Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Perspective

Spine fellowship training reorganizing during a pandemic: perspectives from a tertiary orthopedic specialty center in the epicenter of outbreak

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Introduction

COVID-19 has changed the world significantly over the last few months as we struggle to contain the largest public health crisis in our lifetime. Nearly 2 million people have been formally diagnosed worldwide with over 100,000 deaths despite massive containments efforts. The full public health impact has yet to be recognized. There have also been significant burdens placed on our health-care system with reports of inadequate numbers of beds and ventilators. Health-care workers have been placed under great mental and physical burden with studies citing high rates of depression, insomnia, anxiety, and distress in health-care workers, especially those on the frontline [1–3]. This crisis has impacted the medical and surgical specialties in different ways. Internal medicine, general surgery, anesthesia, and intensivists have the opportunity to use specific training in managing critically ill COVID patients, and have had to ramp up work hours to meet demand. Surgical subspecialists have been impacted differently, as they have been deployed to fields outside of their subspecialties and have had to limit their surgeries to only those deemed as essential. Similar to other hospitals, in our hospital system this has manifested as spine surgeons working in the ICU and medical floors under anesthesiology and hospitalist leadership, with residents and fellows acting as assistance to the medical teams. Other hospital systems have been redeploying spine surgeons in alternative roles in a similar fashion as well [4].

Although the primary focus throughout the pandemic has been managing COVID-19 patients and ensuring a safe outcome for as many patients as possible, it is hard not to think about the potential negative impact this has had on residents and fellows in surgical subspecialties who will never regain this lost time in training. Although the Accreditation Council of Graduate Medical Education (ACGME)-staged system has allowed program directors to waive milestones

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needed to obtain a graduation certificate, a primary goal of fellowship is to obtain the subspecialty skills needed to thrive in your chosen practice with the fellowship year being critical to this. Any disruption in that time can have a significant impact on the confidence and skill of an orthopedic surgeon as he or she starts a practice. For spine surgery, specifically, it has been shown that at least 250 cases should be performed during fellowship year [5]. Although there can be significant difference in the number of spine cases a trainee is involved in during residency (average of 83 spine procedures for orthopedic residents compared with 493 for neurosurgery residents), there is no discernible difference between orthopedic spine and neurosurgical spine surgeons by the end of fellowship, highlighting the importance of this final year of "finishing school" for spine surgeons regardless of their residency background [6]. Furthermore, the lost time may affect some programs more than others based on the case volume at a particular institution and the ability of the fellowship program to adapt to increasing didactic learning in the face of decreased clinical demands. The purpose of this paper is to provide a narrative on how the spine service at a tertiary single-surgical specialty hospital at the epicenter of the pandemic has restructured itself to serve at the frontlines in the battle against COVID-19 while maintaining its mission to provide training and education to residents and fellows in spine surgery.

Current hospital landscape

The implications of the COVID-19 pandemic have altered physician practices and patient access to care. The broad changes in health-care delivery have led to the initiation of expansive policies across hospital networks. Cessation of nonurgent clinics, halting of elective cases, and initiation of telemedicine have become some of the common practices in the wake of this pandemic. The effects of these changes have been felt throughout the entirety of health care and for trainees this has led to a restructuring of education and an incorporation of resource allocation. The initiation of ACGME Stage 3 has signaled a deviation from routine graduate medical education to a complete reconfiguration of health-care delivery toward patient care [7].

The restructuring of orthopedic practices in the epicenter of this pandemic has been largely guided by the needs of the surrounding community. The decision to suspend nonessential care was made effective March 17, 2020 and was implemented to reduce unnecessary risk of COVID-19 exposures to patients and staff. This decision offered reallocation and conservation of resources to support the communities' broader response in combating this crisis while protecting patients and health-care workers. The extemporaneous effects of this decision on patient care have yet to be fully realized, however the loss of surgical volume has had immediate effects on trainees in all surgical subspecialties. Spine surgery fellows are in unique position with a focused time frame of training offering few accommodations for pauses of instruction. The effects of curtailed training greatly impacts fellows' case volumes and heightens concerns for those with limited exposure during residency [8]. This may have far reaching effects with regards to a spine fellow's preparedness for entering clinical practice.

