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ANI Emerging Leaders Project: Point of Care Technology for HIV Prevention and Management

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Point-of-care (POC) technologies offer the promise of improving outcomes and reducing costs through increased access to and use of diagnostic and monitoring solutions. Point-of-care technologies have the potential to improve the management of various diseases and conditions, especially in resource-limited settings where access to quality and timely medical care is a challenge. The ubiquitous nature of mobile technologies, specifically smartphones, in daily life has created opportunities for POC technologies that were not previously possible. Mobile Health (mHealth) approaches use mobile devices, such as a smartphone or tablet computer, for the deployment of health interventions. mHealth approaches vary widely in the types of technology utilized, including SMS text reminders, app-based activities, and web-based educational modules. Mobile devices have the advantage of simple user interface, accessibility anywhere Internet or cellular service is available, relative affordability, and have been promoted specifically as a solution to reach stigmatized and disenfranchised populations.[1,2]

mHealth technology has potential as a valuable tool in the management and prevention of chronic illnesses, such as HIV. Using mobile technologies to more rapidly and accurately assess and modify health-related behavior and biological states can transform healthcare. The use of mobile technology affords numerous advantages, providing real-time feedback and access to important medical, prevention, and other health information, ability to capture time sensitive data, and personalizing and tailoring health information in real-time. The ubiquitous nature of mobile technologies, namely smartphones, in daily life has created opportunities for applications that were not previously possible. As an ANI Emerging Leader, my work focused on the design, development and evaluation of three POC technologies for HIV prevention and management.

HIV Home Testing

In July 2012, the Food and Drug Administration (FDA) approved the over-the-counter sale of a rapid HIV test for home use, OraQuick (OraSure Technologies, Bethlehem, PA, USA), for persons 17 years of age and older. The Oraquick HIV home test is one example of a POC diagnostic device. This technology allows patients to self-test in the privacy of their homes, which is especially relevant for stigmatized diseases such as HIV and other sexually transmitted diseases. The HIV home test has the potential to help curb the HIV epidemic by improving detection of persons living with HIV and enabling them to seek follow-up care.[3] After review and approval of the study by the Columbia University Medical Center IRB, we conducted in-depth interviews, observations, and a think-aloud protocol to better understand

young adults' use of the HIV home test. Our study incorporated a performance record to carefully identify competency in self-administration of a POC test.[4]

Findings from our study indicated that young adults perceived the test to be useful, especially in light of their concerns about lack of privacy in medical settings.[5] Significantly, only one (of 21) participants followed all of the instructions for using the test. The policy implications of this finding are quite notable especially in moving ahead with POC device development and use. The FDA requirements for labelling and packaging are critical for the safe use of devices. At the same time, end-users' abilities to use these package inserts, especially in stressful situations such as when taking a test for a serious illness, must be better considered. The FDA requirements are important for the protection of end-users and the manufacturer, but further study of the burden and barriers associated with lengthy packaging instructions is required and should be better considered in future decisions on the packaging requirements set forth by the FDA.

Design Considerations

Despite the growing interest in mHealth technologies, many mHealth innovations have not been properly evaluated and there remains limited evidence on their acceptability to intended users and impact on health care outcomes.[6,7] Thus, the purpose of this work was to design two mobile phone apps for HIV prevention in high-risk men who have sex with men and for self- management of persons living with HIV (PLWH).[8] Our work was guided by the Information System Research (ISR) Framework.[9] At each phase of the work, we used qualitative ethnographic methods and user-centered human-computer interaction research methods to ensure that the application met the end-user's goals.[10] In our work, we identified the mobile app design preferences, as well as the barriers and facilitators that prohibit or encourage the uptake and sustained use of mobile apps for HIV prevention and self-management.[11–13] Findings from our work informed the technology preferences and features, HIV related content requirements, design specifications, and issues related to long term appeal and maintenance of apps in at-risk and affected populations.

Symptom Self-Management Tools for Persons Living with HIV

Persons living with HIV are often plagued with distressing chronic symptoms caused by HIV itself, induced by antiretroviral therapies, and more recently with HIV associated non-AIDS conditions. The International Nursing Network for HIV/AIDS Research identified and tested self-care strategies to improve symptom reporting for PLWH.[14,15] Building on this work, informatics strategies to implement and disseminate the HIV symptom management manual to help improve outcomes for PLWH were used. To achieve this, we developed and tested a Web-based system to deliver self-care strategies for symptom management in PLWH. In a feasibility trial, this was shown to improve symptom intensity and frequency.[16] More recently, the Agency for Healthcare Research and Quality (R21HS023963 PI: Schnall) has provided funding to disseminate these symptom self-care strategies through mobile health technology.[17]

The National Institute of Nursing Research (R01NR015737 PI: Schnall) provided funding to identify symptoms in persons living with HIV with non-AIDS conditions. This is particularly salient given that PLWH are living longer and suffering from many of the same diseases as their non-HIV affected age-matched peers, such as diabetes, chronic obstructive pulmonary disease, osteoporosis, and asthma.[18] Using the findings from the large Web-based survey will allow refinement of our current informatics tool to broadly disseminate these self-care strategies so that persons living with HIV with non-AIDS conditions can better manage their own health. This project is innovative in that we are helping people identify self-care strategies so that they can later manage the symptoms associated with their disease, medications, and co-morbid conditions in their everyday settings using POC devices, namely mobile technology.

Conclusion

Each of these efforts using point-of care technology provides an innovative approach to allowing persons to better self-manage their own health. The over-arching goal of this work is to allow people to be able to better take care of themselves so they can feel better and live longer and healthier lives and use fewer resources from our healthcare system.

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Biography

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- Point-of-care technologies are on the rise, due to the increased number of mobile devices in use today.
- Mobile Health (mHealth) technologies need proper evaluation to determine their acceptance by users and impact on health outcomes.
- mHealth technologies support self-care and symptom management in persons living with chronic illness, specifically HIV.