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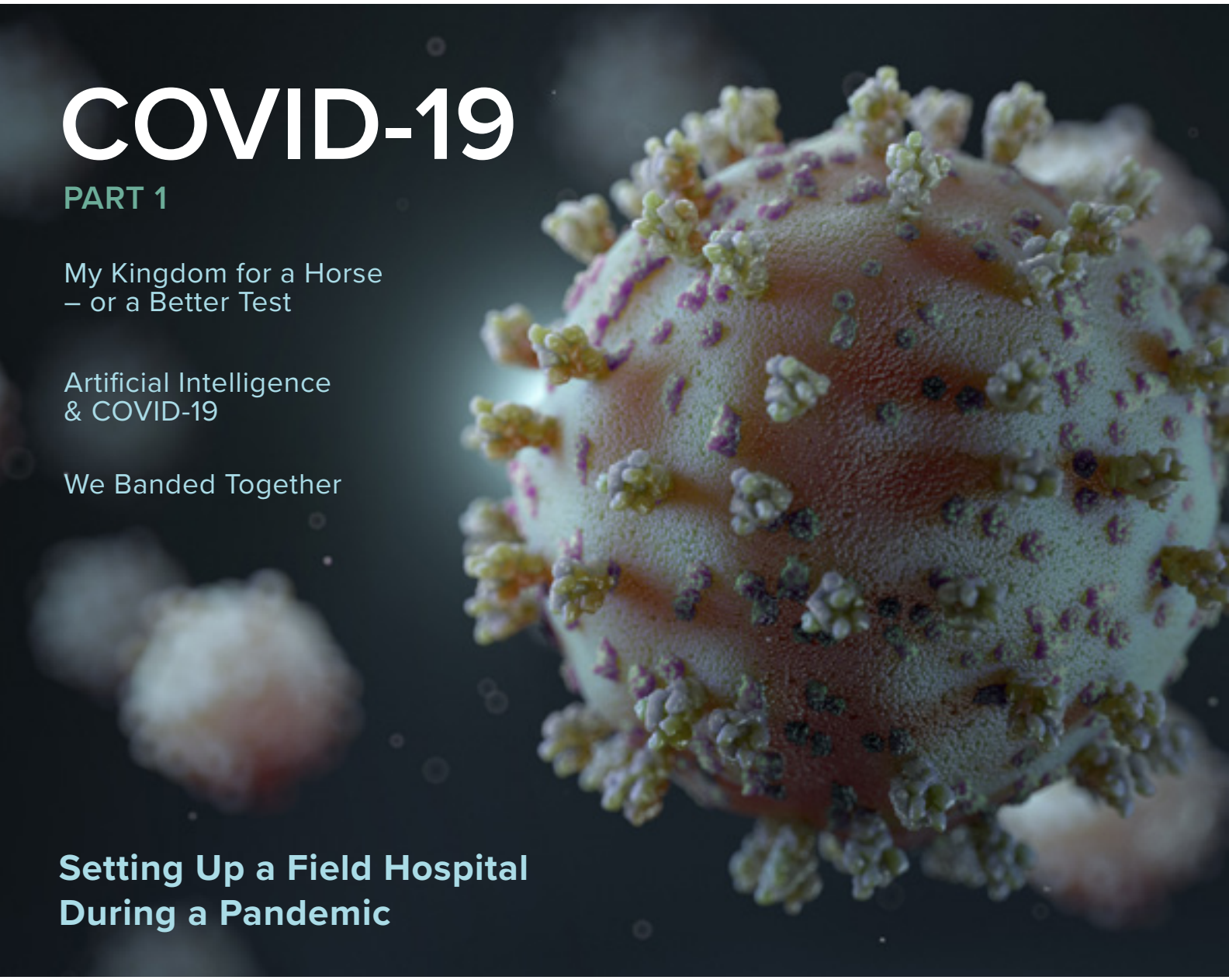

COVID-19

PART 1

My Kingdom for a Horse – or a Better Test

Artificial Intelligence & COVID-19

We Banded Together

Setting Up a Field Hospital During a Pandemic

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on the cover
SARS-CoV-2 Up Close
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Editorial

Jane Lochrie, MD

Our lives have changed dramatically over the past months and will continue to be challenging over the next several months.

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2), or COVID-19 as it is better known, was first identified in Wuhan, China in December 2019, was declared a public health emergency of international concern on Jan. 30, 2020 and a pandemic was confirmed March 11, 2020. As of June 9, 2020, 7.12 million cases have been reported worldwide resulting in more than 406,000 deaths.

COVID-19 has consequences beyond the spread of disease. The pandemic has caused the largest global recession in history with more than a third of the population being on lockdown. Every aspect of life as we know it has been affected. We have seen record unemployment, many are still awaiting their unemployment benefits; schools and universities are closed, many for the foreseeable future; patients are afraid to go to the hospital or physician office; and there are severe pharmaceutical and food shortages. Everyone is wearing a mask and we are all being asked to socially distance. In this issue of *Worcester Medicine*, we will look at COVID-19 in Worcester.

In the first article, Dr. Esposito stresses the importance of having a rapid and accurate test for COVID-19 especially because this condition is readily communicable and potentially lethal. He describes the failure of the Centers for Disease Control to remove contaminated test kits from the market in a timely fashion leading to the delay in containment of the virus and loss of personal protective equipment.

Drs. Kakarmath and Abraham discuss some of the successes and challenges of artificial intelligence and its application to COVID-19. Basically, AI is teaching computers cognitive functions such as pattern recognition, explanation and predictions based on immense data collection from electronic medical records. The pandemic has surged an interest in applying AI to the study of the virus and to aid in the search for potential treatments, vaccines and a repurposing of existing drugs to be used in the treatment of COVID-19. Clinically, it is being looked at to aid in CT interpretation and to predict the risk of mortality and the development of acute respiratory distress syndrome in patients with this disease.

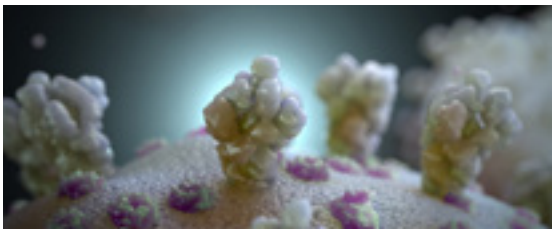
Dr. Larkin illustrates the challenges for operating a medical school during a pandemic while adhering to social distancing. On March 12, 2020 virtual and distance learning was initiated for all academic classes. The pandemic curriculum for students in their clinical years included student-led volunteer opportunities, remote learning opportunities to teach students about clinical care during a pandemic, COVID-19 research, community response, projects related to clerkships and graduation for the fourth-year students two months early. During this time, students participated in telehealth initiatives and virtual rounding, provided care for the homeless and screened patients and visitors for symptoms of COVID-19 at UMass Memorial Health Care.

Dr. Finlay-Morreale shares her interview with Dr. Broach who directed the construction and operation of field the hospital at the DCU Center. The goal was to focus on a patient population who they could care for safely while having an impact on the need for surge beds in the city and state. They faced several challenges including delivery of oxygen, staffing, infection control, pharmacy requirements and IT.

A description of the struggle to provide care during a pandemic is provided by a recent nursing graduate, Ms. Matias, RN, B.S. in nursing. She asks the questions that so many of us have: "How are we going to protect ourselves? And how are we sure that this is enough?" The nursing presence is the nurse's proximity to a patient, position during a conversation, location in the room and the therapeutic touch that has all been altered by the need for infection control and limiting time with a patient. Importantly,

> *"She asks the questions that so many of us have, "How are we going to protect ourselves? And how are we sure that this is enough?"*

Editorial *Continued*



PPE has robbed the ability of the staff to nonverbally communicate with a patient. She explains the importance of adapting the power of nursing to such a complex circumstance.

Pharmacist Drs. Nicolas and Kanaan remind us of the importance of clinical research particularly for a disease like COVID-19 which does not have a treatment. They describe three studies that look at remdesivir as a specific therapy. The first study found that patients who started remdesivir within 10 days of symptoms had a faster time to clinical improvement though this was not statistically significant. The second study found a statistical difference in the median time to recovery (11 days vs. 15 days). The third study looked at the use of 10 days vs. five days of remdesivir and found no difference in the primary outcome.

Dr. Colwell is one of 135 students from University of Massachusetts Medical School to graduate early. Though she had other once-in-a-lifetime experiences planned before starting her internship, she volunteered to work as a surge physician for two months. She tells us how hard it was not to have answers to her questions and having so many of her patients die without visitors.

In closing, I am pleased to report that we have a new publisher with whom we will be starting this issue. Studio DiBella has demonstrated all the qualities that we consider vital - commitment, flexibility, creativity and responsiveness. Thanks to Martha Wright, MBA who spearheaded this endeavor and to the publication committee who met with various companies before making the final decision. We all look forward to working with Bree DiBella, principal creative director, and Nic DiBella, principal content strategist.

Now that we are making major changes in our publisher, I think this would be a good time to have some new leadership for the editorial board. I will be stepping down as editor as of Dec. 31, 2020. If anyone is interested in a position on the editorial board, please let us know.

