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After the COVID-19 Pandemic: Returning to Normalcy or Returning to a New Normal?



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ABSTRACT

The novel coronavirus, severe acute respiratory coronavirus 2 (SARS-CoV-2), pandemic has delivered a profound and negative impact on the United States. The suspension of elective surgeries including arthroplasty will have a lasting effect on all stakeholders including patients, physicians, and healthcare organizations within the US healthcare system. Resumption of elective hip and knee arthroplasty will need to be carefully focused. The purpose of this work is to address potential strategies, concerns, and regulatory barriers in restarting elective hip and knee arthroplasty in the United States.

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A novel coronavirus, now called severe acute respiratory coronavirus 2 (SARS-CoV-2), began in Wuhan, Hubei province, China, and is now a public health emergency of international concern [1,2]. In the United States, the COVID-19 pandemic has led to widespread social distancing, shelter-in-place, and workplace closures. Because of concerns for healthcare resources in initial US pandemic modeling and the experience within New York City and surrounding areas, the US Surgeon General and the Centers for Medicare and Medicaid Services issued guidance to stop performing elective surgeries in the United States [3–5]. This recommendation was based on concerns for the quantity of personal protective equipment present within the United States. A recent

report regarding the COVID-19 pandemic from the US Department of Health and Human Services showed that hospitals are experiencing increasing costs and decreasing revenues which threaten their financial viability. Hospitals have reported that ceasing elective procedures and other services has decreased revenues while their costs have increased as they prepare for a potential surge of patients. Many hospitals reported that their cash reserves are quickly depleting, which could disrupt ongoing hospital operations [6]. As predictive models of the impact of COVID-19 on the United States continue to be refined with more data, the delivery of healthcare services outside of COVID-19 must be addressed.

One of the more commonly cited COVID-19 projection models is produced by the Institute for Health Metrics and Evaluation at the University of Washington. Their current projections show that April 11, 2020, will be the day with maximum resource utilization (intensive care unit beds, ventilators) within the United States. This model assumes that social distancing will be in place until the death rate from COVID-19 falls below 0.3/million people, or likely through the end of May. It also forecasted zero deaths in July and August from COVID-19 if appropriate measures, including mass screening, contact tracing, and foreign national testing upon entry to the United States, and quarantine of infected patients are put in place to guard against the reintroduction of COVID-19 from another

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state or country. Historical examples like the “1918 Spanish flu” pandemic show that multiple waves of the viral diseases occurred over many months. In the 1918 pandemic, the highest mortality was in the second wave (fall) of 1918. The 2002 severe acute respiratory syndrome (SARS) and the 2009 H1N1 swine flu did not follow similar patterns as the earlier pandemic. Indeed, the evidence suggests that there is no predictable temporal patterns for major viral influenza pandemics [7].

The 2020 COVID-19 pandemic has drastically negatively affected the US economy. While the traditional definition of a recession necessitates 2 quarters of economic downturn, many have already referred to the United States as in a recession [8]. A systematic review showed that economic downturn generally decreases the volume of most elective surgical procedures, although a few procedures increased in volume [9]. One study reported that the rate of cancellations of total joint arthroplasties was increased during the last economic recession and appeared to be related to unemployment and consumer confidence [10]. Conversely, another study using the US Nationwide Inpatient Sample showed that the 2007 economic recession did not substantially influence growth trends in total hip and total knee arthroplasty. Importantly, the acute economic downturn could result in the loss of employer-provided healthcare insurance for 12 to 35 million people, with an increase of 11 to 13 million people enrolled in Medicaid, and the number of uninsured could increase to 40 million with bigger impacts in Medicaid nonexpansion states [11]. The economic downturn and associated volatility have the potential to meaningfully impact the volume of elective total joint arthroplasty procedures.

