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Telemedicine Foot and Ankle Visits in the COVID-19 Era

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Abstract

Background: The COVID-19 pandemic created a difficult environment to provide musculoskeletal care to patients with foot and ankle pathology given the limitations placed on in-office visits. Telemedicine offered a unique avenue to reach these patients; however, the efficacy of telemedicine visits in patients with foot and ankle pathology is not well studied. We propose a telemedicine protocol that has allowed us to effectively see and treat patients with foot and ankle pathology.

Methods: A 12-step standardized telemedicine protocol was created within the Foot and Ankle division that was used for seeing patients through telemedicine. Also included in this is previsit preparation and follow-up recommendations. Press Ganey surveys were retrospectively reviewed to understand patient experience with telemedicine.

Results: 85.2% of patients surveyed responded with scores indicating excellent care. When comparing patients who were seen in-office and through telemedicine, 89.2% and 83.4% responded with scores indicating excellent care, respectively ($P = .37$).

Conclusion: Telemedicine offers an effective and convenient way to provide excellent musculoskeletal care to patients affected with foot and ankle pathology. This is the first study that evaluated a comprehensive protocol for telemedicine encounters and can be used to implement telemedicine by others using this approach.

Level of Evidence: Level V, expert opinion.

Keywords: telemedicine, COVID-19, practice management

Introduction

The current COVID-19 pandemic has created a unique problem for orthopedic surgeons by mandating "social distancing" and limiting patient-provider interactions. To continue providing musculoskeletal care, many centers have adopted video consultations. Video telemedicine is not a new concept; it has been used in the past extensively to provide subspecialty care in rural and remote communities. There are many studies describing the setup, advantages, and limitations of conducting patient evaluations via video recording or live face-to-face video transmission with a medical facilitator.[1,8,10,13-15] To our knowledge, little has been written about orthopedic specialists performing direct video evaluations of both new and established patients.

This manuscript is prepared by 2 senior orthopedic surgeons with a subspecialty interest in foot and ankle to develop a "Best Practice" protocol for remote video evaluation of patients with foot and ankle pathology without a medical facilitator.

It is the intention of the authors to recommend a battery of history and physical examination tests that can be completed through patient video-coaching without physically examining the patient. The authors are aware of the possible limitations and pitfalls such evaluations would entail. As a matter of quality control, each patient evaluated with this protocol was documented with a detailed history, remote physical examination and imaging, followed by a survey of the patients to evaluate their experience. It is our hypothesis that enough information can be gathered through this protocol to establish a reasonable diagnosis and plan that would meet the standard of care while maintaining high patient satisfaction.

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Table 1. 12-Step Telemedicine Protocol That Was Developed to Provide Consistent Quality Care to Patients Being Seen Through Telemedicine.

Performed By	Description
Physician extender	Greet patient and perform required intake, including history of present illness, review of systems, past medical history, past operative history, social history
Physician extender	Ask patient to show the body part that is being examined, and if the extremity cannot be well visualized, recommend changing into appropriate clothing
Physician extender	Ask patient to place device on a table or the floor in a well-lit area with enough space for physical examination and pathology-directed testing
Physician extender and surgeon	Review history of present illness and other portions of the history with patient as taken by physician extender
Physician extender and surgeon	Visualize the extremity in question and comment upon alignment, deformity, ecchymosis, swelling, skin color, wounds, etc
Physician extender and surgeon	Gait assessment: ask patient to walk 5 steps back and forth
Physician extender and surgeon	Diagnosis directed testing (Table 2)
Physician extender and surgeon	Review imaging with patient
Physician extender and surgeon	Document diagnosis(es)
Physician extender and surgeon	Discuss treatment plan and prescribe treatment and any further imaging that is necessary
Physician extender and surgeon	Ask for patient input and answer any final questions
Physician extender and surgeon	Plan for follow-up either via telemedicine or in a traditional clinic visit

Materials and Methods

Telemedicine Protocol

Previsit preparation. From experience during this rapid utilization of telemedicine, a previsit phone call made by a member of the office staff or clinical team prior to the appointment is imperative. Patients' technologic literacy can be assessed during this phone call. Based on our algorithm, previsit preparation can be done by a member of the team to optimize a patient's ability to have a smooth visit experience (eg, opportunity to troubleshoot audiovisual issues).