As always, I would encourage everyone to read As I See It, Legal Consult, In Memoriam, News from the Archives and Society Snippets. ✚

COVID-19 Part 1

My Kingdom for a Horse – or a Better Test

Anthony Esposito, MD

"A HORSE, A HORSE! MY KINGDOM FOR A HORSE!" SHOUTS Richard III as he rushes through the battlefield slaying one enemy after another until he is killed, his final words: "I have set my life upon a caste … A horse, a horse! My kingdom for a horse!" Thus, writes William Shakespeare in Richard III.

Does "my kingdom for a horse" mean that Richard was willing to trade his kingdom for a horse, or that because he had no steed to carry him through the desperate battle, his kingdom would be lost? No matter, since the plaintive words are so striking that they have become one of Shakespeare's most memorable quotes. And in no small measure, the words apply to all providers engaged in the battle against the novel coronavirus. Yes, most physicians would give blood or treasure for one thing above all else in the present conflict. And if asked what that one thing might be, the response – as anguished as was Richard's – would likely be, "A test, a test! My sanity for a rapid and accurate COVID-19 test!"

The federal mismanagement of the coronavirus outbreak in the United States and the attendant human suffering and economic dislocation will keep historians busy for years and may overshadow the splendid work done by city and state health departments, hospitals, first responders, grocery store workers, bus and train drivers, and the many others whose service has been invaluable in keeping the country functioning and safe. To those whose scintillating efforts have shown so brightly, we owe an immense debt of gratitude. The debacle around testing, however, will provide ample material for several chapters in scholarly works that will emerge from the pandemic.

One cornerstone of medicine in the 21st century is the ability to rapidly and accurately diagnose a medical or surgical condition and thus with an answer in hand, develop a plan of action to treat the disorder. The imperative to establish a diagnosis is accentuated when the condition is readily communicable, is heightened when the disease is potentially lethal and is most acute when an effective therapeutic or prophylactic treatment does not exist. Recent microbial threats to the United States with the latter characteristics include the Middle Eastern Respiratory Syndrome coronavirus (MERS-CoV) in 2012 and the West African Ebola outbreak in 2014; both of these viral illnesses were associated with case fatality rates in excess of 30%. Fortunately, outbreaks of Ebola or MERS did not materialize in the United States.

The timeline of the COVID-19 pandemic highlights the system failures leading to an inadequacy of testing in the United States. An outbreak of an unusual pneumonia in the city of Wuhan, China was recognized in late December 2019 and a novel coronavirus was identified as the etiologic agent during the first week of January 2020. By the second week of January, the genetic profile of the virus had been shared with the World

COVID-19 Part 1 My Kingdom for a Horse – or a Better Test *Continued*

Health Organization and entities across the globe. The WHO characterized the sharing of the genetic sequencing as "very important for other countries as they develop specific diagnostic kits." Also during the second week of January, the Chinese began obtaining nasopharyngeal swabs from suspect COVID-19 cases and testing with polymerase chain reaction technology and primers based on unique sequences of the novel virus' genome. In the same week, the first case outside of China was reported and about one week later, on Jan. 20, the first confirmed case was identified in the United States.

In the United States, the development of test kits fell to the Centers for Disease Control. Tragically, as it turned out, the test kits being produced were contaminated and were giving false positive results on purified water. As Anita Bartholomew reported: "The troubled segment of the test was not critical to detecting the novel coronavirus … But after the difficulty emerged, CDC officials took more than a month to remove the unnecessary step from the kits." Ms. Bartholomew concludes, "If the contamination had been treated as an emergency … there would have been no delay. Even if bureaucratic hurdles prevented the immediate removal of the contaminated component, the U.S. still might have been able to mitigate the worst of the effects of the coronavirus on public health and the economy, because the CDC wasn't the only place in the world the U.S. could have gotten testing kits … While all this was happening in the U.S., the WHO was distributing a test developed in Berlin, Germany free of charge to countries around the world." In short, technical and operational failures coupled with "a go it alone attitude" and bureaucratic missteps led to a shortage of tests and an inability to implement a containment strategy based on widespread testing, isolating infected patients, and quarantining contacts. February was, in the words of *New York Times* reporters who have detailed the bureaucratic bungling, "the lost month." And the deficiency in the number of test kits available has not been fully resolved at the time of this report. A March 20 headline in the *New York Times* reads, "Frustrated by lack of coronavirus tests, Maryland got 500,000 from South Korea."

The scarcity of test kits not only eliminated any possibility that the pandemic could be contained in the United States, but it also contributed to the evaporation of stores of personal protective equipment. Patients admitted to hospital as possibly infected with the novel coronavirus must be placed in isolation and all providers interacting with such patients – referred to as persons under investigation – must wear PPE that includes an N95 respirator (or its equivalent), a face shield (or goggles), a disposable gown and gloves. Before the introduction of inhouse, rapid assays, PUIs could be in isolation for two or three days before the results of their nasopharyngeal swabs became available and, for that period of time, staff were using considerable amounts of PPE in their day-to-day care of isolated patients. True, innovative ways of preserving PPE evolved (e.g. extended use, etc.) and creative means of decreasing the number of times providers would enter the room of a PUI were instituted (e.g. video consultations, etc.). Nevertheless, because of deficiencies in timely testing, unnecessary supply consumption has been a feature of most hospitals' operations since the pandemic swept ashore.

Most providers are optimistic that the period of test scarcity is coming to an end because of the rapid expansion of diagnostics by commercial vendors, university hospitals, research entities and others. And it is hoped that every hospital will have a rapid, in-house assay soon. However, as anxiety regarding the number of tests ebbs, concerns over the utility of the assays has risen. In short, the sensitivity of the nasopharynx swab in detecting the presence of the 2019 coronavirus in infected patients remains uncertain. Data hastily published by investigators in China indicates a sensitivity of around 70% in hospitalized patients with other evidence of the disease (i.e. characteristic chest CT findings, positive PCR tests on endobronchial secretions, etc.). While it is hoped that because most PCR assays in the United States employ primers from the 2019 coronaviruses that are different from those used in the original Chinese test, the sensitivity of the assay here might be higher than has been reported. However, at this time there is no data to bolster aspirations regarding the tests performed in the United States. Thus, at present, a provider who receives a "not detected" COVID-19 report on a febrile patient with a cough wonders: "Is the result a false negative? Should I continue isolation? Should I do a second test? How does a second test increase the yield in infected patients whose first is negative?" Etc. Etc.

Antibody assays are also becoming available, but their role in diagnosing patients with acute symptomatic infection will be limited. Their roles in epidemiological investigations and in identifying immune individuals will likely be substantial.

Thus, expect pressed providers to continue their plaintive refrain - "A horse, a horse! My kingdom for a horse!" or "A test, a test. My sanity for an accurate COVID-19 test," or some variation on that theme for months to come. ✚

Anthony L. Esposito, MD, Hospital Epidemiologist, Saint Vincent Hospital

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Artificial Intelligence and COVID-19

Sujay Kakarmath, MD, MS

George M. Abraham, MD, MPH, FACP, FIDSA

HUMANKIND IS IN THE MIDDLE OF A PANDEMIC — THE CORONAVIRUS disease 2019 (COVID-19) — caused by a novel betacoronavirus, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Identified in late 2019 as the cause of a cluster of pneumonia cases in Wuhan, China, the virus spread rapidly throughout the rest of the world. In less than six months, the virus has affected about 3.5 million people and caused 250,000 deaths across all but 15 countries of the world, of which 1.1 million cases and 64,000 deaths have been reported in the United States alone. Massachusetts is among the top five U.S. states with the highest disease burden with 66,263 cases and 3,900 deaths since the first case was reported on Feb. 1, 2020. With 6,129 cases and 292 deaths, Worcester County has a moderate but significant burden of the disease (as of the time of authoring this article).

Artificial intelligence is a tool that has gained a lot of traction in the past few years and is being watched closely for its promise to transform health care in general as well as the current pandemic. For the purposes of its application to healthcare, AI can be defined as the use of machine learning, natural language processing, and computer vision applications to teach computers cognitive functions such as pattern recognition, explanation and prediction. AI leverages the massive data assets that have been built within health care over the past decades through the adoption of electronic medical records, high-resolution medical imaging as well as the output of sensors measuring physiological parameters such as those within critical care settings.

In medicine, AI has been applied to the interpretation of medical images (e.g. radiology), risk stratification of patients (e.g. readmission risk scores) as well as improvement of hospital operations (e.g. workflow improvements). The return-on-investment in the application of AI has been the greatest in medical imaging, specifically within radiology. AI has been applied with promising performance in the interpretation of acute neurological events on CT scans, detection of pulmonary nodules on chest X-rays, diagnosis of wrist fractures and acute referral events on head CT scans, to name a few. Within pathology, the application of AI has been restricted by the availability of digitized images of glass slides. Nevertheless, AI has been applied to the detection of breast cancer, classification of tumor subtypes and detection of micrometastases on slides. In addition, AI has been applied to the classification of skin cancer on dermoscopic and photographic images, for the assessment of retinal fundal[1] photographs, and reading of electrocardiograms.

There are several simulated applications of AI to risk stratification of patients. For instance, AI-based stratification of readmission risk for patients with heart failure could potentially guide resource allocation decisions. AI has been applied to predict the risk of mortality, sepsis, Clostridium difficile infection, dementia and mortality after cancer chemotherapy among other things. Most of these applications are limited in their potential for real-world use by the data itself. Electronic medical record data, for instance, is notorious for being noisy, incomplete and a vast majority of it exists in the form of unstructured clinical notes, which cannot be accurately harvested by today's AI. The greatest value addition of AI in the clinical realm has been not only that of performance comparable to expert physicians, but also greatly reduced reading times for images, and the capacity to be scaled easily. By one estimate, AI would be able to process 250 million images for $1,000.

