Systematic Review

The Impact of COVID-19 on the Orthopaedic Sports Medicine Fellowship Application Process

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Over the last year, coronavirus disease 2019 (COVID-19) has spread across the world as a global pandemic, bringing unprecedented changes to the healthcare landscape for patients and physicians. Medical trainees have been similarly affected, as medical schools throughout the United States have implemented remote learning-based curriculums and withdrawn third- and fourth-year students from in-hospital clerkships. Of particular importance is the impact of COVID-19 on current orthopaedic surgery residents applying to subspecialty fellowship programs. Because of the highly transmissible nature of the virus and current social distancing restrictions, orthopaedic sports medicine fellowship interviews are being held virtually during the 2020−2021 application cycle. This transition to videoconference interviewing may de-emphasize an applicant's unique personality or interpersonal interactions that are traditionally captured in a variety of settings during the interview day. In turn, this may lead to increased prioritization of various aspects of the application, such as the applicant's residency program, letters of recommendation, and research productivity. Matching to a sports medicine fellowship program is an inherently competitive process and the COVID-19 pandemic presents novel challenges to orthopaedic residents in their efforts to successfully match. The purpose of this review is to describe the changes made to the orthopaedic sports medicine fellowship interview process resulting from COVID-19 during the 2020-2021 application cycle and discuss how these changes may impact the future fellowship application process. This review discusses the changes made to the orthopaedic sports medicine fellowship interview process caused by COVID-19 during the 2020−2021 application cycle. This review also assesses how such changes may impact the future application process and proposes potential adaptations to the current virtual interview format if it should become the new standard moving forward.

Since being declared a global pandemic on March 11, 2020, by the World Health Organization, the novel coronavirus (COVID-19) has resulted in over 2 million deaths and more than 102 million cases worldwide.[1] This has brought unprecedented changes to the landscape of modern healthcare and medical education,

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The authors report the following potential conflicts of interest or sources of funding: B.R.W. reports publishing royalties, financial, or material support from Elsevier and Arthroscopy*; stock or stock options from Vivorte and Kaliber AI; research support from Arthrex, Inc; board or committee membership for the American Orthopaedic Society for Sports Medicine, the Arthroscopy Association of North America, and* Arthroscopy*; financial or material support from Arthroscopy. He is an unpaid consultant for Kaliber AI, Sparta Science, AAOS, and FH Ortho; and a paid presenter or speaker for Vericel. S.L.S. reports board or committee membership for AAOS; ACL Study Group; American Orthopaedic Society for Sports Medicine; Arthroscopy Association of North America; International Cartilage Regeneration & Joint Preservation Society; Epic Bio; International Society of Arthroscopy, Knee Surgery, and Orthopaedic Sports Medicine; Vericel; and Joint Restoration Foundation; editorial or governing board membership for* American Journal of Orthopedics, Arthroscopy*; royalties from CONMED Linvatec; paid consultancy from Arthrex, Inc, BioVentus, Ceterix Orthopaedics, CONMED Linvatec, Flexion Therapeutics, GLG Consulting, JRF Ortho, Moximed, Olympus, RTI Surgical, Smith & Nephew, Vericel, Zimmer; and stock or stock options from Epic Bio and Vivorte. He is a paid presenter or speaker for Vericel and Joint Restoration Foundation. M.K.M. reports board or committee membership for AAOS, American Orthopaedic Association, American Orthopaedic Society for Sports Medicine, Arthroscopy Association of North America, Ruth Jackson Orthopaedic Society, and The Forum; editorial or governing board membership for the* American Journal of Sports Medicine *Electronic Media;* Arthroscopy*, and Ortho Info; she is a paid presenter or speaker for Arthrex, Inc. Full ICMJE author disclosure forms are available for this article online, as supplementary material.*

Received March 14, 2021; accepted April 22, 2021.

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2666-061X/21434

https://doi.org/10.1016/j.asmr.2021.04.002

introducing uncertainty into the lives of medical trainees and practicing physicians. As hospitals canceled or postponed elective surgical procedures to prioritize care for COVID-19–infected patients early in the pandemic, the surgical field and delivery of musculoskeletal care was impacted on multiple levels.[2,3] Even when hospitals resumed elective procedures, cases were prioritized by clinical urgency and thus orthopaedic patients encountered significant delays in both routine and time-sensitive elective care.[4] Like practicing physicians and their patients, medical trainees have also been adversely affected by changes in healthcare delivery and education necessitated due to the COVID-19 pandemic. Medical schools across the United States have implemented remote learning-based curriculums, which has naturally led to a loss of collaborative experiences in the form of hands-on training, kinesthetic learning, real-time performance assessments, and interpersonal engagement. These lost learning experiences may prove to be a significant detriment to current students' education and future training.

