As the COVID-19 continues to impact the wealth and welfare of our society, much remains to be understood about the pandemic and its impact. Hence, the importance of using scientific research, facts and data for a better understanding of the nature of the pandemic, as well as its associated public health issues, to drive policy making in addressing challenges related to healthcare and wellbeing of the population. This newsletter is intended to provide a weekly overview on the latest information on health-related topics surrounding the COVID-19 pandemic, covering five main themes: infection control and prevention, diagnosis and testing, treatment and therapy, training for healthcare professionals and exit strategies. Each edition of the newsletter will cover a specific sub-theme under the five main themes, providing up to date information on available resources, research, data and studies, along with policy recommendations and implications, based on scientific evidence and facts, for decision makers to utilize in developing polices and measures to address the challenges associated with COVID-19 within the healthcare sector.
COVID-19 is here to stay. People will have to adapt. 

Texas reported its second-highest day of new COVID-19 cases. 

International flights are ramping up. Slowly. And with plenty of caveats. 

Coronavirus: Jacinda Ardern says COVID-19 lockdown 'made all the difference' at saving NZ's economy. 

Trial of Moderna COVID-19 vaccine delayed, investigators say, but July start still possible. 

Study finds hydroxychloroquine may have boosted survival, but other researchers have doubts. 

WHO discontinues hydroxychloroquine and lopinavir/ritonavir treatment arms for COVID-19. 

Latin America sees half of all new COVID-19 infections as health systems flounder. 

Visualization shows exactly how face masks stop COVID-19 transmission. 

India opens one of the world's largest hospitals to fight coronavirus. 

MMR vaccine could prevent worst symptoms of COVID-19. 

Here's what recovery from COVID-19 looks like for many survivors. 

Young people are throwing coronavirus parties with a payout when one gets infected, official says. 

How Chile ended up with one of the highest COVID-19 rates. 

Fever checks are a flawed way to flag COVID-19 cases. Experts say smell tests might help.
Executive Summaries

Infection Control and Prevention:

A concept that started in South Korea is now becoming a reality in the ongoing fight against COVID-19. Personal protective booths allow health care providers to collect a swab without making contact with a patient. These innovative booths minimize the use of PPE, and allow for more efficient and safer testing moving forward. More personal protective booths are being deployed throughout the world. The booths can be used to provide patients with oxygen and nebulizer treatments with the ability to switch from positive to negative air pressure.

Diagnosis and Testing:

Numerous studies are emerging with findings that indicate COVID-19 transmission follows the 80/20 Pareto Principle, meaning 80% of new transmissions are caused by less than 20% of existing cases. The consensus is that most people might not infect anyone at all, while a small portion, some studies even suggest as little as 10%, spread the virus in a large way. Superspreading is not just due to an individual’s degree of infectiousness, but also relies on large congregations of individuals in indoor settings for extended periods of time. Studies conclude limiting large indoor gatherings could significantly reduce disease transmission without the need to impose lockdown restrictions. Masks, social distancing measures, and testing and tracing would also help mitigate superspreading events and the infection clusters that result from them.

False negative tests remain an issue for Reverse Transcriptase Polymerase Chain Reaction Tests (RT-PCR) used to formally diagnose individuals currently infected with COVID-19. Multiple studies suggest a substantial chance for false negatives (about 20%) when using RT-PCR testing, and have indicated that masks and social distancing are essential to keep pretest probability low enough for negative test results to be considered reliable.

Treatment and Therapies:

Moderna’s vaccine, mRNA-1273, uses messenger RNA (mRNA), an approach that does not require a virus to make the vaccine. The messenger RNA, carries instructions for making the spike protein, a key protein on the
surface of the SARS-CoV-2 virus that allows the virus to enter cells when a person gets infected. When the vaccine with this instruction molecule is injected, it goes to the immune cells and instructs them to make copies of the spike protein, acting as if the cells have been infected with the coronavirus. Allowing other immune cells to develop ways to protect the individual and build immunity.

The mRNA-1273 vaccine is in Phase II of its clinical trial, designed to evaluate safety and effectiveness. Moderna, a biotechnology company working with the National Institute of Allergy and Infectious Diseases, intends to enroll 600 healthy volunteers equally divided into two age groups: 18 to 55, and 55 and older. The company announced on June 11 that it will start Phase III of its trial in July with 30,000 volunteers. Phase III, the final clinical trial phase, evaluates effectiveness in a much larger group and compares how well the vaccine works compared to a placebo. Moderna will test a 100 microgram dose and said the company is on track to deliver 500 million doses per year. In mid-May, the company announced that all eight initial trial volunteers given two different dose amounts reached or surpassed the level of antibodies capable of neutralizing the virus.

