



Review

New technologies, new disparities: The intersection of electronic health and digital health literacy

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ABSTRACT

Mobile health, or mHealth, is the implementation of digital health services with mobile and wearable devices, and has ample potential to enhance self-management of chronic conditions, especially cardiovascular risk factors (e.g., blood pressure control and supporting tobacco cessation and physical activity). It remains ambiguous, however, whether such technologies can improve cardiovascular outcomes. More importantly, mHealth carries the additional challenge of digital health literacy, which demands particular skills complementary to general and health literacy. Populations at risk for limited health literacy are similarly vulnerable to having challenges with digital health literacy. We identify such challenges and outline solutions to improve access to digital health services and their use for individuals with limited digital health literacy. We present an 18-point “Digital Universal Precautions” as a mandate for health care organizations committed towards addressing and facilitating eHealth literacy. As health care institutions increasingly advance mHealth through delivery of on-line material and patient portals, they face the challenge of ensuring that digital health services and content are available to all patients.

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1. Electronic health: transforming patient care

Electronic health (eHealth) services – including electronic medical records, electronic prescribing, and telehealth – have changed providers' engagement with the healthcare system [1]. The same can be said of patients, many of whom have been rapid adopters of technologies to improve their access to care. Health care organizations have created online portals to facilitate patient participation and offer remote visits via telemedicine services [2]. The World Health Organization has praised eHealth as a means to provide secure and cost effective care to underserved populations, in which mobile health is expected to play a significant role [1].

Mobile health (mHealth) is defined as the implementation of digital health services via personal mobile devices, including smart phones, tablets, and wearable devices [2]. In the United States, 77% of the adult population owns a smart phone and 15% a wearable device, such that mHealth services are poised to significantly impact care [3]. An estimated 325,000 health-related applications are currently available on the app marketplaces, and 58% of respondents in a large survey reported having downloaded an mHealth app to better their health [4,5].

Mobile health services have definite therapeutic potential in cardiovascular disease, where lifestyle modification and self-management of

chronic conditions are critical to improving outcomes. Studies demonstrate the significant effects of mHealth interventions to improve cardiovascular risk factors, such as blood pressure control, smoking cessation, and physical activity [6]. However, it remains ambiguous whether the widespread use of technologies actually improves clinical outcomes. Further, the absence of regulation in the app market facilitates the promotion of products without demonstration of their evidence [4,7].

2. Digital health literacy: an updated skill set

Health literacy is defined as the degree to which an individual can access, process, and comprehend basic health information and services and thereby participate in health-related decisions. Health literacy incorporates a variety of skills including general literacy, numeracy, comprehension, critical thinking, and information seeking, that individuals must apply to participate in their healthcare. Limitations in health literacy have been associated with challenges that adversely affect health care metrics and outcomes [8].

Much like health care itself, skills required for health literacy have evolved alongside the growing role of technology. Digital health literacy is defined as the ability to appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health-related problem and as such has emerged as an important component of greater health literacy. While digital health literacy shares

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core aspects of health literacy, digital health literacy is distinguished by additional skills: computer literacy, the ability to use computers and related technology efficiently to accomplish tasks, media literacy to use search engines, and information literacy to evaluate a wide variety of sources [9].

3. Limited digital health literacy: disparities in access and guidance

Limitations in digital health literacy and eHealth are particularly prevalent among demographic groups adversely impacted by disparities in cardiovascular care [10]. Individuals with poor eHealth literacy tend to be significantly older and suffer more chronic health conditions [11]. Similarly, those with lower educational attainment participate in fewer common eHealth behaviors, like tracking diet and physical activity or communicating online with providers [12]. One study of a large cohort of older adults found that use of the patient portal was significantly lower among racial minorities including Blacks and Latinos compared to referents of white race, even when adjusting for educational attainment [13]. These same demographic populations are disproportionately affected by challenges in health literacy [8]. As we see more health care interactions occurring digitally, it is not surprising to see that disparities have persisted.

Further, those individuals impacted by social determinants of health can have difficulty accessing eHealth due to the lack of means to do so. While many groups have become regular users of the internet and smart phones, others, including older adults and those earning minimum wage or less, are less likely to own these devices. For patients able to access digital media, other barriers exist including the need for high-level general literacy to understand content. Studies examining online health information have identified that many are written at ≥ 12 th grade reading level, far beyond the 6th grade reading level recommended for medical educational material [14,15]. Medical terminology and jargon, difficult formatting, dense paragraphs, and specialized language similarly persist as barriers for those with limited health literacy [16].

Presenting information in a digital medium creates additional key challenges. Site design, complexity of navigation, and the requisite effort are obstacles to accessing health-related, web-based services or applications [14,17]. In one survey nearly half of individuals who had downloaded an mHealth app reported discontinuing it, the majority citing a high burden of data entry or confusion with app usage [4]. Accessibility of health-related internet information is critical, particularly for the large segment of the population embracing the smartphone.

