

Can Somebody Please Reinstall 2020? It Seems To Have a Virus!

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Flash back to the start:

In December 2019, news of another virus, a SARS variant was streaming out of China. The previous SARS-CoV-1 2002-2004 had infected less than 9,000 individuals with an 11% mortality, the virus stopped as quickly as it had started. Epidemiologists were reporting a highly contagious novel SARS-CoV-2 variant with high R_0 'R naught' that represents how quickly a disease is spreading, or how many people one sick individual would infect. COVID19 had an initial R_0 of 2 to 3; with the Omicron variant R_0 nearly 7. This meant that each person infected with the original strain of COVID-19 would infect 2 to 3 more people. Patients would present with symptoms ranging from fever, chills, cough, and fatigue on the low end of the spectrum, all the way to difficulty breathing with profound hypoxia and overwhelming multi-organ failure with a mortality rate upwards of 4%.

January 20, 2020, a momentous day in this pandemic, the first US COVID-19 case was reported near Seattle, Washington; a 35-year-old with a recent trip to Wuhan, China developed flu-like symptoms complicated by pneumonia. This started an international evacuation of sorts, with US citizens being asked to leave China rapidly and flights out of China were being banned in most of the world. But by then the Wuhan horse had

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already bolted from the stable; and closing the door was at best, symbolic. Eventually, in California, American citizens were flown into military bases from Wuhan, one of them being March Air Force base, just miles from us, to be quarantined for 14 days with COVID-19 testing, at that time, only possible at the CDC in Atlanta, Georgia.

Within months, COVID-19 was reported across the country and by April 2020 most of the schools and non-essential businesses were closed to prevent further spread of this frequently fatal and unpredictable virus. Americans, probably looking for some sense of control stockpiled food staples and paper goods, (the reassurance of having enough toilet paper must be psychologically reassuring!) a phenomenon seen as hours long grocery store lines and store shelves eerily empty, an image associated more with pending snowstorms or hurricanes than with a virus. What a multi winter 'snowstorm' this was to be...

Simultaneously, images of COVID-19 units poured into news media from Lombardi and Veneto, Italy after two tourists tested positive for the virus. Weeks later, the virus had blanketed Italy, which went into lockdown, pharmacies and grocery store shelves empty as heavily armed and masked, military and police patrolled the streets to ensure strict enforcements of mandates of masking and stay-at-home orders. Italian physicians started publishing their experience caring for the octogenarian and nonagenarian patients who were particularly prone to this illness, describing placing breath tubes without bag-masking (an essential process normally, to keep the blood oxygen acceptable after the patient stops breathing due to administered drugs, prior to placing the breathing tube in patients) to prevent aerosolization and exposure of hospital staff. Intubation came with a high risk of death, partly because it was a self-selecting group, already in near *extremis* with little hope of getting off the ventilator and out of the hospital. The pandemic that started in Wuhan eventually affected more than 180 countries or territories across the globe.

Images of COVID-19 featured intensivists and anesthesiologists across the globe donned head to toe in masks, gloves, and eye wear, expressionless, or worse anxious and scared, dressed in blue, yellow, and white gowns. We, the anesthesia-critical care community, were backdrops alongside patients with desperate breathing patterns, who were lonely, and fighting for every breath. Our work areas were littered with the latest scientific 'evidence', usually postulated expert opinions, soon to become obsolete and our *WhatsApp* accounts were filled with algorithms that gave limited guidance to fight a pandemic we thought medicine would easily outsmart. *Tik-tok* videos now featured our nurses proning (or turning patients onto their chest) for improved oxygenation. No longer was social media for entertainment, but now, for teaching medical teams' skills to the tune of 'Dance Monkey' by Joey Stamper. Another modern media outlet, *YouTube*, featured instructions on sharing

one ventilator among multiple patients (an interesting idea, if it ever came to that).

Over the first part of the pandemic, twenty percent of acute care medical professionals left the field, most of whom viewed themselves high risk for COVID-19 morbidity and mortality. The rest of us, hopeful and possibly naïvely, carried on with our Hippocratic oaths, and with a sense of duty, we cared for patients in newly created overflow wards, quarantined from our families, normally our biggest support system, to avoid transmitting this deadly virus from the patients at the hospital to high-risk individuals within our families, neighborhoods, and then communities. A significant number of health care workers were reported to be infected with COVID-19 during the first 6 months of the COVID-19 pandemic, with a prevalence of hospitalization of 15.1% and mortality of 1.5%. (Gholami et al., 2021). Hazardous work, but no extra hazard payment. One of our authors (ACS) had relocated from the northeast US (Philadelphia, PA) to the southwest (Riverside, CA) to be closer to his pre-teenage children and suddenly everyone was quarantined. Not willing to risk infecting his children, he did not see his children for months!

