

The COVID-19 Pandemic: Changing Lives and Lessons Learned

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We have nothing to fear but fear itself.

—Franklin D. Roosevelt

The COVID-19 pandemic is evolving rapidly, and its course is altering the landscape for all citizens of the world, including plastic surgeons. Much remains unknown. However, an increasing body of evidence is guiding swift global action against the virus. The novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for COVID-19, was identified in Wuhan, Hubei Province, China, in December 2019, notably close to a wet animal market that sells poultry, snakes, and bats.¹ The virus shares most of its genetic sequence with coronaviruses found in bats and is thought to arise from that animal, although an infected bat with SARS-CoV-2 has not yet been identified to confirm this theory.² From Wuhan, the virus crossed over to the human population and spread throughout China and beyond: by March 11, 2020, the World Health Organization declared COVID-19 a pandemic, which is the worldwide spread of a new disease that crosses continents and affects a large number of people.³

Details regarding the behavior and implications of the virus are emerging daily. The virus is spread person-to-person and appears to linger in the air for up to 3 hours and upon various surfaces from 24 hours to 3 days.⁴ Accordingly, the Centers for Disease Control and Prevention (CDC) recommend contact and airborne precautions with personal protective equipment (PPE) and N95 respirators.⁵ The virus utilizes the angiotensin converting enzyme 2 receptor as its entry point, which is located predominantly in the lung alveolar epithelial cells and the enterocytes of the small intestine.⁶ Accordingly, COVID-19 presents both as an upper respiratory infection characterized by cough, fever, and fatigue that progresses to pneumonia and as a gastrointestinal illness characterized by diarrhea.⁷ The progression from mild symptoms to respiratory failure requiring ventilation can be rapid, and cardiac failure has also been implicated. Chest radiographs reveal bilateral

lower lobe pneumonia, and computed tomography of the lungs reveals ground glass opacities.⁸ At the moment, supportive therapies are indicated as treatment. While there are no specific treatments officially, medications are being tested including hydroxychloroquine (a retrofitted anti-malaria and autoimmune drug, which has been employed in China and France) and antiretrovirals such as remdesivir.⁹⁻¹¹ There is no approved prophylactic medication at this time. Vaccines are under development as a long-term approach aimed toward prevention (Table 1).

The seriousness of the COVID-19 pandemic echoes the Spanish Flu of 1918, which killed 50 million people worldwide, including 675,000 people in the United States. This pandemic was the source of great interest for scientists looking to understand what made it so deadly to learn from the past. The Spanish Flu—like COVID-19—caused severe pneumonia and pulmonary inflammation. Epidemiologists considered the global landscape in 1918. World War I was underway, troops were traveling the world in close contact and acting as vectors, vaccines did not exist and neither did antibiotics, and there were no viral tests. There were no local, state, or federal governing bodies that were prepared to manage an outbreak or pandemic.¹² This situation is not the case today, and we have learned from the Spanish Flu. We have the CDC in the United States and the World Health Organization globally monitoring and responding to outbreaks. We have governments ready to mobilize resources and implement social distancing policy via school closures, limiting large gatherings, and shelter-in-place measures. The US Strategic National Stockpile stores facemasks, medications, and other materials to respond to a pandemic (Table 2). We are able to test for COVID-19 and to study it using evidence-based medicine. All of these measures have been deployed in recent days to reduce the impact of the novel coronavirus pandemic in the United States and abroad, as much as possible. That China has reported no new domestic coronavirus cases for the third day in a row is encouraging, albeit unusual, news.¹³

Beyond these lessons learned from past pandemics, the handling of the current pandemic in Hong Kong, Taiwan, and Singapore offers insight into successful efforts to “flatten the curve.” This epidemiological term refers to slowing the spread of disease so as to prevent healthcare systems from being overwhelmed. A slow, steady stream of

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Table 1. Contrasting the Seasonal Flu (Influenza A and B) and COVID-19

	Flu	COVID-19
R0 number*	1.3	2–2.5
Incubation time, d	1–4	1–14
Hospitalization rate, %	2	19
Case fatality rate, %	≤0.1	1–3.4
Pandemics/prevention	Vaccine available; herd immunity†	No vaccine; preventative measures advised

*R0 number indicates viral transmission rate. It estimates how many people will be infected by the average individual with the disease.