**Training of Healthcare Professionals:**

A newly tried and innovative curriculum named “Medicine Basecamp” is discussed in this section. The creators of the curriculum selected high yield topics focusing on prevailing conditions and medical emergencies to ensure that it’s concise and achievable. The curriculum is made for trainees and physicians that need to be deployed from other subspecialties to help with the COVID-19 wards. The program can be accessed on both computers and mobile devices.

**Exit Strategies:**

The impact of the COVID-19 pandemic prompted governments and policymakers to consider the vital and pressing need for countries to reform or advance their healthcare systems. While reforms may vary depending on the nature and state of healthcare within a specific country, in order to promote health equity and provide access to quality care, the adoption of new or enhanced digital tools will drive better accessibility, efficient care, and effective evidence-based decision making, which are key attributes that are needed to improve healthcare performance. At the core is the implementation of an effective electronic health record (EHR) system, which can provide the need for timely, accurate and reliable data, that is of utmost importance at all times, but even more so, during a pandemic.
Infection Control and Prevention

Innovation in Infection Control and Personal Protective Equipment: Personal Protective Booths (PPB)

The COVID-19 pandemic continues to reshape our healthcare systems and communities. With the rapid spread of the virus, the need for testing and the lack of personal protective equipment (PPE) for healthcare workers (HCW), it is vital to find new and innovative approaches to testing and evaluating patients safely.

South Korea employed a highly successful strategy to address these issues. Hundreds of “walk-in” or “telephone” testing booths were created and located across the country (Figure 1). The booths are made out of transparent plastic walls with rubber gloves embedded through them. When a person walks into the booth, they speak over an intercom to a HCW that remains outside of the booth. The HCW swabs the individual’s nose and throat using the gloves without ever coming in contact with the patient. The booth maintains negative air pressure. After the test has been completed, a staff member in PPE disinfects all surfaces in the booth. The South Korean innovation sparked international interest and further

Hexapod Booth:

Inspired by the design originally used in South Korea’s Yangji Hospital, a group at Mass General Hospital (Mass General Springboard Studio) developed the “Hexapod”. The Hexapod is an 8-foot-high low-cost plexiglass testing booth that allows a clinician to stand inside, apart from the patient and administer a swab test from gloved external hand ports featured on three sides of the booth to increase throughput (Figure 2). The individual inside the booth is not in direct contact with the patient, which means they do not need to use additional PPE beyond standard exam gloves and surgical masks, saving vital supplies including N95 masks, face shields and gowns. The booth uses HEPA-filtered air to permit safe testing
while minimizing use of PPE. The PPB can switch from positive to negative air pressure, a feature that allows the booth to be used both as a place for HCWs to provide tests and a vehicle to provide patients with oxygen and nebulizer treatments while decreasing risk to caregivers. Other features include a hands-free intercom system and safety dividers to ensure proper distance between patients. The devices have been used in various locations, including the Lunder Respiratory Illness Clinic, the Yawkey Routine Ambulatory Clinic for COVID-positive patients, Chelsea HealthCare Center and Newton-Wellesley Hospital.

Two new versions of the booth have also been created:

• The Oasis: a negative-pressure system in which the patient is inside, and the caregivers are outside.
• The Edele: a plexiglass wall with built-in glove portals for evaluating Urban “walk-thru” testing sites:
Urban “walk-thru” testing sites:

The group SITU—an unconventional architecture practice that uses design, research and fabrication for creative solutions—has been developing an idea of urban “walk-thru” testing sites. These sites serve as an alternative to the “drive-thru” model adopted in suburban and rural parts of different countries. It may also potentially help to test individuals living in densely populated areas that do not use cars as a means of transportation.

The main component of these sites is the personal protective booth (Figure 4). Each booth is equipped with an interactive window that separates the medical practitioner and patient while still allowing tests to be administered. As there are various ways to collect samples and perform examinations, the SITU research group designed several configurations that can be customized for each medical team to best facilitate their workflow. With a range of openings and interactive features, the booth allows full-use of various equipment for evaluation (e.g., stethoscope, pulse-oximeter, swabs, etc.) (Figure 5).

