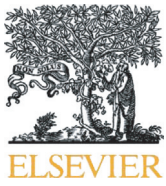




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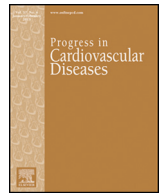
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Cardiovascular services in Covid-19 - Impact of the pandemic and lessons learned



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ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic immediately and perhaps irrevocably impacted society at large, the provision of cardiovascular (CV) care, the function and staffing of hospitals, and CV clinicians. Initially many clinicians at all career stages rose to the challenges, and support and accolades were the initial societal response. Politicization of the public health response as well as widespread misinformation and disinformation all negatively impacted CV clinicians' roles as well diminished and, in some cases, eliminated their public and self-esteem. Unabated stress, disrespect, and a likely lack of emotional and physical respite may all have contributed to the Great Resignation. Insights gained from review of the COVID-19 pandemic may help inform changes to foster system resiliency and prepare for an improved response to the inevitable next stressor.

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic's transformative impact on healthcare was unanticipated, extensive, and still evolving. Cardiovascular (CV) medicine comprises a large portion of health care, particularly in developed nations, and CV clinicians constitute a

substantial portion of the overall health care workforce. While the ultimate effects, and lessons learned, both positive and negative, will likely take many years to document and understand in full, now is an appropriate time to take a partial account. In this article, we hope to briefly review the effects of the pandemic on access to CV care and more importantly try to unravel the myriad of factors which influenced the time course of CV care availability and most importantly, provide some insight into the currently evolving landscape of CV care as the United States (US) and the world emerges from the acute and hopefully worst stages of the pandemic. These insights, we hope, may provide guidance for future actions that will positively impact CV clinicians and the care they provide when other major stressors, infectious pandemics or otherwise, threaten the orderly provision of important, life-saving, life-prolonging, and life-improving services.

The pandemic, from our perspective, may be divided into different phases, each with somewhat different imperatives and priorities.

Abbreviations: ACGME, Accreditation Council of Graduate Medical Education; CTA, Computed Tomographic Angiogram; CV, Cardiovascular; CVD, Cardiovascular Disease; FIT, Fellow in Training; IAEA, International Atomic Energy Agency; MRI, Magnetic Resonance Image; PET, Positron emission tomography; PCI, Percutaneous Coronary Angiogram; PPE, Personal Protective Equipment; R&R, Rest and Relaxation; STEMI, ST Elevation Myocardial Infarction; TEE, transesophageal echocardiography; US, United States.

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In early 2020, as coronavirus infection was sweeping the world, acute medical services were typically directed towards caring for the tsunami of patients with acute infection and its many sequelae. Much about the disease was unknown, and physicians were “building the plane whilst flying it.” Non-essential medical services were paused. Public health efforts were directed towards minimizing community spread, understanding the epidemiology of the disease, and ultimately testing for the disease and delivering treatments. Transmission within health care settings from patients to caregivers, and amongst caregivers themselves, was a major and evolving concern. Each component of this phase had salience for CV care and warrants some elaboration.

In 2021, knowledge of the virus, its epidemiology, the clinical disease it causes, and potential therapies had progressed substantially.^{1–5} The major impacts on the provision of CV care across the spectrum (i.e., preventative, chronic, and acute) that occurred during the earliest phase of the pandemic were being sorted out, prioritized, and addressed. Constraints imposed by supplies, staffing, and still large clinical needs of patients infected with COVID-19 were adversely impacting CV care. Many factors within and external to CV departments were evident, including financial priorities and constraints which were impactful. Understanding this phase of the pandemic's effects on CV care will help with both its resolution and hopefully better prepare for future stressors.

Late in 2021 and into 2022, supply constraints improved in some ways, but worsened in others, CV medicine continued adapting to virtual care delivery, and US medicine, including CV departments, were rocked by “The Great Resignation”. This phase, which is still in progress, may be the most illuminating and novel for readers, as many of the factors were not ever considered or discussed during classic medical education and training.

