Lesson from COVID-19 diagnosis and infectious disease prevention for future

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Abstract

This paper has two objectives 1) to study the influence of digital and new technology on COVID-19 diagnosis and healthcare 2) To propose the integral guideline solutions of the infectious disease for the future. COVID-19 stands for corona (CO), virus (VI), disease (D), or SARS-CoV-2, is a respiratory virus first identified in December 2019 in Wuhan, China(WHO, 2019). It is an epidemiological crisis that caused the deaths and sudden destruction of wealth and health of people around the world. Many countries responded to the crisis with what could only be called urgent prevention and treatment. In the 21st century, our society is based on digital and new technology that can control and prevent the COVID-19 pandemics. However, these ways for solving the problem of COVID-19 pandemics are rising an epistemological crisis too. There are some problems with the COVID-19 diagnosis. From Buddhist philosophy perspective, COVID-19 teaches us the coronavirus is causing us to experience some heightened forms of the three marks of our existence which are the impermanence (aniccā), the suffering (duḥkha), and the non-self (anatta). The establishment of scientific expertise and innovation has shown its value and educating the public about testing, diagnosis, communication, treatment, and vaccine development technology for prevention the of infectious diseases in the future.

Key words: COVID-19, Diagnosis, Infectious Disease, Prevention

1. Introduction

COVID-19 is a 2019 novel coronavirus, or SARS-CoV-2, is a respiratory virus first identified in December 2019 in Wuhan, China. Even as such expertise is appreciated, however, the larger apparatus is revealed to be problematic. However, the response to the coronavirus has demonstrated how technology can help transform how we teach and learn but the push for change started long before the pandemic struck, and it will go on long after the threat subsides. As pathogens, markets, and regimes become intertwined, assumptions about what is real, stable, uniform, predictable, or intelligible have been shaken. The coronavirus (COVID-19) pandemic is challenging our health, work, education, and relationship with our society. Sometimes it is disturbing our peace of mind and forcing us to question our existence too (J.P. Kanne, 2020). As lockdowns ease and schools start to reopen in some places across our region, it's as good a time as any to take stock and look at the likely future of education. Children who start school from now on will grow up to be workers and leaders in a digital-first world that will demand new skills and new ways of thinking. To succeed in life and at work after COVID-19, they will need all the social, emotional, and academic support they can get via rich and flexible learning experiences that will differ vastly from the school days of their parents. Big Data, databased technologies are opening up ways to transform practices, structures, and even cultures in schools and universities. Perhaps technology's most direct impact will be the emergence of "e-learning" where each student enjoys focused individual attention from teachers who will access real-time data on their progress and problems.

2. Digitalized World

Healthcare is one of the largest yet least digitized sectors world today. The pandemic served as a reminder of the need to have robust, efficient, and accessible healthcare services in the future. We see investment opportunities in telemedicine, wearables, and digital platforms for the management of chronic diseases such as diabetes. As more industries undergo digital transformation, the next generation of IT infrastructure is emerging, with 5G at its core. Probably 5G will enable massive internet of things network and power applications such as autonomous driving and remote surgery. We see particular opportunities related to this trend in two key areas: education and healthcare particularly the rise of preventive care, health technology, and telemedicine; and wellbeing including digital entertainment and fitness. Yet it has already reshaped entire industries. Numerous individuals and groups use information as a tool to advance their agendas. Those who are most successful at this have increasingly targeted weak points in the chains between sources and recipients of the information. Advertisers, politicians, campaigners, and advocacy groups take advantage of the squeeze on the mass media, which makes it harder for journalists to check claims and provide context. They take advantage of the openings provided by social media, in particular the incentives of advertisement-based platforms. They take advantage of people's automatic ways of processing information without careful and conscious analysis. Meanwhile, the COVID-19 pandemic has accelerated key trends including e-commerce and digital data penetration, with ramifications for enabling. In this digital era, technology will transform the future of healthcare and education, particularly in the context of an aging and growing global population.

3. COVID-19 Testing Scenarios

However, medical practitioners are re-examining just how they ought to go about the practice of diagnosis given that the ability to connect with and get feedback from other physicians regarding a diagnosis continues to become, in a technical and temporal sense easier. How might patients be impacted when they see that when making diagnoses, their health practitioners are drawing on banks of information collected and scrutinized by other professionals? By the by, health practitioners are already searching the internet during some clinical visits, though sometimes surreptitiously. What would happen if the practitioner turned the screen of their monitor for the patient to see what they are doing, how they are performing it, and what they are acting on based on the results? what are the limits of what software can teach people? Or How do patients and practitioners benefit, and suffer, from the implementation of digital and technology? A compelling, even if untethered to reality, version of the correct approach to diagnosis involves the lone physician analyzing information from a patient's medical history and lab results to create a detailed list of possible diagnoses.