†Seasonal flu is different from a flu pandemic (Swine flu). With annual flu vaccination, we have established herd immunity that reduces both the risk of being infected or that of infecting another individual who may be at high risk.

Table 2. COVID-19 Interventions

Interventions Immediately Available	Future Interventions
Social distancing (individuals spaced 6 ft away, gatherings no greater than 10 people)	Targeted medical therapies (such as hydroxychloroquine or remdesivir under investigation)
Availability and effective implementation of personal protective equipment (masks, gowns, gloves)	SARS-CoV-2 vaccine development
Rotating shifts of healthcare providers to limit exposure and allow recuperation	National lockdown or enforced lockdown
Identification and quarantine of sick contacts	Governmental intervention for production of medications and supplies (PPE, ventilators)

Table 3. How to Flatten the Curve for COVID-19

Intervention	Goal
Ban flights from affected regions	To prevent importation of disease
Close borders	To prevent importation of disease
Social distancing	To slow the spread of disease
Widespread and early COVID-19 testing	To contain disease (early goal)
	To promote epidemiological monitoring and patient care (secondary goal)
Aggressive and monitored quarantine	To contain disease (early goal)
	To slow the speed of the pandemic (secondary goal)
Aggressive tracking of sick contacts	To slow the speed of the pandemic
Development and identification of effective medications and treatment modalities	To treat and cure disease
Development of vaccines	To prevent disease

patients is more manageable compared to a sudden influx of sick patients requiring hospitalization (Table 3).¹⁴ This technique is employed once efforts at containment of an outbreak have failed. China has reported success with measures that would not be easily supported in a democratic society. Hong Kong, Taiwan, and Singapore, however, similarly managed to flatten the curve of new cases without such extreme measures. What can we learn from their handling of the virus? All were quick to screen and then ban entry of flights and individuals from infected regions of China. Social distancing was employed early using the same six-foot benchmark and avoidance of gathering in large numbers. Inhabitants were educated about hand hygiene and wearing masks if they felt ill. The handling and isolation of symptomatic patients and those with travel exposure have been aggressive and appropriate—separate screening locations, separate clinical teams, and separate treatment facilities were used to avoid exposing other patients and limit the possibility of healthcare personnel becoming vectors of transmission themselves. Health authorities have been aggressive in tracking down sick contacts via interviews and closed-circuit television footage and quarantining those at risk. Singapore and Hong Kong were more likely to place identified at-risk

individuals in state-controlled quarantine facilities. Taiwan focused on home quarantine reinforced by hefty fines for those who did not comply. Taiwan and Hong Kong closed schools, while Singapore did not. In short, these 3 regions were swift and aggressive in their response, and they have been effective in limiting their cases despite neighboring China, the epicenter of the outbreak (Table 3). Lessons learned from the past century of pandemics should be heeded and rapidly implemented. Had efforts like these been implemented in Wuhan, perhaps the pandemic could have been avoided (Table 4).^{15–17}

These are uncertain times. We do not know enough about this virus yet. We must learn about its pathophysiology, epidemiology, and treatment. We must focus on being effective and prepared, while avoiding the feelings of panic, which surround all pandemics. What is the path forward? The Centers of Medicare and Medicaid Services, the American College of Surgeons, the American Society of Plastic Surgeons, the Aesthetic Society, and most state medical and regulatory boards have appropriately recommended canceling all elective and nonessential cases.²⁰ This action serves multiple purposes of opening hospital beds for incoming COVID-19 patients, preserving healthcare equipment and resources, and avoiding

