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Scanning electron micrograph of Mycobacterium tuberculosis bacillus. Image courtesy of Sanofi Pasteur.

Treating tuberculosis: A call to action

Left untreated, [tuberculosis](#) eventually kills more than 50 percent of the people with the disease. The annual death toll worldwide exceeds 1.4 million. TB is the leading killer among persons with [HIV](#).

Of course, many more of the millions with TB disease – there are an estimated 8.8 million new cases annually – do not die, largely due to [antibiotics](#).

That’s the good news. The less-good news is that effective antibiotic treatment of TB demands rigor and consistency over time. Patients mustn’t skip doses or end treatment prematurely. Treatment periods range from six months to as much as two years.

“If patients don’t take the antibiotics consistently and completely, poor patient outcomes occur,” said [Richard Garfein, PhD, MPH](#), a professor in the [Division of Global Public Health](#) at the [UC San Diego School of Medicine](#). “The bacterium can rebound and the disease will come back. The patient remains infectious to

others. And drug resistance can develop, making it even harder to treat TB cases.”

To avoid all of that, doctors and public health experts have traditionally practiced a form of treatment monitoring called “[directly observed therapy](#)” or DOT, in which they visually document that TB patients are indeed taking their prescribed, daily antibiotic pills.

DOT, however, is not without its own challenges. It’s expensive and labor-intensive. It requires careful coordination of lives and schedules based on daily home visits by healthcare workers or patient visits to clinic offices. There are privacy issues and, said Garfein, a feeling by some patients that they are being patronized, that they can’t be depended upon to take their medicine without oversight.

A novel treatment monitoring system utilizing cell phone technology may change all of that.

Yesterday, in a presentation at UC San Diego, Garfein debuted “Video Directly Observed Therapy” or VDOT, an [mHealth](#) application developed in collaboration with [Kevin Patrick, MD](#), professor of Family and Preventive Medicine, and other researchers at UC San Diego-based [Qualcomm Institute](#), part of the [California Institute for Telecommunications and Information Technology](#) (Calit2).

The VDOT study is supported with combined funding and in-kind technology services – including [HIPAA-compliant](#) cloud services and 4G smartphones and service - from the [Verizon Foundation](#), totaling nearly \$2.5 million.

In collaboration with public health officials in three cities, the UC San Diego researchers will provide at least 50 TB patients in each city with smartphones that allow them to visually record their medicine-taking, then transmit the encrypted video to a secure server hosted by the [Terremark cloud](#) where a designated health professional can monitor and adjust treatment as needed.

“The whole process takes about one minute a day,” said Garfein.

San Diego County has already begun recruiting patients for the VDOT trial, and San Francisco and New York City are slated to start next.

In the United States, TB is in decline. Last year, for the first time since the federal government began tracking the disease in the 1950s, the number of annual TB cases dropped below 10,000 – 9,951 to be exact.

But the progress is not uniform. In parts of the United States, TB continues to be a serious public health concern requiring vast resources to just to keep it under control, let alone eradicate it. One of those places is California, home to 20 percent of all TB cases in the nation. (Texas, Florida and New York also have worrisome TB rates and, with California, account for roughly half of the nation’s total number of cases.)

The problem is greater at a local level. The rate of TB infection in the U.S. is 3.2 persons per 100,000 population. In California, the rate is 5.9 per 100,000. In San Diego, it's 8.1 per 100,000. And in Baja California, Mexico, which shares the border with California, said Garfein, the rate is five or more times higher than in San Diego.

Thus, public health officials in Baja California, who were involved in developing and pilot testing the original VDOT system, say they are working on how to make VDOT the standard of care in Mexico.

The study, which will last about one year, follows a similar pilot project last year involving 52 TB patients in San Diego and Tijuana. More than 93 percent of the prescribed doses were observed and documented in the pilot; 100 percent of the pilot patients said they would recommend VDOT to other TB patients.

The VDOT program will also be tested this year as a treatment monitoring system for hard-to-reach TB patients in London. The greater ambition, of course, is to eventually expand VDOT to parts of the world where tuberculosis still runs rampant – and kills.

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