The flurry of promising results from applications of AI to health care in recent years has naturally propelled a surge of serious interest in applying it to COVID-19. The United States government has facilitated various research groups and made public datasets to enable and incentivize the application of AI to benefit pandemic response efforts. In the year 2020 alone, almost 300 articles have been published on the application of AI in some form to the COVID-19 pandemic. Quite interestingly, AI is being applied to the study of viral proteins and to aid in the search for potential treatments. In recent times, computational models are being increasingly used to study protein structure. These models leverage similarity between protein structures and/or predict individual attributes of protein structures based on inputs such as the amino acid sequences. A UK-based company — DeepMind, which was acquired by Google in 2014 — has released the predicted protein structures for six viral proteins including SARS-CoV-2 membrane protein, protein 3a, Nsp2, Nsp4, Nsp6, and Papain-like proteinase (C terminal domain).

Other efforts are underway to apply AI to the problem of repurposing existing drugs for the treatment of COVID-19. AI-based predictions of affinity between existing drugs and viral proteins are being proposed as a way to narrow the list of candidate drugs. These methods have resulted in the proposal of drugs such as abacavir, darunavir, itraconazole, metoprolol, adenosine and vidarabine, among others, as potential drugs that could be repurposed for COVID-19 treatment. There have been attempts to discover new compounds that might act on viral proteins using known information about the viral protein's genetic, molecular and three-dimensional structure.

COVID-19 Part 1 Artificial Intelligence and COVID-19 *Continued*

While the idea of developing novel drugs using AI might have appeared far-fetched until very recently, the discovery of the powerful antibiotic halicin earlier this year demonstrates the tremendous potential of this approach.

AI is also aiding vaccine discovery and development of better testing. Broadly, these efforts use AI to identify potential epitopes that may be targeted for vaccine development. Efforts are also underway to apply AI to the improvement of viral nucleic acid detection assays. These efforts aim to identify nucleic acid sequences that are most specific to SARS-CoV-2, thereby improving the specificity of tests and potentially reducing testing times. Finally, application of AI to the molecular makeup of the virus is being used to better understand the relative virulence of different viral strains.

Clinically, the application of AI has been largely to the interpretation of CT scans to aid diagnosis. Some approaches are focused on classifying the image as being consistent with features of COVID-19 or not, while others focus on identifying and highlighting features within a given image to aid human interpretation. Given accessibility and portability considerations around CT scans, several models have also been developed for detection of features on chest radiographs that are consistent with COVID-19 infection. For example, COVID-Net, an AI-based proof-of-concept system trained on open repository data from almost 14,000 patients with various lung conditions, including COVID-19, achieved sensitivity of 87% and 96% positive predictive value. Other studies have proposed risk stratification applications using AI to predict the risk of mortality and development of acute respiratory distress syndrome respectively, for a given patient. Such applications might help provide more data points to make clinical decisions, optimize use of scant resources, reduce the time taken for a specific diagnostic pathway and possibly support families in making key end-of-life decisions for their loved ones.

The above examples might suggest that the application of AI to COVID-19 seems promising overall. However, there is enough reason to exercise caution with applications that have been built thus far. Many applications are proof-of-concept and most lack the maturity required to be deployed in real-world settings. Moreover, many of these applications are built from limited data that are likely to be affected by selection bias, generalizability and other quality issues. As more data of better quality becomes available, some of these limitations can be expected to be addressed. Claims of clinical and other benefits from these applications then need to be verified in rigorously designed studies that resemble the real-world context of their use. Applications designed to support clinical decision making should meet the regulatory standards set by the FDA before they can be widely adopted. With the pandemic predicted to recur in several waves, there is reason to be optimistic about the potential for mature AI applications benefiting patients and hospitals directly before we see the closing chapter of this pandemic. ✚

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Setting Up a Field Hospital During a Pandemic

Interview with **John Broach, MD**
by **Heather Finlay-Morreale, MD**

WHO CAME UP WITH THE IDEA OF A FIELD HOSPITAL AT DCU?

Most people in the disaster and health care communities at large realized that there was likely to be an increase in demand across all levels of medical care. The state government realized that one way to address the acute care capacity need would be to create alternate care sites and the Massachusetts Emergency Management Agency and began the process of identifying suitable sites. Very early on, our CEO, Dr. Eric Dickson, advocated for creating one of those sites in Central Massachusetts and was one of the key drivers in getting it done. The University of Massachusetts and the City of Worcester realized that we were going to need an alternate site that allowed us a large amount of space as well as flexibility to construct the infrastructure needed to take care of patients. Huge credit here goes to City Manager Ed Augustus, the Worcester Emergency Management group and, in particular, Meghan Gomes and Nicole Valentine.

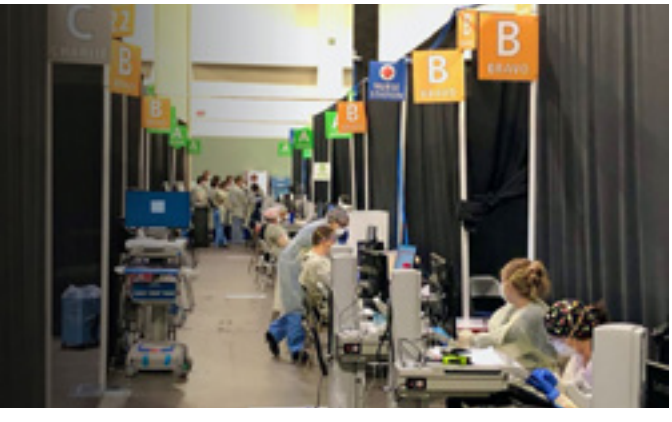
WHAT WAS THE PROCESS OF DESIGN - FIGURING OUT STAFFING, PHARMACY INFRASTRUCTURE, BUILDING RE-DESIGN - OXYGEN, SHOWERS, ETC? DID YOU HAVE ANY TEMPLATES TO WORK OFF OF?

Approximately two weeks before we opened, we met at the DCU to start the process of figuring out how this was going to work. Even before we could figure out how we were going to do it, we needed to figure out exactly what it was we were going to attempt. The next decision was what level of care we were going to provide. Ideas ranged from only SNF patients to ICU level of care. Remember, at the time we were making the plan, very little was known about how the disease would behave. Other parts of the U.S. and the world were a few weeks ahead of us in their surge so we knew that we would likely have a large number of patients that needed long-term oxygen therapy and who would have a significant potential to rapidly decompensate, even after several days of modest O2 requirements. Ultimately, we were able to integrate our effort with the rest of the UMass and Central Massachusetts planning teams and focus on a group that we knew we could care for safely while still having an impact on the need for surge beds. Our final ConOps document included the need to provide up to four liters of oxygen per minute and basically any other medical needs for these patients.

In the disaster medicine literature, there were some suggestions about considerations for field hospitals and alternate care sites but, large-scale field hospitals like ours, meant to provide inpatient care to acutely ill patients, hadn't been attempted in the U.S. for a pandemic since 1918. This meant the playbook was pretty thin when we started and we made up most of our plan from scratch.

Staffing and oxygen delivery were the two things that we knew early on would be very challenging. The O2 delivery was the first thing we started work on and the last thing to be ready before we opened. Actually, we opened on a Thursday morning at 7 a.m. and had received the fire certificate and done the O2 testing at 11 p.m. the night before. Nothing like taking it down to the wire.

Speaking of wires, one thing that I didn't appreciate the difficulty of was the IT infrastructure we would need. Our IT team did an incredible job getting it done and the key folks here were Greg Kelley, Andrew Costa, Joe Wagner, George Zina, and many, many others.



LEFT
University of Massachusetts' DCU field hospital in May 2020

RIGHT
Dr. Broach, medical director at University of Massachusetts' DCU field hospital in May 2020

COVID-19 Part 1 Setting Up a Field Hospital During a Pandemic *Continued*

We also had an entire team working on just staffing. Drs. Dave McManus, Rick Forster and Greg Leslie working with Michelle Streeter from the UMass Medical Group were instrumental and basically set up an inpatient medical team of providers including UMass folks as well as onboarding providers from Reliant and elsewhere. Janell Forget and Sheryl Van Vliet in concert with our human resources team organized the interviewing and onboarding of hundreds of nurses, patient care assistants, licensed practical nurses and others to make sure that we had staff.

Our model was based on care teams which included an attending physician, resident or advanced practice provider and medical students who worked with a nurse, LPN and PCA to take care of a group of about 10 patients per team. That care team approach was created by our associate chief nursing officer for field operations and the guy who made the whole thing run, Peter Lancette. Pete is a retired U.S. Army officer with significant experience setting up care sites down-range in austere environments and was invaluable.

I can't say enough about our EMS partners as well. Worcester EMS and Life Flight had a paramedic or flight nurse stationed at the DCU 24/7 for the entire operation. This was important not only in case someone needed to be moved out, but crucially in case a patient decompensated and needed intubation. All of our WEMS paramedics and Life Flight crew members are specially trained in rapid sequence intubation and were our critical airway management team. Luckily, they didn't have to use that skill at the DCU but we couldn't have operated the hospital without them being there to provide that level of safety to our patients.