The booths are designed to plug into larger testing sites that separate HCWs and patients. Configured as outdoor medical tents or dedicated indoor spaces, HCWs occupy a central controlled space reserved only for staff, thereby reducing the need for PPE.
On the patients’ side, partitions provide privacy and prevent contamination between adjacent booths (Figure 6). These outer areas are then disinfected between examinations to mitigate exposure for the next user.

Deployable screening centers

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https://situ.nyc/fabrication/projects/covid19-relief-efforts

*Figure 7: SITU Fabrication Planned Diagram of an 8-booth testing center*
Superspreaders Could Account for 80% of COVID-19 Transmission

What is a superspreader?

A superspreader, simply defined, is an unusually contagious individual infected with a disease. Whether superspreader incidents result from an individual being more infectious than others, or the circumstances surrounding the event is yet to be determined. Recent research has led to the consensus that COVID-19 transmission follows the 80/20 Pareto Principle, meaning 80% of new cases are caused by less than 20% of those infected with the virus. Replace the sentence starting with Most with: Most people do not play a role in transmission; they infect anyone at all, while a small minority spread the virus in a large way. As outbreaks are traced and studied around the world, many are found to be linked to a “single event where a superspreader infected dozens of people”. This data contradicts the idea that each infected individual leads to an average of 2-3 new cases (Reproductive value of 2-3), and suggests most people do not transmit the virus to anyone. One preprint study goes even further, estimating that only 10% of current cases are responsible for 80% of new infections. Another preprint analyzing clusters in Hong Kong found the a similar distribution of numbers (20% accounting for 80% of new infections) and that all 20% of the superspreaders were linked to social gatherings. They also found an additional 10% of cases accounted for the remaining 20% of new transmissions with most individuals only spreading the virus to 1-2 people within households. Finally, the study concluded that 70% of positive cases did not contribute to infection spread.

How does superspreading happen and what does it mean?

While most superspreading is found to be linked to large gatherings, why infection spread happens in clusters remains an interesting question. Superspreading depends on several linked factors: an individual’s degree of infectiousness, the length of exposure to other people, and the environment or setting. While the virus is mainly transmitted via droplets, large transmission clusters seem to indicate aerosol transmission. Some people also shed the virus disproportionately to others. Just as some people breathe more particles out, individuals could exhale viral particles disproportionately as well. Evidence

1 Adam, Dillon, et al. “Clustering and Superspreading Potential of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Infections in Hong Kong.” Research Square, 21 May 2020, doi:10.21203/rs.3.rs-29548/v1.
indicates a small amount of people emit respiratory particles at a higher level than others, but this hasn’t been linked to any discernible characteristics. The volume a person speaks at could also affect the amount of viral particles exhaled, and singing spreads viral particles more than speaking, explaining major outbreaks traced to choir practices. Fitness classes with 22 students at a time were linked to 65 cases in South Korea, but yoga classes in the same areas were not connected to any case spread, further indicating that respiration intensity is tied to infection spread.

Avoiding the three C’s could help reduce superspreading events and overall transmission

Regardless of what makes a superspreader, one factor every superspreading event has in common is a large congregation of individuals. If gatherings are limited to five people, a superspreading event would be unlikely if not impossible. A smaller group makes it less likely someone will be infectious, but time plays a role as well. Longer gatherings are also more likely to be superspreading events. One study of 110 cases in Japan found that transmission in a group was more than 18 times more likely indoors versus outdoors. Another study in London analyzed clusters of cases and found most of them had occurred in indoor spaces or indoor-outdoor settings4. As a result, countries have encouraged their citizens to avoid situations with the three C's: closed spaces with poor ventilation, crowded spaces, and close-contact situations. Ultimately, these findings could make the virus easier to control, they indicate that preventing larger outbreaks could have a crucial impact on slowing down transmission without the need for lockdown restrictions. Social distancing and masks remain important in reducing the spread of infection in social and work settings, in addition encouraging that social gatherings of more than five people take place outdoors could reduce transmission levels as well5.