As the medical system looks ahead to resume elective arthroplasty cases, there are certain financial issues to be considered. As with the so-called practice of “cherry-picking” and “lemon-dropping” of patients based on the case complexity and resource requirements, an analogous scenario exists with the payer mix. By the time elective surgeries are resumed, the medical system will be under considerable financial strain due to a several month hiatus of incoming revenue. As such, there will be enormous pressure to quickly ramp-up surgical volume to meet both the financial needs of the institution and the medical needs of the large cohort of patients whose surgical procedures were put on hold because of the COVID-19 pandemic. There could very well be a tendency to prioritize patients with straightforward cases who have minimal comorbidities and insurance plans with favorable reimbursement fees. Previous studies have demonstrated that patients with increased medical comorbidities can increase the risk of post-operative complications which can lead to increased costs to the medical system [12–17]. It has also been shown that economically disadvantaged patients have lower function and quality of life before and after total joint arthroplasty [18,19] and experience higher risk of certain complications and use more resources after primary total joint arthroplasty when compared with non-economically disadvantaged patients [20]. With this in mind, there is potential for a widening disparity of care for those who are most vulnerable and for the underserved to become even less served [21,22]. It remains to be seen how the systems will address these potential disparities while striving for economic stability.

The resurgence of elective surgeries will likely require abundant administrative resources. In order to meet these demands, optimizing hospital and practice administrative resources for scheduling surgeries, obtaining pre-authorization (when necessary), and coordinating preoperative medical clearances will be critical to avoid an overwhelming situation. Moreover, insurance companies will need to be ready on their end to process the large number of pre-authorization requests. It is unclear whether the healthcare administrative and payer infrastructure will be able to withstand the potential vast increase in surgeries in the post-COVID period.

For academic programs during this time period, financial regrowth and optimizing efficiency may be at odds with resident and fellow education. Previous reports have demonstrated longer operative times, greater healthcare resource utilization, longer hospital stays, and higher costs at teaching hospitals [23–25]. Balancing the need for efficiency and cost mindfulness with the need to educate residents and fellows in the operating room may be challenging. One solution to this may be to utilize existing midlevel staff (ie, physician assistants and nurse practitioners) to help with the increased caseload and overall throughput in the hospital and thereby facilitate attending surgeons’ ability to continue with resident and fellow education. Also, to address the backlog of postponed surgeries and remain efficient, hospital systems may need to utilize multiple “flip rooms” with extended hours into the evening and weekends. Initially this may result in an increased overhead as there will be a time lag between the start of elective surgery recommencing and receipt of payments. But over time, the revenue stream will be revived, and hopefully economic equilibrium will be achieved.

Aside from the financial implications, logistical planning as it relates to handling of known positive or suspected COVID-19 patients is still under discussion. At the time of this writing, the only tests available for detecting the virus are nasopharyngeal swab or bronchoalveolar lavage polymerase chain reaction rapid testing for the SARS-CoV-2 genetic material. Some institutions with capacity for testing have implemented preoperative testing for all preoperative patients. For nonemergent, urgent elective cases, a COVID-19 test is obtained 48 hours before the scheduled procedure. If test is negative, then surgery may proceed as scheduled with patient and surgeon understanding that the true false-negative rate for testing in asymptomatic patients is unknown. However, if the test is positive and the procedure can be delayed, the surgery is rescheduled for a later date.

Antibody testing may be another means to assess patients’ COVID-19 status. There is still only preliminary data regarding the antibody response that occurs after exposure to the novel coronavirus. In a recent study out of China, the median duration of IgM and IgA antibody detection was 5 days, while IgG was detected 14 days after symptom onset [26]. It remains unknown for how long the IgG antibody response will persist, and whether it will confer long-term immunity. Nonetheless, serologic testing for antibodies to the SARS-CoV-2 virus is under development for clinical use. On April 1, 2020, the Food and Drug Administration approved the first commercial serologic test in the United States. It is anticipated that there will be several commercial tests available in the near future. Antibody testing would provide a clearer understanding of the prevalence and fatality rate of the disease, because it could identify patients who had the virus even if they had mild or no symptoms. The widespread utilization of antibody testing may also have a large impact on the clinical care pathways for arthroplasty patients as it may have implications for an enhanced ability to segregate patients into known immune and nonimmune categories (if the case for long-term immunity can be proven with IgG antibody detection). This may facilitate the establishment of separate COVID-19 and non-COVID-19 zones within a hospital or perhaps even the designation of dedicated COVID-19 and non-COVID-19 hospitals.

