

The inaugural 2022 HRX meeting: A patient-centered digital health meeting for the acceleration of cardiovascular innovation



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The inaugural 2022 HRX meeting (HRX22) was sponsored by the Heart Rhythm Society (HRS). In 2019, in alignment with HRS's strategic plan to innovate to improve patient care and expand digital health and after launching the *Cardiovascular Digital Health Journal*, HRS planned to annually convene all stakeholders to accelerate cardiovascular innovation. The HRX22 meeting focused on innovation in digital health. Unlike other digital health summits, HRX22 brought together the entire spectrum of stakeholders, including cardiovascular clinicians; engineers; product developers; entrepreneurs; investors; hospital administrators; medical technology, commercial technology, and pharmaceutical companies; regulators; nonprofit organizations; and patient advocacy groups to develop patient-centered digital solutions to many of the challenges of the current healthcare environment. The meeting was designed to be small, and it took place in a single and "intimate" conference room with 1 central stage in San Diego, California, in September of 2022, and was enabled by digital tools for presentations and interactions. The meeting was attended by almost 600 participants—the target for the inaugural HRX event. In addition to main tent sessions, fireside chats, crash courses, and roundtable discussions, the meeting included abstract presentations showcasing innovative digital health research and a pitch competition for innovators with premarket development ideas. Some of the important topics discussed at the

meeting are shown in [Figure 1](#). This paper highlights the main discussions that occurred at the meeting.

Digital data ownership was discussed at length. The widespread use of electronic health records, the increasing availability of FDA-cleared commercial cardiovascular monitoring devices, and the increasing acceptance of commercial devices by diverse patients and clinicians have generated petabytes of new data and created tremendous opportunities for big data research. However, to conduct big data research, several important issues related to data ownership, interoperability, and privacy must be addressed. An essential first step in this process is to gain the trust of patients who, as a result, would feel comfortable with the medical community handling their data. Patients' trust can be gained through transparency, assurances of the choice to opt out of allowing their data to be accessed, education regarding the benefits they may derive from algorithms that can identify them as potential candidates for a test or an intervention, and guarantees that the results will be shared with them. In this model, the different stakeholders function as custodians of the data who protect the patients' digital rights. Notably, the costs of data sharing are tremendous, especially when interoperability is sought. Methods to reduce these costs are desperately needed. In addition, data definitions and maintenance of data quality are top priorities for accurate phenotyping. Steps toward ensuring high-quality data include automation of data entry and analysis, and interoperability and connectivity of systems that create an infrastructure to deliver patient-centered care that improves health outcomes while reducing costs.

Although there is general agreement that patients own their health data, it should be acknowledged that without the digital sensors, artificial intelligence and analytics, and

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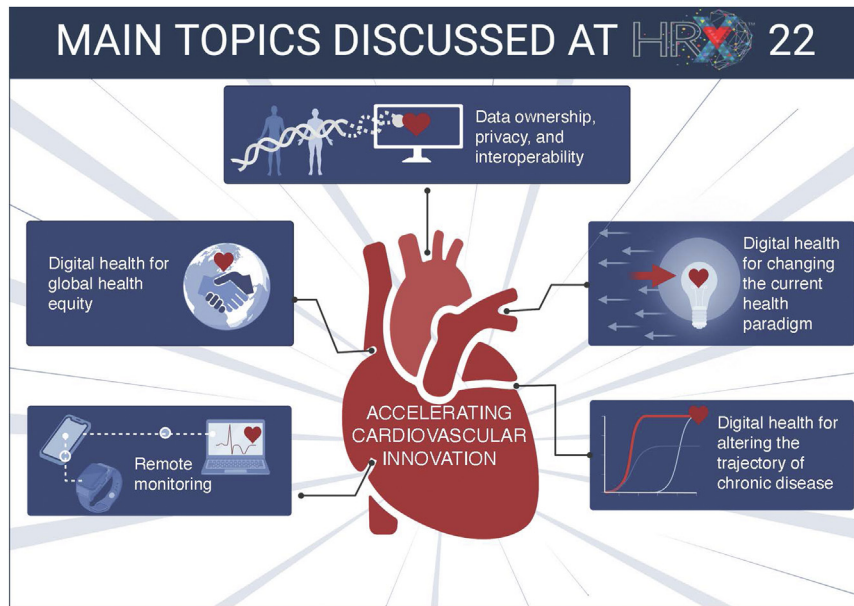


Figure 1 The main topics discussed at the HRX22 meeting.

the apps that engage patients and clinicians, the full value of digital data cannot be realized. Some have argued there may be multi-ownership of the data by the patient, the clinicians who interpret the data, and the hospital at which the data were generated. Others have argued that everyone owns the data for a period of time and then passes the data along to others. Finding the right balance of data ownership will be essential to stimulating ingestion, curation, and insight generation from multimodal sensor data merging them with clinical data from electronic health records.