3.1 Diagnostic testing

Diagnostic testing is intended to identify current infection in individuals and is performed when a person has signs or symptoms consistent with COVID-19, or when a person is asymptomatic but has recent known or suspected exposure to SARS-CoV-2. Examples of diagnostic testing include:

3.3.1 Testing people who have symptoms consistent with COVID-19 and who present to their healthcare provider

3.3.2 Testing people as a result of contact tracing efforts

3.3.3 Testing people who indicate that they were exposed to someone with a confirmed or suspected case of COVID-19

3.3.4 Testing people who attended an event where another attendee was later confirmed to have COVID-19.

3.2 Screening tests

Screening tests are intended to identify infected people who are asymptomatic and do not have known, suspected, or reported exposure to SARS-CoV-2. Screening helps to identify unknown cases so that measures can be taken to prevent further transmission. Examples of screening include testing:

3.2.1 Employees in a workplace setting

3.2.2 Students, faculty, and staff in a school setting

3.2.3 A person before or after travel

3.2.4 At home by someone who does not have symptoms associated with COVID-19 and no known exposures to someone with COVID-19

3.3 Public Health Surveillance Testing

Public health surveillance is the ongoing, systematic collection, analysis, and interpretation of health-related data essential to the planning, implementation, and evaluation of public health practice. Public health surveillance testing is intended to monitor community or population-level outbreaks of disease or to characterize the incidence and prevalence of the disease. Surveillance testing is performed on de-identified specimens, and thus, results are not linked to individual people. Public health surveillance testing results cannot be used for individual decision-making. Public health surveillance testing may sample a certain percentage of a specific population to monitor for

increasing or decreasing prevalence or to determine the population effect from community interventions such as social distancing. An example of public health surveillance testing is when a state public health department develops a plan to randomly select and sample a percentage of all people in a city on a rolling basis to assess local infection rates and trends.

The physician attempts to rule out all possible diagnoses save one, the correct diagnosis. Such a cursory procedural overview does not explicitly state that physicians, especially early-career practitioners as well as physicians in training, should consult other physicians when making a diagnosis. The image of a solitary physician teasing out a correct diagnosis from disparate and often disconnected mounds of data might make compelling television drama, but it also presents a misleading narrative: only one physician is required to make accurate diagnoses. From diagnosis to intervention, the practice of medicine is adapting to one of the most significant social trends of the last two decades: nearly all inquiry begins with an internet search. We seek answers to questions and information on topics by typing into a search bar and, seemingly, trusting the results we find there. We might not be far off from a time when "seeing a doctor" only tangentially involves an actual human doctor. Just as lay publics seek out health information on the internet, so, too, do medical professional trainees and practitioners through analysis of web-based patient vignettes (Dhaliwal 2013; Meyer, et al. 2013). Recently developed software e.g., the Human Diagnosis Project provides even greater connectivity for such analysis, allowing users to compare their diagnoses with responses from other health practitioners. Is our understanding of the social beginning to thicken, or are we simply imagining individuals cogitating and diagnosing on their own without much need for interacting with other practitioners? Effective and compassionate communication on the part of the

physician requires practice and desire: practitioners must believe it works, and not just because some committee or software tells them it does. When truth and knowledge are found online, mere keystrokes and clicks away, however, anything other than unidirectional communication seems both absurd and tedious.

4. Reporting Diagnostic, Screening, and Public Health Surveillance Testing Results

Both diagnostic and screening testing results can be reported to the people whose specimens were tested and/or to their healthcare providers. In addition, laboratories that perform diagnostic and screening testing must report test results (positive and negative) to the local, state, tribal, or territory health department.

Public health surveillance testing results cannot be reported to the people whose specimens have been tested and are not reported to their healthcare providers. Public health surveillance testing results test results that are de-identified – can be reported in aggregate to local, state, tribal, or territory health departments upon request. Results from testing that is performed outside of a CLIA-certified facility or without an FDA-authorized test can only be reported to a health department if those results are used strictly for public health purposes, and not used for individual decision making.