Impact on CV services

In the beginning, as COVID-19 case numbers and fatalities steadily rose across the globe, news outlets became dotted with unfamiliar images of healthcare providers donning gas masks, goggles, and biohazard suits. Then came reports of overrun emergency departments and intensive care units as well as shortages of personal protective equipment, ventilators, and dialysis machines. Dramatic photos emerged of loved ones embracing through plastic sheets or touching hands through panes of glass. Later came reports of refrigerated trucks as mobile morgues and the construction of mass graves. All this brought a deep sense of uncertainty about what was to come and spurred a marked change in patient behavior.^{6–8} A survey conducted by the Centers for Disease Control and Prevention in June 2020 found that amongst ~5400 U.S. adult respondents, approximately 40% reported having delayed or avoided any medical care due to concerns regarding COVID-19, this included both routine care (~30%) as well as urgent or emergency care (~10%).⁹

At the encouragement of many public health experts, government officials in at least 49 countries implemented emergency measures that limited civilian activities to slow the spread of disease.¹⁰ Restrictions varied from country to country, and in some instances varied within the same country based on the conditions or politics within a specific geographic or municipal region. Examples of such restrictions included: 1) compulsory quarantine for individuals located in or with recent travel to high risk geographic regions; 2) restricting air travel to and from high risk locations; 3) discontinuing in-person school activities for children; 4) ‘stay-at-home’ orders; 5) temporary closure of all non-essential businesses, with an emphasis placed on remote working solutions; and 6) cancelation of all elective and non-urgent medical procedures. The duration of such restrictions also varied, from days to months. Ultimately, they proved to be successful in slowing the spread of COVID-19 as there was a marked decrease in the number of detected cases between May and August 2020.¹¹

For a myriad of reasons, the volume of CV care delivered was dramatically impacted by the ‘first wave’ of the COVID-19 Pandemic. Early on, individual healthcare systems in the US recognized that both the volume and duration of acute CV hospitalizations had declined considerably, which correlated with a local rise in COVID-19 cases.¹² The International Atomic Energy Agency (IAEA) Division of Human Health would later conduct a large-scale, multi-national survey to understand how the COVID-19 pandemic had affected diagnostic CV procedure volumes worldwide. Representative data was collected from >900 sites located in 108 countries. This study estimated that CV procedure volumes declined precipitously from historical baseline in March 2019 versus March and April 2020, with more severe declines noted in poorer countries (see Fig. 1). Volumes for non-aerosolizing procedures such as coronary angiogram and transthoracic echocardiograms declined by roughly 50% but were less affected than more highly aerosolizing procedures like transesophageal echocardiography (TEE) and exercise stress tests, which were down by roughly 75%.¹³ Similarly, during this period volumes for catheter based cardiac interventions declined but were in general less affected than operative volumes. For example, percutaneous coronary interventions and transcatheter aortic valve implantation volumes were down by roughly 25%, whereas coronary artery bypass grafting, and surgical aortic valve replacement were down roughly 40% or more.¹⁴ In summary, urgent CV evaluations as well as inpatient care was often deferred or abbreviated, CV diagnostic testing was pursued less frequently, and far fewer patients underwent percutaneous or surgical interventions. There are numerous anecdotal reports of delayed presentations of acute conditions, such as myocardial infarction and serious arrhythmias with patients often succumbing to what was perceived to have been treatable conditions had they presented earlier. What was immediately apparent to administrators at hospitals and health systems was the immediate decline in revenue that these CV procedures, less complex hospitalizations, and other associated care typically produced.

As time went on governments relaxed social distancing recommendations and other restrictive policy measures. A cautious public began participating in higher-risk activities known to contribute to community spread.¹⁵ By the fall of 2020 cases began to increase dramatically in a phenomenon colloquially referred to as the “second wave” of the pandemic. Again, governments around the world responded by implementing emergency restrictive policy measures to reduce community spread, patient behavior changed, healthcare resources became strained, and a second chill was felt on CV patient volumes. One large meta-analysis, pooling data from 158 observational studies from 49 different countries, across 6 continents, found that there was no difference in the decline in hospitalizations for acute CV disease between the first and second waves of the pandemic.¹⁶

The tide began to turn favorably in the fight against COVID-19 by the end of December 2020. One year into the pandemic, healthcare providers had a much better understanding of how to manage critically ill patients with COVID-19 and the US Food and Drug Administration had approved the first COVID-19 drug therapy along with multiple highly-effective vaccines.^{1–5} By the spring of 2021, the story regarding diagnostic CV procedure volumes would become slightly more nuanced. A follow up study by the IAEA found the cardiac procedure volumes had recovered by April 2021 from the nadir in April 2020 in high and upper middle-income countries (recovery rates of 108% and 99%) but remained depressed in lower-middle and low-income countries. This broad recovery in procedure volume, particularly in more heavily resourced countries, did not come as a surprise. Neither was the finding that CV practice patterns were evolving to favor advanced cardiac imaging modalities [e.g., coronary computed tomography angiography (CTA), magnetic resonance imaging (MRI) and positron emission tomography (PET)] in lieu of traditional treadmill stress testing. However, the IAEA suggested something largely unexpected as well - physicians reported psychological stress was a significant predictor in the recovery of CV procedure volumes. Fig. 2 illustrates change in volumes at three timepoints,