The focus has been on test availability, but test accuracy is just as important

While testing is hailed as a necessity for any plans to reduce restrictions, false negatives remain a concern for tests used to formally diagnose COVID-19 cases. Diagnostic tests can be inaccurate in two ways: a false positive, causing unnecessary precautions to be taken, but more importantly, a false negative could have serious implications and hinder efforts to control infection spread. The risk for false negatives is specifically linked to the sensitivity of the reverse transcriptase-polymerase chain reaction (RT-PCR) tests used to confirm infections.

A Study finds 11% of sputum, 27% of nasal, and 40% of throat samples to be falsely negative

Diagnostic sensitivity for RT-PCR tests is highly variable, however early data from China suggests “relatively poor sensitivity” for the diagnostic tool. One preprint study from February 2020 tested 213 patients hospitalized with COVID-19 using 205 throat swabs, 490 nasal swabs, and 142 sputum samples (a median of 3 tests per patient) in days 1-7 of illness. The study found 11% of sputum, 27% of nasal, and 40% of throat samples to be falsely negative. Another preprint study of 173 hospitalized patients published in late March, found a 67% accuracy rate when testing confirmed positive patient. Additionally, a preprint review of 5 studies, including the ones mentioned above, found false negatives ranged from 2-29%, though the certainty of this review could be considered low, the evidence is enough to raise important concerns about the implications of false negatives. Because the tests are imperfect, a negative result only means that a person is less likely to be infected. This can be calculated using Bayes’ Theorem, taking into account how likely you were to be infected prior to testing (pretest probability) and test sensitivity. With test sensitivities likely to be around 70%, keeping pretest probability low by limiting exposure, engaging in social distancing, and wearing masks is important to ensure a negative test result is more likely to be true.

Another study reports longer duration of viral shedding in asymptomatic individuals

Finally, an assessment of test sensitivity in asymptomatic positive cases is urgently needed to increase certainty in test results and for contact tracing efforts. A study published mid-June in Nature reported a “significantly longer duration of viral shedding in asymptomatic patients versus the symptomatic group” making the case for the importance of mass testing and surveillance, as well as tests with improved sensitivity.

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Figure 1: Chance of SARS-CoV-2 Infection, Given a Negative Test Result, According to Pretest Probability. The blue line represents a test with sensitivity of 70% and specificity of 95%. The green line represents a test with sensitivity of 90% and specificity of 95%. The shading is the threshold for considering a person not to be infected (asserted to be 5%). Arrow A indicates that with the lower-sensitivity test, this threshold cannot be reached if the pretest probability exceeds about 15%. Arrow B indicates that for the higher-sensitivity test, the threshold can be reached up to a pretest probability of about 33%. This also illustrates the importance of social distancing and mask wearing, as keeping your pretest probability low helps ensure negative results are reliable and significant.

Moderna Vaccine

Scientists are mobilizing their resources quickly, sharing information about the virus with unprecedented pace, and turning experiments into peer-reviewed research in a matter of weeks.

In the US, Moderna’s Phase I clinical trials began on March 16\(^1\) in collaboration with the National Institute of Allergy and Infectious Diseases (NIAID), the US National Institutes of Health (NIH), and Kaiser Permanente Washington Health Research Institute KPWHRI. It is the first testing in humans of the mRNA vaccine and was looking to enrol a total of 45 healthy adult volunteers aged between 18-55 years.

“This Phase 1 study, launched in record speed, is an important first step toward achieving that goal,” NIAID Director, Dr. Anthony Fauci said in a statement.

Moderna’s approach is particularly unique in its speed. Because the biotech company was already researching ways to tackle the coronavirus, which causes Middle East Respiratory Syndrome (MERS), they were able to adapt their methodology and vaccine design for SARS-CoV-2. The experimental vaccine, mRNA-1273, contains genetic material from the spike protein present in SARS-CoV-2 embedded within a lipid nanoparticle.

The protein is critical to the survival of the virus because it enables it to get inside human cells and begin making copies of itself. However, what makes it dangerous also makes it a target.

The messenger RNA (mRNA) carries instructions for making the spike protein. When the vaccine with this instruction molecule is injected, it goes to the immune cells and instructs them to make copies of the spike protein, acting as if the cells have been infected with the coronavirus. This allows other immune cells to develop ways to protect the individual and builds immunity. The spike protein acts as the WANTED poster.

\(^1\) https://www.cnet.com/how-to/coronavirus-treatments-remdesivir-hydroxychloroquine-and-vaccines-for-covid-19/
After Chinese researchers shared the genetic sequence of the virus in January, the team was able to design and produce samples of the spike protein in the lab. They then mapped its structure using a specialized form of microscopy.