5. The Problem of COVID-19 Diagnosis

5.1 Low quality, inaccurate and incomplete data test result: Test-related factors like low sensitivity or specificity or data subjectivity limit diagnostic accuracy. In the case of COVID-19, the window period with polymerase chain reaction (PCR)(White, P.L., 2013) and low antibody specificity might lead to underestimates or overestimates of infection/exposure due to false positives or false negatives. And also

limited access to testing collection supplies, coupled with limited availability of both reagents and appropriate analyzers, prevents some hospitals, clinics, or even regions from assessing the true extent of the COVID-19 pandemic.

5.2 Diagnostic data that misses the Big Images

Lack of patient longitudinal data limits diagnostic and tracing efforts, making it more difficult to prevent outbreaks in a patient's community or workplace (M Juan, 2020). Too often, diagnostic data is only a snapshot, a picture of a specific factor or system at one point in time. When the COVID-19 pandemic erupted, a patient's medical history and travel history were not always available when the patient arrived at the care facility, making it more challenging to accurately diagnose COVID-19. A specific challenge is the lack of access to comprehensive information at the point of decision. The data infrastructure in many healthcare organizations makes it difficult to bridge the information gap between departments and organizations. In many countries, the need for an integrated digital infrastructure that makes all relevant information available to the caregiver and the patient has become painfully visible during the COVID-19 pandemic. Limited information on patients' behavioral history and family life can hide risks, potentially limiting patients' compliance to specific treatments or to preventive measures like self-isolation.

5.3 Diagnostic information that is too complex to be actionable

COVID-19 challenges include assessing a high volume of data from many patients. Complex tasks, like assessing chest imaging with suspicious readings, as well as support in interpreting conflicting results (on molecular and antibody tests, for example), must be completed promptly to appropriately diagnose and care for the individual patient (Patterson, T.F. and Donnelly, J. P, 2020)

In medicine in general, the total volume of data is growing at a rate of 48% per year, presenting a huge challenge to healthcare providers, who may be acting on outdated information. Many hospitals and health systems lack the scalability, performance, and analytic capability to support clinical decision-making and to make timely and targeted care interventions.

6. The Possible Solutions

6.1 Improve data quality

The two main types of testing for COVID-19 are PCR testing for active infection and antibody or serologic testing to Determine recent or prior infection with SARS-CoV-2. Together, these two tests can help health agencies get a clear picture of the state of the pandemic. For an accurate diagnosis, these tests must be validated and must offer sensitivity and specificity close to 100%. Lower specificity in areas with low exposure to the virus might lead to overestimates of community exposure due to false-positive results. Accurate and widespread testing helps assess community status and identify infection “hot spots.” How much COVID-19 testing is needed? The recommendation from health organizations and thought leaders is to conduct widespread testing to identify and contain outbreaks. In many countries, an initial gap or learning curve was identified between the ideal number of tests for mitigation and suppression and the actual testing being done. Further strengthening of testing programs was necessary to close these gaps. Beyond improved tests, data should transition, when possible, from non-structured or qualitative into structured or quantifiable. Quantifiable data allows for more precise diagnosis and subclassification. For example, generation of quantitative or semiquantitative results for COVID-19 antibody titers will be important

to characterize the immunity, if any, conferred by prior exposure to SARS-CoV-2.

6.2 Provide comprehensive longitudinal data at the point of decision

COVID-19 taught us that the diagnostic process does not need to occur strictly in a practice or hospital. It can begin at home, for example, using a smartphone or a PC, bolstered by digital tools such as patient portals, digital tracers, screening algorithms, point of care technology, remote access, and telemedicine. This broader approach to diagnosis, and to understanding the "whole patient" incorporates lifestyle data, which can be crucial to mitigating the spread of infectious disease. For patients with suspected COVID-19, the picture of the "whole patient" includes previous tests, travel history, and tracing data. Smartwatches can provide additional data, including heart rate and temperature changes, that can be important in early screening the potential presence and severity of infection. Digital enablers and infrastructure are needed to guarantee secure access across settings (e.g., ambulatory, hospital admissions, home care, cell phones). Healthcare provider organizations must invest in digital enablers for secure information transfer, and more importantly, must develop an enterprise-wide strategy for secure data access and sharing.