Matching to a sports medicine fellowship program is an inherently competitive process in itself, and the COVID-19 pandemic presents novel challenges to orthopaedic residents in their efforts to successfully match.[5,6] Although the influence of the COVID-19 pandemic on orthopaedic surgery residency applications has been previously described,[7] there is a paucity of literature assessing similar impacts on sports medicine fellowship applications for current orthopaedic surgery residents. The purpose of this review is to describe the changes made to the orthopaedic sports medicine fellowship interview process resulting from COVID-19 during the 2020–2021 application cycle and discuss how these changes may impact the future fellowship application process.

Traditional Sports Medicine Fellowship Interview Process

Over the last 2 decades, there has been a trend toward fellowship training and subspecialization in orthopaedic surgery in the United States.[8] Recent studies have reported an estimated 90% to 95% of current orthopaedic surgery residents intend to pursue fellowship training.[9,10] The orthopaedic subspecialty fellowship application process comes at a significant cost for residents, both financially and educationally. On average, residents spend $458 per fellowship interview and a total of $5875 to cover interview-related expenses, such as travel and lodging.[11,12] Moreover, this process is a substantial disturbance to the applicant's residency education, because residents are typically away from training for a mean of 11 days during the application cycle.[12] Most residency programs account for this by giving residents a specific amount of time off for interviews (range, 3-20 days).[13] However, this has done little to address the disruptions in training and workflow perceived by orthopaedic residency program directors (PDs). Oladeji et al.[12] reported that 62% of PDs surveyed found the orthopaedic fellowship application process extremely disruptive to a resident's training. This sentiment was echoed in a 2020 study by Taylor et al.,[13] in which the authors found that significantly more PDs felt that time off for fellowship interviews negatively impacted their residents' education ($P < .001$). To counterbalance the monetary and educational costs of the interview process, some have advocated for regionally coordinated interview dates or conducting interviews remotely over videoconferencing.[13-15]

Given the highly competitive nature of applying for orthopaedic sports medicine fellowships, it is imperative for applicants to have a sound understanding of the traditional interview structure and the most critical selection criteria for matching to an orthopaedic sports medicine fellowship program. In a 2017 study, Haislup et al.[16] surveyed 38 fellowship PDs and provided useful information regarding the organization of orthopaedic sports medicine fellowship interviews prior to the COVID-19 pandemic. Within the pool of PDs surveyed, 42.1% stated that they interviewed 21 to 30 applicants per year and 28.9% have only 1 fellow per year at their respective program. The interview day's length is variable across programs, because 48.6% of programs conduct half-day interviews (8 AM to 12 PM), and 51.4% have full-day schedules (8 AM to 4 PM). During this time, 76.3% of programs stated that they arrange for applicants to have ≥4 interviews during their interview day, and the vast majority (94.7%) include large group interviews in some capacity. Most (73.0%) individual interviews are conducted with 1 to 5 faculty members per applicant and generally (63.2%) last between 5 and 15 minutes each.[16]

Both before and during the interview day, applicants are rigorously evaluated based on numerous factors. Regardless of subspecialty in orthopaedic surgery, it has been found that the most important criteria for fellowship PDs in completing the rank list is the interview, followed by letters of recommendation (LOR) from subspecialty faculty or the applicant's residency program director, and the applicant's expressed interest in the program.[17] These trends have also been observed specifically in the ranking of orthopaedic sports medicine fellowship applicants. Baweja et al.[18] surveyed 57 fellowship PDs and reported that the single most crucial factor in determining an applicant's rank was the quality of the interview, followed by LOR, the strength of the applicant's residency program, publications/research, and personal connections, respectively.

Promising evidence has been published regarding fellowship match outcomes.[19] From 2010 to 2017, the

mean number of programs participating in the fellowship match was 92.9 with an average of 244.8 applicants per year.[19] Of these programs, 75.8% matched all available fellowship positions and interviewed an average of 9.0 applicants per position compared to programs that did not fully match, which interviewed 6.5 applicants per position. Furthermore, Mulcahey and colleagues[19] revealed that 92.0% of these applicants successfully matched into a sports medicine fellowship program.