The research team showed there are similarities between the spike protein in the coronavirus responsible for the 2002-2003 SARS outbreak and the new coronavirus, SARS-CoV-2. However, the latter appears to bind to human cells even more strongly than the SARS virus did and antibodies against the first SARS virus don’t seem to react to the new virus in the same way.

Creating the 3D map of the spike protein in SARS-CoV-2 is the first step in speeding up vaccine design and development. Experiments to examine how successfully it elicits an immune response are ongoing, but looking to previous viruses provides a little hope according to Jason McLellan, a structural biochemist at the University of Texas, Austin.

“The spike proteins from other coronaviruses, such as MERS-CoV and SARS-CoV have been very immunogenic when used as a vaccine antigen,” McLellan says. “We expect the same to be true for this novel coronavirus.” That’s the case for McLellan, and his team at UT Austin who have been studying similar coronaviruses for years. Their latest study, published in the journal Science², took advantage of state-of-the-art technology at the university to map the molecular structure of the novel coronavirus, with a particular focus on the virus’ “spike protein.”

**Trials**

In the trial, patients will receive two injections of the mRNA-1273 28 days apart. The 45 patients will be divided into three groups of 15 and given differing doses, of 25 micrograms, 100 micrograms or 250 micrograms. Safety reviews will be performed after the first four patients receive the lowest and middle doses and again before all patients receive their shots. Another safety review of data will be performed before the 15 patients are set to receive the highest dose.

Even if the vaccine is proven to be safe and shows promise in protecting against COVID-19, it could still be a year away, at least.

The US NIH added a second site to the clinical trial of Moderna’s Vaccine as of March 27³. Emory University in Atlanta enrolled healthy adult volunteers aged between 18-55 into a Phase I trial. This is considered an extension of the trial carried out in Seattle, with the ultimate goal of enrolling 45

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² [https://science.sciencemag.org/content/367/6483/1260](https://science.sciencemag.org/content/367/6483/1260)
participants across the two states.

You can visit NIAID’s website for all the information on the trial. Moderna has finalized the design and dosage of its Phase 3 COVID-19 vaccine trial, keeping it on track to start the pivotal test in July. Work to get the 30,000-subject Phase 3 trial underway is advancing in parallel to ongoing enrolment in earlier phases of development.

Messenger RNA biotech Moderna set out its expectations for the Phase 3 trial when it shared a first glimpse at clinical data on its mRNA-1273 vaccine last month. At that time, Moderna expected the Phase 3 trial to test a dose between 25 Qg and 100 Qg, reflecting the adverse events seen in the 250-Qg cohort, and get underway in July.

According to the FDA, Moderna plans to randomize 30,000 people in the US on a one-to-one basis to receive either 100 Qg of mRNA-1273 or a placebo.

The primary objective of the trial is to assess the ability of mRNA-1273 to prevent symptomatic COVID-19 disease. Secondary endpoints will assess the ability of mRNA-1273 to prevent hospitalization and infection with SARS-CoV-2.

Ideally, the vaccine will stop people from catching and transmitting SARS-CoV-2. However, preclinical data on the vaccine the University of Oxford is developing with AstraZeneca raised the prospect that some of the candidates in development may be able to stop severe COVID-19 cases but not prevent the spread of the virus.

Moderna has shared data on the effects of its vaccine in eight Phase 1 trial participants to date. In picking the mix of primary and secondary endpoints, Moderna has positioned Phase 3 to detect several different signs of efficacy. Depending on the endpoints Moderna hits, mRNA-1273 may fall short of what the world wants from a COVID-19 vaccine, but still be a useful tool in protecting people and healthcare systems from the most devastating effects of the virus.

The nature of the endpoints means it is unclear when Moderna will have Phase 3 data. As the three key endpoints are driven by SARS-CoV-2 infections, the extent to which participants are exposed to the virus will dictate how quickly the trial shows whether mRNA-1273 is helping. Moderna is continuing to enrol participants in the Phase 1 and 2 trials. Phase 1, which showed that 100 Qg is the optimal dose, is still enrolling subjects in three cohorts. Enrolment in the first, 300-subject cohort of
Phase 2 is now complete, 13 days after the dosing of the first subject. Moderna has also fully enrolled a sentinel cohort of 50 people aged 55 years and older. If the vaccine looks safe in that population, Moderna will go on to enrol 300 people aged 55 years and older.

