
THE ORTHOPAEDIC FORUM

An Orthopaedic Department's Response to the COVID-19 Health-Care Crisis

Indirect and Direct Actions with Thoughts for the Future

Nicholas P. Iannuzzi, MD, William D. Lack, MD, Albert O. Gee, MD, and Howard A. Chansky, MD

Investigation performed at the Department of Orthopaedics and Sports Medicine, University of Washington, Seattle, Washington

On January 20, 2020, the first confirmed case of coronavirus disease 2019 (COVID-19) in the United States was diagnosed in Snohomish County, Washington¹. Community spread of the novel coronavirus, now known as severe acute respiratory syndrome (SARS)-CoV-2, was recognized on January 30, after testing of samples that had been acquired as part of the Seattle Flu Study, a collaborative community surveillance study conducted by the University of Washington (UW) and the Fred Hutchinson Cancer Research Center². Since that time, the UW health-care system has been heavily involved in the response to the COVID-19 outbreak. Efforts are being made to “flatten the curve” and reduce the number of patients who are being treated at any one time in order to prevent the local health-care system from being overwhelmed. There are promising early signs that this has been particularly effective in Washington State³. As a surgical subspecialty department within the UW, the Department of Orthopaedics and Sports Medicine has been confronted with unique challenges as local and state health-care systems take measures to mitigate the spread of COVID-19. In contrast to a mass casualty event when traumatic injuries require mobilization of orthopaedic resources, this pandemic affects surgeons indirectly; despite this, orthopaedic surgeons may still play an important role.

As a conceptual framework, we have divided our department's response into indirect and direct actions to provide sustained and effective support of the health of our community.

We define indirect actions as those involving the avoidance of typical clinical practices that would be counterproductive during the current pandemic. We consider direct actions to be those taken in addition to our normal practice—actions involving direct patient care but performed outside of the usual setting. We hope that this brief communication will aid other private and academic orthopaedic practices that may face similar challenges in the weeks to months ahead.

Indirect Actions

As orthopaedic surgeons, most of our early measures in response to the pandemic involved indirect actions that were taken to support frontline providers such as our emergency medicine and internal medicine colleagues. These steps included cancelling elective cases, limiting outpatient clinic visits, and adjusting the workforce to account for the reduced requirements that are associated with fewer patient visits. The definition of what constitutes an elective surgery, even for the same procedure, may vary depending on a multitude of factors. In general, our department has followed the principle that if a surgery can be delayed for 4 to 6 weeks without undue suffering or a detrimental effect on the patient's outcome, then that surgery would be considered elective. Other departments around the country have developed similar criteria, and a conceptual framework that was advanced by the University of Pennsylvania is available through the American College of Surgeons⁴.

Disclosure: The authors indicated that no external funding was received for any aspect of this work. The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (<http://links.lww.com/JBJS/F881>).

Cancelling elective procedures and rescheduling nonurgent outpatient clinic visits create a cascade of effects on the health-care system—limiting interpersonal interactions, preserving bed capacity and personal protective equipment (PPE), and allowing staff to be redeployed to best confront the COVID-19 crisis. While multiple potential treatments for COVID-19 have been proposed, the current treatment primarily remains supportive^{5,6}. Therefore, limiting interactions between individuals, or social distancing, is currently the mainstay in mitigating additional spread of SARS-CoV-2, and multiple modeling studies have demonstrated the potential effects of these efforts^{7,8}. Cancelling elective procedures and rescheduling outpatient clinic visits prevents unnecessary interactions between patients and the multitude of providers (medical assistants, nurses, and physicians) whom patients would typically encounter during these visits.

Cancelling elective procedures also preserves hospital resources, including surge-bed capacity and PPE. In a 2017 study, Molloy et al. estimated that >700,000 total knee arthroplasty procedures and >300,000 total hip arthroplasty procedures are performed each year in the United States⁹. Following total knee and total hip arthroplasty, patients remained in the hospital for an average of 2.97 and 2.75 days, respectively⁹. By cancelling these elective procedures, a substantial increase in hospital capacity can be created. In addition, the resources that are typically used for these patients (approximately 83,000 surgical cases per month)—including PPE such as gowns, gloves, and surgical masks—can be redirected toward caring for patients with COVID-19.

The elimination of elective surgeries also may free internal medicine physicians and other inpatient providers to focus their efforts on addressing the COVID-19 crisis. In a study evaluating consults after total joint arthroplasty, a total of 189 consults were requested for 694 patients who underwent total joint arthroplasty at a single academic center, representing just over 1 consult for every 4 patients¹⁰. During a crisis in which internal medicine services are at capacity caring for patients with COVID-19, the resources that typically are devoted to inpatient consults after elective procedures are needed elsewhere.

