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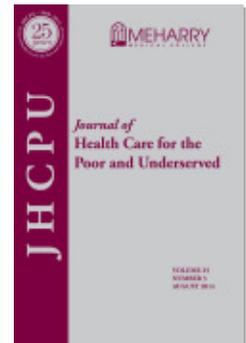
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## Assessing mHealth: Opportunities and Barriers to Patient Engagement

Thomas Martin

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## Assessing mHealth: Opportunities and Barriers to Patient Engagement

Thomas Martin, MBA

*Key words:* mHealth, mobile, health disparities, Text4Health, health care, meaningful use, HIT.

*m*Health—the practice of medicine and public health through the use of mobile devices—presents an opportunity to revolutionize the health care system both in the U.S. and globally. Cell phones, tablet computers, and other wireless devices all play a role in shaping mHealth. mHealth is often presented as a low-cost option for increasing communication between patients and providers, including the sharing of data—also referred to as patient health information (PHI)—and the integration of monitoring devices to achieve broad population health benefits and the potential to decrease or mitigate rising health care costs.<sup>1</sup> There is currently limited evidence about how well and under what circumstances mobile phones (and other mobile/wireless devices) compare with or enhance current means to improve health and health care.<sup>2</sup> Despite a lack of robust empirical evidence, a number of programs throughout the world and the United States have embraced the mobile device as a platform to engage and educate patients, especially in populations where medical afflictions occur in disparate proportion to the rest of society. These programs, which use short message service (SMS or texting) to share information, are only now being assessed for efficacy in reaching certain disparate populations and for how they can be integrated into the contemporary health care system. A number of policies are already in place to engage and reduce disparities and some of these provide important opportunities to leverage the power of mHealth to achieve their objectives. However, as technologies continue to rapidly evolve, policymakers, clinicians, and academics are lagging further behind the technology curve in assessing the potential of these new technologies to reduce disparities through increased empowerment *via* education or engagement and improved health outcomes.

International mHealth development has focused primarily on engaging rural populations through cellular phones. Mobile devices provide the ability to share information quickly and without the need for additional robust infrastructure. In addition, mobile technologies promise to allow for more care in rural communities through communication with remote providers and through education of the layperson on basic care

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*THOMAS MARTIN* is a doctoral student at the University of Delaware: School of Public Policy and also serves as the manager of mHIMSS, the mobile initiative for HIMSS (Health Information and Management Systems Society). He can be reached at 4300 Wilson Blvd., Suite 250; Arlington, VA 22203; trm@udel.edu.

techniques. The majority of these initiatives aim to improve population health based on simple texts or SMS.

The advent of smartphones has provided an avenue into a wide assortment of households. Among the most used technologies used is the SMS text, developed in 1984 and utilized by physicians for decades for communication regarding patient matters. Despite a long history of use by physicians, SMS texts are only now being assessed as an effective tool for direct patient engagement. There are also a number of application- (or *app*-) based software interventions aimed at using advanced mobile devices to engage, educate, or inform patients or caregivers. While there is an increased cost associated with using smartphones as a platform, these devices are gaining market share among disparate populations or communities of color.<sup>3</sup> There are a number of opportunities to analyze existing policies to promote population health and decrease care disparities and find ways to improve them through inclusion of mobile technology. There is an urgent need to assess quickly and appropriately mHealth technologies to ensure that new technologies are incorporated in a cost-effective, evidence-based manner with patients across all populations.

**Access.** The prevalence of mobile devices is a key factor to their attractiveness as platforms to educate and engage low-income or rural families. As of 2009, 90% of the world's population had access to a cell phone signal and there were over 4 billion cell phone subscriptions worldwide, with adoption growing rapidly in developing countries.<sup>4</sup> Access to technology has remained an important component of international development theory<sup>5</sup> and improved health care outcomes.<sup>6</sup> Therefore, the effective and efficient use of health IT (HIT)—a term that encompasses both mHealth and non-mHealth-related technologies—remains a vital tool in achieving the goals of health care reform to increase health care access, to improve care delivery, to engage in culturally competent outreach and education, and to enhance workforce development and training.<sup>7</sup> As with almost every technology, concerns also exist about the availability of mHealth to all segments of the population, including those with limited resources,<sup>8</sup> but the mobile platform is emerging as a key component of any population health education or engagement strategy because more members of the general populations are likely to have access to mobile technologies than other technologies in the health care space.