Infection control was an incredible challenge as well. The first thing we did was turn the entire space into a negative pressure environment. Sandy Dunn, and the team at the DCU Center, were incredible with this and Dr. Dick Ellison and the Infection Control team at UMass helped us design a safe system of air locks and personal protection equipment procedures so that our staff was protected.

Pharmacy was another challenge. Neil Gilchrist and Neil Wallis were the point people for pharmacy and did an incredible job. They created an entire satellite pharmacy location at the DCU and made sure that our patients had whatever medications they needed.

Lab and X-ray services were also very important. We had an onsite digital X-ray machine and a lab pick-up schedule. We worked with the radiology department at UMass and Steve Beaudoin was our radiation safety officer.

We also had to feed the staff and patients and make sure the place was clean and sanitized. The UMass teams led by Kate Saunders (food services) and John Jepsen (environmental services) were instrumental in making it work.

In terms of allied services, we also had respiratory therapy, physical therapy, case management, and social work teams. All of these were integral to our work and we couldn't have done it without them. About 40% of our patients were non-English speaking and having an outstanding interpreter services group with us was also incredibly important.

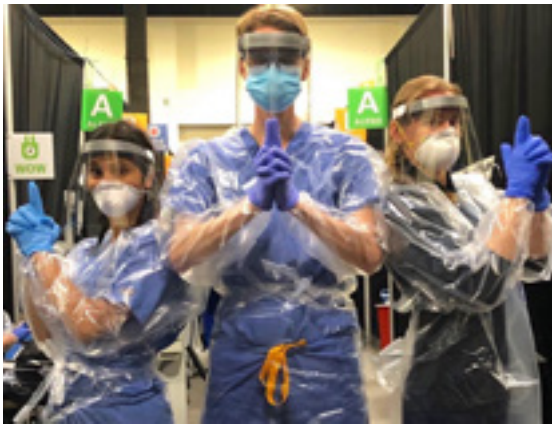
I should also mention the UMass Medical School students who worked with us. They were outstanding and did an amazing job helping take care of our patients. Three in particular who helped lead the effort were Blake Foster, Conor Robinson and Grant Lewandrowski. We had a disaster medicine elective followed by a clinical rotation and the medical students did a ton of valuable work. They also organized and ran a follow-up program which helped make sure our patients were safe even after discharge. There are a thousand other details that I'm forgetting, but we got it all to come together in about eight days.

WHAT IS DISASTER MEDICINE? WHAT DID YOU LEARN IN YOUR TRAINING AND WHAT DO YOU TEACH YOUR FELLOWS?

Disaster medicine is basically the study of how to provide the best care possible in situations where the need for resources is greater than the resources available. This includes everything from setting up tent hospitals after natural disasters, preparing for mass shootings and an influx of trauma victims, to preparing for and responding to a pandemic. A lot of times it means stripping down medicine to the core of what it means

LEFT

University of Massachusetts' DCU field hospital medical student rotation in May 2020



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Gearing up in PPE at University of Massachusetts' DCU field hospital in May 2020

to care for a patient and treat an illness. We don't always have all of the frills and niceties of a traditional hospital but we find creative ways to get the critical things to a patient as quickly and as safely as possible. Importantly, it's not all about response but equally important are the other phases of disaster medicine; preparation, recovery, and mitigation. These are the principles that I learned and that we try to teach our fellows in addition to getting them experience in the field and in committees and other efforts preparing for disasters.

HOW DID YOUR DISASTER TRAINING HELP YOU ESTABLISH THIS FIELD HOSPITAL? WHAT OTHER ASPECTS OF YOUR TRAINING WERE BENEFICIAL?

My disaster training was invaluable in helping me be a part of this effort. I've had the opportunity to deploy to a number of incidents both abroad and domestically and learn what approaches work well for providing medical care in non-traditional environments. It comes down to being creative and focusing on what is most important for the patient to be safe and get better. This was like a long disaster deployment except instead of sleeping on a cot in a tent, I was fortunate enough to be able to go home every night. I have also been fortunate to get some additional training along the way having gotten an M.P.H. and an MBA. Public health training is extremely important for all aspects of disaster response but particularly important during a pandemic. Nothing saves more lives worldwide than good public health. My business training was focused on health care and was helpful in understanding some of the nuances of how hospitals operate administratively.

WHAT WAS ONE OF YOUR MOST MEMORABLE PATIENT STORIES FROM SETTING UP THE HOSPITAL?

There were so many patients that we treated who were memorable. When we discharged a patient, the entire staff gathered to clap and cheer them on. That meant a lot to us and I hope it meant something to the patients as well. Every time we successfully helped someone get through this, it was very meaningful.

WHAT WAS THE FUNNIEST THING THAT DIDN'T QUITE WORK OUT ACCORDING TO PLAN AND HOW DID YOU SOLVE THE PROBLEM?

There were so many little things. One issue that we worked really hard to solve was how we could get hot food for our patients and staff. We had to have a way to heat up meals there because we had to deliver them into the "hot zone" from outside. We eventually got a hot dog maker for the staff - a huge hit!

WHAT LESSONS/STRATEGIES WILL YOU BRING BACK TO YOUR POST-PANDEMIC ROLE AS AN EMERGENCY ROOM PHYSICIAN AND DISASTER MEDICINE EXPERT?

I have taken a lot back that I think will stay with me for a long time. Every deployment is different, but they all make me remember what is most compelling about medicine - making sure people with training and resources are where they need to be to help someone. It is an incredible privilege and the best job in the world. There are also a lot of practical lessons that I've learned about treating COVID-19 by watching the incredible work that our hospital medicine colleagues did. How to protect staff, how to set up safe areas with good infection control are all lessons that will translate really well back to my practice in the emergency department.

ANYONE YOU WANT TO GIVE A SHOUT-OUT TO?

I think I included most of the names above. The entire UMass team, the City of Worcester, MEMA, and the Commonwealth of Massachusetts worked together seamlessly. Our current and future disaster medicine fellows, Dr. Sophie Monnier and Sonny Martin as well as our fellowship director, Andrew Mislten.

Most importantly of all, I also want to give a big shout-out to Sharon Rudinski and Jodi Darby. They led the nursing crew for the entire six weeks and were absolutely tireless. Above anyone else, these two people made it happen! ✚

Heather Finlay-Morreale, MD is a pediatrician for UMass Memorial and tweets at @finlaymorreale *and blogs at* www.finlaymorreale.com/essays.

John Broach, MD, MPH, MBA, FACEP, Assistant Professor, Emergency Medicine Director, Division of EMS and Disaster Medicine, Department of Emergency Medicine

COVID-19 Part 1

University of Massachusetts Medical School Response to the COVID-19 Pandemic: The Balance of Challenges and Opportunities

Anne Larkin, MD

All in the medical community, across all practice models and no matter the specialty, were deeply affected as the rate of COVID-19 cases began increasing in Massachusetts in March 2020. As the landscape shifted rapidly, so too did the administration and faculty of the University of Massachusetts Medical School in preparation for a period of multiple rapid transitions. Modifications were, of necessity, swift yet thoughtful. In order to adhere to social distancing, virtual and distance learning were initiated on March 12, 2020 for all academic classes and school-related events. This transition to distance learning necessitated an immediate adaptation of the means of delivering the curriculum for each of the four years of medical school with complete engagement of faculty and students. Implementation was divided into two phases with the first three weeks serving as a transition period that led into the weeks that followed. The most unique and creative aspects of this plan were the delivery of a pandemic curriculum to the third-year students during a transition back to clinical clerkships, student-led immersion in a multitude of volunteer opportunities in the institution and community, and the graduation of the fourth-year students two months earlier than scheduled.

The pause in face-to-face activity allowed for the creation of a unique pandemic curriculum which was utilized as a transition for students whose clinical rotations had been temporarily interrupted. This curriculum capitalized on remote learning opportunities to teach students about clinical care during a pandemic, COVID-19 research, community response and the participation in projects directly related to clerkships. This unique and highly innovative approach was not only directly beneficial to the students, but will impact curricular content in years to come.

While students were temporarily withdrawn from direct educational interactions and patient care, they felt the enormity of the impact of the pandemic on the community and institution. Students rapidly mobilized to garner their collective energy for the provision of skills across a spectrum of opportunities. The variety of these initiatives were immense and have left a lasting impact on how medical care is being delivered going forward. The student volunteers were instrumental in the advancement of institutional telehealth initiatives and virtual rounding, provided care for the homeless at the medical shelter, and screened patients and visitors at UMass Memorial Health Care, among many other volunteer activities that worked toward supporting patients, staff, faculty and fellow students. In short, despite the upheaval, students stood shoulder-to-shoulder with colleagues and peers to assist in accomplishing critical tasks during an unprecedented time.

In the early days of these transitions, it became apparent that additional manpower would not only be beneficial, but also necessary for ongoing patient care needs and, as such, in consultation with the Massachusetts Secretary of Health and Human Services and the Massachusetts Board of Registration in Medicine, UMMS was able to offer an early graduation date of March 31, 2020 for those students who desired it. Upon notification of the opportunity for a provisional license for early graduates, UMMS academic leaders developed a process to determine whether fourth-year students met graduation requirements and qualified for an early graduation.