Current Orthopaedic Sports Medicine Fellowship Interview Process

As a result of the COVID-19 pandemic, orthopaedic sports medicine fellowship interviews are being held virtually across all programs during the 2020–2021 application cycle (Table 1). These virtual interviews are performed on various platforms including Zoom (Zoom Video Communications, Inc., San Jose, CA), Thalamus (Thalamus; Santa Clara, CA), and Microsoft Teams (Microsoft Corporation; Redmond, WA). Typically, a program will hold a virtual social gathering in advance of the interview day to allow applicants to speak freely with the fellowship program's current fellows or attendings to learn more about the program. The interview day itself is similar to an in-person interview, often with several interviews between applicant and one or more of the program's attendings. Virtual interviews typically do not include a virtual tour of the program's facilities or the city in which the program is located.

For applicants, virtual interviews eliminate the financial and time burden associated with interview travel.[11,12] This allows applicants the freedom to apply to more programs and to "attend" more interviews than they normally would, however, the opportunity cost of this process still exists when virtual interview activities overlap with residency training commitments on selected time points. Although it is unclear at this time what effect this truly has on fellowship applicants, it is possible that this could ultimately lead to a "shotgun" approach whereby applicants apply to a large number of programs around the country in hopes of receiving a high number of interview offers, an approach currently used by many medical students applying to orthopaedic surgery residency programs.[20] This leads to the best applicants receiving an unnecessarily high number of interview offers, with fewer interviews given to average to below-average applicants, thereby potentially limiting the chances of a successful match for programs and applicants. Conversely, this may also result in fellowship programs primarily offering interviews to a small pool of excellent applicants already with multiple invites to other programs, thereby potentially dropping their program lower on the applicant's rank list.

Table 1. Overview of Virtual Fellowship Interview Process

Performed over videoconferencing platforms (i.e., Zoom, Thalamus, Microsoft Teams)
Typically do not include virtual tour of program's facilities or home city
Virtual social gathering for applicants and faculty prior to interview day
Similar one-on-one interview structure with program's attendings
Further emphasizes importance of fellowship program websites and informational resources
May de-emphasize applicant's unique personality or interpersonal interactions

With limited access to programs during this year's application cycle, it is difficult for applicants to assess a program's "feel," sense of community, and nonstaged interactions. Factors related to the broader community and life outside of the hospital setting (i.e. nightlife, family or childcare, living arrangements) also play a pivotal role in determining an applicant's overall level of comfort at a program. Thus further emphasis is placed on the importance of fellowship program websites to learn about each program. Previous studies have demonstrated the deficits in online resources available for fellowship program information.[21-23] With regard to orthopaedic sports medicine fellowships in particular, Yayac et al.[23] found that only 54% of fellowships included a link on the American Orthopaedic Society for Sports Medicine website. Of these, 14% of the links were nonfunctional.[23] Furthermore, website content may be outdated and inaccurate, with no oversight from organizations such as the American Orthopaedic Society for Sports Medicine or the Arthroscopy Association of North America.

Because sports medicine faculty are unable to meet applicants in-person this year, there is possibly less emphasis on the interview itself compared to normal because it may be difficult to become acquainted with someone over a videoconference call. This may de-emphasize an applicant's unique personality or interpersonal interactions that are not captured in a variety of settings such as the pre-interview social, the interview itself, and informal conversation with a program's current fellows. Moreover, the decreased time allotted for preinterview social engagements detracts from the opportunity for applicants to speak with a variety of faculty members outside of the program leadership and thereby establish themselves as more competitive candidates. Because applicants must interview virtually during the 2020–2021 cycle, word of mouth references and relationships with former fellows, mentors, or PDs may be expected to play a more prominent role in a program's decision-making with limited exposure to the applicant. As a result, this may lead to increased emphasis on various aspects of the application such as the residency program of the applicant, strength of

LOR, and research productivity or other scholarly activity. Further studies are necessary to determine whether this is truly the case or if the virtual interview still holds substantial weight and which aspects of the virtual interview have an effect on a program's perception of an applicant (e.g., use of a virtual background, attire, lighting, etc.).