6.3 Generate actionable insights from large and complex data sets;

High-quality data is important, but what we do with it is even more so. Physicians must be able to translate data into actionable insights to deliver personalized medicine. For example, consider chest computed tomography (CT) scans or X-rays. AI-powered decision support systems can help radiologists identify suspicious areas for evaluation or even suggest diagnoses that could be considered, based

on analysis of many similar cases. This is especially important for patients with rare conditions, atypical presentations, or confounding physiological or pathological factors. COVID-19 transcends the definition of respiratory disease. Its symptoms can mimic other conditions (i.e.: gastrointestinal disease, flu, conjunctivitis), making it exceedingly challenging to diagnose and treat. Clinical decision support algorithms can help healthcare providers arrive at the right diagnosis in the face of such complexity and may help avoid ruling out COVID-19 in atypical presentations. As mentioned earlier, it's vitally important to incorporate other aspects of the patient's life and health history. We've learned from COVID-19 how the economic and behavioral consequences of the pandemic triggered an unprecedented impact on mood problems and stress, affecting many activities of daily life. A proper evaluation of mental health is key to accurate and actionable diagnosis and effective

7. Prevention

7.1 Identifying the source of the disease outbreak

Epidemiologists should do field investigations to find out how the new virus started. They conducted surveys in the community and in health facilities and collected nose and throat specimens for lab analyses. These investigations showed them who was infected, when they became sick, and where they had been just before they got sick. Using this information, epidemiologists determined that the virus possibly came from an animal sold at a market. The new virus was found to be a coronavirus, and coronaviruses cause a severe acute respiratory syndrome

7.2 Defining the disease Cases

Like the virus that causes COVID-19 began to spread from person to person in communities (community transmission), scientists needed to track the disease and try to slow its spread. To do so, they needed a common definition for a case of COVID-19. Having a case definition helps to make sure cases are counted the same way everywhere. COVID-19 became a nationally notifiable disease, meaning that health departments are required to report cases of COVID-19. Collect and send data on cases of COVID-19 to CDC. This helps the agency monitor trends in cases within states and across the country.

7.3 Studying the disease

Institutions around the world are conducting thousands of epidemiological studies to learn more about COVID-19 and the virus that causes it. These studies help us understand, Read the latest reports of studies on COVID-19 from CDC's Mortality Reports. The time between when someone is exposed to the virus and when they have symptoms (incubation period). We now know that someone can be infected with the virus for 2–14 days before they feel sick and that some people never feel sick. How long a person who is infected can shed (release from the body) the virus. To avoid spreading infection, we recommend that people infected with the virus avoid being around others until they have gone 3 days without fever, their symptoms have cleared, and 10 days have passed since their symptoms started.
The range of signs, symptoms, and severity of the disease (spectrum of disease). Knowing this information helps people be on the lookout for early symptoms and helps healthcare professionals diagnose and treat the disease. The risk factors associated with severe disease. We now know that people who are older or have serious chronic health conditions are at higher risk for becoming very sick from COVID-19.

How often the disease causes illness and death in a population (morbidity and mortality rate). This information helps epidemiologists understand the impact of COVID-19 on public health**.**

7.4 Developing Guidance to Protect the Public's Health

The same applies to vaccination. It is possible to believe that most vaccines are beneficial to most people, yet it is wise to space out vaccinations or to avoid a few of them. Or that most vaccines are beneficial to most people, yet to oppose vaccination requirements to attend school. Many vaccines are unnecessary but coercive measures to promote vaccination are warranted to ensure that the most contagious vaccine-preventable diseases are controlled. Back on Earth in the early twenty-first century, the clinical diagnostic process still involves human engagement. The four critical components of gathering information, developing a hypothesis, testing that hypothesis, and reflecting critically on the results of the test(s), at present, is done by people, not software alone (Sang. M. Lee.; DonHee. Lee ., 2021)

8. Conclusion

We are at a crossroads, where the digitalization of medicine is making integrated data-driven approaches to diagnosis and treatment a real possibility. Innovative Technology for example Artificial Intelligence (AI) is also enabling decentralized care and precise remote monitoring so that physicians will have greater insight than ever before into the mechanisms of disease and how they affect patient's lives. Now is the time for healthcare leaders around the world to adopt a precision diagnostic mindset, embrace the integrated approach to diagnosis, and help their healthcare teams develop robust insights for effective and proactive diagnosis and prevention. Digital enablers such as AI-based tools can support complex integration of multiple data sources and comparison of individual patient data with aggregated data sets to

streamline and improve clinical decision-making. Today, there are tools available that aid in a specific field, as aiding in the interpretation of imaging data, and other tools that incorporate multiple data sources to suggest a treatment pathway. This can apply to population health concerns as well. Streamlined access and integration of multiple data sources, coupled with automation, can accelerate contact tracing in the wake of COVID-19 diagnoses, which is key to suppressing potential outbreaks for infectious diseases in the future.

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