In order to prepare for a potential early graduation, a review board was convened and was charged with assessing whether students had adequately met the program requirements and competencies necessary for completion of the M.D. degree. They worked under the premise that the holistic review of experiences would ensure an individual student's readiness for graduation by taking into account the entirety of their work and performance. Following this review, the board deemed that all 135 students met the program objectives and submitted this proposal to the overseeing curriculum committee, which has oversight over graduation requirements.

The UMMS educational policy committee then determined that all 135 students of the class of 2020 had adequately completed the requirements for the M.D. degree and recommended to the dean that all students graduate early. The UMMS graduation ceremony was conducted virtually on March 31, 2020, and, while virtual, was no less impactful for students

UMMS Response to the COVID-19 Pandemic:
The Balance of Challenges and Opportunities *Continued*

and faculty, with moving tributes and perspectives offered by the president of the university as well as the governor of the Commonwealth. It offered a unique opportunity early in the pandemic for reflection on a journey traveled and one yet to come.

In concert with UMass Memorial Medical Center, UMMS then created a new position for the "early graduates," as limited-licensed physicians in order to meet the ever-increasing patient care needs during the pandemic. While all 135 early graduates of UMMS were eligible to become contract employees, a total of 57 new graduates ultimately began practice as physicians in early April under a special 90-day limited license. Early graduates were destined for residencies across the country in diverse specialties including internal medicine, orthopedics, family medicine, surgery, obstetrics/gynecology and many others. During their time as contracted physicians, these new physicians were assigned to work on medicine ward teams and in intensive care units of UMMMC, backfilling for residents who were redeployed to essential COVID-19 units and a local field hospital. The early graduates functioned in team-based patient care activities and were deployed as part of a model that allowed them to support one another.

The addition of the new graduates was critical in allowing the redeployment of housestaff to areas of acute need. They were invaluable to the hospital medicine physicians assigned to services without housestaff coverage and their assistance allowed for the care of a high volume of patients with rapid turnover, despite the increased acuity.

As the landscape has continued to shift, the faculty and administration have reviewed the outcomes of educational interventions regularly and without interruption. The variety of responses has unceasingly supported the educational mission, the clinical care of patients within the institution, and the community as a whole. A key element to the development and implementation of each of these responses to the COVID-19 pandemic was communication and attentiveness to the voices of all members of our community. Yet the journey is not complete. We have learned immensely from our experiences, which will continue to inform and enhance how UMMS students are taught. This remains a core component of our mission and one which we will continue to uphold. ✚

Anne Campbell Larkin, M.D., FACS
Senior Associate Dean for Educational Affairs
University of Massachusetts Medical School

COVID-19 Part 1

Responding to COVID-19 with the Essence of Nursing

Saisha Matias, RN, BSN

Expect the unexpected. I never expected in the first year of practicing as a licensed registered nurse to encounter a pandemic. Among all the anticipated fears of being a newly licensed nurse working on a stepdown unit, came an avalanche of other worries. Being assigned to the first patient admitted to the hospital with suspected COVID-19, I had to rely on my understanding of infection control practices as we were all just learning about detectability, viability and transmission of COVID-19. As the novel coronavirus pandemic accelerated globally, and national guidelines evolved, hospital protocols changed daily. Widespread shortages of personal protective equipment affected hospitals everywhere creating anxiety about whether I was doing the right thing to protect myself and my patients. Although concerning, this was not the most challenging part. Providing holistic nursing care to what Florence Nightingale describes as the "reparative process known as disease" (Nightingale, p. 24, 1860) required nurses to think creatively as we undertook care of patients under observation for or with COVID-19.

March 16 began as another casual day, but, before I could even clock in, the nurse called me over. She pointed to the door, "3615." I see signs on it that say "airborne" and "contact precautions." The device on the door indicates that negative pressure is on. I turn around to the resource nurse and she adds, "We just got this admission overnight. They are questioning a diagnosis of COVID-19." My heart suddenly started beating fast. My knowledge of COVID-19 is limited; I've been following the news, but we haven't yet gotten any protocols in place for protecting ourselves from exposure on the unit. I asked: "What are we doing to protect ourselves? And how are we sure that this is enough?" I have many unanswerable questions. Intense anxiety hit me that I feel I cannot show. I cannot deny care to a patient. At this time, CDC guidelines were to follow airborne and contact precautions with the use of N95 masks, face shields, gowns and gloves (CDC, 2020). After donning my protective equipment, I prepared to enter the patient's room. What will I find on the other side of the door? How can I appropriately communicate

COVID-19 Part 1 Responding to COVID-19 with the Essence of Nursing *Continued*

without the patient being able to see my face?

After entering the room, I see a middle-aged male patient lying in bed. I introduce myself attempting to hide the anxiety from my voice. I am standing at the end of the bed in fear of being too close not knowing how contagious COVID-19 might really be. Yet, it doesn't feel right. I feel I am neglecting him because of my fears. Nursing presence, a commonality of physical categorizations that are believed to affect the healing process, is needed but I am afraid of being too close. Nursing presence includes things like relative proximity to a patient, being at eye level when conversing, active listening, being attentive, therapeutic touching and giving patient baths (Modammadipour et al., 2017). At this moment, I recognize I am not truly present for this patient. My PPE has made it harder for me to communicate. My anxiety about the unknown has created an invisible barrier between the patient and me. How must my patient feel with every person that comes into contact with him completely covered from head to toe with PPE?

I moved closer to the patient attempting to avoid my fears of contracting the virus. "How did you sleep last night?" I asked. With a flat affect he states, "I had to ask for something to sleep. Not knowing my test results and all the noise outside the room kept me up most of the night. I did not want to ring because I know how annoying it must be to have to gown up every time you come in." I assured the patient that calling was not a problem, we were here to help him. He smiled. After assessing his heart and lungs, I made sure to clean up the room. I opened the curtains.

Florence Nightingale (1860), highlights that healing is not merely the use of medications and set therapeutic plans. It is the use of physical presence, light, a healthy diet, sleep, the temperature of a room and cleanliness. I cannot begin to explain the difficulty in using strategies when the pressure of limiting exposure time with a patient is real. How can I focus on lighting and cleanliness when the guidelines have created a ticking timer in my head? My uncertainties are blinding my view to what is in front of me: a human being that deserves a holistic approach. This is what was so compelling about nursing such clinically ill patients during the COVID-19 pandemic. We nurses needed to figure out the coexistent use of nursing presence and natural law, as Florence Nightingale would call it, and medicinal therapy in a timely manner so we were not exposing ourselves unnecessarily. Donning PPE, adhering to infection control best practices, and putting anxiety aside allowed me to provide the holistic care, including nursing presence, that was needed. Moments in time illustrate the provision of such care. It was the moment when I shaved an elderly man's beard while giving him his first convalescent plasma therapy and seeing him smile at himself in the mirror. It was the moment of assisting a usually independent 35-year-old woman with a bed-bath while she was receiving High-Flow oxygen therapy. And the success felt when a patient finally ate his lunch for the first time in several days because attention was given to calling for his preferred meal to ensure appropriate nutrition. Despite my anxiety and all my unanswered questions about COVID-19, I wore appropriate PPE and figured out how to be present for each patient and provide the holistic care they needed. Although COVID-19 is a new diagnosis with uncertainty, adapting the essence of nursing to these new and complex circumstances propelled me forward to meet each patient's needs. ✚

> *"healing is not merely the use of medications & set therapeutic plans.*

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Remdesivir Use in Patients with COVID-19

Abir Kanaan, PharmD, RPh **Samar Nicolas, PharmD, RPh**

There is limited data on effective treatments for COVID-19 and currently, a specific therapy is not approved in the United States. Remdesivir, a monophosphate nucleotide prodrug, has activity against RNA viruses, such as Severe Acute Respiratory Syndrome Coronavirus and Middle East Respiratory Syndrome Coronavirus.[1] Remdesivir terminates RNA transcription and inhibits viral replication by binding to the viral RNA-dependent RNA polymerase.[2] Remdesivir exhibits linear pharmacokinetics and its half-life is less than 35 hours.[1] Although dose adjustments are not warranted in patients with compromised renal or hepatic function, its use is not recommended with GFR <30 mL/min. Published case reports support the use of remdesivir in COVID-19 patients and ongoing clinical trials will likely further clarify its role and inform clinical practice.[3,4]

Remdesivir was evaluated in adult patients with confirmed COVID-19 symptom onset of less than or equal to 12 days before enrollment.[5] Inclusion criteria required O2 saturation (SpO2) of less than or equal to 94% on room air or a ratio of arterial oxygen partial pressure to fractional inspired oxygen of of less than or equal to 300 mmHg and radiographically confirmed pneumonia. Randomization occurred in a 2:1 ratio to remdesivir (200 mg loading dose on day one, followed by 100 mg daily on days two through 10) or saline for 10 days. Lopinavir/ritonavir, corticosteroids, and interferon use was allowed. The primary endpoint was time to clinical improvement, defined as improvement on an ordinal scale or discharged alive from the hospital, whichever came first. Results from 237 patients were analyzed in which 158 received remdesivir and 79 received saline. There were no differences in the primary outcome (HR 1.23; 95% CI, 0.87-1.75) and in the 28-day mortality rate (14% vs. 13% in the remdesivir and saline groups, respectively). Although not statistically significant, patients who started remdesivir within 10 days of symptom onset had a faster time to clinical improvement compared to the saline group (median 18.0 vs. 23.0 days, respectively; HR 1.52, 95% CI, 0.95-2.43). The study was stopped before reaching target enrollment limiting its applicability and requiring further studies to confirm the reduction in time to clinical improvement. The use of concomitant medications may have also impacted the results.