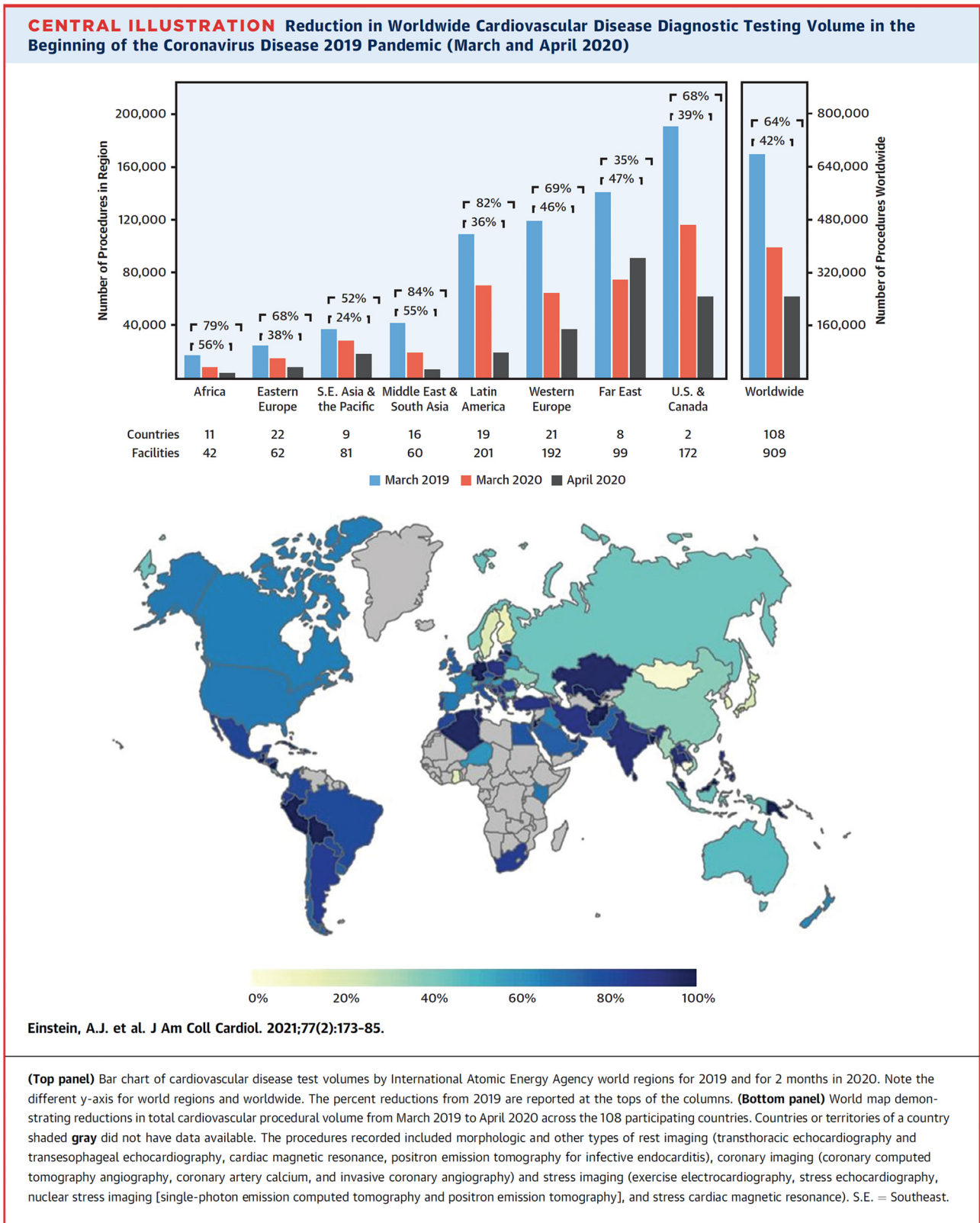


Fig. 1. Reduction in Worldwide CV Diagnostic Testing Volume in the Beginning of the COVID-19 Pandemic.

