

The Impact of COVID-19 on Surgery and Procedures: A Commentary

Frank Annie¹, Jaineet Singh Chhabra¹, and Aravinda Nanjundappa¹

¹Affiliation not available

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Frank H Annie, PhD¹; Jaineet Singh Chhabra³; Aravinda Nanjundappa, MD²;

¹CAMC Health Education and Research Institute

3200 MacCorkle Ave. SE, Charleston, WV 25304.

²CAMC Vascular Center of Excellence, Charleston Area Medical Center.

3200 MacCorkle Ave SE, Charleston, WV 25304

³Marshall University, School of Medicine.

1600 Medical Center Dr, Huntington, WV 25701

Study Locations:

Charleston Area Medical Center, 3100 McCorkle Ave SE, Charleston, WV, 25302 and Charleston Area Medical Center Research Institute and Center for Clinical Sciences Research, 3200 McCorkle Ave SE, Charleston, WV, 25302

Correspondence:

Frank Annie M.A; MPA, PhD

Research Scientist

CAMC Health Education and Research Institute

3200 MacCorkle Ave. SE,

Charleston, WV 25304

Phone 304-388-9921

Fax: 304-388-9921

Email: Frank.H.Annie@camc.org

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Background

Originating in Wuhan, China at the end of 2019, Coronavirus 2019 (COVID-19) is a disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (1). The World Health Organization (WHO) first characterized COVID-19 as a pandemic on March 11, 2020 to promote the need for better detection and spread containment internationally (2). Healthcare facilities across the United States (U.S.) are significantly changing their operations to protect patients and employees from exposure, including use of telehealth communication for triage, assessment, and care for patients with mild illnesses (3). For emergency cases, the American College of Surgeons (ACS) recommend lead physicians and administrators organize alternative measures in response to trauma, cardiac, and stroke systems reaching full capacity when possible (4). While practice of social distancing is currently the best way to prevent overload of our healthcare system and protect our employees (5), the ACS, in compliance with CDC guidelines (6), gently reminds us that postponement of elective surgeries or procedures may eventually prompt emergent cases due to disease progression (7). When elective cases and procedures become emergent, non-deferrable interventions require strict adjustment of hospital protocol. Aside from minimization of contact and appropriate use of personal protective equipment (PPE) during mass casualty incident (MCI) response, major Italian surgical and anesthesiologic societies emphasize the need of segregation of COVID-19 and non-COVID-19 patients requiring surgery along with careful monitoring of resource usage such as staff, intensive care beds, material, and device conservation (8).

Singapore General Hospital, a large tertiary level acute care center, implemented some these disaster measures before Coccolini et al. published their insights. They divided surgical staff members, including on-call anesthesiologists, into two groups, in which one exclusively cared for patients infected or suspected to be infected with COVID-19 while the other group managed treatment for non-COVID-19 patients. They also postponed non-urgent preoperative assessment clinic visits, relocated elective surgeries for non-COVID-19 patients to their main operating room (OR) complex away from three smaller ORs housing COVID-19 cases, switched to stricter sanitary practices, and ran *in situs* simulations to prepare for unexpected problems during crisis. With repetition, team members comprising various surgical disciplines improved their ability to address situational problems including scenarios involving infection control breaches and unsatisfactory equipment set-up (9). In accord with Singapore General Hospital, there are other organizations that aim to use their experiences with COVID-19 to create a system that best addresses the needs of all patients requiring procedural or surgical intervention. The Asian Pacific Society for Digestive Endoscopy affirms that deferment of elective procedures, such as non-emergent endoscopies, is essential to prevent further spread. However, they suggest that semi-urgent procedures be reviewed on a case by case basis (10). In collaboration with Asian and European Organizations, major departments of Otolaryngology across the U.S. are making strong efforts to emulate the strict safety guidelines employed by centers in Singapore and Hong Kong when considering intervention for patients who are not necessarily in need of emergent treatment (11).