A recent report suggested the superiority of remdesivir over saline (placebo) in patients with COVID-19 and lower respiratory tract infection.[6] In this double-blind, placebo controlled study, hospitalized adult patients were randomized to remdesivir (200 mg loading dose on day one, followed by 100 mg daily for up to nine days) or placebo for up to 10 days. The primary endpoint was time to recovery, defined as either discharge from the hospital or hospitalization for infection-control purposes only. Results from 1,059 patients were analyzed in which 538 received remdesivir and 521 received placebo. A statistically significant difference in the primary endpoint was reported. Specifically, the median recovery time was 11 days (95% CI, 9-12) vs. 15 days (95% CI, 13-19) in the remdesivir and placebo groups respectively, and the rate ratio for recovery was 1.32 (95% CI, 1.12-1.55; P<0.001). Although mortality was numerically lower in the remdesivir group, the difference was not statistically significant (HR 0.70; 95% CI, 0.47-1.04). The Kaplan-Meier estimates of mortality by 14 days were 7.1% and 11.9% in the remdesivir and placebo groups, respectively (HR 0.70; 95% CI, 0.47-1.04). Serious adverse events occurred in the remdesivir (21.1%) and placebo groups (27%). These included respiratory failure (5.2% vs. 8% in the remdesivir and placebo groups, respectively), anemia or decreased hemoglobin (7.9% vs. 9.0% in the in the remdesivir and placebo groups, respectively).

In a phase three trial, the use of remdesivir for 10 days vs. five days was evaluated in hospitalized adult patients with severe COVID-19 not on mechanical ventilation or extracorporeal membrane oxygenation.[7] Patients were included if they were 12 years of age or older with confirmed COVID-19 in the four days before randomization, had radiographic evidence of pulmonary infiltrates and SpO2 less than or equal to 94% with or without supplemental oxygen. Randomization occurred in a 1:1 ratio to remdesivir (200 mg on day one, then 100 mg daily) for five or 10 days. The primary endpoint was clinical status on day 14 using a seven-point ordinal scale: death; hospitalization with mechanical ventilation, or ECMO or supplemental oxygen; hospitalization for medical care without supplemental oxygen; hospitalization for remdesivir protocol only; or discharged. Results from 397 patients were analyzed with 200 in the five-day group and 197 in the 10-day group. At baseline, clinical status was significantly worse in more patients in the 10-day group compared to the five-day group (30% vs. 24%, respectively, P=0.02). There was no difference in the primary outcome on day 14 (P= 0.14). Patients who had more than 10 days of symptoms before initiating remdesivir had a higher discharge rate than those who had symptoms for 10 or more days (62% vs. 49%, respectively). Recovery at day 14 was similar between both groups (95% CI, -15.7-2.8). The median time to clinical improvement was 10 and 11 days in the five-day and 10-day groups, respectively (HR 0.79; 95% CI, 0.61-1.01). In a post-hoc analysis, the rate of death by day 14 was higher in the five-day group which required invasive mechanical ventilation at day five of therapy compared to the 10-day group (40% vs. 17%, respectively). Patients who were on room air or supplemented by noninvasive forms for

COVID-19 Part 1 Remdesivir Use in Patients with COVID-19 *Continued*

ventilation did not have better outcomes if remdesivir was used beyond five days. Given the national allocation of remdesivir, this study offered insights on the duration of therapy in patients not requiring invasive mechanical ventilation or ECMO.

The National Institute of Health COVID-19 Treatment Guidelines recommends the use of remdesivir in patients with severe COVID-19 defined as SpO2 less than or equal to 94% on room air or requiring oxygen supplementation (level AI-strong recommendation), or requiring mechanical ventilation or ECMO (level BI-moderate recommendation). Remdesivir may be used for five days in severe non-intubated COVID-19 patients (level AI), and may be extended up to 10 days when mechanical ventilation, ECMO or improvement is not seen after five days of therapy (level CIII-optional recommendation). For patients with mild or moderate disease, the guidelines do not support or recommend against remdesivir use.[8]

As more data becomes available, remdesivir's role will be further clarified. Practitioners may use the above recommendations to guide practice. ✚

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We Banded Together

Lauren Colwell

In late March, as schools across the United States closed campuses, University of Massachusetts Medical School Chancellor Michael F. Collins called us to work stating he trusted our education and we [were] ready. Though voluntary, I felt we were being called to duty and in this call, we banded together. The hospital called us game changers, allowing more people in the hospital to take sick leave and manage the extra work.

I had planned my fourth-year spring to be packed with once-in-a-lifetime experiences. In February, I climbed to the temple in Petra, studied medicine in Israel and had a vacation on the beaches. In April, I had plans to bike across the country and raise money for world health. However, as I tried to return from Israel, my flight was canceled and the impact of COVID-19 spread quickly. One day, I feared my foreign travel would impact going to Match Day,

BELOW

Lauren Colwell, MD; Patrick Lowe, MD; Jason Yang, MD, PhD; and Emma Materne, MD

but then the next day, the school canceled all in-person gatherings. The extraordinary was happening. No more biking across the country. No hugs from my parents on graduation. No face-to-face goodbyes from classmates, teachers or staff.

In a span of three weeks, the class of 2020 matched, graduated and many began caring for patients in the hospital. Family and friends would ask, "how are you doing?" I responded vaguely, needing more time to reflect. I was still processing the news of Italy, Iran, Spain and our country.

On my first day of surge work, I arrived at the hospital seeing signs "STOP, no visitors, mask required." I used my badge as my first line of defense, reassuring myself I must belong. After receiving a mask, I would head down to the lower level, leaving the windows behind and pulled on scrubs to enter the COVID-19 surge unit.

The material of treating COVID-19 is nothing like my previous hospital work as a student, where I could go home and read about my patients each night. There was only so much the scientific community knew. Patients asked me questions to which I had no answers, nor did my attending physician. This was a new territory for me as a trainee. I felt at the will of the virus.

In the morning, I completed my own rounds where I would peer through the glass door and wave at my patients. Unfortunately, many of my patients slept most of the day. I relied on the nurses' comments and vital signs. When I called patient rooms to check-in with them, I tightened my arms and subconsciously held my breath. I could not see them smile at my mediocre jokes. I could not hold their hands as they described pain with coughing. I had to remind myself throughout the day to loosen my muscles as the foreignness of this role built up in my body.

At night, I wondered about my patients and if they may die. As a student, I also wondered about my patients, but rarely did any of them die near the time of my care. Approximately three patients I carried would die during a clerkship. During this time on a COVID-19 floor, four of my patients died each week. My classmates also experienced more death than before. Each day, we paused together. We tried to respect both the loss of patients while continuing to work and treat the next patient that filled the room.

One of the patients I received at sign-out, who I had never met, died in the morning. I was faced with the responsibility to write his death discharge. In that moment, I wished I was still a student. I was caught off guard transitioning from student to doctor. A few months ago, I was treating patients in an ophthalmology clinic, answering questions and studying. Now, I was the direct line to families and their family members. I was a doctor and was tasked with the rewarding successes of having a patient respond to my medical plan and tasked to manage the grueling and sad moments when a patient dies. Each day, my emotions went up and down as the patients ebbed and flowed into and out of the floor.

COVID-19 has shaped my experience in medicine because I learned none of us have the magic bullet. Instead of the doctor I dreamed of as a teenager, one who could balance bedside and bench side medical advancement, I was met with the reality of time limitations and patients with individual needs. I felt I was providing realistic expectations and hope. One of my first lessons I learned and will carry in my career is how

ABOVE

Recent graduate Dr. Colwell communicates a patient's clinical status to a family member.

to communicate with family. Knowing that family members of COVID-19 patients could not visit, we went the extra mile caring for the patient and their family. We called families each day with updates. We even met family members on the grass lawn while they waved through the windows at their mom, dad, uncle, or son who we warned may not make it through this hospital stay.

Though our days were strenuous and long, I will not forget the time I shared with my classmates. We were given one more chance to learn from our teachers and each other; to give back and help patients, our community and those who have helped us be the doctors we are today.

On May 27, 2020, the school hosted a small virtual gathering for our class to congratulate one another. After two months since the official 45-minute virtual graduation and four days from the planned commencement, I finally felt a sense of closure. We shared reflections of our first-year trip to Maine, our Class Show in second year and helping each other study. We had banded together from the beginning. We toasted one another and I realized graduating early and caring for patients did not dictate our medical school experience nor negate the medical tenets we learned. ✚

Lauren Colwell, M.D. is one of 135 medical students who graduated early from UMass Medical School on March 31, 2020. She worked as a surge physician in April and May during the COVID-19 pandemic before starting her intern year at Newton-Wellesley Hospital and her ophthalmology residency in 2021 at UMass Memorial. Email: Lauren_colwell@alumni.brown.edu.

From the Archives

Curator **B. Dale Magee, MD**

Worcester Medical News
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My Boy: The Public School and the Common Cold

Ernest L. Hunt MD

The period of the lower grades is extra hazardous to the child because of exchange of upper respiratory infections. Many serious conditions follow in the wake of the common cold. Ninety million workdays are lost annually because of them.