April 2019, March 2020 and March 2021, demonstrating the decline and recovery of CV procedure volumes worldwide.¹⁷

Indeed, the pandemic stressed the ability of both healthcare systems and providers to deliver care around the world. As time has gone on,

waning immunity, inequitable distribution of vaccines and vaccine hesitancy have contributed to an environment in which new genetic variants of the COVID-19 virus could evolve - and they did, leading to changes in disease severity, transmissibility and varying degrees of

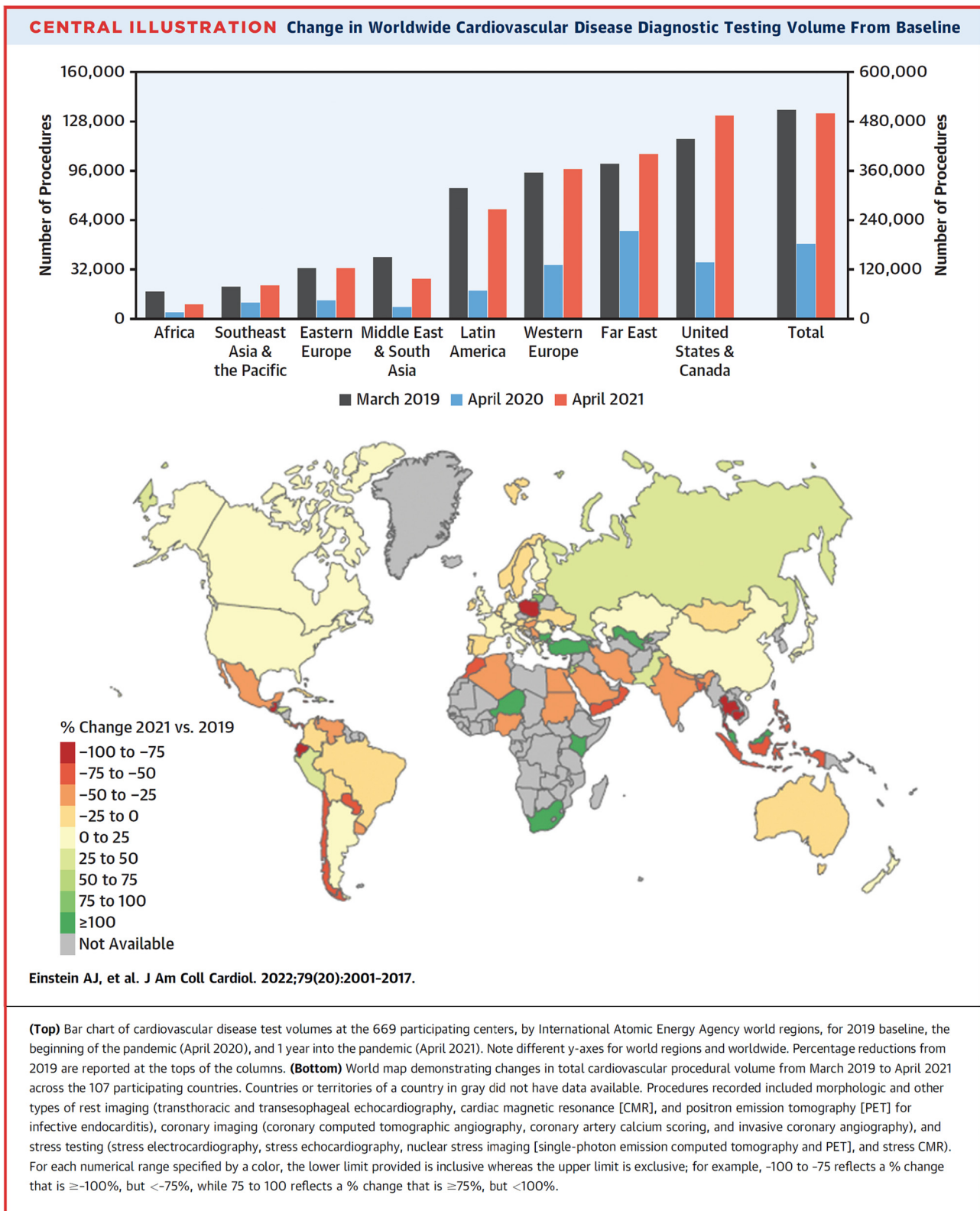


Fig. 2. Change in Worldwide CV Diagnostic Testing Volume From Baseline During the COVID-19 Pandemic.

antibody escape.¹⁸ Successive waves of cases, though not as devastating as their predecessors, continue to rise and fall, taxing an already hobbled healthcare system.

Looking to the future, we are now beginning to understand that the CV consequences following COVID-19 infection are significant and

longstanding. Evidence suggests that acute COVID-19 infection confers increased risk of new CV events for at least 12 months across a litany of CV disease processes including, ischemic cardiomyopathy, dysrhythmias, inflammatory disorders of the pericardium and myocardium, thromboembolism, and cerebrovascular disease. Elevated risk is seen

regardless of COVID-19 illness severity, patient vaccination status, as well as across a range of traditional demographic criteria.^{19,20} With this in mind, there is little doubt that the COVID-19 pandemic will continue to have ripple effects that impact the volume and composition of CV care long into the future.