Digital technology was acknowledged as having tremendous promise to promote health equity. “Health techquity” was introduced as a term that means the design, creation, and implementation of technology solutions that promote and potentially enhance health equity. Some opportunities for digital technology to improve health equity were considered. First, incorporation of social determinants of health into the electronic health record is likely to be beneficial. Second, creating diagnostic and treatment algorithms that are race and ethnicity agnostic will likely reduce, if not eliminate, unwarranted variations in how patients are treated; ie, the epidemiology of care. Similarly, when artificial intelligence models are built, every attempt must be made to keep them unbiased. Third, augmenting and enhancing the use of readily adopted and accessible telehealth to avoid the need for public transportation will help disadvantaged (with demographic, socioeconomic, or other impediments to access to care), rural, and remote populations achieve access to care and consistent follow-up. Fourth, big data will enable the medical community to understand the paths that should be taken to address disparities. That coupled with digital technology will likely result in reducing disparities. Fifth, technology that could reduce disparities must be designed in a way that maximizes its effectiveness. Why technology may not result in achieving

the desired outcome is frequently due to factors that were not considered in the design phase. For technology to work, an infrastructure must be established with access to affordable broadband, and health and technology literacy must be promoted. Finally, efforts should focus on enrolling disadvantaged people in clinical trials. Reasons for the lack of enrollment of these disadvantaged people in clinical trials include lack of awareness, hardships related to participating in clinical trials, and lack of trust. These challenges can be overcome by creating tools that enable researchers to rapidly search for and reach disadvantaged patients, making participation in trials easier through decentralization and virtual designs, and gaining patients’ trust through transparency, assurances regarding how the data will be handled, partnering with trusted members in the community (including social media platforms) who can promote the research, and involving disadvantaged people in the design of trials.

Another area that was discussed thoroughly at the meeting is how digital health can change the current healthcare paradigm. Patients are undoubtedly being empowered through mobile apps and wearables. However, in order for this empowerment to translate into improved patient care and outcomes, the challenges faced should be well understood. Atrial fibrillation was presented as a prime example of how digital tools are changing the healthcare paradigm. Challenges involved in provisioning digital health care for patients with atrial fibrillation were reviewed. There are real concerns about the current process. Patients are concerned about cost, how they can transmit tracings from their wearable devices to their care team, and the security of the data once transferred to clinicians. Clinicians are worried about the accuracy of the atrial fibrillation diagnosis, how they can manage the deluge of data sent to them and bill for the time and effort needed to review the data and act on them,

maintaining security of the data, and demanding evidence that data obtained from available digital tools can lead to interventions that improve outcomes at a reduced cost. The medical community is working on addressing many of these concerns, but a lot remains to be done. As solutions are proposed and this process is optimized, every attempt must be made to prevent depersonalization of medicine.

Personalized prediction was also discussed. Atrial fibrillation was again used as an example. Predicting stroke, heart failure, and cognitive decline in atrial fibrillation is of paramount importance. The limitations of the CHA₂DS₂-VASC score were highlighted in relation to suboptimal predictive power and the need for more personalized stroke prediction that considers the burden of AF and other potentially relevant comorbidities. The importance of predicting response to treatments (such as recurrent AF after catheter ablation) was also emphasized in relation to aiding clinicians in selecting patients for treatments.

The meeting participants generally agreed that predictive analytics, including artificial intelligence, may enable cardiovascular health professionals to intervene earlier and alter the natural history of chronic cardiovascular diseases. Several steps can facilitate this process. First, when possible, artificial intelligence should be incorporated in diagnostic digital health tools. Second, integrating data from wearables and implantable devices into clinical-grade data repositories is also important. Third, digital health tools and algorithms, including those aimed at supporting clinical decision-making, must target disease management. Fourth, the next generations of clinicians should be trained in digital health. Fifth, the medical community should advocate for reimbursement for using digital tools; professional societies may be able to assist in this process. Sixth, patients must be effectively engaged as partners, and their input must be sought regarding strategies for self-management, including control of risk factors, that are likely to be effective.

Notwithstanding the immense opportunities for digital health to transform patient care, important gaps were acknowledged. These gaps involve the need for validation of the accuracy of diagnostic and screening digital tools; ease of use, scalability, and implementation of such tools, as well as tools used for monitoring and treatment; the need to engage different stakeholders, including patients (especially disadvantaged ones), in designing, testing, and implementing these tools; the need to ensure the clinician-patient relationship is protected; the need to make wearables affordable for those most in need; and effective models for connec-

tivity, interoperability, and cybersecurity. Also, the meeting participants acknowledged the importance of subjecting digital health tools, software, and algorithms to the same scrutiny as other healthcare diagnostics and interventions to prove their impact on patient outcomes through prospective cohort studies and randomized clinical trials.

By bringing together all relevant stakeholders and providing them with an innovative platform to brainstorm about many of the challenges of the current healthcare environment and offer digital patient-centric solutions, the 2022 inaugural HRX meeting will hopefully accelerate digital health transformation and form a strong foundation for many future HRX meetings that will continue to propel innovation in digital health and other areas in medicine.

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