A number of scholars have pointed to the formation of a digital divide related to accessing health and health information among individuals in low income settings. Researchers have found that health care providers' access to technology is increasingly unencumbered by the provider's race or ethnicity.<sup>9,10</sup> Recent studies have also evaluated the use of technology among various racial and ethnic groups and have found that mobile technologies are often utilized at a much higher rate within communities of color.<sup>11</sup>

A 2010 study by the Pew Hispanic Center found reduced access to common information technologies, such as the Internet and broad-band access, among Blacks and Hispanics compared with Whites. However, access to mobile phones remains high across all ethnicities in the United States: 76% for Hispanics, 85% for Whites, and 79% for Blacks.<sup>11</sup> It is the widespread distribution of mobile devices across diverse populations within the U.S. that makes them an attractive platform for patient engagement and educational tools surrounding health and health care. In addition, cellular telephone numbers tend to be more stable over a six-month period than home address or non-

cellular telephone numbers,<sup>12</sup> providing the potential to improve care coordination across transient or impecunious populations. Mobile technologies are great equalizers for access to advanced technology in that they place a wealth of information within the palm of any individual's hand (whether that individual is a provider or a patient).

Increasingly, patients and providers are looking towards mobile technologies to address the many barriers to health care facing diverse populations within the United States. A small study in 2009 evaluating SMS-based reminders found that text message immunization reminders would be well-accepted in a diverse population of urban parents.<sup>13</sup> A more recent study released in 2012 used a randomized clinical trial to assess the efficacy of texting reminders for vaccination follow-up among low-income populations and found an increase in vaccination rates for patients within the SMS intervention group.<sup>14</sup> While the general trend in current literature is to assess the use of SMS, likely in part because texting capabilities remain more prevalent than advanced interventions via "apps." in low-income socioeconomic groups, there is a need to begin to assess the use of smartphone apps to address issues of literacy or limited medical knowledge. Currently the National Institute of Health is moving towards a more robust mHealth Public-Private Partnership to address the rate of mHealth research, adoption, and implementation.\*

In the United States, patient-centered health care has been identified as a core component of quality care by the National Institute of Medicine.<sup>15</sup> To implement patient-centered care, the National Institute of Medicine and the Patient-Centered Primary Care Collaborative has employed the concept of the *patient-centered medical home*, one pillar of which includes coordinated and integrated care across a complex health care system.\*\* mHealth can play a role in the development of patient-centered medical homes by providing an important avenue for patient engagement and information collection or exchange. The opportunities for patient-centered care coordination and cost containment extend to both patients and providers regardless of race or ethnicity. While there is racial/ethnic variation in the use of the Internet and e-mail, it does not disfavor Black and Hispanic Americans: use of the Internet was reported by 41% of Black study participants, 31% of Hispanic study participants, and 29% of White study participants; a practice of using e-mail was reported by 33% of Black study participants, 27% of Hispanic study participants, and 26% of White participants.<sup>11</sup> However, there remains a limited evidence base regarding how well and under what circumstances mobile phones (and other mobile/wireless devices) compare with or enhance current means of communication to improve health and health care<sup>2</sup> including the efficacy of specifically designed mobile apps which may assist in overcoming literacy barriers or difficulty with understanding complex medical terminology.

**Opportunities for patient engagement.** Within the health care sector, recent policy initiatives have sought to "build up" the information technology (IT) architecture in clinical and hospital environments, mostly through stimulus funds associated with the Health Information Technology for Economic and Clinical Health (HITECH) Act of

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\* [http://www.fnih.org/press/fnih-in-the-news/PPP\\_mHealth](http://www.fnih.org/press/fnih-in-the-news/PPP_mHealth)

\*\* <http://www.pccpc.net/>

the American Recovery and Reinvestment Act (ARRA). HITECH has not only provided the platform that could serve as the policy model for mHealth technologies, but also has created the incentive structure that seeks to increase the utilization of technology in health care, which may serve as a direct driver of mHealth deployment.

A number of the core objectives of *meaningful use*—a regulatory program called for in HITECH—involve secure communications with patients and other objectives aimed to improve population health through education and patient engagement, especially in disparately impacted populations.<sup>16</sup> While no objective in meaningful use clearly isolates and promotes mobile technology as the leading avenue for patient engagement, mobile technology is an important tool to meet the goals of meaningful use. These opportunities for patient engagement include the use of texting and smartphone apps. Again, the ubiquity of mobile phone use across target populations, including the broad use of such technologies across communities of color or disabled populations, make patient engagement *via* mobile devices attractive.

The later stages of implementing meaningful use call upon providers to further increase patient engagement. The regulations currently under development particularly emphasize the need increase patient engagement as a means to reduce disparities in health outcomes by increasing access to primary medical care; accomplishing this necessitates considering the technical strengths and weaknesses of mobile devices.

