Will the COVID-19 Epidemic Reshape Cardiology?
Mohamad Alkhouli MD1, Megan Coylewright, MD, MPH2, David R Holmes MD1

1 Department of Cardiovascular Medicine, Mayo Clinic, Rochester, MN
2 Section of Cardiovascular Medicine, Heart and Vascular Center, Dartmouth-Hitchcock Medical Center, Lebanon, NH

Corresponding Authors:
Mohamad Alkhouli, MD FACC
Department of Cardiovascular Medicine
Mayo Clinic School of Medicine
200 First Street SW | Rochester, MN 55905
Phone: 507-255-2502
Fax: 507-255-2550
Email: Alkhouli.Mohamad@mayo.edu

Twitter Handles:
@adnanalkhouli, @MCoylewright, @davidrholmes2

Disclosures: none

Acknowledgment: none

Data user agreement: The data underlying this article will be shared on reasonable request to the corresponding author.

Word Count: 1,956
2,146 (all inclusive)

Key Words: cardiology; coronavirus; telemedicine; medical education; medical practice.
The emergence of the novel coronavirus infection (COVID-19) began a series of unparalleled changes in health care systems worldwide. In the United States, the rapid evolution of the epidemic poses unprecedented challenges to hospitals, medical staff, training programs, policy makers, and professional societies. For cardiology, COVID-19 brings substantial changes to the way we conceptualize and practice medicine. As others have observed, the abrupt change of our routines and priorities offers us the opportunity for reinvention; in this space, we can critically examine several facets of our profession. In this perspective, we discuss key questions resonating in the cardiology community in the midst of the epidemic. The discussion is structured around three domains: clinical practice, education and training, and professional values. We describe the immediate ramifications and potential long-term impact of COVID-19 on each domain.

Clinical Practice:
Cardiology has a long history of excellence in large clinical trials, informing clinical guidelines that shape everyday practice. The rapid escalation of the epidemic mandated immediate adjustments and reprioritization of outcomes in several aspects of our practice. The wellness and safety of the healthcare workforce, in the context of a pandemic posing great risk to those providing direct care, now competes with patient access to cardiovascular clinical encounters, testing and procedures. Those are demonstrated in 3 realms:

1. Prioritization of “essential” procedures: Following the March 12, 2020 declaration from the World Health Organization of an international emergency, many hospitals mandated that elective procedures be postponed. On March 18, 2020, the Centers for Medicare and Medicaid Services (CMS) followed, and called for all non-essential procedures to be postponed to help containment efforts, and to preserve personal protective equipment (PPE). However, balancing the complex
equation of risks and benefits to a specific patient and their health care team is nearly impossible. Identifying which cardiac procedures were deemed to be “essential” was immediately recognized to be challenging. Although professional societies published timely recommendations to navigate this complex process, several issues became evident. First, the length of the deferment period is uncertain and undergoing dramatic evolution. Initial plans to defer procedures for 4 weeks are repeatedly modified due to variations in predictive modeling for timing of local “surges” of COVID-19 cases, driven in part by the inter-state differences in the epidemic spread in the setting of varied mandates for stay-at-home orders, school and business closures and adherence to social distancing. Second, there are limited data to support the safety of deferring certain procedures. For example, societal recommendations suggested that low-risk patients with Non-ST-elevation myocardial infarction may managed medically. However, no data are available to support postponing angiography >72 hours or forgoing it in this setting. Similarly, triaging of symptomatic patients scheduled for aortic valve replacement or pacemaker implantation presented another clinical conundrum due to the unpredictable course of those ‘relatively’ stable patients. Third, physicians are facing another unanticipated problem; the anxiety and stress inflicted on the patients and their families due to delaying what they perceive as life-saving treatment. This requires a high level of engagement from healthcare providers to frequently remotely counsel patients and their families. Although shared decision-making is a central focus in many procedural decisions within cardiology, cardiologist are now serving more paternalistic models in their conversations with patients as choices are limited.

2. Expanded use of telemedicine: Prior to COVID-19, telehealth was limited to specific cardiovascular services mostly in rural areas. However, considering the risk and logistical challenges of patient travel to healthcare facilities, CMS and other payers allowed the expansion
of virtual visits to a wide range of patients and healthcare providers. Institutions had to quickly scale up their telemedicine abilities, upgrade their virtual private networks, and coach physicians and other healthcare workers on the use of the technology. In addition, telehealth further expanded to an unexpected district, inpatient care. To reduce the risk of infection, cardiologists were often asked to utilize telehealth tools to communicate with patients with confirmed or suspected COVID-19, and to provide counseling and/or proctoring to colleagues at other institutions. Whether this remarkable growth in the use of telemedicine to deliver cardiovascular care will continue beyond the epidemic remains to be seen. Expanding flexibility for deployment in cardiology, including options of working from home, has been discussed as an important aspect of the ability to recruit and retain physician parents or caregivers of elderly family members. This may prove to be a positive addition in efforts to diversify the field given that women are more likely to carry the bulk of these responsibilities.