All participants will receive either a placebo or a 50-Qg or 100-Qg shot of mRNA-1273. Moderna will give each participant two shots 28 days apart and follow them for 12 months after the second dose.

**Updates on the Oxford Vaccine**

University of Oxford scientists are partnering with AstraZeneca to develop a COVID-19 vaccine made from a weakened version of a common cold virus, the adenovirus, taken from chimpanzees. The adenovirus is genetically altered so it can’t reproduce itself. The vaccine is combined with genes of the spike protein to trigger production of vaccines against it that allows the immune system to destroy the SARS-CoV-2 virus. A Phase I/II clinical trial began in April in the UK to assess its safety and how well it works in more than 1,000 healthy volunteers 18-55 years old. Now, recruiting has begun for Phase II/III trials, which will enrol up to 10,260 adults and children. For both Phase II and III, volunteers will receive one or two doses of either the COVID-19 vaccine or a licensed vaccine that will be used as a control for comparison. In early June, Brazil, hard hit with COVID-19 cases, joined the clinical trials, planning to test 2,000 volunteers there.

After reaching a license agreement with the University of Oxford and others, AstraZeneca agreed to supply more than 2 billion doses globally, anticipating delivery of 400 million doses before the end of 2020. The first clinical trial in South Africa and on the continent for a vaccine was announced June 23 at a virtual press conference hosted by the University of the Witwatersrand in Johannesburg. The trial is part of Oxford’s larger effort and the first participants were planned to be vaccinated at the end of June.
Training Health Care Professionals: Innovations in Teaching and Learning

**Medicine Basecamp**

All hands-on deck: Creation of an online internal medicine redeployment curriculum (Merali, Z., Carayannopoulos, K.L. and Lai, A. (2020)

As the number of hospitalized patients increased during the COVID-19 pandemic, this has required the redeployment of physicians and trainees from different specialties. For many trainees and physicians, it can be difficult to practice medicine outside their subspecialty. Most patients with COVID-19 are treated under internal medicine. The repurposed trainees and physicians may be unfamiliar with the latest internal medicine guidelines and practices. As internal medicine encompasses the treatment of a wide variety of ailments, redeployed trainees may face challenges in deciding what to learn. The authors created a curriculum that provided structured learning for redeployed trainees to addressed potential knowledge gaps.

The Intern at Work [www.theinternatwork.com](http://www.theinternatwork.com) is a learner-generated podcast series. Using the materials from this initiative, the authors created Medicine Basecamp. [www.theinternatwork.com/basecamp](http://www.theinternatwork.com/basecamp). Medicine Basecamp was designed as a 10-week curriculum, a practical resource for trainees who are re-learning internal medicine material for repurposing. Each subspecialty week consisted of five medicine topics. The authors selected high-yield topics focusing on prevailing conditions and medical emergencies to ensure that the curriculum is concise and achievable. Medicine Basecamp was structured in the following way:

1. For each topic, trainees first listen to a 10-15-minute podcast outlining physiology, history, physical examination findings, investigations, and management.

2. A visual aid consolidated material and assisted with information recall.

3. Practical management strategies were provided.

4. Trainees were encouraged to review one topic per day or to make individual learning plans.

Medicine Basecamp was created as a resource and an on-the-go reference source. Trainees were able to access the resource from computers and
mobile devices. It was released on 30 March 2020 and advertised on social media to reach a diverse set of trainees who were physically distancing. The authors evaluated the utility of the resource by analyzing website traffic and social media responses. The website received 19,900 unique page views within 34 days of release and was accessed from six different continents. Trainees expressed positive feedback. Even though the authors did not evaluate the effectiveness of the training program, the high level of website traffic and positive feedback highlights how Medicine Basecamp was able to fulfill a need for a structured curricular resource. In addition to the authors existing podcasts, they added accessible reading material and visual elements to highlight practical management strategies. In summary, the rapid creation and distribution of Medicine Basecamp efficiently provided a structured internal medicine curriculum explicitly designed to meet the unique needs of redeployed trainees during the COVID-19 pandemic.