Just prior to the COVID-19 pandemic declaration, evidence from China indicated case fatality rates in patients with preexisting comorbid conditions at 5.6% for cancer, 6.0% for hypertension, 6.3% for chronic respiratory disease, 7.3% for diabetes, and 10.5% for cardiovascular disease (CVD) (12). Though COVID-19 is greatly associated with respiratory illness (13) in elderly patients (14), the impact of this virus on hypertension and cardiovascular disease (CVD) also requires significant attention given that SARS-CoV-2 infects host cells via angiotensin-converting enzyme 2 (ACE2) receptors. These receptors are highly expressed in both the lungs and heart (15). Considering the role of ACE2 in SARS-CoV-2 entry, there is much debate whether angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin receptor blockers (ARBs) should be administered to hypertensive patients. However, there is currently little evidence that clearly shows whether ACEIs/ARBs inhibit ACE2 or upregulate it. Major organizations, including the American College of Cardiology (ACC) and the European Society of Cardiology, strongly recommend that physicians continue giving ACEIs/ARBs per standard protocol until further investigations suggest otherwise (16,17). The ACC also cites the need for further investigation to determine the impact of COVID-19 on CVD-naïve patients that were otherwise healthy prior to infection (18). Though preoperative administration of ACEIs/ARBs

remains the same, delaying surgery for non-COVID-19 and COVID-19 patients with chronic hypertension may negatively affect their care due to a highly individualized treatment regimen (19) that could be further complicated by disease progression.

In addition to the possible impact of COVID-19 on blood pressure management, its negative effects on patients with underlying CVD, potential cause of acute myocardial injury (20), and facilitation of the FDA's approval for use of extracorporeal membrane oxygenation (ECMO) in lieu of ventilators (21) pose great challenges for healthcare staff involved in cardiovascular care. The ACC and Society for Cardiovascular Angiography and Interventions (SCAI), in accord with other disciplines, recognizes that teams, including cardiac surgeons, interventional cardiologists, and anesthesiologists, must make difficult decisions regarding whether they should proceed with scheduled valvular or structural interventions. The ACC/SCAI advise teams move forward on a case by case basis (22). For example, it is currently reasonable to postpone scheduled transcatheter aortic valve replacement (TAVR) procedures for asymptomatic patients with severe aortic stenosis while monitoring them via telehealth communications as opposed to delaying intervention for symptomatic patients who are at high risk of clinical deterioration, prolonged hospital stay, or repeat hospitalization. Complexity becomes increasingly apparent, however, when considering symptomatic TAVR candidates who could also benefit from percutaneous coronary intervention (PCI). Per the ACC/SCAI consensus statement, PCI scheduled or recommended for symptomatic TAVR candidates before implantation of their new aortic valve should be deferred unless coronary artery disease (CAD) is affecting clinical presentation. Those on the front lines in Italy agree that comprehensive cardiovascular care need be multifaceted and integrative (23), suggesting that multidisciplinary organization and collaborative preparedness will help us better manage patients with CVD.

The COVID-19 Guidelines for Triage of Vascular Surgery Patients established by the ACS do provide some direction regarding non-emergent cases, such as allowing a surgeon to exercise judgment when considering repair of an abdominal aortic aneurysm (AAA) > 6.5 cm or revascularization for a high grade restenosis stemming from previous intervention (24). Though elective cases must be postponed, vascular department heads worldwide are collaborating on safe surgical and procedural measures for patients requiring non-emergent, as well as emergent, care. Vascular surgery leadership at Walter Reed National Military Medical Center conveys the importance of forming international partnerships, calling attention to how the U.S. military drew on the experiences of other nations and amassed their support to handle the crisis that took place on 9/11/2001 (25). The aforementioned safety measures that some health centers in Singapore are taking extend to their vascular surgery departments. Emulation of their team segregation practices, excellent use of telehealth, and resource conservation (26) will possibly better enable U.S. health systems to keep workers and patients safe while addressing gray areas related to elective surgery cancellations.

There is proposal of using some ambulatory surgery facilities, due to their closure, for resource contribution that may partially relieve the current strain on our healthcare system (27). Though additional evidence is needed to elucidate special safety measures and confirm the overall benefit of this suggestion, improved resource distribution may help U.S. organizations provide broader care without ignoring the situation at hand. Delaying interventions, especially for patients with vascular and/or structural heart disease, enables worsening of minor to moderate conditions. Additional evidence is necessary for determining how we can safely treat both non-COVID-19 and COVID-19 patients requiring surgeries or procedures during this pandemic, as cancellation of elective interventions may have larger implications than minor inconveniences. Literature citing association between past receipt or donation of organs and negative outcomes stemming from SARS-CoV-2 are also lacking (28). Along with provision of multidisciplinary care for COVID-19 patients and the importance of adjusting to constantly evolving information, it is crucial for us to remember that there are non-infected persons with progressive diseases directly suffering from this crisis as well.

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