Air pollution trapped areas by bacteria of upper respiratory infections is readily demonstrated. Infections are spread by droplet propulsion by sneezing, coughing and talking; droplet nuclei dispersion by air currents; sedimentation of bacteria and redispersion by movement.

In the absence of effective immunization, contact and airborne infections must be controlled by methods now available. Much could be accomplished through schools by:

1. Rigid exclusion of pupils at the first evidence of a cold
2. Wider spacing of seats—a minimum five feet between heads
3. Smothering coughs and sneezes in handkerchiefs
4. Careful washing of hands and implements, use of paper towels and individual drinking cups, ample and clean toilets
5. Ventilation changes to dilute and remove pollution including:
6. Fresh air intakes higher up; polluted air exhausts near floor
7. Relative humidity kept at 55° and temperature at 70°
8. Longer noon hours to allow children more sunlight

The author concluded with the suggestion that one school should be allocated for the intensive study of methods for prevention of common colds. ✚

As I See It

Rising to the Challenge of COVID-19

Ed Augustus, City Manager

The COVID-19 virus has challenged us in ways we could never have imagined. Our response, however, is nothing less than what we have come to expect from Worcester.

Our medical community has led the way, caring for patients and shedding concerns for their own personal safety and wellbeing.

Our frontline heroes, those dedicated and tireless doctors and nurses, have adapted to unique safety protocols while still providing a top-notch level of care. They have done so throughout this pandemic, all while witnessing the loss of life brought about by this terrible disease and bearing the weight of a threat to their own personal health.

That they have met this challenge is no surprise. Worcester and its surrounding communities are blessed to be served by world-renowned medical institutions and medical professionals.

This is what Worcester has always done: meet challenges, no matter how daunting, rise to the occasion, no matter how steep the climb.

Since day one of the COVID-19 crisis, we have seen the community pull together to accomplish amazing things.

We were the first in the state to establish temporary homeless shelters, which helped ease the burden on our hospitals by serving a population that might otherwise have ended up in a hospital bed.

We were the first in the state to set up a statewide field hospital, overseen by UMass Memorial Health Care.

We were one of the first communities in New England to launch an emergency small business grant program, which, through two rounds of funding, has issued 268 grants totaling about $1.9 million.

One of our greatest sources of pride has been the Worcester Together initiative, which beyond raising more than $8 million to help dozens of local organizations, has brought together nearly 100 people from many different sectors to identify and address a variety of issues facing the community.

These are but a few examples of the resourcefulness and resilience the city has shown in this trying time.

There is no denying the lasting impact COVID-19 has had on us all, but I believe we will be stronger as a result of having weathered this experience. We will face a new post-COVID-19 reality as we move forward, but we do so as we always have – together.

As we navigate our way through the COVID-19 crisis, it could not happen without the selfless efforts and sacrifices made by our medical community. It could not happen without the close collaboration and partnerships we have forged with our medical institutions. I extend my heartfelt thanks to them for the work they do each and every day. ✚

Edward M. Augustus Jr.,
Worcester city manager

What We Learned in a Pandemic

Michael Hirsh, MD

I write this cautiously as the pandemic is not over. But through the nearly three months that we have experienced this cataclysmic change in our lives that we owe to COVID-19, there is much that we have learned.

Before the pandemic, there was a great deal of concern about lack of engagement, and the dreaded "burnout" that attendings, fellows, residents, medical students and evening premeds were experiencing in the pursuit of medical careers. After the pandemic started, we learned that all these factions had a previously unknown gear that they could activate. One that was selfless, courageous, committed and yes - gritty.

We could step up and think outside of ourselves. We could give up doing our chosen specialty and tend to the sick in different ways. We could do this unflinchingly and with 100% engagement. We did this without coaching or courses or simulation. We did it because the sense of duty and dedication was within us and easily summoned when the chips were down. The medical community as a whole became heroic. Allied health professionals and doctors of different specialties worked together seamlessly and collaboratively.

And because of the inspiration that the medical community's cohesiveness and sacrifice provided, the public did its part to try to help us by following the rules of sheltering in place, maintaining physical social distancing, performing hand hygiene and wearing masks. They did this so that we, the medical providers, would not get overwhelmed. They sent us PPE, food, messages of encouragement and volunteered for work in homeless shelters, field hospitals and delivering meals to the quarantined.

In short, it took a pandemic to reveal the resilience and grit and engagement that was within us all along - features that could not be turned on with simulations, courses, or lectures. We had it within us because that is why we pursued this field of endeavor- to help the sick and heal the world. I am not saying we were intrinsically great. Greatness has nothing to do with this. Admiral Bull Halsey - hero of the Pacific Theater in WWII, famously said - "There aren't any great men. There are just great challenges that ordinary men like you and me are forced by circumstances to meet." But we as a profession rose to the challenge and came through the other end stronger, wiser and tougher than we ever knew we could be.

Moving forward, we face two challenges as I see it. One, how to maintain this newfound level of engagement and enthusiasm as we return to a post-pandemic medical world. The other, how to make use of the new found respect we have earned within our society and point our medical system to fixing our woefully inadequate public health system. Can we muster internal support for the shift away from rescue care to preventive care? Can we advocate successfully for the changes the we know must be made? How much better off as a society would we have been if we had spent more time preparing for pandemics and dealing with climate change and providing better access to health care/insurance coverage than doing e-learning for you and courses on how to be respectful? I will leave you all to answer.

But in the meantime, I would like to take a moment to thank you all as we prepare for the graduation season of 2020, for the amazing work and exemplary leadership you have all displayed in every facet of your pandemic response. You have done our residency, our department, our medical system and our community proud. Best of luck to you in the future. Hold on to the spark that you have demonstrated burns within you all. ✚

Dr. Michael P. Hirsh, Chief of the Division of Pediatric Surgery, Director of Trauma Services and Surgeon-In-Chief, UMass Children's Medical Center

Previously published in a surgery newsletter

In Memoriam

Burton Rose, MD

Burton "Bud" Rose, 77, died on April 24, 2020 from Alzheimer's disease complicated by COVID-19.

Bud was born in Brooklyn, New York on Nov. 19, 1942. As a youth, he played stickball and basketball. An outstanding student, he attended Princeton University where he majored in history. He attended medical school at New York University and completed a medical residency in New York as well. Following this training, he served in the U.S. Navy as a nephrologist for two years.

After the stint in the Navy, in 1974, Bud and his wife Gloria moved to Wellesley, Massachusetts as he was appointed director of nephrology at St. Vincent Hospital. During his time at St. Vincent, Bud wrote two books: "Pathophysiology of Renal Disease" (1981) and "Clinical Physiology of Acid-Base and Electrolyte Disorders" (2001). Bud's nephrology rotation was popular with University of Massachusetts Medical School students and his books became standard nephrology textbooks.

In 1991, he left St. Vincent to become chief of nephrology at Brigham and Women's Hospital in Boston. During this period, Bud conceived of the idea of UpToDate, an online medical information service which was continuously updated by a panel of medical experts. This project, originally developed in his Wellesley garage, is now an international resource for current medical information.

Bud and Gloria enjoyed traveling, doing the *New York Times* crossword puzzle, and attending services and programs at Temple Beth Elohim in Wellesley.

Bud leaves his wife Gloria, a brother and a sister, two daughters and a son, and three grandchildren.

A memorial service is planned for the future. ✚

Nathan Alan Harris, MD

Nathan Alan Harris, 70, died May 24, 2020 in a tragic bicycle accident in Tucson, Arizona.

Alan was born in Yonkers, New York on Nov. 26, 1950. He attended Horace Mann High School then Stanford University in Stanford, California. He took a medical degree at Mount Sinai Medical School in New York and a master's of public health from the University of California Los Angeles.

Alan trained as an allergist. He was married to pathologist Diane Lebel. They came to Worcester in 1982 and settled in West Boylston. Alan established an allergy practice where he worked from 1982 to 2016 when he retired. He was a member of the West Boylston board of health.

Alan was a superb athlete, devoted cyclist and skilled amateur writer. He was a cheerful and happy-go-lucky man enjoying life to the fullest. He climbed Mount Kilimanjaro, trekked in Nepal and explored Antarctica. Most recently, he went rafting on the Colorado River through the Grand Canyon. He ran the Falmouth Road Race year after year.

A memorial service is planned for the future. ✚

John Hoell, MD

Dr. John F. Hoell, 87, of Whitinsville died May 22, 2020. He was born March 31, 1933 in Worcester and graduated from St. John's High School Class of 1951. He attended The College of the Holy Cross graduating in 1955 and later New York Medical School. He trained as a resident in internal medicine at Flower Fifth Ave. Hospital in New York completing in 1960. He had further internal medicine training at St. Francis Hospital in Hartford, Connecticut and at St. Vincent Hospital in Worcester.

Dr. Hoell worked as a general physician at the Milford Regional Hospital from 1964 until 2004. Later, he served in a part-time role at the Family Care Center in Springfield.

He was married to Arlene (Negus) Hoell. They celebrated their 56th anniversary on June 16, 2018. Mrs. Hoell died later that year.