Institutional policies have greatly altered the landscape of everyday activities within hospitals battling the current outbreak. The heightened awareness of protection of patients, health-care workers, and auxiliary staff has forced assessment of personal protective equipment and utilization mandates. Skin-based thermometers have been used to identify potentially symptomatic patients whereas surgical masks have been required for those entering hospitals. Patients and those accompanying them have been required to undergo screening protocols for potential symptoms in addition to focused travel histories. The large number of international patients within our hospital network has required initiation of screening protocols including restriction of patients from known "hot spots." Institutionally, operating rooms have been converted into double occupancy intensive care units along with designation of inpatient floors as isolated COVID-19 units. Training modules were rapidly mobilized and utilized by attendings, fellows, and residents who were being deployed to participate in medicine and intensive care teams. Additionally, all staff were trained in optimal donning and doffing of personal protective equipment, as well as ventilator and medical management of complex patients. Management of COVID-19 patients with droplet precautions as outlined by the Centers of Disease Control was widely implemented throughout the hospital as a universal precaution [9]. As these physical transitions occurred, care team restructuring rapidly transformed typical roles of physicians and staff to focus resources toward care of COVID-19 patients. Fellows rapidly filled roles for coverage needs with orthopedic trauma clinics and inpatient COVID care teams.

Changes to care delivery

The transformation of our surgical subspecialty tertiary referral center into a COIVD-19 hospital occurred in conjunction with the growing needs of the surrounding community. The alarming number of COVID-19 cases within our community during February and March rapidly elevated national and international attention with subsequent designation of New York City as a COVID-19 epicenter [10]. The implications of this pandemic altered the hospital's elective single surgical subspecialty focus to incorporate the care of COVID-19 patients. Outpatient community clinics were repurposed to serve as orthopedic urgent care clinics with the most notable transition occurring at the main hospital which housed the newly created orthopedic triage center (OTC). The institution of the OTC occurred in conjunction with surrounding local emergency departments, health-care networks and city and state officials. Fellows,

along with physician assistants, were charged with providing coverage and coordination of care for OTC patients. Fellows' clinical roles, regardless of subspecialty, transitioned to meet the needs of these orthopedic trauma patients. The repurposing of the orthopedic health-care delivery model allowed urgent and emergent onsite musculoskeletal care while accommodating medical-surgical and critical care needs inundating New York's hospitals.

Telemedicine

Telemedicine offers unique benefits of reaching patients in far-away or nearby locations in an efficient manner for the both the provider and patient. These advantages have been outlined in the literature since 1990s, but adoption has been slow due to resistance to change, cost, reimbursement, and other reasons [11−13]. Social distancing during a pandemic, however, has made implementation of telemedicine a necessity for all providers. As a result, there has been rapid expansion of telemedicine for evaluating new patients with spinal pathology and patients requiring routine follow-ups. The federal government has also eased regulations regarding utilization of telemedicine to facilitate appropriate reimbursement for physician services through "virtual" interaction [14]. This has prompted multiple insurers to reimburse at rates comparable to in-person consultation, motivating many providers to rapidly adopt this technology. However, it should be noted that video conferencing is an essential portion of telemedicine for reimbursement purposes as it reimburses at a higher and more consistent rate than isolated telephone encounters. State governments have also suspended restrictions on out-of-state providers in conducting virtual care for patients residing in their locality. These developments have allowed both attendings and fellows to provide vital spine care for patients isolated to their homes in a broad swath of our region despite being unable to physically examine them. Fellows on-call, for instance, have been able to utilize telemedicine to quickly evaluate a post-operative wound in order to avoid sending a patient to the emergency room, potentially avoiding a potential exposure of the patient to COVID-19. Surgeons have also been able to identify patients requiring essential surgery by visually identifying neurologic deficits during virtual examination.

Fellowship training

It is imperative for spine surgery fellows to gain the operative and clinical experience necessary to be independent spine surgeons. As stated earlier, the ideal number of cases for a spine surgical fellowship is 250 [5,15]. If a fellow is doing fewer, he or she may not be getting enough operative experience. On the other hand, if there are significantly more operative cases, there is a possibility that outpatient care, teaching, and research are being compromised. Most spine surgery fellowships around the country are designed in a manner that fellows will have done around 250 cases by the last quarter of the year. As a result, the anxiety of decreased caseload has been somewhat alleviated by the fact that the pandemic arrived in earnest by late March of the training year.

Given the unexpected increase in time without clinical responsibility that the abrupt stoppage in elective spine surgery has resulted in, several fellowships, including ours, have creatively found ways to optimize educational opportunities. This includes the completion of numerous research projects as well as the formation of a comprehensive educational curriculum involving staff, fellows, and residents that includes daily didactic sessions. Combining this with the unexpected opportunity to work with medical colleagues caring for patients suffering from COVID-19 and/or other serious medical conditions that required inpatient medical care has resulted in a well-rounded educational experience that no one would have predicted.