Impact on CV training programs

Residency and fellowship training are prolonged (often 6 or more years), arduous, and formative. The experiences of trainees are thought to influence where and how they practice for the rest of their careers. Thus, the disruption caused by the COVID-19 pandemic is important, both for the trainees individually, but also for their ability to deliver high quality, compassionate care for years to come.

Accreditation Council on Graduate Medical Education (ACGME) accredited graduate medical education fellowship programs are the mechanism by which physicians in the US are trained to deliver safe, high-quality care. Core Program Requirements are in place to standardize the learning and working environment for fellow-in-training (FIT). These include guidelines regarding: 1) the process for evaluating fellows and faculty; 2) a description of appropriate clinical responsibilities; 3) curriculum organization; 4) scholarship activities; 5) patient safety; 6) FIT wellbeing; and 7) fatigue mitigation. When the magnitude of the COVID-19 public health crisis became evident, the decision was made to waive all but 4 specialty-specific requirements: 1) work-hour restrictions were to be continued; 2) broad guidance was offered regarding attending supervision; 3) fellows as Acting-Attending-Physicians; and 4) the provision of infection protection.²¹ The abrupt and open-ended deviation from long standing norms was cause for concern amongst many FIT. The decision to temporarily discontinue elective CV procedures created a situation where CV fellows at some centers were at risk of not fulfilling the procedural volume recommendations set forth by the ACGME.²² Some institutions significantly altered clinical practice patterns from the common 'standard of care'. For example, some percutaneous coronary intervention (PCI) capable centers temporarily reverted to the use of thrombolytics for acute ST Elevation Myocardial Infarction (STEMI).²³ While such changes are understandable and justified, the collateral effect was a decrease in the number of key procedures for many trainees.

In the Spring of 2020, a national survey was conducted of CV fellows to assess the perceived impact on training. Pooling data from approximately 1000 respondents, representing training programs in all 50 states, the District of Columbia, and the territory of Puerto Rico, found overwhelmingly that CV fellows were concerned by the quality of their education and personal safety in the COVID-19 era. Hands-on, interactive, faculty moderated didactics were often put on hold as program leaders scrambled to switch from an in-person classroom to a virtual one, a transition that was made with varying degrees of success. Secondly, the decline in cardiac catheterization and echocardiography volumes negatively impacted the ability of trainees to develop the necessary procedural skills for independent practice. Thirdly, around 50% of CV fellows report being redeployed from primary cardiology services to other services within the hospital. While justified by the crisis environment of the pandemic, this likely negatively impacted training in cardiology. Perhaps most importantly most CV fellows expressed discomfort regarding both the recommendations regarding the use of personal protective equipment (PPE) at their home institutions. PPE policy decisions were rarely shaped with direct input from CV fellows, and institutions often failed to communicate policy changes effectively. Overwhelmingly, fellows felt PPE recommendations were driven by current or anticipated supply shortages, as opposed to scientific evidence or provider safety.²⁴ Again, while such PPE policies are understandable from the crisis perspective, trust between the trainees and the institutions wherein they worked was placed under strain.

There is an inherent contradiction in the pre-existing standards for training, wherein procedure volumes and time on clinical services was

assiduously tracked, though recent competency-based metrics in the US diminished but did not eliminate this focus, and the redeployment and diminished procedure volumes compelled by the pandemic. It is uncertain if the cohort of "COVID-19 fellows" will be less prepared than their predecessors. Focused study and deep reflection on the early career course of these trainees will help inform potential future changes to training programs and the importance of life-long learning after formal fellowship.

Bad news (misinformation) travels fast

We all expect Media coverage to be objective and honest, particularly when it involves public safety. News outlets serve an important function during times of national and international crisis by disseminating essential information to the general public.²⁵ Citizens need to know how to stay safe, and this requires both the facts on the ground and guidance from elected officials to be shared unfiltered and in real-time. Historically, this role was filled by traditional news sources (i.e., radio, television, and print media) often with established track records of trustworthiness upon which the public could confidently place its faith.

Today, with the advent of the internet and social media, news organizations can spread information with truly unprecedented speed and scale. Throughout the COVID-19 pandemic, health experts were able to effectively harness the power of these online platforms to communicate directly with the public. This is how most people learned about the importance of social distancing, how to properly wear a face mask, the latest guidelines for testing and treatment, as well as local vaccine availability.

