

Digital health for primary prevention of cardiovascular disease: Promise to practice



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Within the United States health care system, conflicts between incentives and goals have limited the efficacy of primary preventive strategies. An abundance of literature indicates that future risk may be substantially modifiable through optimization of blood lipid levels, blood pressure, glycemic control, weight, diet, physical activity, sleep, and tobacco abstinence. Although guidelines from cardiovascular professional societies recommend comprehensively addressing these factors to reduce cardiovascular disease risk, in practice, an exceedingly small proportion of the general population achieves target goals across all measures. Cost-effective scalable primary prevention strategies are necessary to target the large proportion of the population at risk for cardiovascular disease, which remains the leading cause of death in the United States.¹ There is now an opportunity to capitalize on the rapidly developing remote frameworks being developed in response to care disruption caused by the coronavirus disease 2019 (COVID-19) pandemic to pivot from traditional clinic-based primary prevention toward remote management of high-risk patients.

Cardiac rehabilitation, a lifestyle modification program, is effective and available for patients who have already developed symptomatic cardiovascular disease.² A large study of approximately 25,000 patients from Kaiser Permanente Northern California showed a 43% decrease in mortality rate among those who achieved all target secondary prevention goals with cardiac rehabilitation compared to those who met fewer target preventive goals. However, similar therapies to prevent the initial onset of symptomatic cardiovascular disease itself, such as weight loss centers or diabetes prevention programs, are largely nonexistent or are not covered by traditional insurance plans. Costs, logistics, accessibility, and behavioral modification for asymptomatic individuals often are recurring limiting factors when applying

primary prevention therapies. Although primary care clinics focus on screening for and implementing preventive pharmacotherapies, there often is limited physician contact time in short visits to comprehensively address the concurrent health behavior changes required for maximal efficacy.

Therefore, lifestyle modification for primary prevention outside of conventional clinical encounters has been emphasized, including workplace wellness programs, insurance-based incentive programs, and policy programs aimed at addressing systemic barriers to health-related behaviors. However, these programs have resulted in variable success. Recent observations in a study of almost 33,000 participants questioned the efficacy of workplace wellness interventions, showing an increase in self-reported weight management behaviors and exercise engagement but no impact on clinical outcomes or medical/pharmaceutical utilization.³ In addition, rates of engagement in well-intentioned health promotion activities are generally low.

Digital health—spanning mobile health technologies, health information technologies, and telehealth—has been proposed as a means for health promotion and general cardiovascular disease prevention (Figure 1). During the COVID-19 pandemic, we have seen dramatically increased need and ability to widely implement digital health to augment and supplant routine nonurgent clinical encounters. Between 2011 and the onset of COVID-19, investors spent an estimated \$30 billion in digital health for varied goals, without major successes to date. Key reasons for previous disappointments include (1) risk-averse investments for incremental improvements within the confines of an existing health care system; (2) “tech for tech’s sake” without addressing key problems; (3) lack of synergy between industry and health care; (4) misaligned financial incentives across patients, providers, insurers, and companies; (5) inability to overcome inertia within complex health care systems; (6) long development cycles forced by lack of data interoperability among digital platforms; and (7) health care distribution that is currently enterprise-facing and not consumer-aligned.

There are several proposed use cases for digital health, with variable utilization in today’s health care landscape during COVID-19. (1) Virtual clinic visits are now highly

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KEY FINDINGS

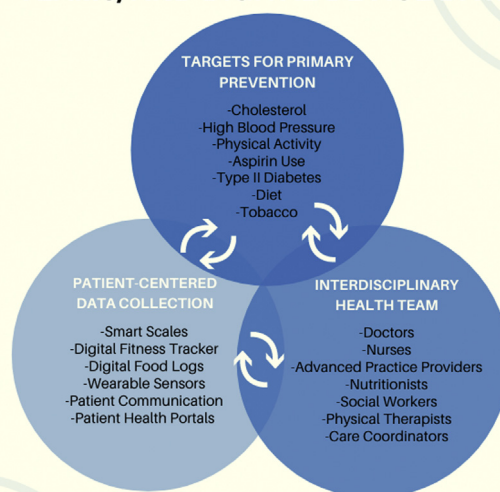
- The current landscape of digital health usage during the coronavirus disease 2019 (COVID-19) pandemic highlights its potential for widespread use in cardiovascular prevention.
- Harnessing the full benefit of digital health for cardiovascular primary prevention will require timely and thoughtful research investment.
- Research should be aimed at demonstrating digital health benefits in improving patient access to care, quality of life, usability for providers, and health care outcomes; streamlining workflow; and limiting costs.
- Special care must be taken to ensure increasing use of digital health results in equitable care for all patients rather than worsening disparities in the so-called “digital divide.”

utilized and may increase access to care and resources.⁴ (2) Web-based secondary prevention interventions have shown decreased overall weight, blood pressure, and cardiovascular disease endpoints.⁵ (3) Patients can use continuous wearable sensors for remote screening for elevated disease risk and risk mitigation. However, to effectively engage these proposed uses, key research agendas must be met across stakeholders.

The existing investments in digital health have been made on sound premises, yet the evidence supporting broad health care system benefit remains limited. Research sponsorship for digital health is often caught within a unique quandary. Digital health is not a key goal of typical sponsors of cardiovascular disease research, who often may look to the well-resourced technology industry for support. As the technology industry increasingly engages with health care professionals and investigators, research sponsorship spearheaded by diverse parties may provide the necessary path toward amassing requisite evidence needed across stakeholders. In broad terms, research agendas should consider access and usability for patients; quality of life and outcomes for both providers and patients; system integration and harmonization for provider workflow; costs and health care utilization for insurers; and algorithms, marketability, and claims by companies. Significant ongoing investment in digital health to best approximate conventional ambulatory care during COVID-19 also may be leveraged for durable primary prevention strategies.

Access and usability for patients must remain integral to digital health research efforts by emphasizing social determinants of health and human-centered design. Digital health may decrease barriers to care for those with difficulty in accessing transportation to clinical care or those facing a high cost to attend clinical appointments. At the same time, the “digital divide” evident during the pandemic has shown decreased access to care for some of society’s most vulnerable

INTERCONNECTING PATIENTS, HEALTH TEAMS, AND DIGITAL DEVICE DATA



Synchronized data collection and communication between an interdisciplinary health team for primary prevention across digital health platforms

Figure 1 Interconnecting patients, health teams, and digital device data.

due to the lack of ubiquitous technology, digital literacy, and Internet connectivity. It is paramount to ensure that digital health interventions and translational research make significant financial and training investments to bridge the divide in access, use, and impact of these interventions among those of lower socioeconomic status, the elderly, and those with language and literacy barriers. Design and research agendas should aim for algorithmic features that incorporate a diverse set of users as they scale to promote health equity for subsets of the population historically underrepresented in large studies to mitigate the propagation of current health inequities. Research seeking input for human-centered digital health design can aim to factor in quality of life for diverse patients and providers with varied workflows across health systems. New technologies allow for multidirectional communication among patients, provider teams, and digital devices (Figure 1), necessitating careful data governance to harmonize and protect the real-time exchange of data. Finally, as technology companies partner with academic institutions, marketing claims will be accompanied by higher levels of credibility.

Overall, there is a clear path for digital health interventions to improve primary prevention of cardiovascular disease and its associated mortality. This is the time for investment in research regarding multiple facets of digital health. Although there is widespread interest across sectors and stakeholders, investment in research and implementation may enable translating the promise of digital health for primary prevention into practice.

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