3. Emergency Preparedness: Disaster preparedness plans have been integral to the operation of large institutions including hospitals and other healthcare facilities. However, this concept is not as familiar to cardiologists as it is to physicians in other disciplines such as emergency medicine, critical care, trauma surgery, and infectious disease. Indeed, a google search of ‘cardiology and disasters, or cardiology and emergency’ led to a list of resources focusing on managing complications in the Catheterization labs. COVID-19 brought cardiologists into a different level of ‘emergency preparedness’ by forcing major restructuring in inpatient services, procedural laboratory processes, management algorithms, physician’s assignments, and other logistics. These developments raised some difficult questions: How prepared are cardiologists to handle national emergencies? Should we incorporate the contingency staffing plans we developed in the COVID-19 era in our master scheduling in the future? Are cardiologists truly redeployable, or did our ultra-
specialization render us incapable outside of our narrow scope of practice? Which proportions of our services are truly essential? The way we address those questions will not only influence the way we prepare and manage the next crisis, but how we weigh risks and benefits of our cardiac interventions as we move to a time period of greater control of the epidemic.

**Education:**

Medical education has become a pillar of modern cardiology. This is demonstrated by the enormous proliferation of cardiology training programs and scientific meetings in the last 50 years. It is therefore conceivable to envision a tremendous impact of the COVID-19 epidemic on cardiology educational programs:

1. *National Conferences*: the broadening of the COVID-19 outbreak resulted in mass cancellations of cardiology meetings that were expected to attract hundreds of thousands of participants. Organizers scrambled to find innovative solutions to absorb the impact of those cancellations, such as the offering of essential components of the meeting on virtual platforms. While the success of this approach is yet to be determined, debates on the relevance of live conferences in the modern era have resurfaced. Arguments were made on the diminishing value of in-person meetings in view of the growth in multisource and online education. However, proponents of live meetings suggest that those serve additional purposes beyond dissemination of medical knowledge including the offering of a platform for networking, hands-on training, and cross-discipline learning. The impact of COVID-19 on future cardiology meetings is difficult to predict, but it is likely that the majority of those meetings will include a mature ‘virtual’ option that may attract an increasing audience, and perhaps one that is more diverse given the challenges of travel for physicians with young families, caregiving responsibilities for elderly parents, physicians with disabilities or colleagues with limited funding.
2. *Fellowship Training*: The need to defer non-urgent procedures and restructure cardiology services directly affected fellows in training. Although this was most appreciable in interventional cardiology and electrophysiology training where trainees suffered the halting of elective procedures for several months; the current time frame in which their involvement in procedures is limited is unclear and may necessitate extending training. The impact of COVID-19 on fellows is, however, more broad-ranging: In-house face-to-face conferences were either cancelled or switched to virtual meetings. Fellows have taken the lead in utilizing social media crowdsourcing to address pressing questions (e.g., management of STEMI in COVID patients) due to the inescapable lag in traditional peer-reviewed sources. The Accreditation Council for Graduate Medical Education suspended accreditation-related activities, upheld other requirements such as work-hours regulations, and emphasized the need to provide trainees with coaching in infection control and PPE use. Non-COVID-19 related scholarly activities suddenly feel less relevant and more like ‘scientific luxury’. Indeed, researchers are worried that more research funding will be re-allocated away from cardiology to develop other areas related to infectious disease, epidemiology, or public health. Job opportunities for current fellows have become uncertain, as many institutions consider hiring freeze and budget cuts to cope with the financial difficulties during and after the epidemic.

**Professional Values:**

The swift and extensive impact of COVID-19 on cardiology practice and education were easily measurable. Nonetheless, the epidemic also led to other less discernable effects on our profession at large.

1. *The Meaning and purpose of medicine*: Although modern medicine has been criticized by some as being ‘too materialistic’, helping people in need remains a common reason stated by medical
students for choosing medicine. In real-life, offering help often requires considerable self-sacrifice. For cardiologists, this has typically meant long work hours, less family time, the stress of making risky patient care decisions, and the need to answer emergency calls at night and on weekends. However, COVID-19 called up yet another meaning of self-sacrifice that cardiologist had not routinely experienced; risking own life to save patients. The nationwide shortage of PPE and testing kits, as well as the highly contagious nature of COVID-19 meant that every healthcare worker (including cardiologists) is at risk of contracting a potentially lethal disease while caring for patients. This led to a revival of healthy discussions about the purpose of our profession, and the level of altruism needed in pursuing that purpose. In the post-COVID era, these discussions may help reevaluating our core values as physicians in light of the increasing pressure to focus on the economic and administrative aspects of medicine.