Table 4. Previous Pandemics

Pandemic	Organism	Impact	Lessons Learned
1918 Spanish Flu	H1N1 Influenza	50,000,000 deaths	Secondary bacterial infection was a leading cause of mortality including healthcare workers who were at risk and suffered increased mortality
2003 SARS	SARS-CoV-1 Coronavirus	744 deaths	WHO International Health Regulations for prompt coordinated global alerts and action
2005 Avian Flu	H5N1 Influenza	<1,000 deaths	Highlighted weakness in healthcare infrastructure Updated WHO Pandemic Preparedness US Department of Health and Human Service's Pandemic Influenza Plan established guidelines for local, state, and national agencies
2009 Swine Flu	H1N1 Influenza	151,700–575,400 deaths	WHO defined requirements for "Pandemic" ¹⁸ Importance of PPE (N95) Highlighted lack of hospital infrastructure
2015 Zika Virus	Zika Virus	2,656 cases of microcephaly	Need for government support for long-term funding to allow companies and research institutes to develop vaccines and clinical trials Need for proactive investment versus reactionary investment during outbreaks
2019 COVID-19	SARS-CoV-2 Coronavirus		Expedite drug approval via FDA Enact Defense Production Act to expedite production of needed supplies Expand COVID-19 rapid testing Close borders early to visitors from all affected countries as well as Canada and Mexico Enact coronavirus economic stimulation plans to buffer and later restore the economy

*New virus emerges in humans, minimal or no population immunity, causes serious illness with high mortality/morbidity, spreads easily from person to person.

FDA, Food and Drug Administration.

From Kilbourne¹⁸ and Madhav et al.¹⁹

hospitalizations for patients recovering from elective surgery, which can also place them at risk in a hospital housing infected patients. Additionally, canceling elective surgery supports social distancing in the healthcare setting. Practices that are functionally shut down at this time can elect to donate resources, particularly PPE, including gowns, masks, and gloves, which are in high demand and short supply.²¹ Such a shortage of PPE is unprecedented in the wealthiest nation in the world, and it places our physician colleagues and fellow healthcare personnel at great risk on the front lines.

The pandemic has profoundly altered how plastic surgeons will practice. Much of what we do is elective surgery. Our practices have slowly evolved according to the national and international response to this virus. Healthcare meetings have been canceled throughout the summer and fall—with no certainty that any professional conferences will be held for the duration of 2020. In plastic surgery, patients travel domestically and internationally to undergo surgery. As countries close their borders and restrict travel, we can expect a substantial reduction in these patient visits to our offices. Telemedicine offers an alternative to communicate with these patients who seek our care and will likely become a common part of future medical practice. Simultaneously, COVID-19 has destabilized the financial markets. The lasting extent of the damage will depend on the virus' course, whether we find a cure, and how government aid buffers the downturn. As with the economic recession in 2008, we may find that a substantial portion of patients will lack the disposable income to seek elective plastic surgery. Plastic surgeons will have to evolve and to respond creatively to this change in landscape (Table 5).

This pandemic will have broad implications for global behavior. Beyond life lost, we can expect it will alter or accelerate societal habits. In America, we are increasingly relying on services that decrease social contact—grocery

delivery services replace store visits; virtual meetings supersede their real-life counterparts; virtual education blends with traditional schooling; working from home is increasingly common; religious gatherings will stream online. By the time the dust settles—months or even over a year from now—we may have acclimated to this new norm, which is functionally an acceleration of where present technology is leading us already. Moreover, we may even prefer the absence of in-person interaction, recognizing it as safer and virus-free. If the pandemic response leads to enforced quarantine and the like, individuals may turn to the safety of authoritarianism over the dangers of individualism. The stunning lack of American control on the supply chain for essential products such as PPE and common medications may cause the nation to turn inwards to domestic production and away from global interdependence.²²