Our staff will also ensure that any previous patient imaging has been uploaded into our system, or if unable to be uploaded, coordinates for the patient to drop this off to the office with enough time for upload prior to their visit. If new imaging is to be performed before the telemedicine visit, staff may check to see if this has been completed or ensure an appointment is in place to have this done prior to the appointment. This can be done either at one of our institutions imaging locations or at a facility most convenient for the patient and then uploaded to our system.

In our experience, older patients with multiple medical comorbidities, and living alone, were more likely to have lower technologic literacy and in turn had more difficulty with telemedicine visits. We have also found that a high-speed wireless connection for a laptop computer with modern audio and video capabilities (microphone and forward-facing web camera) provided the best visit experience for patient and provider alike. With this setup, patients are easily able to move the laptop allowing for an improved virtual physical examination. This set up is superior to a tablet, which is superior to the use of a cellphone. We found the inability to adequately prop and position tablets and cellphones to be a major limitation for obtaining a quality physical examination.

Location, lighting, and attire are also important topics to address with patients during this previsit. Early in our telemedicine experience, we had many patients arrive for their visit in a parked car as they were completing daily tasks. Locations like this severely limit the ability for the provider to come to an accurate diagnosis. We recommend that all patients conduct telemedicine visits from their homes, in a well-lit and spacious area. Our experience has been that the patient's living room provides the best location for a telemedicine visit as there is space available for them to demonstrate natural gait and diagnosis-specific physical examination maneuvers. Other areas such as the kitchen and bedroom can be used but have often been inadequate because of space restrictions. The living room also gives the usual advantage of having adequate natural light, which we have found to be the best lighting for these visits. If natural daylight is unavailable, LED-lit rooms are preferable to incandescent-lit rooms in terms of video quality. Lastly, patients should be dressed in a way where both lower extremities can be easily examined from the knee down. We advise our patients to wear shorts, but pants that can be rolled up and can stay up can be worn as well.

Telemedicine visit. A 12-step standard protocol to evaluate a patient was developed (Table 1). The combined approach between a physician extender and physician allows for maximal time efficiency and rooming of multiple patients in virtual examination rooms, available through multiple conferencing platforms such as Zoom, GoToMeetings, Doxy, etc as would be done in a traditional clinical setting.

With a detailed history taking, inspection, and gait examination, we were able to formulate a working differential

Table 2. Diagnosis-Directed Examinations Used in Telemedicine Visits Help to Provide Objective Examination of Patients When They Are Not Able to Be Physically Examined.

Examination	Description	Positive Test	Differential Diagnosis
Gait testing	Ask patient to take 5 steps toward camera, and then 5 steps away from camera	Antalgic gait, steppage gait, wobbling gait	Trauma, foot drop, myelopathy, cerebellar issues
Single-leg balance[9,12]	Ask the patient to stand on one leg and balance, compare with contralateral side	Inability or decreased ability as compared to contralateral side	Ankle instability
Single-leg heel rise[9]	Ask the patient to stand on one leg and then lift heel off the ground	Inability to perform, or pain with performing repeated rises	Posterior tibial tendon dysfunction, diminished calf strength
Single-leg hop[9,12]	Ask the patient to hop on one leg	Inability to perform or lack of coordination	Deconditioning
Single-leg squat test[12]	Ask patient to perform full squat	Ability compared with contralateral side	Test for agility and strength
Thompson's test	Ask patient to lay in prone position, flex knee to 90 degrees, and squeeze their calf	Lack of plantarflexion	Achilles rupture
Morton's test	Ask patient to squeeze the forefoot in the intermetatarsal space	Increased pain or radicular symptoms	Morton's neuroma
Windlass test[4]	Ask patient to dorsiflex the great toe with the ankle in neutral alignment	Increased plantar foot pain	Plantar fasciitis

diagnosis list for most of our patients. Next, we performed "diagnosis-directed examination [DDE]" maneuvers to test and verify our diagnoses. Table 2 provides a short list of example DDE maneuvers relating to common foot and ankle problems.