Unfortunately, there are very few guardrails in place to assure the quality of information that is being spread. The same web-based forces that amplified the messaging from our nation's leaders also allowed for the inauthentic amplification of healthcare related misinformation (false or inaccurate information) and disinformation (deliberately misleading or biased information). Over the last several months, we have come to recognize that ideologically driven groups often masquerade online as news organizations or falsely represent themselves as having medical expertise. This deception is taken to promote an agenda that is often not in the public's best interest. Armchair experts and social agitators, who might willingly put public health at risk, were allowed to further sow seeds of doubt and division amongst people. The rise of online hyper-partisan news outlets, often lacking journalistic integrity, further diluted public discourse.

Public health experts have found that, during the COVID-19 crisis, we saw a rise in several broad categories of false information including: 1) intentional distortion of scientific findings; 2) advancement of false or overtly dangerous treatments; 3) politically motivated speculation regarding the origin of COVID-19; 4) scapegoating vulnerable groups of people; 5) conspiracy theories untethered to reality; and 6) anti-vaccine messaging.^{26–29} On April 14, 2020, Secretary-General of the United Nations, António Guterres released a statement that began "As the world fights the deadly COVID-19 pandemic – the most challenging crisis we have faced since the Second World War – we are also seeing another epidemic – a dangerous epidemic of misinformation. Around the world, people are scared. They want to know what to do and where to turn for advice. This is a time for science and solidarity. Yet the global 'misinfo-demic' is spreading. Harmful health advice and snake-oil solutions are proliferating. Falsehoods are filling the airwaves. Wild conspiracy theories are infecting the Internet. Hatred is going viral, stigmatizing, and vilifying people and groups. The world must unite against this disease, too."³⁰ The way that different demographic or socioeconomic groups are influenced by various categories of misinformation is an area of active research and will likely be important for the medical community to understand if it wants to have effective public health communication strategies in this brave new world.³¹

False information online has real world consequences. We now know that exposure to COVID-19 misinformation and believing it as true led to maladaptive behavioral changes, like increased vaccine hesitancy, and reduced adherence to social distancing guidelines.³² Concerningly, there is additional evidence that ‘bots’, semi-autonomous social media accounts, disproportionately contributed to the proliferation of COVID-19 misinformation. Groups of bots, sometimes numbering in the thousands, can function in coordination with each other to rapidly amplify content online, enabling them to be super spreaders of misinformation. One of many such examples involves the pervasive false narrative regarding hydroxychloroquine as a possible treatment for COVID-19, which was at least in large part executed by armies of bots online. This ultimately impacted two distinct sets of patients: 1) those who put their faith in a treatment for COVID-19 that lacked scientific evidence, often refusing treatment that was supported by clinical trial data; and 2) those who had medical conditions that are effectively treated with hydroxychloroquine, but who faced drug shortages caused at least in part by the online misinformation campaign.³³

Conspiracy theorists and science deniers existed long before the start of the COVID-19 pandemic, and will likely continue to exist long into the future. But what occurred during the pandemic goes far beyond individuals with fringe ideas. Rather, well-resourced ideologically driven organizations create and inauthentically amplify misinformation to advance an agenda that is divorced from the public interest. These groups are being given a platform, global in scope, on which they are allowed to misrepresent their credentials to create the illusion of credibility, with no requirement to disclose sources of funding, conflicts of interest, or affiliations with hostile foreign governments or terrorist organizations. And when their false messaging is unflagged by social media companies, many patients have a difficult time recognizing it as false because it has the veneer of approval from the hosting social media platform. The public needs to be notified, in no uncertain terms, when they are being presented health information from an unverified source online, because it has the same credibility as a message hastily scribbled on a bathroom stall.

Healthy scientific discourse should not be monolithic and should allow for controversies to exist. It should allow for ambiguity when the data is inconclusive, and it should allow for disagreement. Of course, there will be times when well-designed clinical trials have results that are discordant, when the results of a study are unexpected. Not only is this allowable, but it is also often where some of the greatest insights are to be found. But patients should be protected against a deluge of misinformation that is intentionally designed to deceive, amplified to distort public opinion, or create the illusion of conflict within the scientific community when none exists. These forces are corrosive, corrosive to the public health, and on point for this manuscript, detrimental to the spirit of many CV clinicians who labored diligently to inform and treat the public and their individual patients. Health care workers, including physicians, have been considered authorities on matters of individual and public health for literally centuries. The recent pandemic has essentially defrocked these clinicians, most of whom have dedicated their entire professional lives to the acquisition of accurate biomedical information and its application, at least in many venues, in preference to many who have little knowledge, training, or experience.

