

Cell Phone–Based System Could Improve HIV/AIDS Drug Tracking

Antiretroviral therapy can be a life-saving treatment for people infected with HIV or suffering from AIDS. But such treatment is scarce in Africa, where the disease kills millions each year. Researchers at New York University are working on a cell phone–based drug-tracking system aimed at improving the availability and use of HIV/AIDS drugs.

Of the estimated 33 million people worldwide infected with HIV or suffering from AIDS, more than two-thirds live in sub-Saharan Africa—which holds only about 12 percent of the world’s population.¹ In 2007 alone, an estimated 1.9 million people in Africa became infected.

Highly active antiretroviral therapy (HAART), which combines two to five antiretroviral medications, is widely seen as the most effective treatment option for people with HIV/AIDS. While commonplace in developed countries, these life-saving drugs are available to only a small percentage of Africans affected by the disease.

Researchers at New York University (NYU) have identified key barriers to HAART programs in various regions of Africa. Due to poor drug-tracking systems, supply chains for HIV/AIDS medications are often plagued with theft and counterfeiting problems. And when the drugs do make it through, patients often don’t adhere to the proper dosage regimen.

The NYU researchers aim to combat both of these problems with a project they call SmartTrack—a low-cost, cell phone–based system that will make it easier to gather



A health worker in Ghana extracts blood to measure the T-cell count of a patient. SmartTrack enables medical professionals and even patients to remotely access and update a patient’s T-cell history on a mobile phone using a single SMS message.

Fast Facts

Project Principals:

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Profile:

Researchers at New York University are teaming up with several partners to develop SmartTrack, a cell phone–based system designed to easily track the flow and consumption of antiretroviral drugs used for treating people infected with HIV or suffering from AIDS.

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important patient data and to track the flow and consumption of drugs in HAART programs.

The project, which is being supported with cash, hardware and software from Microsoft Research, is a collaborative effort that involves NYU's Computer Science Department and School of Medicine and the West Africa AIDS Foundation in Ghana. The researchers plan to build on the results of a similar effort, called eMedonline—a smart phone-based system that has been used successfully by cancer programs in the United States to track patient medication use and treatment outcomes.

If the SmartTrack project is successful, it could be deployed in other parts of the world hard hit by HIV. The system could also be used to combat other treatable diseases such as malaria and tuberculosis, says Lakshminarayanan Subramanian, Ph.D., an assistant professor of computer science at NYU and one of the lead researchers on the SmartTrack project.

"The exciting thing about this is that you will really be able to monitor your patient on a daily basis without having any direct contact with them."

—Dr. Brian Levine,
New York University School of Medicine

"Cell phone prevalence is huge, even in rural Ghana," Subramanian says. "That means cell phones could be a very powerful tool for improving the distribution of drugs."

Last summer, three medical students from NYU—John Trahanas, Phil Smith and Giulio Quarta—conducted a two-month needs-assessment study for SmartTrack. Working in conjunction with the West Africa AIDS Foundation and the Korle-Bu Hospital in Ghana—the largest hospital in West Africa—the students conducted in-depth interviews with 516 AIDS patients throughout rural Ghana.

In addition to learning more about existing HIV/AIDS treatment in those areas, they wanted to find out how much access the patients have to cell phones and how adept they are at using them. More than half of the patients interviewed had access to a cell phone, but their ability to use anything beyond basic functions was limited.

Forty-four percent of the patients interviewed by the NYU students were illiterate, and many were innumerate. They spoke a total of 11 different languages. The students found that the patients did much better at understanding pictograms—symbols that can be used to pose basic questions about symptoms or specific medications.

As a result, the researchers are now working on a prototype SmartTrack that uses a text-free interface and a basic cell phone rather than a more advanced smart phone. To track the drugs, they plan to use "smart tag" technology—such as bar codes or radio-frequency identification (RFID).

Smart tags will be attached to packaging—from bulk containers to individual pill bottles. As the drugs move through the supply chain, healthcare workers, physicians and patients will be able to use SmartTrack phones to scan the tags and confirm each shipment's progress.

SmartTrack phones will also be equipped with a data-gathering application that will enable physicians and healthcare workers to keep tabs on an individual patient's adherence to HAART regimens and to monitor how the patient is responding to treatment.

The researchers have developed a software application that uses more than 60 pictograms. Using these various symbols, SmartTrack phones will remind patients when to take particular medicines and then ask them to confirm that they took them. Patients will also use the phone to answer questions about symptoms or drug side effects. All of that information will be stored in the phone and then sent periodically via text message to the patient's physician or healthcare worker.

"The exciting thing about this is that you will really be able to monitor your patient on a daily basis without having any direct contact with them," says Brian Levine, a physician at NYU who came up with the idea behind SmartTrack.

One of the biggest challenges is making SmartTrack economically feasible. Cell phone rates are prohibitively expensive in places like Ghana, Subramanian says. The researchers are working on an application that will compress numerous patient inputs into a single text file that can be sent to the healthcare provider every week or so. Subramanian says the researchers still need to resolve some key issues, such as how to make sure the device keeps patient data private.

Once SmartTrack has been field tested, the researchers plan to pilot the project through the West Africa AIDS Foundation, a nonprofit organization that provides free antiretroviral therapy to 6,000 HIV/AIDS patients. SmartTrack has also caught the attention of the South Africa-based Reproductive Health and HIV Research Unit (RHRU), one of the world's largest dispensers of HIV/AIDS drugs.

If the project is successful, the researchers believe it could easily be replicated to help combat AIDS and other diseases worldwide. Says Levine, "I am obsessed with the idea that technology is the future of healthcare in the developing world."

¹ 2008 Report on the global AIDS epidemic," Joint United Nations Programme on HIV/AIDS (UNAIDS).

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