Following DDE examination of the patient, the screen share function available in most telemedicine platforms should be used for reviewing of imaging with the patient. At the end of the consultation, a diagnosis was made by the orthopedic surgeon and a plan of treatment was offered to the patient.

Follow-up. At the end of each visit, patients who are candidates for surgery are given the option for an in-office appointment prior to surgery to meet with the surgeon and further discuss surgical planning. If patients are comfortable moving forward with surgery without a traditional visit, an in-person examination and surgical consents are completed and signed the day of surgery. When discussing the planned surgery, we discussed all possible iterations of the procedure if an in-person physical examination may modify the offered procedure.

For postoperative and nonoperatively managed patients, a traditional appointment is offered if deemed necessary from the virtual visit (eg, intra-articular injections or wound complications). However, for the vast majority of patients, follow-up is set up as a repeat telemedicine visit given the limitations placed by the current pandemic.

As a quality control measure for our clinic patients, a Press Ganey questionnaire was distributed to all patients in a standard fashion and patient-reported outcomes collected. We reviewed the surveys that were received for office visits between April and June 2020. The question that we used to evaluate the telemedicine process was "Using any number from 0 to 10, where 0 is the worst provider possible and 10 is the best provider possible, what number would you use to rate your provider?" Patients answering this question with a response of 9 or 10 were grouped together to represent an excellent experience, and patients answering with an 8 or below were grouped together representing a less than excellent experience. Fisher exact test was used to compare groups, with alpha <0.05. Analyses were conducted for total patients as well as separated for both surgeons (surgeon A and surgeon B). All statistical analyses were conducted in Statistical Package for the Social Sciences version 24 (Armonk, NY).

Results

From April to June of 2020, there were a total of 183 patient encounters by the 2 foot and ankle providers during the study period. Of these, 127 of the encounters were via telemedicine, and the remaining 56 were traditional in-person encounters.

In addition, 106 telemedicine patients and 50 in-person patients gave responses of 9 and higher for a total of 156 of 183 (85.2%) patients rating their provider as excellent. When comparing telemedicine encounters and in-person encounters, 83.4% of telemedicine patients gave a rating of 9 and higher and 89.2% of in-person patients gave a rating of 9 and higher ($P = .37$).

Thirty-six of 44 (81.8%) telemedicine patients and 30 of 33 (90.9%) in-person patients gave responses of 9 and higher for surgeon A. In total, 66 of 77 (85.7%) patients gave responses of 9 and higher. When comparing visit ratings for telemedicine and in-person visits for surgeon A, no significant difference was seen ($P = .33$).

Seventy of 83 (84.3%) telemedicine patients and 20 of 23 (87.0%) in-person patients gave responses of 9 and higher for surgeon B. In total, 90 of 106 (84.9%) patients gave

responses of 9 and higher. When comparing visit ratings for telemedicine and in-person visits for surgeon B, no significant difference was seen ($P > .99$).

When comparing surgeon A and surgeon B, no difference was seen in overall satisfaction rates ($P > .99$). In the comparison of only virtual visits between the providers, no difference was seen either ($P = .80$).

Discussion

Telemedicine services have been widely used in the past to provide an array of subspecialty services to remote and rural communities. A successful telemedicine program requires reliable remote video communication technology, medical personnel trained and willing to evaluate patients remotely, and a health care system including third-party payors willing to carry the cost of telemedicine delivery.

A study by Nesbitt et al in 2000 reviewed the experience of a University of California Davis telemedicine program with 1000 consecutive consultations.[11] The program was successful in providing subspecialty care in nutrition, dermatology, behavioral health as well as other disciplines including orthopedics with a high level of satisfaction for both patients and specialists. A Cochran review of telemedicine studies conducted prior to 2013 found that telemedicine had produced an equal quality of care in treating heart failure patients and better performance in controlling blood glucose in diabetics.[5]

In the traditional telemedicine model, there was a medical provider present with the patient and communicating with a subspecialist through a live video teleconference service or by delayed transmission.[7] At that time, limited technology and availability of subspecialist may have limited the wide adoption of this service. The recent COVID-19 pandemic has led to widespread isolation of patients and providers, necessitating the use of teleconference to provide orthopedic care. We have found that rapid adaptation by providers and patients alike has been possible, and even preferable to a traditional clinic visit after restrictions are lifted. We also do recognize that this transition was made easier at our institution through the assistance of physician extenders (athletic trainers, physician assistants, nurse practitioners, residents, and fellows) but believe that this protocol could be adapted to smaller practices through careful previsit planning.