While patients may have access to more of their health information than ever before because of services like patient portals and Open Notes, this abundance of information without sufficient guidance and explanation could lead to confusion and stress. As more opportunities for access arise, health care organizations must ensure that information is communicated in a way that facilitates understanding and true shared decision making.

4. Universal precautions and critical opportunities for improvement

Universal precautions are best practices instituted uniformly in a standardized fashion to improve communication and participation for all patients regardless of health literacy [8,16]. Universal precautions recognize the contribution of health literacy to health care disparities and seek to improve access to health care systems for all users. Health care organizations must similarly identify universal precautions of digital health literacy to improve accessibility for everyone who stands to benefit from eHealth services.

We have outlined a proposed Digital Universal Precautions for the eHealth literate health care organization. We summarize our Digital Universal Precautions in Table 1. As a first step, we advocate formation of a multidisciplinary team. Such a team requires physicians, designers and app- and web-based programmers. More importantly, it also

Table 1
Digital Universal Precautions to promote eHealth.

1	Form a team	Develop a multidisciplinary team of providers, designers, programmers, and patients.
2	Identify opportunities	Determine which systems of care can be improved with digital technology.
3	Make health literacy standard	Encourage development of material and tools in line with universal precautions.
4	Offer actionable content	Write material that is clear, concise, and easy for patients to act on.
5	Assess readability	Review materials to ensure they are accessible to those with limited literacy; avoid jargon such as procedural and medical terminology.
6	Promote intuitive design	Create tools and material that are easy to navigate.
7	Enhance communication with varied media	Make materials available in video and audio format for those with limited general literacy.
8	Present information with context	Ensure test results are given along with a health literate interpretation and solicit questions.
9	Provide access to additional information	Use links to related material to give autonomy and facilitate deeper understanding.
10	Use tailoring	Use patient details to tailor messages that are specific to their individual experience.
11	Focus on ease of use	Minimize features that are work intensive or time consuming.
12	Determine access to technology	Identify patients' available and preferred means of communication.
13	Provide means to access services	Make access sites available, such as kiosks, for patients who do not own a personal device.
14	Encourage patient participation	Advertise services or incentivize their use.
15	Offer technical support	Designate employees to support patients using eHealth services.
16	Recommend helpful services	Promote the use of evidence-based applications that may offer benefit, such as fitness trackers or pill box apps.
17	Solicit patient feedback	Encourage patients to evaluate services and suggest improvements.
18	Share the results	Study interventions to determine efficacy to improve patient experience and care.

requires patients. An advantage to online services is the capacity for widespread distribution and timely feedback. Health care systems can leverage patients by having them contribute feedback on content, readability, formatting, and accessibility. Patients can be engaged as partners at the kiosk, tablet or smartphone to contribute towards improving their access to digital communication [14].

Digital media offers the ability for patients to interact with content, and they should be able to do so through programs that are user friendly and convenient. Content must be straight-forward, actionable, and evidence-based. While written word materials have can be difficult for patients with limited literacy, delivery through video and audio can facilitate improved communication. Digital formats provide unique opportunities to enhance communication by including links that provide more detailed material when relevant and encourage autonomy [18]. For example, the patient reading an echo report can link to information that provides information on how to interpret values such as the ejection fraction as a patient-facing explanation. Interactive services further provide the opportunity to personalize content for each patient, a practice called tailoring. Interventions employing tailored information that is culturally and situationally appropriate improve engagement and outcomes [18,19]. When patients do encounter difficulties or questions, effective technical and medical support staff should be made available.

An essential step for health care organizations is to identify the individuals who may not benefit from the increasing focus on eHealth services, such as those lacking internet access or having limited eHealth literacy. Digital health care services have potential to make information widely accessible to patients, but it is a distinct irony of digital health literacy that such services may reinforce obstacles and propagate disparities while employing the same technologies aimed at improving access to health-related information. For patients who want to engage

with eHealth, but are limited in doing so by situation, organizations should provide access to devices. Finally, eHealth strategies require continued evaluation and study to determine which interventions are effective at improving the healthcare experience for all individuals.

5. Conclusion

Digital health services are changing how individuals manage their health and participate in their care. While such technology offers great promise in improving patient care, disparities in access and digital health literacy exist that continue to impact vulnerable populations. At present the same barriers faced by individuals with limited health literacy persist in the digital realm. The potential for disparities to persist and grow in the eHealth era is vast, particularly as more information is provided online. Health care organizations must adopt a universal precautions-based approach in designing eHealth services to provide accessibility to all patients.

Declaration of Competing Interest

The authors report no relationships that could be construed as a conflict of interest.

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