More immediately, a stark change in attitude is on the horizon. Generation Z college students continued with mass spring break gatherings despite the CDC guidelines to socially distance, aimed specifically at protecting their own high-risk parents and grandparents.²³ The World War II generation faced almost certain death in Normandy by German machine gun fire to free Europe and to save men, women, and children from the ovens of Nazi concentration camps. Today's college students may not even leave the beach to safeguard their elders, despite the understanding that these young people are believed to be largely asymptomatic carriers of COVID-19. Until now, this generation along with millennials have never felt a sense of real fear or endured a large-scale loss of life. This moment is a tipping point for a society engulfed in selfie culture, softened by the comforts of the internet and the availability of almost everything at the click of a button. While this pandemic will test our society in ways most of us have never experienced, it also represents an opportunity for positive change, a chance to forge modern leaders who

Table 5. How COVID-19 Has Changed Plastic Surgery

Change	Solution
Practice closures	Telemedicine and virtual consults Virtual postoperative appointments
Patients in quarantine/reluctant to visit in person	Social distancing as standard practice unless in-person physical examination is needed Fewer physical postoperative appointments Trend toward most visits being virtual Communication via social media and personal electronic devices Update websites and social media to allow scheduling of these visits
Global and domestic travel restrictions	Ensure HIPAA compliance of virtual visits and telemedicine consults Virtual consultations
Postponement and cancellation of professional conferences	Online webinars and live streaming education
Postponement and cancellation of board examinations	Online examinations at home with virtual monitoring
Restrictions in healthcare supplies	Increased conservation and reuse of supplies with sterilization techniques (UV light, auto-clave)

HIPAA, Health Insurance Portability and Accountability Act.

Table 6. Societal Changes Post-COVID-19

Change	Implications
Increased adversity	Resilience is born from hard times. Not since World War II have we been tested like this as a nation and a global community. We will no longer take the luxuries of a wealthy democratic nation for granted.
Disappearance of instant gratification	Patience is learned in times like these. Gone are instant deliveries and here are product shortages and malfunctioning supply chains. We appreciate more what we work hard to gain.
Fear and panic	Strength is built from fear. Character is built from facing these fears. Much has been written about the anxiety younger people face today in America as a result of the sheltered lives they lead. No more. We will learn that we are stronger than we thought. We will become self-reliant, more selfless and prepared to overcome the obstacles we encounter.
Paradigm shift in social contact	Social contact has tumbled to an all-time minimum. Is the social handshake gone for good? Will it always be tainted with the fear of disease transmission? We are already witnessing a transition to virtual social events, “game nights” and “happy hours.” Will these social gatherings become the new norm?
Increase focus on others over ourselves	The elderly mortality associated with COVID-19 is a direct challenge to the me-focused mentality. To protect our friends, family, neighbors, and fellow citizens—and most of all our parents and grandparents—we will need to self-sacrifice to put their needs first and mitigate their risk.
Return to core American values	Thomas Jefferson once opined that the virtue of the republic was based on the virtue of its citizens. Our society must turn away from the celebration of the narcissism of the aughts and return to the disciplined civic virtue that characterized previous generations, and this opportunity change gives us hope. Our predecessors fought against British colonial rule, fought in World War I and II, and fought for civil rights and equality at home. Each of these accomplishments required placing the needs of others above self-interest. Where previous generations sought to free themselves and others from the shackles of bondage, our generation’s war is a moral one to free ourselves from the shackles of narcissism.

will rise above their own needs to tackle the challenges at hand, a chance to reset our values and priorities (Table 6). It is not too late to change the course of this pandemic, and we must lead in this crisis situation to empower, to fight resiliently, and to succeed.

We are entering a period marked by uncertainty. How long will we be isolated, quarantined, and unable to practice as usual? Will we be called upon to act as intensivists as in other countries should our healthcare system be overwhelmed? As plastic surgeons and doctors first, we will continue to take the very best care of our patients, even in difficult times. We will have to be creative and intrepid to do so. However, if there *is* one certainty in times such as these, it is that plastic surgeons have the creativity, the intelligence, and the grit to find solutions to the challenges we encounter. In the words of Sir Winston Churchill, “If you’re going through hell, keep going.”

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