We turned our attention to appropriate testing and quarantine time for those exposed to COVID. Initially all exposed staff had a mandatory two-week quarantine, but we were almost daily exposed to COVID-19 patients. Then came the orders to come to work fully masked regardless of exposure unless positive for symptoms. Moreover, the advice for the public to stay at home to protect themselves contrasted sharply with the requirement for healthcare workers to continue attending work to care for patients, which emphasized the concept of healthcare workers making a significant sacrifice by continuing to work. ‘Healthcare heroes’ was a term bandied around like it would negate the high or somehow justify the extra risk we took every day. Each morning we were greeted with a new mask and the question, “Any symptoms?” Do you really want my honest answer? “I’m fatigued, my muscles ache, and I have a headache from long hours and little rest”, was what wasn’t said, instead a curt “no” sufficed. Fearing we would be a COVID “spreader,” we got tested for COVID-19 regularly with each little snuffle or headache, thankfully always negative despite our frequent exposure. And as we all know, those quasi-brain biopsies like tests, will bring tears to your eyes! Serology testing gave us clues into our asymptomatic cases and was initially encouraged to identify healthcare workers who could donate convalescent plasma to immunocompromised patients. Eventually PCR became the gold standard for testing for COVID-19 and the initially promising convalescent plasma studies failed to show any benefit.

Across our country, we scrambled to increase our healthcare workers, military reserves were called into duty, and healthcare schools founded hybrid teams using medical and nursing students in unique capacities to help with patient care. We purchased our own N-95 masks,

retrofitted BIPAP masks with ventilator filters when N-95s were limited, and sterilized shared air purifying respirators (PAPRs) which blow filtered air into face masks. In the early days, the PAPR would allow us to separate from 'COVID fear' and so we could turn our attention completely to our patients. Across the world, came the change from the silent gratitude and appreciation to clapping and banging of pots and pans, at a fixed time every day, from Brazil and Argentina to USA, especially in New York, France, and Italy and all the way to India. The mass clapping expressing solidarity with healthcare workers, especially doctors and nurses, the frontline of our defense. The clanging traverses the annals of history taking the form of banging on pots and pans, also known as *cacerolazo* in Spanish — the traditional sound of protest against government. In this instance it was both, a protest and support coming from unexpected sources, like *Starbucks* who offered free coffee to healthcare workers during the early pandemic, and *Crocs* who offered free shoes to the first healthcare workers to register each day.

The skill set: ventilating, and then intubating a patient, best practiced in cool, calm, and controlled environments; usually, were now being performed in dire circumstances as the last hopes to keep a patient alive. Mount Sinai Hospital in New York, Temple University Hospital in Philadelphia, and many others, developed teams of roving anesthesiologists, who responded to all 'code blue' calls with the expectation that the next one, almost certainly a COVID-19 positive patient, would be *in extremis* and would also need intubation. Personal risk aside, prior to vaccines and PAPR protection becoming more routine, double masking and N95 masks (some of dubious quality) and faith in the higher purpose of saving lives were the mostly effective shield of the clinical warrior. It is a surprise that more of our clinicians were not contracting the virus and dying, though too many of them did. Unfortunately, *Medscape* lists were filled with obituaries of healthcare workers, hundreds of our brothers and sisters who died of COVID-19 while upholding the highest principles of medicine.

We protected our young resident physicians and medical students almost as much as our at-risk older colleagues who might have hypertension, diabetes, autoimmune diseases, transplants, or obesity. We did not realize our colleagues' ailments until they too became patients in our Intensive Care Units. We donated on *GoFundMe* to the families of our fallen friends, and we wept tears of helplessness and unfairness of events at the bedside of patients in multiorgan failure. However, our expressions were unseen not only by our face recognition *iPhones*, but also by our communities who struggled with *fake news*, and by our patients who were too ill to notice our desperation. Who could grasp our reality and the blame *fake news* cast on physicians? We struggled with limited resources, unprecedented illness, wavering scientific evidence, and expressionless masks. How could anyone grasp the complexity of healthcare during a

modern pandemic, let alone the emotional burden cast on physicians? The almost all, unfair criticism of medical personnel from the fringes, who accused us of being part of the problem, with some sort of money-making conspiracy theories was, to put it very mildly, disheartening. While handshakes and warm hugs were strictly discouraged in a socially distancing world, we became adept at “air high fives” and elbow bumps and even ankle shakes, showing our need to connect as humans. Perhaps *namaste* is all we could do safely.