The great resignation

Historically the provision of medical and nursing care has been described as high stress and high demand occupations that provide satisfaction and personal reward to many. Indeed, early in the pandemic nurses, physicians, respiratory therapists, and others were called heroes by the public, often with regular displays of appreciation. Many clinicians rose to the immense and often unknown challenges during the early phase of the pandemic. They worked long and hard, often at risk to both themselves and their families. As a group and as individuals,

mere recognition, thanks, and commendation are insufficient to fully describe the efforts. Public displays of appreciation, such as the boisterous clanging of pots and pans each afternoon in New York City, were widespread.³⁴ Hospitals and health systems did what they could during this phase to make the daily lives of these heroic workers a bit easier; provision of meals and sleeping quarters in nearby hotels (now empty of tourists) were common. Certainly, some clinicians, fearing for personal safety, chose to cut back on clinical duties, and others simply did not possess relevant knowledge and skills. Many health care workers served where they could be of immediate aid; health system accountants may have provided food to patients or transported drugs and lab samples within the hospital. Much has been written elsewhere about leadership in times of crisis, and undoubtedly there are numerous specific examples of how to encourage and generalize these positive actions and deeds. Churchill’s public speeches in England and Rosie the Riveter in the US are perhaps relevant touch points from World War II.

2021 saw the infectious aspects of the pandemic changing dramatically. Effective vaccines were produced at unprecedented speed, though their availability and uptake varied both throughout the world, and even amongst different communities within a given country. Knowledge of COVID-19 clinical effects and their mitigation with effective medical treatments were developed and disseminated at unprecedented speed because of the internet and medical social networks. Indeed, the existence of the vaccine and evidence based therapies actually sometimes served as a wedge between patients and clinicians, with patients often refusing vaccination or requesting and demanding unproven therapies. Perhaps even more upsetting and dispiriting to many clinicians was the denigration of vaccination and the promotion of ineffective and dangerous therapies by celebrities and politicians who obviously had far less knowledge or experience than frontline clinicians.

These developments impacted cardiology with force, as the presence of pre-existing CV disease or many of its risk factors also increased both the likelihood of an individual getting COVID-19, but also its severity. Couple this with the fact that many CV diagnostic tests and therapies require close patient-clinician contact and the stage was set for frequent resentment, frustration, and unfavorable communication.

The latter half of 2021 was notable for what has been termed “The Great Resignation”. Initially this was thought paradoxical, at least in the US. Case severity was decreasing, hospitalizations were generally abating, and certainly the care of the sickest patients was becoming a bit more routine. Indeed, health systems were able to widen their focus from COVID-19, and many nurses and physicians returned to their prior roles and discretionary inpatient and outpatient care resumed. Thus, with the general trajectory being a return to the prior “normal” the dissatisfaction and disengagement of many clinicians, culminating in their resignations was unanticipated, not understood, and hugely impactful on health care delivery throughout the US and elsewhere. Many of those with the most personal experience treating patients with COVID-19 simply quit their jobs, others retired early, and others opted to change to transient or “travel” positions. These latter positions typically paid far more than routine salaries, as hospital administrators, desperate to provide services, responded to the basic laws of supply and demand. While perhaps easy to understand in context, it made clinical care provided by physicians, nurses, and others far more transactional.

Nurses reported pervasive unsafe working conditions before the pandemic. During COVID-19, they have cited a range of stressors and traumatic experiences, including furloughs, a lack of adequate protective equipment, increased violence, excessive workloads, and reduced support services. A great deal has been written about the psychological toll that this placed on frontline workers, who now report record levels of distress at work and job dissatisfaction.^{35–37} Today, approximately 1 in 5 nurses have transitioned away from bedside nursing, or left the profession entirely since the start of the COVID-19 pandemic.³⁸ Studies have reported improved nurse staffing, improved job satisfaction

amongst nurses, and improved patient outcomes legislation was enacted prohibiting mandatory overtime for nurses and establishing maximum patient-to-nurse ratios.³⁹ This may be a reasonable place to start if the medical community hopes to address the current nursing shortage in a way that rebuilds trust with its frontline workers. Strengthening the healthcare force is something we can and must do, particularly if we plan on rising to the incredible challenge of rehabilitating and providing support to patients who continue to deal with the negative health consequences from COVID-19.⁴⁰

Understanding this substantial change in the attitudes, behaviors, and career decisions by CV clinicians is immensely important. By most measures the acuity of care of patients afflicted with COVID-19 had decreased, effective therapies for the disease were known, reasonably available in developed countries, and the pandemonium seen early on was far less common. There may be features of COVID-19 illness, such as transmission by asymptomatic individuals or the viral evolution resulting in waves of illness by variants such as Delta and Omicron. These points require further study. There are abundant anecdotal descriptions of how the initial public support was empowering to many. There are also many descriptions of how derision of medical science, flaunting and elimination of public health measures which were implemented in good faith, and the polarizing politicization of an infectious illness were anathemas to those clinicians who entered their professions driven by science, concern for public health, and the desire to help those in times of illness and need.⁴¹ The solution here is uncertain; certainly the political polarization does not appear to be lessening in most developed nations.