This also raises the question of how to maintain underutilized staff within the hospital during the ongoing pandemic surge and keep them healthy and prepared to resume elective surgical procedures once the temporary restriction is lifted. There have been some reports of health systems cutting the salaries of underutilized medical staff or even furloughing them during this crisis [27]. Other health systems have proposed repurposing staff to help with the overwhelming number of COVID-19 patients that are engulfing much of the financial and manpower resources within the hospital

systems. With the passage of the recent Coronavirus Aid, Relief, and Economic Security Act (“CARES Act”), \$100 billion has been made available to “eligible healthcare providers” for healthcare-related expenses or lost revenues attributable to the COVID-19 pandemic. This influx of emergency financial assistance may help offset lost revenue during the pandemic and permit the preservation of a healthy workforce which would be well prepared for redeployment.

Another issue which will likely require significant attention is how to decide which patients should receive priority for proceeding with surgery once elective surgeries are reinstated. It is likely that elective procedures will slowly be reinstated in a staged fashion over a period of weeks to months once the surge has passed. Because SARS-CoV-2 is a newly identified pathogen, there is no preexisting immunity to it in the human community, and there is no definitive cure to treat the disease. This is problematic for all patients. However, the elderly, those with underlying chronic conditions, and those with weakened immune systems are particularly vulnerable. From the early experience with COVID-19 in China, it was reported in a recent JAMA article that those aged 70 to 79 years had an 8.0% case fatality rate (CFR), and in those aged 80 years and older the CFR was 14.8%. The CFR was notably elevated among those with preexisting comorbid conditions—10.5% for cardiovascular disease, 7.3% for diabetes, 6.3% for chronic respiratory disease, 6.0% for hypertension, and 5.6% for cancer [28]. In a recent meta-analysis from China which evaluated 46,248 infected patients, it was noted that hypertension, respiratory system disease, and cardiovascular disease were significant risk factors for patients infected with the SARS-CoV-2 virus to develop severe disease compared to patients who had nonsevere disease [29]. A recent study from Wuhan, China, reported on 34 patients who were in the incubation period of infection with COVID-19 and were unintentionally scheduled for elective surgery. Postoperatively all 34 patients developed pneumonia, and 44.1% of the patients needed intensive care unit care, and 20% of the patients died [30]. This mortality rate is much higher than the reported overall CFR of 2.3% in COVID-19 patients without surgery [28]. The authors also noted a shorter onset of severe symptoms in this group of postsurgical patients compared to other reports of nonsurgical COVID-19 patients. Because of this and the overall significantly higher mortality rate, the authors hypothesized that surgery may accelerate and exacerbate disease progression of COVID-19 [30]. As such, it may be reasonable to initially restrict elective arthroplasty to those patients without significant medical comorbidities during the early stages of resuming elective procedures when there will still be some degree of COVID-19 patients present in the hospital. This could minimize the risk of postoperative patients developing severe disease should they be exposed and infected with the coronavirus. Analysis of US Medicare data reveals substantial regional variation in patients at the highest risk, and rates of arthroplasty resumption may concomitantly differ [31]. As the census of COVID-19 patients begins to diminish, it may then be safe to reintroduce patients with more concerning comorbid diseases into the hospital setting to undergo elective surgical procedures in parallel pathways of care.