Most scientific studies on facial expression use static images, historically dynamic expressions were difficult to capture and reproduce. Now, *Zoom*, *Microsoft Teams*, and *FaceTime* allowed remote facial expressions, a feature anesthesiologists and intensivists utilized to fill our time with Continuing Medical Education (CME) COVID-19 lectures and remote meetings with colleagues across the world. We had little appreciation for conspiracies and power struggles. We were first in line for any vaccine available, and we quickly returned to work trying to help COVID-19 patients survive until we could get them the latest treatments shown to have scientific benefits whether APRV, a controversial mode of ventilation that has been shown to benefit some COVID-19 patients, or ECMO, extracorporeal membrane oxygenators.

ECMO was first introduced in the 1950s and was initially used to provide oxygen to newborns with immature lung function and cardiac patients during heart lung surgeries. ECMO has most recently been used as a bridge to heart and lung transplant allowing our patients time to heal from lung or heart failure or to be transplanted. The artificial oxygenator passed blood volumes through circuits, allowing oxygen replacement and removal of carbon dioxide while a perfusion technician watched continuously. Any interruption in the circuit would immediately be fatal. ECMO was the last line of our algorithm in COVID-19, a limited, expensive, resource-intense modality with a litany of complications and unfulfilled expectations.

Many of our patients were willing to receive monoclonal antibodies or convalescent plasma but were resistant to receive a vaccine they viewed as “untested” despite accumulated development over the past 30 years and the first mRNA influenza vaccine clinical trials dating back to 2015. The polarity of the political climate propelled vaccination opinions in strongly divergent directions. Arguments over political views were soon replaced by a stance for or against vaccination. Rational scientific conversations were soon replaced by claims that mRNA vaccines altered DNA makeup and claims that everyone receiving vaccination would suffer mysterious long-term health consequences, while actual vaccination risks were rarely discussed. Some patients were willing to accept the threat of death and grave disability from COVID-19 rather than accept a vaccine with possible future consequences.

We, the physicians, watched attentively as mRNA vaccines went through various stages of development including patient safety data on 43,548 international patients who enrolled in Pfizer BioNTech COVID-19 vaccine placebo controlled clinical trials. Emergency use authorization, EUA, was issued by the FDA December 2020, within a year of the first reported case, an unprecedented timeline for vaccine creation. Medical providers and essential workers across the country lined up for vaccination, excited to put a stop to the pandemic that had plagued us far too long. mRNA vaccines have been studied for decades to provide immunity against viruses like HIV and Ebola. Unfortunately, the mRNA blueprints would be degraded before reaching cells until lipid nanoparticles were developed in 2020 to protect the blueprint long enough to enter the cell and create spike proteins as seen on the COVID-19 virus. These spike proteins could not cause infection but would trigger the immune system to create antibodies and immunity against COVID-19. The mRNA and spike proteins were degraded by the body with antibodies and immunity remaining. The vaccination rates were slower than desired for herd immunity in large part due to “lack of confidence in vaccination and/or complacency about vaccination”. The technological advancement was too rapid for some, although not soon enough for far too many. (Anand & Stahel, 2021).

Many patients looked for using old medications for COVID-19. Our scientific community was initially eager to try any medication that could offer benefit. Physicians and scientists studied antibiotics like Azithromycin, antiparasitics like Ivermectin, and antimalarials like Hydroxychloroquine for improving COVID-19. However, these medications showed little or no improvement in morbidity or mortality and were unfortunately associated with toxicity, heart arrhythmias, and even sudden death. Our Hippocratic oath, *primum non nocere* (“first do no harm”) kept us from endorsing any such unproven medication. Many of dubious intent, some with ‘dr’ in their name, from allopathy, osteopathy, homeopathy, naturopathy, chiropractic, acupuncturists, even pharmacology and nursing, had no compunctions in declaring themselves as self-styled experts, marketing all kinds of combinations, guaranteeing a cure or prevention from COVID-19. Some even made claims to data that did not meet rigorous scientific standards and price gouged medications and COVID-19 tests. The DEA, FDA, and other state agencies tried to control this with cease-and-desist orders, but the erroneous reports easily infiltrated websites and social media outlets. Similar to a hydra syndrome, more would pop up as soon as one was shut down. These unproven home remedies were, at least partially responsible, for the delay in medical care being sought, possibly contributing to the morbidity and mortality of the pandemic.

The kinds of scams were prevention scams, research scams, testing scams, contact tracing scams, “mask exemption” card scams,

treatment scams, supply scams, vaccination scams, telemedicine frauds, charity scams, phishing schemes, app scams, provider scams, insurance scams, investment scams, price gouging, misinformation about masks, and many others.