Often mobile programs provide local solutions to local problems. To provide prominent examples to the nation of how HIT might promote higher-quality and more-efficient care, within HITECH Congress authorized the Beacon Community Cooperative Agreement Program, which seeks to provide local HIT solutions to impact local population health needs.<sup>17</sup> The use of mobile-device engagement programs to educate and reach out to disparate communities is on the rise. A number of Beacon Community programs have leveraged mobile technologies to address urgent health issues within ethnically diverse populations *via* Text4Health projects. While the specific goals of each Beacon Community vary, the overall improvement theme is to electronically collect, share, and use the right data in a timely way across the community of providers, patients, and public health entities.<sup>18</sup> A number of Text4Health programs have targeted diseases that disproportionately affect communities of color including diabetes and smoking cessation support.

**Opportunities to expand the reach of mHealth.** There are a number of services enabled through the Universal Service Fund\* to aid individuals with the purchase of a mobile phone.\*\* The Universal Service Fund provides financial support for the dissemination of technology into rural and underserved communities. In addition the fund enables the provision of low cost cellular phone services to individuals in need. However, a number of plans do not provide texting capabilities as components of base

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\* The Universal Service Fund is administered by the Federal Communications Commission and created in 1997 to meet Congressional universal service goals as mandated by the Telecommunications Act of 1996. The goal of the program is to provide telecommunications services across the United States in a non-discriminatory fashion. Other programs associated with the Universal Service Fund include the *Connect America Fund* aimed at providing broadband build out into rural areas.

\*\* [http://transition.fcc.gov/wcb/tapd/universal\\_service/](http://transition.fcc.gov/wcb/tapd/universal_service/)

rates for various plans or carriers exclude the association with these plans altogether.\* Given the growing trend of consumer text use—the Cellular Telephone Industries Association (CTIA) reports that monthly text messaging has grown from 18.7 billion in 2006 to 193.1 billion texts in 2011<sup>20</sup>—consideration should be given to the inclusion of SMS in a tiered approach within federally funded programs, especially given recent findings in clinical studies showing the efficacy of mHealth interventions as efficacious in care delivery. A number of programs have leveraged in kind support from wireless carriers, including Text4Baby. However, consideration should be given to extending the scope of programs where individuals use cellular programs supported by the Universal Service fund to include support for enabling health-based texting.

**Limitations of and future challenges for mHealth.** While mHealth technologies have the potential to improve population health outcomes and delivery of care, there is a need to use and develop mHealth applications with caution. The use of text messaging still requires a certain level of literacy. In addition, researching the use of “apps” to provide education and patient engagement in elderly populations may be hindered by the prevalence or access of certain technologies, such as smartphones within this population. While the mobile platform remains flexible to engage patients *via* written, spoken (text-to-speech technologies such as the iPhone’s Siri), or even video interactions, there is a need to consider how the elderly or individuals without advanced technical skills will interact with the device or participate in the intervention.

In the future patients can enjoy increased access to information facilitated through and across varied mobile platforms. However, given the current lack of evidence to support mHealth integration, and at times conflicting economic interests surrounding financial benefits or entrenched approaches to care delivery, there is the possibility that the full value of mHealth may not be realized in vulnerable populations. Comparative effectiveness research trials must be designed for the dynamic, unique needs of community medical practice.<sup>19</sup> mHealth presents an opportunity to truly tailor both research and interventions to community needs. In addition, a number of key policies in the United States have sought to reduce disparities in health outcomes by increasing patient access to health information, and some of these programs may increase access to particular mHealth technologies, such as the upcoming requirements for Stage 2 Meaningful Use or potential changes to the Universal Service Fund.

A key component of any sound outreach or engagement program is the ability quickly and inexpensively to deliver high-quality educational material *via* mobile devices or wireless technology. However, accessing diverse patient populations for educational or engagement remains a challenge. Barriers include literacy, access to hard-wired technologies (e.g., desktop computers), and understanding of an increasingly complex network of medical care. The mobile platform provides a number of solutions to many of the current questions surrounding how information technology will play a role in care improvement and engagement for disparate populations.

Future research into the field of mHealth will require a trans-disciplinary effort to bring research efforts up to speed quickly. In addition, the tools and methodologies for

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\* <http://www.assurancewireless.com/Public/MorePrograms.aspx>; <http://www.verizonwireless.com/b2c/landingpages/lifeline.jsp>

assessment must be adapted to fit the constrained timeline due to the rapid advancement of technology. There are opportunities for the inclusion of mHealth to augment existing policies, especially as it relates to improving health in disparate communities. The future for mHealth remains bright and may include fundamental, sorely-needed changes the existing health care paradigm to better the position of people who are medically underserved now.

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