, resulting in expanded reimbursement for all telemedicine services provided to Medicare patients, regardless of originating site, during the pandemic. The Act gives states the option to suspend interstate licensure requirements that had hampered the delivery of telemedicine across state lines [57,58]. In addition, the expansion allows TJA providers to evaluate and treat patients on the basis of history and discussion when it is impractical to perform a physical examination [59].

Also in response to the COVID-19 pandemic, Health Insurance Portability and Accountability Act (HIPAA) regulations have been relaxed [59]. The primary goal of the HHS during this emergency is to enable the provision of quality care to patients regardless of location. The HHS acknowledges that compliance with HIPAA regulations may not always be possible during telemedicine delivery. Thus, the HHS and the Office of Civil Rights have exercised their discretionary authority to decline prosecution for HIPAA compliance violations that occur during “good-faith” efforts to provide patient care during the pandemic.

Future direction and long-term focus

Licensing and legal requirements

After the COVID-19 pandemic has ended, continued expansion of telemedicine will depend on licensing restrictions and legal changes. These requirements vary by state; therefore, practice leaders should consult legal and compliance advisors before creating or continuing their telemedicine practices to confirm ongoing compliance [60–62]. During the pandemic, regulatory changes have evolved rapidly, and practice managers and providers should update their understanding of these changes on a daily basis.

Feasibility of telemedicine in a TJA practice

TJA patients in several stages of evaluation are appropriate for telemedicine encounters. For patient counseling and education, as well as imaging review, remote synchronous video encounters appear to be equivalent to in-person visits. However, because of the need for hands-on patient care and in-office procedures, traditional clinic visits cannot be replaced entirely in TJA practices.

Given the current pandemic, our department rapidly implemented a telemedicine TJA clinic to treat all patients except those deemed to require in-person evaluation. In-person visits were limited to first postoperative visits and urgent care needs that could not be managed remotely; otherwise, all patients capable of doing so were evaluated via telemedicine. Telemedicine was used for new patients, as well as established patients. The range of topics addressed at these visits included nonoperative treatment options, preoperative counseling, imaging review, acute concerns not requiring in-person evaluation, routine postoperative follow-up, and long-term surveillance. The patient education typically provided before TJA can also be accomplished through interactive telemedicine [63]. Thomas et al. [63] reported practical tips to improve the telemedicine patient-provider experience (Table 1). A TJA practice should choose which patients are appropriate for telemedicine based on practice philosophy, the needs of the patient, and, during the current pandemic, the greater good of society. Neither the American Association of Hip and Knee Surgeons nor the American Association of Orthopaedic Surgeons has yet made recommendations regarding which patients would benefit from telemedicine vs in-person visits [64]. Such decisions may be based on data from other fields and determined experientially.

Evidence supports the effectiveness of telemedicine for TJA patients. One study found that orthopaedic surgeons reported that telemedicine, including telemedicine for TJA patients, was not inferior to standard clinic visits across the spectrum of visit types, from new consultations through long-term follow-up [65]. The authors reported no significant difference in duration of evaluation in telemedicine visits compared with in-person encounters but emphasized the importance of having radiographs taken before the evaluation and available for remote review. Importantly, their exclusion criteria for telemedicine visits included the inability to provide informed consent, which can prevent the use of telemedicine for patients with advanced cognitive dysfunction, incarcerated patients, patients who need an interpreter, and patients with complex problems requiring extensive physical examination. Although the need for an interpreter has been cited as a reason not

to use telemedicine, current IT platforms and telemedicine workflows allow the use of remote interpreter services, which expands the pool of potentially eligible patients.

Consistent with recommendations made by Buvik et al. [65], we have imaging readily available when the physician or advanced practice provider meets the patient. This practice is accomplished by having imaging completed before the scheduled appointment. For patients who have had their imaging performed in an imaging center that is unaffiliated with our institution, a HIPAA-compliant cloud-based imaging application can allow for remote review of images. Most telecommunication platforms have a “share screen” function, so that imaging and laboratory results can be reviewed with the patient in real time.