In the meantime, our physician scientists conducted rigorous scientific studies to increase our arsenal against this deadly virus. Our infectious disease specialists quickly studied an anti-SARs-COV-1 medication named remdesivir which was shown to stop viral RNA replication in the cells. By November 2020, the ACTT-1 study was published in the *New England Journal of Medicine* showing improved mortality of 6.7% in hospitalized patients receiving remdesivir compared to 11.9% in the placebo group as well as decreased ventilatory utilization and decreased length of initial hospital stay, which are very important markers of efficacy of treatment. Benefits were greater when given earlier in the disease and most enrolled patients had severe respiratory failure requiring oxygen use. (Beigel et al., 2020).

Our rheumatologists struggled to discover the inflammatory cascade that propelled multi-organ failure long after the virus had been cleared. Our patients were quickly started on anticoagulation to prevent microthrombi associated with strokes, pulmonary embolisms, and heart attacks in our COVID-19 patients. They placed patients on steroids like dexamethasone to decrease the hyperinflammation associated with multi-organ failure. They also repurposed anti-rheumatic medications targeting interleukins in the COVID-19 cytokine release syndrome (CRS) like tocilizumab, siltuximab, and sarilumab hoping to stabilize patients in the later stages of disease. (Du et al., 2021).

Other healthcare teams utilized telehealth for patient care, unfortunately surgery, anesthesiology, intensivists, emergency medicine, and obstetric practitioners did not have this luxury, forcing us to become the unseen, humbled physicians behind, literally, paper masks. Surgical procedures were delayed, when possible, to prevent intubating COVID-19 positive patients for elective procedures. However, many emergency surgeries were necessary and often on COVID positive patients who feared being placed on a breathing machine. We performed emergency bedside cesarean deliveries on hypoxic mothers in hopes their breathing would improve after delivery, and we struggled with mechanical ventilation when our bleeding trauma patients arrived COVID positive.

For family practice and internal medicine teams, telehealth became a multibillion-dollar industry where they learned to diagnose and treat patients from a distance. Stethoscopes gathered dust as *Haiku EPIC* access allowed physicians to place orders remotely, and patients accessed their drive-through COVID-19 nasal PCR swab in *MyChart*. While historically billing for telehealth coverage was problematic, COVID-19 changed billing rules, patient willingness, and provider access for

telehealth. The Federal Communications Commission allocated multiple grants of more than \$200 million for increasing telehealth connectivity through the Coronavirus Aid, Relief, and Economic Security (CARES) Act (Bestsenny et al., 2021).

Why did deaths continue to increase at the height of technological advancement in 2020 and beyond? Death rates not only from COVID-19 but also from cancer, myocardial infarction, and stroke all increased during this time. Did asymptomatic virus cause havoc in multiple organ systems? Did technological literacy impact access to telehealth? Were our patients seeking healthcare in advanced stages of disease, afraid of contracting COVID-19 if they sought healthcare in our institutions? Did the highly polarized political climate of 2020, across the globe, contribute to the greater than 5.4 million deaths? How did lack of trust, humanism, and mentorship contribute to the chaos and desire for individual control?

We struggled to innovate medical therapy, sharing whatever success we could find, gleaned by word of mouth and email and text messages followed by robust scientific evidence that was poorly accepted by our patients. We struggled to quarantine from our loved ones and to mask from each other. However, our emotional energy was drying with our tears, under the excuses of burnout and PTSD our relationships and social support networks disintegrated, humanism became lost, and our *Zoom* videos replaced human touch. More than ever, we desired to protect and heal our patients, but even with a tremendous effort to improve technology and the COVID-19 armamentarium, physicians struggled with the tangled rollercoaster rides of multiple COVID-19 surges.

One desaturation away from intubation, a COVID-19 patient was maximized on oxygen therapy on both a non-rebreather and high-flow nasal cannula, HFNC, at 60 liters per minute. His wife was called in to have one last conversation before intubation, and she pleaded to stay with him and somehow didn't leave his room for ten days. The doctors and nurses didn't think the patient would survive, and she didn't step outside the room for fear of never being allowed to return. How that patient survived until hospital discharge and how his wife stayed for 10 days during strict visitation policies, we will never truly know. Perhaps medicine still depends on human connections, expressions, and a gentle touch. At the beginning of 2022 and beyond, medicine continues its path of innovation enriching our Hippocratic oath which says, *"I will remember that there is art to medicine as well as science, and that warmth, sympathy, and understanding may outweigh the surgeon's knife or the chemist's drug."* The authors hope that scientific insight, sound reason, innovative technology, and unbiased compassion can bring resolution to this pandemic and re-install a sense of community and purpose across all 195 countries.

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