The Importance of a National Health Information Technology Platform

The impact of the COVID-19 pandemic has prompted governments and policymakers to consider the pressing need to reform their healthcare systems. One way is through the adoption of new or enhanced digital tools to, for example, improve workflows and provide better access to information. While reforms may vary depending on the nature and state of healthcare within a specific country, health equity, access to quality care, utilizing technology to enhance accessibility, efficient care, and effective evidence-based decision making are vital to improving healthcare performance. At the center of this is the need for an effective electronic health record (EHR) system, which can provide timely, accurate and reliable data, that is of utmost importance at all times, but even more so, during a pandemic.

EHRs, which track all aspects of patient care, were designed to ensure safety, reliability, security, as well as provide an effective method to deliver team-based care. A study published by The Lancet in 2018, indicated that when 195 healthcare systems were compared globally, those that had adopted EHRs, five out of the eight, were ranked in the top 20. While EHRs have certainly provided a higher standard of care, there are also several issues associated with these platforms; for example, in the United States, there have been challenges associated with accessing patient data. In 2018, the Office of the National Coordinator for Health Information Technology (ONC) noted that only 36% of clinicians could access EHRs from outside providers, defeating the purpose of having an effective, centralized, and accessible platform for patient data. While this may seem problematic for countries, such as the United States, where patient data might need to cross city and/or state lines, perhaps similar to the crossing of data across country borders, viable solutions do exist. The European Commission had addressed the issue of accessibility by adopting a cross-border interoperability of EHRs in the EU, fostering secure sharing of health data, through a set of principles that governed the exchange of information, including data protection guidelines.

2 https://www.aafp.org/practice-management/health-it/product/intro.html
3 “Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories and selected subnational locations: a systematic analysis from the Global Burden of Disease Study 2016” The Lancet; Volume 391(10136); P2236-2271
4 2018 Report to Congress: Annual Updated on the Adoption of a Nationwide System for the Electronic Use and Exchange of Health Information: The Office of the National Coordinator for Health Information Technology
Digital tools, such as EHRs, bring up the urgent need to address cybersecurity issues. This is especially true with regards to the protection of data, and the vulnerabilities that continue to exist within digital infrastructures in relation to data attacks and breaches. The WannaCry cyberattack that devastated computers in healthcare facilities across the UK in 2018, costing the National Health System 92 million pounds, is an example of how important addressing the data security vulnerabilities are key in ensuring a sustainable, credible and reliable for better delivery of care. Thus, as new or improved healthcare digital systems and platforms are considered and adopted, emphasis needs to be made on ensuring that appropriate regulations and rules are in place for data protection, management and privacy to support an enhanced and more efficient practice of medicine.

The Need for a Robust National Health IT Infrastructure

In a recent article published in the Journal of the American Medical Association (JAMA), Sittig and Singh presented the urgent need to revamp the US healthcare system by enhancing a real-time, technology-driven, surveillance and reporting infrastructure to provide sound and reliable evidence to drive decision making during emergencies. They noted that this would require the presence of a collection of interconnected health care nodes, within all healthcare facilities, large or small, by developing a virtual infrastructure with EHRs. To date, more than 95% of the hospitals in the US use EHRs, which provides an opportunity to develop a more robust, nationwide, real-time data collection infrastructure, that can be further facilitated by health information exchanges (HEI), for the collection, exchange and analysis of clinical and administrative data between clinicians and healthcare facilities. However, before this infrastructure can be established, a number of challenges need to be addressed.
For one, there are several legal and social barriers that need to be resolved. Many of the HEIs involve patient consent before data can be exchanged, and in some cases, healthcare facilities and organizations are reluctant to participate, due to the fear that they may lose patients to other facilities. Furthermore due to issues related to privacy, most HEIs do not retain information that could be used to develop a longitudinal platform of patient data. In 1998, Congress prohibited the Health and Human Services (HHS) from developing a national patient identifier; thus, the lack of such a tool, led to further unreliability in patient data, which was highlighted as being an important factor in dealing with a public health crisis. Centralized health records with the capability of merging information from other government databases proved to be a valuable tool during infectious disease outbreaks, such as the COVID-19 pandemic.

Taiwan, which had in place an infrastructure that consists of an interconnected system between local health departments and centers, allowed for the centralization of real time data through a national database. This helped support COVID-19 disease surveillance and case detection, effectively delaying and containing transmission in the country.

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Implementing a reliable pipeline of clinical data for each patient from multiple sources, and using the data for accurate reporting, with the appropriate rules and regulations in place, helps manage public health emergencies for the following reasons:

- Data from digital platforms could generate a more accurate real-time assessment of disease burden on healthcare systems, and the need for resources, such as personal protective equipment and intensive care unit beds.