One of the considerations moving forward is to further increase the volume of outpatient arthroplasties in a nonhospital setting. This approach is attractive because an ambulatory surgery center located remote from a hospital might be better able to isolate and prevent the spread of the coronavirus. Over the past decade, there has been increasing interest in performing primary hip and knee arthroplasty in the outpatient setting, with these procedures having been successfully performed during the past decade by a select group of surgeons and institutions with multidisciplinary care team coordination, standardized perioperative protocols, discharge planning, and careful patient selection [32–46]. Multiple

systematic reviews have reported that outpatient arthroplasty is safe and effective [43,47,48]. In 2018, the American Association of Hip and Knee Surgeons, Hip Society, Knee Society, and American Academy of Orthopaedic Surgeons put forth a position statement supporting the notion that some primary hip and knee arthroplasties can be appropriately and safely performed in the outpatient setting with discharge on the day of surgery provided strict preoperative patient selection, standardized perioperative protocols, safe discharge plans, and sufficient practitioner and surgeon experience are maintained [49]. The current COVID-19 pandemic may impel an increased utilization of outpatient surgery centers for primary total hip and knee arthroplasty in appropriate patients in order to disencumber the strain currently placed on hospital systems managing patients with COVID-19 disease.

Regardless of the location of the procedure, it is likely that there will be increased demands placed on surgeons to handle the large volume of procedures that will need to be performed over the course of the next several months. Questions will arise as to how we as surgeons will meet this demand, maintain quality care and safety for our patients, and protect ourselves from COVID-19 exposure and from fatigue and surgical errors. Discussions are already occurring regarding increased operating room (OR) volumes with extended hours into the evening and weekends [50]. Such an increased work burden will undoubtedly place additional stress on surgeons, anesthesia staff, residents, fellows, physician assistants, nurse practitioners, nurses, and surgical technicians which may lead to physical and mental fatigue as well as strain on their mental health and overall well-being. Fatigue has been described as both physical and mental weariness and has been shown to negatively impact surgeon performance [51]. Recent literature has also described another component of fatigued performance known as “decision fatigue” which describes a declining ability to repeatedly make critical decisions—independent of physical or mental weariness [52]. A 2003 study of surgical errors by Gawande et al [53] found that 16% of self-reported surgical errors at 3 teaching hospitals in Massachusetts were attributed to surgeon fatigue. A similar study among Harvard orthopedic residents found that those functioning at a fatigued, sleep-deprived level demonstrated a mean 22% increased risk of medical errors attributable to fatigue [54]. The number of cases being performed in a day along with the case order is also important. A recent study demonstrated that surgical case order is an independent risk factor for adverse events in arthroplasty procedures, with procedures performed later in the day having a higher risk of arthroplasty-specific adverse events (but not for systematic adverse events). Significantly increased operative time, higher cost, and longer length of stay were noted for fourth or later arthroplasty cases ($P < .01$) [55].

Taking this all into consideration will be critical to developing a safe and efficient strategy for moving forward once elective surgeries are reinstated. Fatigue risk mitigation and enhanced safety strategies have been outlined by Janofer et al. Key components include comprehensive preoperative planning, promoting fatigue awareness, and taking intraoperative “microbreaks” [52]. Some of the key applications of these strategies include establishment of clear operative team roles, responsibilities, and assigned tasks in a preoperative team brief; reduction of need for extra intraoperative decisions; optimization of surgeon sleep, nutrition, and hydration to maximize surgeon endurance; and establishment of a detailed backup contingency plan [52]. Preoperative safety checklists are another procedural safeguard to help ensure patient safety. It has been shown in multiple studies that performance of a preoperative safety checklist reduces wrong site surgery, improves timely administration of prophylactic antibiotics, and decreases postoperative complications and mortality [56,57].

How to optimally balance the needs for processing a large surgical volume with patient and staff safety will likely be varied and institutionally dependent. However, there have been several reports in the literature outlining integral strategies to successfully yield high operative efficiency and productivity. An article by Attarian et al [58] reported improved OR efficiency and productivity via improved communication, elimination of silo mentalities, enhanced team work, and high-efficiency OR teams adapting parallel processing. Implementation of these types of strategies, particularly enhanced communication with anesthesia, OR staff, and central processing for short turnover times, will be crucial for high efficiency and productivity. One of the more profound tenets identified in this article for the success of the program was “sincere gratitude to the team players every day” [58]. During this critical time, the importance of such a creed cannot be overemphasized. In addition, clear communication with industry vendors during this time will also be essential for ensuring the necessary instruments and implants are available, especially if supply chains are disrupted or not fully replenished to keep up with the heightened demand.