ACGME update

The continued evolution of the COVID-19 outbreak has brought forth a new conceptual framework that allows graduate medical education (GME) to continue operating during this pandemic. The pressures of the COVID-19 pandemic have been recently mounting throughout the United States. As a result, many "COVID-19 positive" patients are requiring care at teaching hospitals. As such, the ACGME has developed a 3-stage guideline to support institutions during the current pandemic (Table). Stage 1 is considered as "business as usual" [7]. In stage 2, trainees continue with clinical duties and educational sessions. During this stage trainees must adhere to work hours with supervision from attendings, even if these duties are not directly related to general activities within the fellowship. Emphasis is diverted away from specific case logs and programs will not be penalized if case logs are lower than expected [7]. If stage 3 is initiated, academic activities of all fellowships are cancelled [7].

In regards to graduation, each program director has been directed to evaluate each fellow based on specific subspecialty milestones [7]. Specifically, if a fellow has met milestones, the program director can graduate that fellow, at their discretion, in communication with the fellow. However, in the case where a fellow has not met specific milestones, the ACGME has not yet provided a detailed plan. Currently, graduation would remain at the discretion of the program director in concert with departmental leadership.

What now?

It is highly unlikely that any spine fellow currently in training has faced a pandemic similar to COVID-19. The current outbreak has resulted in widespread work stoppages, hospital-wide reorganizations, drastic changes in societal norms, and has raised new amounts of anxiety and uncertainty for everyone [2,16,17]. As such, everyone is glued to various media outlets in hopes of learning as much

Table
Stages of ACGME pandemic response

	Stage 1: Business as usual	Stage 2: Increased clinical demands guidance	Stage 3: Pandemic emergency status guidance
Definition	No significant disruption of patient care and educational activities; planning underway for increased clinical demands	Some residents/fellows need to shift to patient care duties; some educational activities are suspended	Most or all residents/fellows need to shift to patient care; majority of educational activities are suspended
Requirements in effect	Governed by the Common and specialty-specific Program requirements	Governed by the Common and specialty-specific Program Requirements and variances	Governed by four overriding requirements: • Work hour limit requirements • Resources and training requirements • Supervision requirements • Fellows allowed to function in core specialty
Flexibility	ACGME activities suspended: • Site visits (accreditation, recognition, and CLER) • Self-Study • ACGME Surveys Telemedicine requirements in effect	Stage 1 plus variances: - Increased Clinical Demands Guidance, on the following: Fellows working as attendings • Residents/fellows • reassigned • fail to accrue required minimums • Graduation • Educational program changes • Review Committee evaluation of disruptions	Stages 1 and 2 plus specialty-specific requirements waived
ACGME notification		If educational activities are disrupted for over 30 days, contact the relevant Review Committee Executive Director	Sponsoring Institutions can declare Pandemic Emergency Status; contact Institutional Review Committee Executive Director

Adapted from https://acgme.org/COVID-19/Three-Stages-of-GME-During-the-COVID-19-Pandemic

as they can about how others are being impacted by this health crisis and what their response to the pandemic has been. Fellows (as well as residents and attendings) have been forced to adapt to a situation that is extremely unfamiliar [18,19]. It is only human to be frustrated over losing crucial weeks (and may be months) of operative training. At the end of the day, however, mitigating the outbreak and serving society is an opportunity that we are unlikely to ever have again, and ultimately, is the reason we decided to pursue medicine.

During this pandemic, surgical trainees have undergone significant temporary reassignments to help cover the emergency department, inpatient care, and intensive care units. Not only has this helped alleviate the health care worker shortage, but it has also resulted in new relationships with colleagues across all specialties. As such, the new lessons of dynamic teamwork, empathy, courage, and quickly learning new tasks are essential to the personal development and the molding of a physician. This pandemic has forced everyone to understand the concept of rational management of limited resources and new versatility to adapt to constant change and uncertainty. It is important to remember that the role of surgical subspecialty trainees during this COVID-19 pandemic is critical and many have played a significant role in supporting health-care colleagues and society. At some point, this crisis will pass, but until then, it is important to remain vigilant and serve our communities with whatever skills that have been bestowed upon us. There will come a day where all clinicians will return focus to their particular subspecialty. But until then, we have been given the gift of opportunity, and it is our duty to make the most of it, and play our role in guiding our communities through this pandemic.

Conclusions

The COVID-19 pandemic has brought many challenges to our hospital system. Hospital leadership was tasked with turning an orthopedic specialty hospital into a facility that could properly care for critically ill COVID-19 patients, while at the same time ensuring the proper safety of the entirety of the health-care team. This was only possible with exquisite team work and unity throughout the hospital system. Changes that were made to hospital practice structures will benefit the community and ultimately our hospital system through this COVID-19 crisis and beyond. This includes ensuring proper training for our residents and fellows and adapting to the community as this crisis dictates. The spine fellowship has been impacted, but not diminished, by this crisis and ultimately we are uniquely positioned for the future to have had the opportunity to learn from a pandemic that has been unseen for the last 100 years. This will pass and we will be stronger than ever.

Supplementary materials

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.spinee.2020.04.015.

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