2020: A Crash Course in Digital Health

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Although digital health has been a hot topic for several years, adoption has been slow, held up by the administrative, reimbursement, and cultural barriers that make systemic change inherently challenging. However, the COVID-19 pandemic has changed all that. The sudden, unexpected need for socially distanced remote care for millions of patients around the world accelerated the adoption of digital health at an unprecedented scale, giving healthcare professionals and patients alike a crash course in digital health technologies ranging from telemedicine to remote monitoring.

While these technologies have been a lifeline during the pandemic—and have opened the door to exciting opportunities to improve cardiovascular care—it's early in the game, and we must still reckon with incomplete evidence, the challenges of cultural change, and many of the same practical, ethical, and legal barriers that we faced before COVID-19. In an excellent editorial in *BMJ Health & Care Informatics*, Drs. Niels Peek, Mark Sujan, and Phillip Scott point out that although many countries used emergency measures to quickly roll out digital health platforms and temporarily loosen both privacy and data laws and reimbursement regulations, it is unclear how those frameworks will look in a post-pandemic world.[1] Thus, evaluating and understanding the technology is all the more important as we decide how the digital transformation should proceed.

When we planned this issue in late 2019, we had no way of knowing how the "novel coronavirus" would turn our world upside down in the months to come. However, even without the context of the pandemic, we felt that the time was right to take a deep dive into digital health and wearable technologies, understanding that a digital transformation was upon us—if perhaps slower in our original calculations. Over the last decade, the American Heart Association, American College of Cardiology, and European Society of Cardiology not only acknowledged the rise of digital health but also launched initiatives to develop and promote digital health and advance innovative technologies in the cardiovascular world. The World Health Organization (WHO) and United Nations (UN) have embraced "appropriate, accessible, affordable, scalable, and sustainable person-centric digital health solutions" as a key component in a global strategy to meet the UN's health-related Sustainable Development Goals, and the WHO recently outlined a global strategy to accelerate equitable digital health over the next 5 years.[2]

Technology, in its broad identity, is the application of science and tools that are advanced by humans. Through innovation,

we try to make technology work for us to make our daily lives easier, more efficient, more precise, and more productive. In cardiovascular medicine, we strive to use technology to provide patient-tailored cardiovascular care, or "precision health." Digital health technology offers the potential to identify early red flags for at-risk patients, allowing us to implement aggressive primary prevention techniques or provide patients with the right care in a reasonable amount of time with appropriate (and accurate) data. It could save time and money for patients and providers alike, and it could potentially decrease the workload of cardiovascular imagers by using machine learning and performing more optimized imaging techniques. The opportunities for new technologies in cardiovascular medicine are endless.

We are now at the forefront of a digital revolution that could dramatically change how we interact with patients and practice cardiovascular medicine. When we set out to produce a review journal on digital health, the newness of the field presented a challenge—and an opportunity. Early research, while robust, has not had time to produce enough evidence for the cardiovascular community to form a settled consensus, making writing traditional review articles more difficult. However, we believe the imminent changes to our field, ushered in with the growth in digital technology, make it essential for clinicians to inform themselves about the technological opportunities on the horizon. Thus, we invited cardiovascular experts at the forefront of digital health to write reviews nuanced by their personal experience and expertise, injecting these pages with informed—and sometimes conflicting—opinions on what the digital future holds.

We begin the issue with Drs. Karthik Seetharam and James Min, who present a state-of-the-art review of artificial intelligence (AI) and cardiovascular imaging. Machine learning has been a hot topic for a while, with multiple studies showing promising data, especially in the field of imaging. A couple of years ago, when a Stanford study demonstrated a machine algorithm that could outperform radiologists in diagnosing pneumonia based on chest x-rays, it was telling not just of technological advances in AI but also the speed of these advances.[3] It is a field that is ripe for breakthroughs that can only be limited by imagination. The authors discuss types of machine learning, how they can be used in different cardiovascular imaging modalities, and how it can make our care for patients more accurate, efficient, and personalized.

Both technology and our understanding of data have progressed significantly over the years. Our ability to manage

the vast output of data produced by digital health technologies is crucial to providing better, more personalized, and efficient care to our patients. In our second review, Dr. Khurram Nasir and colleagues discuss how big data could provide a solution for population health management, especially in cardiovascular diseases. The authors explain how proper use of big data, with careful planning and investing in human and technological resources, could be an asset in our quest to optimize care, identify disease, and intervene earlier to manage different pathologies with medicinal and other approaches.

Next, Dr. Ahmed Soliman delves into the history and future of telemedicine. Long recognized as a useful tool in the digital health armamentarium, telemedicine has recently leapt into the spotlight as an invaluable tool for patient care during the COVID-19 pandemic. Dr. Soliman discusses the opportunities of and challenges to widespread adoption of telemedicine in the cardiovascular world.

The seeming landslide of new hardware and software for digital health and patient monitoring sometimes seems mind boggling. Drs. Kimberly Aguillard and Arthur Garson Jr take on the world of cardiovascular devices and apps for patient use, asking the critical question, "Are we getting our money's worth?" The Achilles' heel for digital—particularly mobile—health this early in its lifecycle is a lack of quality randomized controlled trials to accurately assess the technology's effectiveness. Aguillard and Garson review apps and devices geared toward cardiovascular disease risk factors, such as diabetes and physical activity, discussing how we can (and cannot—at this time) integrate these technologies into our daily clinical practices.

This opens the door to the next review, wherein Dr. Sanjeev Bhavnani discusses the opportunities and challenges in developing the next generation of technology-enabled models of cardiovascular care. The digital transformation of health care is not just driven by healthcare system needs but also by the patients (consumers) seeking a health component to their digital daily lives. One of these components is digital remote monitoring, which is expected to be a major cornerstone for chronic disease management. Such monitoring produces a wealth of data that, in and of itself, requires proper platforms to ensure it reaches its fullest potential to enhance patient care.

With the abundance of new technologies comes unprecedented challenges, creating an opportune moment for large groups and societies to lead in this relatively fast transformation. To that end, Dr. John Rumsfeld, chief innovation officer for the American College of Cardiology (ACC), and Drs. Rashmee Shah and

Regina Druz give an inside look at the ACC Innovation Program. Starting in 2017, the program is a multipronged approach to facilitating the digital transformation of cardiovascular health care delivery, developing opportunities for ACC members to play active, impactful roles in the expansion of digital technology and its administrative and legislative factors.

As much as digital health promises, it is not without its drawbacks. Critics caution that rushing headlong into a digital transformation raises myriad concerns, such as false calls in diagnoses, overly aggressive risk calculations leading to unnecessary imaging or procedures, unresolved privacy issues, and giving patients the false sense of being "continuously" monitored. Dr. John Mandrola makes a compelling case against rushing into digitalization, arguing that there isn't enough evidence to prove that digital health is as good as or better than what we have now, and that with an onslaught of physical data, we risk losing sight of what constitutes true health.

As we look forward to a future beyond COVID-19, we must ask ourselves what role digital health should play in the post-pandemic health care world. Now that the digital future is upon us, it is more important than ever that we, as a community, gather and assess evidence and challenge preconceptions to ensure that we integrate digital health in a way that best serves our patients and advances our goals of enhancing cardiovascular care. We hope this issue will spark lively conversation and debate in our community as we work together to optimize this technology for our patients and practices. We invite you to continue the conversation on social media, tagging @debakeyCVedu and #DeBakeyCVJournal. We also encourage you to watch a special DeBakey CV Live webcast featuring authors from this issue as we debate the future of digital health. Watch January 26, 2021, at 5 p.m. CST at livestream.com/debakey.

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