Although data are scarce regarding telemedicine in TJA practice, evidence suggests that telemedicine compares favorably with traditional clinic visits for TJA patients, including the ability to examine patients via surrogate findings. Assessment of range of motion can be effectively performed through telemedicine by selective questioning involving activities of daily living such as sitting and rising from the toilet, the ability to don socks, or the ability to tie shoe laces [66]. In addition, Sharareh and Schwarzkopf [67] found that 33 postoperative TJA patients seen through telemedicine had significantly higher satisfaction rates, fewer unscheduled clinic visits, and fewer telephone calls to the office during the 90-day period after TJA compared with 40 patients who were seen in traditional clinic visits. No postoperative adverse events occurred in either the in-person or the telemedicine group during the 3-month study period. Similar findings have been noted in other surgical and nonsurgical fields.

Recommendations

We recommend the following actions to facilitate the adoption and expansion of telemedicine:

1. Federal and state rules regarding physician licensing requirements and originating site should be optimized to support the use of telemedicine to evaluate and treat appropriately selected patients.
2. Medicare supplement and Medicaid reimbursement policies for telemedicine services, which currently vary by state, should be harmonized to the extent possible to remove financial disincentives to providing telemedicine care.
3. Practices and providers should be educated about the benefits of telemedicine and factors essential to its adoption. These topics

Table 1
Practical tips to improve patient-provider telemedicine experience [35,63].

Problem	Tip
Technical barrier before visit	Create a simple chart or pictorial representation of how to download the necessary technology for the encounter, including how to download on a computer, laptop, tablet, or smartphone Have people available in person for training the patients Create a list of frequently asked questions and tip sheet Have a staff member contact the patient 15 min before their appointment to remind them and prepare them for the encounter
Language barrier	Determine the languages available through interpreter services offered by your institution Review strategies to link interpreters to the telemedicine visit before the encounter, which may be available through the electronic medical record
Poor audio quality	Allow adequate time to notify the interpreter, as well as the patient, about visit time Wear a microphone to maintain consistent volume during the encounter Reduce background noise when possible Mute the microphone when not speaking
Poor audio or visual quality	Mute both microphones, keep the video on, and use a telephone for audio communication Offer an alternate source of communication, such as telephone or another audiovisual platform such as Zoom (Zoom Video Communications, San Jose, CA) or Skype (Skype Technologies, Palo Alto, CA)
Reduced engagement by family/caregivers	Ask the patient to position their camera so any accompanying family/caregivers are visible in the same frame Encourage patients and family to ask questions and/or comment
Patient dissatisfaction	Provide feedback on the encounter to help make adjustments for process improvement

include costs and components of telemedicine platforms, information on documentation, reimbursement guidance, tips to improve telemedicine workflow efficiency, and liability and privacy considerations.

4. Patients should be educated about the use and benefits of telemedicine, and they should be assessed for their technological competency and willingness to use telemedicine.

The benefits of telemedicine are considerable, especially when access to in-person clinical care is limited, such as during a natural disaster or pandemic. Telemedicine can lower health-care costs and improve access to care, especially for patients in rural or underserved areas. In appropriately selected patients, telemedicine produces similar outcomes to those of in-person visits. During crises such as the COVID-19 pandemic, when health-care access is limited and mobility is impaired, telemedicine allows providers to continue delivering quality patient care while avoiding unnecessary risks to themselves, the care team, and their patients.

Conflict of interest

Dr. Golladay reports royalties, speakers bureau/paid presentations, being a paid consultant, stock/stock options, and research support from OrthoSensor, Inc.; research support from KCI and Cerus; stipend from *Arthroplasty Today* (AAHKS); editorial/governing board of *Arthroplasty Today* and the *Journal of Arthroplasty*; and board member/committee appointments for the AAHKS Publications committee and the Virginia Orthopaedic Society Board. Dr. Golladay recused himself from the review and decision process for this manuscript, which underwent blinded peer review and editorial decision by another member of the Arthroplasty Today Editorial Board. Dr. Levin reports stock/stock options in Integra LifeSciences, Pfizer, and SeaSpine Holdings and board member/committee appointments for the AAOS and the Musculoskeletal Tumor Society. Dr. Thakkar reports board member/committee appointments for the AAHKS – Young Arthroplasty Group Committee Member. All other authors have no conflicts of interest to report.

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