The Future of the Sports Medicine Fellowship Interview Process

Because the full impact of the COVID-19 pandemic on the orthopaedic sports medicine fellowship application process has yet to be determined, the traditional interview process may be subject to further changes moving forward. With the transition to fully virtual interviews for the 2020–2021 application cycle, it is possible that this could emerge as the new standard for fellowship interviewing in the future or as part of a 2-tiered system for in-person and virtual interview options. The use of videoconferencing for orthopaedic subspecialty fellowship interviews has been previously described with mixed results.[15] Healy and Bedair[15] found that 85% of the adult reconstruction fellowship applicants surveyed in 2017 felt that virtual interviews gave them a satisfactory understanding of the fellowship program and 81% felt comfortable ranking the program after the interview. Applicants also expressed a universal appreciation for the reduced cost and convenience associated with the virtual interview process. However, the authors highlighted concerns over the fact that 34% of candidates stated that the virtual interview format had an unfavorable impact on their ranking of the program, and 30% believed that it was not a good approach for fellowship interviews.[15]

To mitigate concerns over a completely virtual interview process, fellowship PDs may consider offering candidates the option to interview either remotely or in-person in the future. This approach would provide applicants with greater flexibility and choice over their interview format. If virtual interviews become the "standard" but are not required for future application cycles, this may allow programs to offer in-person interviews in hopes of persuading and matching more competitive candidates. However, conducting both virtual and in-person interviews for fellowship positions becomes problematic when PDs are faced with the challenge of compiling interviewees from both groups into one final rank list. Because in-person interviews allow for a more holistic assessment of a candidate's noncognitive attributes (i.e., honesty, maturity, teamwork) and overall "fit" for a program, additional evaluation of emotional intelligence may be necessary for those who choose to interview virtually. Another viable alternative may be to hold in-person interviews at a neutral location such as the American Academy of Orthopaedic Surgeons annual meeting.[12] This would allow applicants to participate in multiple interviews at a single location in a short period of time, thereby saving time and money, while allowing applicants to meet in-person with faculty from various fellowship programs. Future studies are necessary to better describe approaches to measuring the success of the virtual interview process, how it compares to the in-person format, and the feasibility of a hybrid interview model moving forward.

Maintaining the virtual interview format for future orthopaedic sports medicine fellowship application cycles would save applicants time and money and result in less interruption in residency training. If this were to be the case, fellowship PDs may consider adjusting their interview-day schedules to give applicants a more comprehensive view of their program over videoconferencing platforms and better recreate in-person interview activities (Table 2). This may be in the form of a live, guided tour of the institution's facilities with individual introductions of faculty, research points of contact, and other resources. An overview of team coverage responsibilities, research opportunities, didactics and educational content should be given along with information on courses attended and budget allotted for Continuing Medical Education and industry-sponsored events. Additional training opportunities, such as moonlighting or the presence of cadaveric surgical skills labs, should be discussed in depth. Current fellows or faculty may present data pertaining to expected caseloads, broken down by joint and procedure, as well as samples of prior years' fellowship case logs. Moving forward, it would be prudent of orthopaedic sports medicine fellowship PDs and faculty to further describe potential adaptations that could be made to the virtual fellowship interview process under current COVID-19 restrictions.

Table 2. Potential Improvements to the Virtual Interview Process

Overview of institution's facilities
Guided virtual tour of facilities
Research faculty and resources
Presence of cadaver and biomedical engineering labs
Discussion of educational opportunities
Overview of didactics and fellowship educational content
Courses attended, budget allotted for CME and industry-sponsored events
Journal clubs and grand rounds meetings
Moonlighting opportunities
Research expectations and productivity
Faculty and current fellow presentations
Staff cameos with individual introductions of faculty and points of contact
ACGME case logs, broken down by joint and procedure (including targeted cases of interest; e.g. osteotomy, Latarjet, etc.)
Samples of prior years' fellowship case logs
Overview of team coverage responsibilities

ACGME, Accreditation Council for Graduate Medical Education; CME, Continuing Medical Education.

Conclusion

The COVID-19 pandemic has led to changes in the traditional orthopaedic sports medicine fellowship application process. With the transition from traditional in-person interviews to virtual interviewing for the 2020-2021 application cycle, fellowship candidates should be cognizant of the influence this may have on the weight placed on various ranking criteria. Although virtual interviews save time and money for fellowship applicants and minimize disruption in residency training, it is unclear what effect these virtual interviews have in terms of a successful match for both applicants and programs. Future investigations should aim to describe viable quantitative approaches to measuring the success of virtual interviewing, how it compares to the in-person format, and the feasibility of potential hybrid interview models during future application cycles.

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