Perhaps an instructive analogy to burn out and resignations by beleaguered health care workers may come from the military. Without overdoing the analogy, across the centuries and across many nations, military personnel have been subject to the physical and mental stresses of war. There are actual battles, but also considerable stress even when physical battles do not occur. Common strategies to minimize “battle fatigue”, and improve overall performance is the practice of rotating soldiers and other military staff out of the region or theater of battle for several weeks or longer. The long-term benefits to troop morale and performance are well appreciated, even though this rest and relaxation (R & R) results in a transient decrease in staffing levels.⁴² In contrast, many hospitals and health systems simply ramped up operations as soon as feasible. While this practice was driven both by the desire not to lose revenue nor market share as well as provide discretionary and elective care that may have been postponed, the lack of respite may well have produced such a large toll on the staff that the great resignation was catalyzed. The great resignation was the aggregate effect of individual attempts to construct personal respite or R & R. To the extent that the military practice of scheduled and programmed rejuvenation time may diminish burn out and its sequelae, compensated vacation and respite time after crisis may be just as important for health care workers who have staffed in a crisis setting. This view, and the implications for future health care workers and their schedules deserves substantial study and trials of innovative potential solutions.

Summary and a way forward

In brief, the COVID-19 pandemic was devastating to health care systems around the world. CV medicine was particularly affected, given not only the nature and scope of the field, but also the large share of all health care services that are CV in the developed world. Institutions and individuals often rose to the initial challenges, redirecting and prioritizing cardiovascular care. Multiple stressors, logistical, cognitive, financial, and emotional impacted individuals, programs, and hospitals, and health systems. The aftereffects continue to reverberate, with increasing levels of personal stress, job dissatisfaction, restriction of clinical services, uncertain impact on trainees, and adverse financial burdens. Yet, at the same time, there is much for CV medicine to be

Table 1
Impacts of the COVID-19 Pandemic.

<p>Positive Legacy of COVID-19</p> <ul style="list-style-type: none"> Extraordinary performance of CV providers as frontline workers Excellent use of information technology to rapidly disseminate the latest COVID research and public health guidance Timely transition of CV medical education to remote learning Changes in CV practice patterns to minimize exposure to aerosolizing procedures
<p>Neutral or Undetermined Impact</p> <ul style="list-style-type: none"> Effect of COVID-19 on population level CV mortality Disruption of CV training programs Long-term CV sequelae from COVID-19 CV Outcomes for patients who received delayed or abbreviated care
<p>Negative Legacy of COVID-19</p> <ul style="list-style-type: none"> Inequitable distribution of PPE, COVID-19 Treatments/Vaccines Unmitigated dissemination of medical misinformation Irresponsible politicization of public health recommendations Erosion of public trust in government and healthcare institutions The Great Resignation

COVID-19, coronavirus disease 2019; CV, cardiovascular; PPE, Personal protective equipment.

proud of, particularly the fortitude of its practitioners and the rapid cycle innovations in clinical investigation and care delivery.

It is still too early for the final words on lessons learned, but several themes appear evident (See Table 1). The first is the need for more resilience in the health care system as a whole. Lean staffing, just in time supply chains, and the financial disincentives to stockpile equipment and supplies that are more than routine needs all contributed to many of the problems evident early on. Improvement here is perhaps easier in theory than in practice, as the source(s) for the money needed to address these issues is unclear and uncertain. The second theme is the misuse and thwarting of biomedical information to advance individual, group, and political aims rather than advance the public good. While there is often uncertainty and disagreement in biomedical science and clinical medicine, recent trends in using information and misinformation as a cudgel are disturbing, as they advance agendas antithetical to CV and public health. This may represent an increasing distrust of authority and an anti-intellectual theme that is gaining force in the US and elsewhere. While it cannot be stopped or reversed by CV clinicians and scientists alone, these individuals have a responsibility and duty to speak up when appropriate to provide important countervailing information. The last theme is the need to provide respite to those individuals and perhaps the systems they staff after another crisis, rather than attempting to quickly resume “business as usual.” This is a theme that can and should be adopted by leaders in CV medicine. Just as airplane pilots, truck drivers, and now medical trainees all have formal restrictions on work hours, so too there must be a realization that practicing physicians, nurses, and others will be both personally and professionally better with these short-term respites. More transformative, and important for the next crisis, would be longer and formal (and compensated) respite after weeks and months of unrelenting stress and heroic work. The front-line care providers are due no less.

Declaration of Competing Interest

None.

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