- The availability of reliable data can be instrumental in allocating resources to identify new and better therapies, and prioritizing based on areas and patients.

- The data collected can be used by public health officials to identify hotspots, and provide the evidence to drive policies to limit the spread of infection. Countries, such as South Korea, Singapore, and Taiwan, were able to use the data collected to implement the test, track, isolate and quarantine strategy (TTIQ), which contributed to their success in reducing the pandemic’s spread within those countries11.

- Clinical data linked to telecommunication platforms, such as mobile phones, will allow for the tracking of data based on location, which can be extremely effective for supporting contact tracing efforts, an essential measure to mitigate the spread of infection12.

- In a recent report published by the American Enterprise Institute, a public policy think-tank, the features and capabilities of a national surveillance system were highlighted13. This system, which will require coordination between healthcare providers on the state and local level, with Federal support through the Centers for Disease Control (CDC), could serve as the basis for public-health surveillance strategies. However, in order for such a government-based system to be effective, sound governance would need to be in place, especially in relation to data protection, privacy, and the right to choose. A robust governance framework can be seen in Taiwan, where the National Health Insurance database, only provides the Taiwan CDC with patient information under the auspices of high security and strict privacy regulations in place. In the US, Sittig and Singh suggest that the governance framework would require a bipartisan public and private consortium with experts representing wide-ranging legal, social, political, technical, and ethical points of view.


Furthermore, these surveillance systems do not have to be “active” at all times and could be implemented during a pandemic or national emergency.8

**Improving EHRs**

Outdated infrastructure, as well as limited governance and regulations for data management, protection and privacy, are a hacker’s paradise14. Thus, as EHRs are an integral part of establishing a digital IT healthcare system, this presents an opportunity to assess some of the current challenges associated with these tools, so that they are properly addressed to provide EHRs that can stand the stress of a public-health crisis.14

1. With regards to functionality and usability, the organization of information (into several tabs) can lead to frustration when trying to navigate patient records. Currently, these systems are more optimized to track billing and payment, rather than provide a user-friendly, easy way to access patient information, which, during a pandemic, becomes a critical factor to consider, as the lack of a holistic view of the patient’s health may lead to an incorrect analysis and view of a patient’s risk for COVID-19.14 Furthermore, one of the major issues with these systems is the lack of a cohesive data model, where there is an intuitive way for clinicians to find information on their patients, such as tracing their signs, symptoms, and diagnostic tests.

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For too long, patients and healthcare ecosystems have been largely disconnected.


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2. There will be a need to ensure that there are increased resources for efficiently updating these systems to protect against cyberthreats, especially in public-health emergencies. During the COVID-19 pandemic, Epic, maker of the most widely used EHR, released an update to help clinicians identify potential COVID-19 patients. However, overall these systems need to be more agile, efficient (in terms of speed), and less resource intensive in relation to updates.

3. It is essential the EHRs are built to share data across platforms, especially during a public-health emergency, where testing and tracing become critical elements in the mitigation strategy. Scalability of these systems, for tracking and tracing measures, is also an important factor. The current EHR infrastructure is capable of supporting dozens of patients, but data flow for interoperability during a pandemic would require supporting much more data. Recently, the Trump administration mandated the exchange of data and information through application programming interfaces (APIs), which would allow for secure platforms for sharing information, greatly enhancing the national effort to deal with a public health emergency. It is pertinent that all these measures ensure that data privacy and ethics regulations are not compromised.

Policy Implications and Recommendations

1. As governments consider healthcare reform in lieu of the COVID-19 pandemic, the need to enhance and advance digital tools to support better care and delivery, especially during public-health emergencies, should be at the core of these considerations. Countries should invest in a national healthcare IT infrastructure, to enhance healthcare delivery and access to patient data, while maintaining the highest ethical, privacy, and legal standards for maximizing benefits of scarce resources and ensuring health equity, while maintaining the trust and confidentiality of the patients.

2. Having a national, centralized database of electronic health records is important in dealing with public health emergencies. Furthermore, EHRs will need to be revamped to address not only technical related issues, but also to enhance accessibility, efficient care, and effective evidence based decision making, at all times, but especially for handling the stresses and strains of a public health emergency.

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