A reduction in the number of cases and outpatient visits also allows orthopaedic departments to adjust the workforce in response to a lower surgical workload, which can prevent infection among team members and create reserve groups that can provide care in the event that other providers become ill. At the UW, rotations have been adjusted so that hospitals are staffed by approximately half the normal number of residents and attending physicians at any given time, in a fashion similar to that described by other institutions³. Reserve teams of residents remain at home for a week at a time and rotate into active clinical work on the alternate weeks. Should a team of residents become ill or be quarantined, reserve teams could rotate in during their off week to ensure continuity of care¹¹. Attending physician care teams have been created in a similar fashion. Redundancy among care teams also has been created, with an effort to limit interaction among those teams. For instance, our trauma service has created multiple services with similar surgical expertise should one team be required to self-quarantine.

In addition to changing resident and attending physician schedules, during the early stages of the COVID-19 crisis, the UW eliminated medical student participation in surgical cases. This step was taken primarily to preserve PPE, with the additional benefit of eliminating any unnecessary patient-provider interaction. Eventually, medical students' clinical rotations were cancelled altogether in furtherance of these goals.

Direct Actions

Direct actions that our orthopaedic surgery department has taken to address this nontraumatic health-care crisis include increasing telehealth capabilities, providing more efficient consultative care to emergency departments (EDs), and helping to direct patients with traumatic injuries toward hospitals that are not overburdened by the management of patients with COVID-19. The expansion of telehealth capabilities allows the department to reduce the number of outpatient visits that are needed to care for some new, established, and postoperative patients. These "visits" may be conducted over the telephone or by using video-conferencing technology, thus minimizing unnecessary contact between patients and providers. Patients requiring imaging can be directed toward free-standing imaging centers or sites that are less burdened by patients with COVID-19. Images can then be sent to the treating orthopaedic surgeon for review remotely. In general, patients have been very amenable to postponing visits to health-care facilities and grateful for opportunities to be evaluated via telephone or video.

Orthopaedic surgeons also may improve the timely care of patients in the ED and potentially reduce the number of patients requiring admission to the hospital. As part of the response to COVID-19, the orthopaedic surgeons in our department provide a more direct line of communication with the ED at 1 of the hospitals in our system, and we are ready to provide a direct line of communication at additional hospitals should those EDs be overwhelmed during the response to COVID-19. Direct consultation with orthopaedic attending physicians may decrease the time that patients wait for care in the ED and also may permit early definitive care in the ED, reducing the need for inpatient admissions. Residents remain involved in the delivery of care but direct communication between the ED attending physicians and the orthopaedic attending physicians has streamlined and improved the efficiency of care. Depending on surge levels, additional attending physicians may be available to provide staffing for consultations in the ED, with a plan to convert adjacent treatment space within the ED into an orthopaedic-only treatment area. A proposed, but not yet enacted, surge plan includes triage of patients by the intake ED nurse, directing those with isolated musculoskeletal injuries to this isolated treatment area where they would be treated by orthopaedic staff and nurses, bypassing the traditional ED environment almost entirely. These types of services may reduce the ED providers' overall workload, allowing them to focus on the expected surge of patients with COVID-19. Additionally, orthopaedic faculty have provided their availability in the event that the outbreak surge overwhelms particular areas of care, in which case providers will be asked to participate outside of their specialty area, including providing inpatient and intensive care unit (ICU)

care for patients with COVID-19 with use of “just-in-time” training and close supervision. The UW School of Medicine has developed in-house web-based software to assist with these redeployment activities.

Lastly, orthopaedic surgeons have worked with local emergency medical services to facilitate the transfer of patients from the field to hospitals with greater current and projected capacity to care for traumatic injuries. The diversion of trauma patients from hospitals that are more heavily burdened by patients with COVID-19 reduces the overall resource burden, preserves PPE by reducing unnecessary transport and rooming, and may limit additional spread of the virus.

Additional Steps and Recommendations

While the above steps represent indirect and direct actions that orthopaedic providers may take in order to help confront the COVID-19-related health-care crisis, additional steps can be considered by hospital administrators and medical directors in order to help address this challenge. In some local hospitals, salaries have been established based on productivity prior to COVID-19. These salaries have been guaranteed for a number of months, thus encouraging physicians to delay nonurgent cases as noted above. In addition, in order to ensure a distribution of patients who are very ill with COVID-19 that takes maximal advantage of the expertise and capacity of hospitals in Western Washington, there has been regional coordination among hospitals that are usually competitors.

The local response to this pandemic has been timely and well-executed. The UW faculty have felt well-supported by our physician and nonphysician administrators. However, through early hindsight we have several recommendations that may help should there be a second wave of COVID-19 or another pandemic in the future. Foremost among these recommendations is that all staff use all available evidence to ensure that personal and patient-protective measures are taken to prevent transmission while preserving PPE supplies. In our situation, there was some early conflict between the administrators and the surgeons regarding the recommendations of our administration to maintain elective clinics while avoiding using surgical masks during routine interactions with asymptomatic patients. The U.S. Centers for Disease Control and Prevention (CDC) and hospital recommendations subsequently converged on guidance that was consistent with the original wishes of the faculty. Furthermore, it is now recommended that both

patients and providers (as well as the general public) wear masks.