2. Individual vs. population-based medicine: Cardiologists are trained and expected to prioritize the needs of the patient they are caring for above all else. Particularly in our interventional practice, with increasing options for our most elderly, comorbid patients, our decision making rarely considers features of population health, including scarce medical resources. The burden of rationing scarce resources should not be placed on front-line workers, but rather guided by ethics committees and hospital leadership. However, this provides a dissonance to cardiologists who are used to providing care across a broad continuum of age and risk, even when the benefit may be low.

3. Physician-Administrator Relationship: the constrains of ongoing healthcare reforms, increasing costs, and diminishing reimbursement led to a substantial growth in the number of healthcare administrators in the last 2 decades. The relationship between administrators and physicians at
many hospitals has been described as tenuous, challenging, or fractured. COVID-19 came to add fuel to the fire; reports from national hotspots of the epidemic indicated a rising friction between those who deliver healthcare and those who administer it. Physicians on the front-line often felt betrayed, unheard, and in danger. Administrators, on the other hand, felt under an extraordinary pressure to overcome the lack of supplies, the brutality of the free market, and the diminishing revenue. Concerns about job security and compensation added more stress to these fragile dynamics. A few institutions with unique leadership paradigms (e.g., physician-administrator partnership model) distinguished themselves for their effective, coordinates, and unified approach to the crisis. Lessons learned from such institutions will be critical in the aftermath of the epidemic as more the need to invest in successful futuristic models for physician/administrator collaboration become increasingly relevant.

Crises are never wanted, often unpreventable, but always result in major lessons to the affected communities. The current epidemic has taken us to uncharted territories (Figure-1). While the COVID-19 story is still being written, we can use the lessons we learned thus far to revisit, refine, and reinvent key aspects of our profession.
References:

1. Adalja AA, Toner E, Inglesby TV. Priorities for the US Health Community Responding to COVID-19. JAMA 2020.
2. Welt FGP, Shah PB, Aronow HD, Bortnick AE, Henry TD, Sherwood MW, Young MN, Davidson LJ, Kadavath S, Mahmud E, Kirtane AJ, American College of Cardiology's Interventional C, the Society of Cardiovascular A, Intervention. Catheterization Laboratory Considerations During the Coronavirus (COVID-19) Pandemic: From ACC's Interventional Council and SCAI. J Am Coll Cardiol 2020.
3. Services TCfMM. Telehealth Benefits in Medicare are a Lifeline for Patients During Coronavirus Outbreak. 2020.
4. Douglas PS, Rzeszut AK, Bairey Merz CN, Duvernoy CS, Lewis SJ, Walsh MN, Gillam L, American College of Cardiology Task Force on D, Inclusion, American College of Cardiology Women in Cardiology C. Career Preferences and Perceptions of Cardiology Among US Internal Medicine Trainees: Factors Influencing Cardiology Career Choice. JAMA Cardiol 2018;3(8):682-691.
5. Dara SI, Farmer JC. Preparedness lessons from modern disasters and wars. Crit Care Clin 2009;25(1):47-65, vii.
6. Kates AM, Morris P, Poppas A, Kuvin JT. Impact of Live, Scientific Annual Meetings in Today's Cardiovascular World. J Am Coll Cardiol 2018;72(17):2082-2085.
7. Education TACfGM. ACGME Response to the Coronavirus (COVID-19). 2020.
8. Emanuel EJ, Persad G, Upshur R, Thome B, Parker M, Glickman A, Zhang C, Boyle C, Smith M, Phillips JP. Fair Allocation of Scarce Medical Resources in the Time of Covid-19. N Engl J Med 2020.
9. The L. COVID-19: protecting health-care workers. Lancet 2020;395(10228):922.
10. Herrell JH. The physician-administrator partnership at Mayo Clinic. Mayo Clin Proc 2001;76(1):107-9.
Figure Legends:

Figure-1: Illustration of the Impact of the COVID-19 Epidemic on Cardiology

COVID-19; novel coronavirus 2019
IMPACT OF THE COVID-19 EPIDEMIC ON CARDIOLOGY

CLINICAL PRACTICE
Prioritization of “essential” Procedures
Expanded use of Telemedicine
Emergency Preparedness

EDUCATION
Conversion to virtual meetings
Cardiology Training Challenges

PROFESSIONAL VALUES
Reviving the Purpose of Medicine
Individual vs. population-based medicine
Physician-Administrator Partnership