Dr. Hoell was a member of the Massachusetts Medical Society and a communicant at St. Patrick's church in Whitinsville. He was an avid runner and ran many marathons. He was a member of the Whitinsville Golf Club and the West Bay Yacht Club of East Greenwich, Rhode Island.

He is survived by two sons, two daughters, eight grandchildren and one great-granddaughter. ✚

Sidney P. Kadish, MD
WDMS Memorials Committee

Restructuring Practices The Legal Way

Peter Martin, Esq.
Jake Tosti, Esq.

Among the manifold devastations of the COVID-19 pandemic and consequent public health emergency, has been the disruptive effects on the health care provider community. Some of those effects may be to accelerate changes that were already in motion and ultimately desirable, such as the increased use of telehealth methods of delivering care. Other such effects may be longer-term but no less consequential, such as how the pandemic provides a vivid example of how varying social determinants of health affect disease outcomes. One immediate effect on providers, and one that confronts them with very serious near-term decisions, is the economic damage the pandemic has wrought on practices of all types and sizes.

That economic damage was highlighted by a recent Health Policy Commission study of more than 400 practices of all provider types in Massachusetts. That study found over half of primary care practices were considering furloughs, layoffs, pay cuts, or cutting services and expenses. It also found nearly a quarter of primary care practices were considering the more extreme steps of closing or merging their practices. Given the complexities of employment law, practitioners should tread carefully when considering reducing staff or salaries. The following pointers may help practitioners to avoid the many traps for the unwary in this field of law.

REVIEW YOUR EMPLOYEE AGREEMENTS

Before taking any employment action, practitioners should carefully review any and all relevant employee agreements. This is an important and necessary first step, as such agreements may significantly restrict practitioners' options. For example, agreements that guarantee a salary or bonus, establish a fixed-term of employment, or contain provisions governing termination (such as requiring cause and/or advance notice) must be addressed prior to a layoff or salary reduction. Violations of such terms, termination and compensation provisions can lead to an expensive claim for monetary damages.

Agreements can also impose substantial post-employment obligations on both practitioners and staff through provisions such as restrictive covenants (such as non-solicitation or non-poaching agreements), confidentiality clauses, or terms that address or require severance pay. Restrictive covenants require particularly close attention, as the enforcement of such clauses may be prohibited or limited under applicable state law. Massachusetts, for example, specifically limits the enforceability of restrictive covenants against physicians and nurses by statute and case law has construed broadly what constitutes an unenforceable restrictive covenant.

Practitioners who want to deviate from an employment agreement may consider approaching the employee to bargain for an amendment or new agreement. However, keep in mind that pursuant to the Massachusetts Wage Act, employers can enter into an agreement with an employee under which the employee forfeits earned wages, including any accrued but unused vacation payments. One upshot of this principle is that while a practitioner may want to change its vacation policy to save costs, changes to how employees can use their vacation time can only apply prospectively and employees must be given reasonable prior notice of the change.

Practitioners considering salary reductions for non-physician employees — regardless of whether the salary is fixed in a written agreement — must also be mindful that the federal Fair Labor Standards Act requires payment of at least $684 per week on a salary basis for executive, administrative and professional employees (other than physicians) to qualify as exempt employees. A salary reduction that places a non-physician salaried employee below this threshold can result in the employee becoming nonexempt, which means that he or she must be paid per hour, as well as time-and-a-half for any overtime hours worked in a given week.

LAYOFF OR FURLOUGH?

The terms layoff and furlough are often used interchangeably but have significantly different legal consequences. Practitioners seeking to reduce payroll costs should be aware of these differences and their implications before taking employment action.

In short, a layoff is a termination of the employment relationship while a furlough is a temporary (but mandatory) leave of absence that does not end the employment relationship. A layoff comes with no guarantee of rehire whereas a furlough is for a defined length of time and generally short-term (usually measured in weeks, not months).

If an employee is laid off, his or her final wage payment (including payment for all accrued but unused vacation) is due on the last day of employment. Unless otherwise agreed, all of the employee's benefits will cease, subject to any COBRA rights, and the employee will be eligible for unemployment benefits.

In contrast, furloughs can be unpaid—although employers can also allow furloughed employees to use accrued time off. Furloughed employees can remain eligible for employee benefits, subject to the terms of the employer's plan, and may also be eligible for unemployment benefits during the furlough period. Accordingly, a furlough may be a better option for practitioners that expect regular (or something approximating regular) operations to resume in the relatively near term and intend to call back all current staff.

Practitioners considering a furlough should be mindful of the differences between exempt and nonexempt employees under state and federal wage and hour law. Nonexempt employees need only be paid for time actually worked whereas exempt employees must be paid their full salary for any week in which any work is performed. Thus, if a furlough starts on Wednesday, an exempt employee must

receive his or her full salary for that week, even if not working from Wednesday through Friday.

In all cases, a practitioner's decisions regarding who is selected for layoffs and furloughs must be based on legitimate business reasons. Failure to do so can expose a practitioner to potential liability for claims of discrimination, retaliation and interference, among other reasons.

CONSIDER WORKSHARE AS AN ALTERNATIVE

Practitioners may also want to consider applying for the WorkShare program administered by the Massachusetts Department of Unemployment Assistance as an alternative to layoffs or furloughs. The program allows employees to work reduced hours and simultaneously receive unemployment benefits along with their reduced wages. To qualify for the WorkShare program, employers must develop and submit for approval to the DUA one or more plans to uniformly reduce work hours for a fixed percentage — between 10% and 60% — for either the entire workforce or a given unit, department, shift or job category for a period up to 52 weeks. Plans can include salaried employees as long as the employer reduces both hours and pay on a pro rata basis (e.g. if salaried employees work 80% of their regular work week they receive 80% of their salary).

However, practitioners should be aware that employees can decline to participate in a WorkShare program and also that owners and officers of companies (including members of partnerships or LLC's) cannot participate in the WorkShare program unless they are eligible to receive unemployment benefits. Further, if an employee is guaranteed a fixed salary pursuant to a written agreement, that will have to be addressed prior to taking any action with respect to that employee's pay.

A NOTE ABOUT THE FFCRA

Generally, since April 2020, small employers with fewer than 500 employees have been required to provide their employees with emergency paid sick leave and expanded family and medical leave pursuant to the Families First Coronavirus Response Act. However, the FFCRA provides that employers of "a health care provider or an emergency responder" may elect to exclude such employees from receiving FFCRA leave.

Practitioners should be aware that U.S. Department of Labor currently defines the term "health care provider" very broadly to include, inter alia, "anyone employed at any doctor's office, hospital, health care center, clinic ... or any similar institution, employer, or entity" including non-clinical employees. Accordingly, practitioners have relatively wide discretion to exempt their workforce from application of the FFCRA. However, practitioners must always be mindful of their obligations under any employee agreements, policies, and the laws and regulations promulgated under the Americans with Disabilities Act, the Family and Medical Leave Act, and the Occupational Safety and Health Administration, when faced with a request for leave.

It is evident that the legal rules under which health care practices operate have been significantly modified by the pandemic and public health emergency. For the most part, these changes have increased those practices' flexibility to respond to extraordinary circumstances. That legal relief is notably absent in the largely unchanged area of employment law which remains a compliance challenge for health care employers. The urgency to take immediate steps to preserve a practice should not overcome a prudent analysis of how to do so legally. ✚

Peter Martin, Esq. is a partner at Bowditch and Dewey.
Jake Tosti, Esq. is an associate at Bowditch and Dewey.

Society Snippets

2020 Graduate School of Nursing Community Partnership Award: Congratulations to Dr. Michael Hirsh

DR. MICHAEL P. HIRSH'S CLINICAL TITLES AT UMASS Memorial Medical Center include chief of the division of pediatric surgery, director of trauma services and surgeon-in-chief of the Children's Medical Center. In addition, Dr. Hirsh is the City of Worcester's medical director and has helped to lead the city's response to the COVID-19 pandemic.

Dr. Hirsh's dedication to all that he is involved with is, at bare minimum, impressive. In all that he does he is a dedicated educator. He is always willing to bring students — nursing or medical — to the table to be part of the solution. He has always been a true partner with the Graduate School of Nursing — offering experiences clinically, academically, and with a humanistic approach and enthusiasm that is contagious. He seamlessly works in interprofessional teams treating all professions on an even playing field and valuing everyone's input as necessary and contributing.

We are fortunate to work with him as often as possible and he is always willing and available to us and our students and we are grateful. ✚

Jill M. Terrien Ph.D., ANP-BC
Director, Adult-Gerontology, Family & Psych Mental Health NP Programs
UMass Graduate School of Nursing


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DON'T PUT YOUR HEALTH ON HOLD.

Your safety and well-being are always our first priority.

Because your health is our core focus, now and always, we're enhancing our already high standards to ensure the safety of all our patients and caregivers. Following guidance from the CDC and our own COVID task force, we've implemented the following:

- *Virtual visit options*
- *Universal masking*
- *Screenings upon arrival*
- *Hand sanitizer stations*
- *Social distancing*
- *Stringent cleaning practices*
- *Increased touch-free processes*

Health conditions don't stop for a pandemic. Unforeseen emergencies and chronic illnesses can be compounded by anxiety and fear, and avoiding routine care can be dangerous. We understand you may be hesitant — that you may have concerns about on-site treatment — but when waiting can mean much worse, trust that you are safe with UMass Memorial. Reach out today for virtual or in-person appointments.

855-UMASS-MD
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