Updating and sharing new pertinent information is critical for both morale and effective planning. As soon as the channels of communication are in place to collect, assimilate, and analyze hospital logistical data (e.g., daily inpatient floor and ICU census, number of patients requiring ventilation, and number of patients who have been successfully extubated and discharged), it is imperative that this information be communicated in real time to medical staff. To do otherwise fosters distrust at a time when sacrifice and collaboration are critical.

The current COVID-19 pandemic represents an unprecedented challenge to our society and health-care system. As surgical subspecialists, we may not be on the front line of the current pandemic, but it is important to remember that our actions can have a substantial impact on the health-care system and the availability of resources for patients and health-care providers. We may also be called on to assist with the care of patients with COVID-19 and associated medical conditions if our intensivists and internal medicine colleagues are overwhelmed while caring for these patients. Adjustments to this model will undoubtedly be required as the situation evolves, but we hope that our early experience can provide guidance to those who have yet to experience a similar impact from this pandemic.

To craft this document, the authors employed social-distancing measures as well as teleconferencing and online collaborative tools. ■

Nicholas P. Iannuzzi, MD¹
William D. Lack, MD¹
Albert O. Gee, MD¹
Howard A. Chansky, MD¹

¹Department of Orthopaedics and Sports Medicine, University of Washington, Seattle, Washington

Email address for N.P. Iannuzzi: iannuzzi@uw.edu

ORCID iD for N.P. Iannuzzi: [0000-0001-6770-4967](https://orcid.org/0000-0001-6770-4967)
ORCID iD for W.D. Lack: [0000-0001-5720-2808](https://orcid.org/0000-0001-5720-2808)
ORCID iD for A.O. Gee: [0000-0001-9422-204X](https://orcid.org/0000-0001-9422-204X)
ORCID iD for H.A. Chansky: [0000-0003-4650-424X](https://orcid.org/0000-0003-4650-424X)

References

- Centers for Disease Control and Prevention. First travel-related case of 2019 novel coronavirus detected in the United States. 2020 Jan 21. Accessed 2020 Apr 12. <https://www.cdc.gov/media/releases/2020/p0121-novel-coronavirus-travel-case.html>
- Centers for Disease Control and Prevention. CDC confirms person-to-person spread of new coronavirus in the United States. 2020 Jan 30. Accessed 2020 Apr 12. <https://www.cdc.gov/media/releases/2020/p0130-coronavirus-spread.html>
- CNN. Birt: this begins and ends with community. Accessed 2020 Apr 1. www.cnn.com/videos/health/2020/03/31/deborah-birt-coronavirus-death-graphs-community-sot-vpx-ts.cnn/video/playlists/coronavirus
- American College of Surgeons. COVID-19 guidelines for triage of orthopaedic patients. 2020 Mar 24. 2020 Mar 27. <https://www.facs.org/covid-19/clinical-guidance/elective-case/orthopaedics>
- Del Rio C, Malani PN. COVID-19-new insights on a rapidly changing epidemic. *JAMA*. 2020 Feb 28. [Epub ahead of print].
- Murthy S, Gomersall CD, Fowler RA. Care for critically ill patients with COVID-19. *JAMA*. 2020 Mar 11. [Epub 2020 ahead of print].
- Kristof N, Thompson SA. Trump wants to 'reopen America.' Here's what happens if we do. 2020 Mar 25. Accessed 2020 Mar 27. <https://www.nytimes.com/interactive/2020/03/25/opinion/coronavirus-trump-reopen-america.html>

8. McCullough M. Coronavirus math shows the importance of social distancing, and the horrible consequences of not doing it. 2020 Mar 24. Accessed 2020 Mar 27. <https://www.inquirer.com/health/coronavirus/coronavirus-wuhan-math-behind-social-distancing-20200324.html>

9. Molloy IB, Martin BI, Moschetti WE, Jevsevar DS. Effects of the length of stay on the cost of total knee and total hip arthroplasty from 2002 to 2013. *J Bone Joint Surg Am.* 2017 Mar 1;99(5):402-7.

10. Baumgartner BT, Karas V, Kildow BJ, Cunningham DJ, Klement MR, Green CL, Attarian DE, Seyler TM. Inpatient consults and complications during primary total joint arthroplasty in a bundled care model. *J Arthroplasty.* 2018 Apr;33(4):973-5. Epub 2017 Nov 29.

11. Schwartz AM, Wilson J, Boden SD, Moore TJ, Bradbury TL Jr, Fletcher ND. Managing resident workforce and education during the COVID-19 pandemic. *JBJS Open Access.* 2020 Apr-Jun;5(2):e0045.