Concerns regarding the ability for providers to deliver quality care virtually are well taken and warranted given the paucity of literature surrounding the use of telehealth. As orthopedic office visits are often more reliant on physical examination than other specialties, concerns for assurance of quality care are even more applicable in this setting. Buvik et al conducted a randomized controlled trial of 389 orthopedic patients who were seen via telehealth (199) or in office (190) and found no difference between surgeon self-assessment of the visit in terms of evaluation when pooling very-good and good responses.[3] Similarly, Vuolio et al[17] conducted a randomized controlled trial of 145 orthopedic patients seen via videoconference (69) and outpatient clinic follow-up (76) and found similar patterns of disease management and complication hospitalization. Another area of concern for providers beginning to use telehealth is the length of encounters. Though we did not formally measure encounter times, patients were given 15-minute encounter slots and clinics did not typically run behind. We share the sentiment that though an in-person evaluation may provide us more comfort in our diagnosis, we have not felt that telemedicine has stopped us from reaching the correct diagnosis in a time-efficient manner.

Another limitation of telemedicine visits has been that older patients do not have the technology to utilize this resource, or if they do, have trouble in execution to allow for a full evaluation. The 2010 US Census reported that for citizens aged $\geq$65 years, only 62.1% lived in a house with computer and Internet access.[16] Burrus et al conducted a survey of more than 1200 patients who were seen in outpatient orthopedic clinics in 2014 and found that 84.9% of patients reported access to the Internet.[2] Though they did not analyze access by age group, it can be inferred that Internet access is more ubiquitous in 2020 than in 2014, including in older age groups. In our experience, very few patients were unable to engage in telehealth visits as a result of not having a device that was capable to do so. In terms of older patients being able to effectively engage via telemedicine, we agree with Grandizo et al[6] in that patients who were unable to set up a telehealth visit on their own often also required help in getting to their appointments. Because of this, family members and friends have been very effective at helping this population to set up and conduct telemedicine visits.

We also recognize that patient satisfaction is of the utmost importance and this may be affected by the use of telemedicine. When reviewing Press-Ganey scores during the COVID-19 pandemic, 83.4% of patients surveyed after Telehealth visits rated their visit as 9 or 10 and 89.2% patients surveyed after in-person appointments rated their visit as 9 or 10, which was not found to represent a statistically significant difference. Though these numbers are small and should be taken with caution, it does help us to determine that telemedicine is a feasible option in terms of patient satisfaction, but that work may still need to be done to improve the experience for patients.

The COVID-19 pandemic has changed the way that orthopedic surgeons have needed to deliver care to their patients. Though the transition has had its difficulties, it would be a failure in progress to not recognize and adopt the advances that have been made during this time. This change has allowed us to continue to provide quality care while reducing the number of in-person interactions with providers and staff during this pandemic. Though the adaption of telemedicine was made out of necessity at our institution, the lessons learned during this trying time has enabled us to provide excellent orthopedic care that can continue once restrictions have been lifted.

Summary

The widespread and rapid adoption of telemedicine during the COVID-19 pandemic serves as a model for future continued telemedicine utilization. This study serves as an example and guide to development of a telemedicine protocol in a foot and ankle subspecialty practice. With physician, payor, and hospital support, telemedicine may improve the delivery of orthopedic subspecialty care to our patients, especially to those who travel great distances or cannot afford to make routine office appointments.

Ethics Approval

Ethical approval was not sought for the present study because this is a presentation of a novel protocol with no specific patient information that was collected.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. ICMJE forms for all authors are available online.

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