Commentary

Can mHealth Interventions Reduce Health Disparities among Vulnerable Populations?

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Disparities in healthcare and health outcomes are pervasive and pernicious. Such disparities exist between persons living in high-income countries in comparison to those in low to middle-income countries (LMICs), between whites and racial/ethnic minorities, between those with substantial differences in literacy/numeracy, between high-income and low-income persons, and between other advantaged groups compared to disadvantaged or vulnerable groups. This is particularly true for chronic diseases such as type 2 diabetes, a leading cause of morbidity and mortality in the United States and globally and a disease with significant economic and societal costs as well. For example, within the U.S., racial/ethnic minorities have 2-4 times the rate of diabetes-related microvascular complications (e.g. limb amputations, end-stage renal disease and blindness) in comparison to whites [1].

Unfortunately, significant advances in medical technology, clinical treatment options and healthcare delivery methods are often slower to spread, with lower rates of utilization, within vulnerable populations, thus further exacerbating health disparities in the care and outcomes among such groups. mHealth interventions have the potential to do the same. The "e-movement" has largely consisted of white, relatively affluent voices with lower representation by racial/ethnic minorities, low-income persons and/or other vulnerable populations. Relatively few studies of mHealth interventions have included vulnerable populations or specifically tailored programmatic aspects to fit the cultural, linguistic, literacy/numeracy or other needs of marginalized groups. Thus, mHealth technologies may ultimately prove to be another mechanism for widening health disparities in the US and globally.

However, studies that do exist of mHealth interventions within vulnerable populations show promise at engaging patients in self-management, health promotion behaviors and chronic disease management [2,3]. Further, because of high rates of utilization across socioeconomic groups, including low income, low literacy groups and racial/ethnic minorities, mobile technology represent a natural bridge across the digital divide to serve these traditionally "difficult-to-reach" populations. In fact, there has been a "reverse digital divide" between racial/ethnic minorities and whites in the utilization of mobile phones for a range of services, and the digital divide in smart phone use continues to narrow. Thus, mHealth represents a unique historical opportunity to potentially *reduce* health disparities by disproportionately *improving* the health and well-being of vulnerable populations. There are many reasons to believe that this is so. For example, because many of the mHealth self-monitoring applications (e.g. physical activity, blood pressure,

blood glucose, caloric intake) can assist in the management of chronic diseases (e.g. diabetes, hypertension, heart disease), which are disproportionately experienced among vulnerable populations, mHealth programs' *content* often has more direct relevance to low-income racial/ethnic minorities than other populations.

A recent review of mHealth and internet interventions among disadvantaged/vulnerable persons with diabetes found high rates of satisfaction with the full range of intervention platforms [4]. This may reflect a strong desire by such groups, who disproportionately report negative healthcare experiences, to feel supported and 'cared for' by their health system and healthcare team. There is evidence that automated mHealth programs can provide a sense of social support among vulnerable populations [5] and social support has been linked to health-promoting behaviors and improved health outcomes across of a range of medical conditions and patient sociodemographic characteristics.

At the health systems level, mHealth programs also have the potential to *improve care* for vulnerable populations by addressing some of the patient-level barriers to medical care within resource constraints of health systems. For example, interventions utilizing Short Message Service (SMS), or text messages, allow providers/health systems and patients to communicate outside of the standard office visit, which may be particularly relevant for socially complex, vulnerable patients who need multiple touch points between clinic visits. mHealth also has the potential to improve quality of care by automating patient and provider reminders for tests, immunizations, clinic appointments, and other healthcare delivery aspects. mHealth interventions can potentially increase *access to care*, particularly in low-resource settings, by shifting tasks to lower level providers or to an automated electronic system. Implementing an automated text-message system in conjunction with a case management program, for example, may allow the program to increase patient/case manager ratios and thereby reach more patients at little marginal cost.

The potential for mHealth technology to improve the health of vulnerable populations can be magnified if mHealth interventions are also designed to specifically connect persons to health-promoting information and resources within the communities where people live, work and play. Because racial/ethnic minorities and other vulnerable populations disproportionately live in under-resourced communities, technologies that help such populations identify, navigate and access health-promoting goods and services (e.g. low-cost options for physical activity, healthcare organizations that accept uninsured and underinsured

patients) may play a powerful role in mitigating health disparities [6,7]. For example, a community health worker (CHW) intervention in New York City is currently using mobile decision-support applications to help patients manage their disease [8]. The intervention targets patients with diabetes and hypertension, and CHWs can connect their patients to a vast network of community partners (e.g. fitness centers, yoga classes, cooking demonstrations, faith-based organizations, health education classes) in "real time" through mobile support.

Thus, there are many reasons to have hoped that mHealth interventions can help reduce health disparities among vulnerable populations with chronic diseases, both in the U.S. and internationally. Within the U.S., as physician and healthcare system payment models transition from traditional fee-for-service to value-based models, healthcare organizations will have increasing financial incentives to invest in mHealth programs—particularly in socially disadvantaged, high-risk communities. Accountable care organizations (ACOs) and bundled-payment models (e.g. capitation) will inevitably reward healthcare systems for the population-based outcomes of their constituents, including vulnerable populations that have disproportionately poor health outcomes.

There are growing incentives and interest in making mHealth interventions part of the solution to reduce health disparities. Now is the time for innovative strategies and bold action that leverage mHealth to effectively connect vulnerable patients to health information, health promotion, self-care and healthcare services in ways that are scalable and sustainable. Collectively, we have the technology, financial resources, and human capital to make significant improvements in the health of the world's residents, particularly the most vulnerable among us. We just have to act to make it happen.

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