Temporary regulatory changes could help the nation’s surgeons meet pent-up demand, especially if surgeons have been sharing off/on rotations. In academic medical centers, allowing more liberal overlap of routine procedures with resident assistance would increase efficiency. Many programs have developed new active and remote resident rotations; guidance from the Accreditation Council for Graduate Medical Education (ACGME) and/or the Residency Review Committee (RRC) on tracking compliance with the 80-hour workweek during the pandemic would help avoid multiple disparate interpretations.

Many patients are limited in terms of expertise with the technology to be reached through telemedicine. Temporary relief of certain Health Insurance Portability and Accountability Act (HIPAA) requirements has been granted from the Department of Health and Human Services’ (HHS) Office of Civil Rights through notification of enforcement discretion that allows for temporary use of more commonly used video and messaging products so long as they are “nonpublic facing” [59,60]. This could make communication smoother and help reduce telephone “tag.” Temporary allowance to use smart phones in this fashion would allow virtual rounding through nurses or physician assistants on stable patients at hospitals separate from the one where the surgeon is busy in the OR and would diminish hospital-to-hospital contamination. It is recommended that the reader familiarize oneself with the details of this temporary change and be prepared for its ending.

Younger surgeons are facing added stress, and the American Board of Orthopaedic Surgeons could help relieve that part arising from meeting certification requirements. This has occurred in part already on April 8, 2020, with the American Board of Orthopaedic Surgeons announcing changes to the case collection period [61]. They had already allowed for time away limits to be averaged over time. They have yet to change the dates for written and oral boards in July of this year; given the disruption, postponing both by 4 to 8 weeks would probably be welcomed by applicants. Finally, failure on the written boards is usually accompanied by notification that the applicant is unable to self-describe as “board eligible” until passing; again, given the disruption, relaxing that rule to allow for one failed examination before receiving that status could be understood to be a one-time exception.

All normal timelines should be negotiable. A collective action by fellowships to allow for an extra month before new fellows start would allow the programs to keep their current fellows an extra month if outside practices and hospitals do not have the reserves to hire at this time. The funding for graduate medical education could be revised for 1 year to allow for current chief residents to stay as instructors with a salary increase for 1 or 2 months awaiting to start

fellowship. In both cases, the more site-specific efficiencies would be maintained and the pandemic curve allowed to reach its nadir before multiple young physicians move from one medical center to another throughout the country.

There has already been noteworthy short-term regulatory relief from the Centers for Medicare and Medicaid Services [62,63]. It would help if the overlapping procedure rules when with residents could be relaxed such that the key or critical presence component has been physically met for routine cases without having to document an available second surgeon. The Center for Medicare and Medicaid Innovation had proposed a 3-year extension of the Comprehensive Care for Joint Replacement (CJR) alternative payment plan/bundle with new rules; the current CJR has been extended to March 31, 2021; in addition, caps on expenditures were placed 30 days before and during the declared national emergency, and the Extreme and Uncontrollable Circumstances policy applied to CJR, MIPS, and ACOs [64,65]. COVID-19 is a new disease affecting the population broadly with yet to be defined long-term consequence for those who become ill, especially those of Medicare-eligible age. The risk adjustments for CJR, Value-Based Purchasing, the Readmission Reduction Program, and the hospital-specific and surgeon-specific cost measures are now hampered. The disease and its aftermath could arguably warrant a new hierarchical condition category to be considered in federal performance measure risk models. Knowing its full impact may take time and clearly is going to be regionally disparate; temporarily lifting those measures and their financial impacts could avoid undue burdens on the hospitals of the regions hardest hit.

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