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9-5-2019

Digital Health Support In Treatment For Tuberculosis

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Recommended Citation

E. Yoeli, J. Rathauser, Syon Bhanot, M. K. Kimenye, E. Masini, P. Owiti, and D. Rand. (2019). "Digital Health Support In Treatment For Tuberculosis". *New England Journal Of Medicine.* Volume 381, Issue 10. 986-987. DOI: 10.1056/NEJMc1806550
https://works.swarthmore.edu/fac-economics/467

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CORRESPONDENCE

Digital Health Support in Treatment for Tuberculosis

TO THE EDITOR: Improving support for patients with tuberculosis is a major priority for governments and development agencies.[1] Digital health interventions have the potential to address shortfalls in the current standard of care.[2] Although access to the Internet, smartphones, and other forms of technology is still limited in areas with a high tuberculosis burden, mobile "feature" phones (i.e., phones that lack the advanced functionality of smartphones but can be used to make calls, send text messages, and access some simple Internet features through a text-based interface) are ubiquitous.[3] We therefore developed a digital health platform that was compatible with feature phones to provide support for patients with tuberculosis.

Each day, patients received a text message asking them to verify adherence to treatment. Such interactive messaging approaches have shown more promise for promoting adherence than one-way reminders.[4] If the patient did not verify adherence, two additional messages were sent to the patient at 1-hour intervals, followed by messages and then phone calls from study team members who had personal experience of successful completion of treatment for tuberculosis; if there was still no response, a notification was sent to the clinic. This approach ensured that nonadherence was addressed in a timely fashion and presented patients with a resource for overcoming barriers such as challenges in accessing care, stigma in the community, and lack of information, motivation, or support. It also made patients feel accountable to others for their adherence or nonadherence; social science research suggests that such accountability motivates cooperative behavior.[5]

The digital health platform also provided information about tuberculosis. Weekly motivational messages such as "Taking your pills will help you get better and keep you from infecting family and friends" were sent by text message, and patients participated in an "adherence contest" in which they could compare their reported adherence with that of others and could qualify for a "winner's circle" if their adherence was 90% or higher. These features further enhanced accountability, helped to establish a norm of adherence, and emphasized the benefits of adherence in the community — all of which motivated patients to cooperate.[5] All platform content was developed in conjunction with local study team members to ensure that it would be comprehended by and appropriate for the study population.

To determine whether this platform would result in a better frequency of treatment success when it was combined with the standard of care, we collaborated with 17 clinics in Nairobi to perform an individual-level, parallel, randomized, controlled trial (Tables S1 through S3 in the Supplementary Appendix, available with the full text of this letter at NEJM.org). The primary trial outcome was an unsuccessful treatment outcome, which was defined as a composite of death during treatment for tuberculosis, treatment failure (i.e., the patient's sputum smear or culture was positive at month 5 or later), or loss

to follow-up (i.e., the patient interrupted treatment for ≥2 consecutive months).

The trial was approved by the institutional review board of Kenyatta National Hospital and the University of Nairobi. Trial patients or their parents or guardians provided written informed consent. Details about the methods are provided in the Supplementary Appendix and the protocol and statistical analysis plan, available at NEJM .org; ClinicalTrials.gov number, NCT03135366.

After exclusion of patients who had received a misdiagnosis or were transferred out of their clinic, 1104 patients remained: 535 in the control group and 569 in the intervention group. Of these patients, unsuccessful treatment outcomes occurred in 70 patients (13.1%) in the control group and 24 patients (4.2%) in the intervention group (P<0.001) (Fig. 1). The results in the two groups were similarly large and significant when only loss to follow-up was considered, when only patients with bacteriologically confirmed infection were included, or after adjustment for individual characteristics (Tables S5 and S6 in the Supplementary Appendix). Our results suggest that interventions delivered with feature phones can help to address shortfalls in the current standard of care for patients with tuberculosis.

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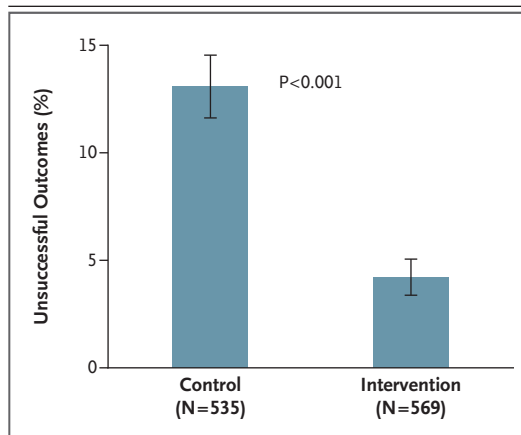
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Figure 1. Unsuccessful Treatment Outcomes, According to Trial Group.

An unsuccessful outcome of treatment for tuberculosis was defined as any of the following: death during treatment, treatment failure (the patient's sputum smear or culture was positive at month 5 or later), or loss to follow-up (the patient did not start treatment or interrupted treatment for ≥2 consecutive months). A total of 535 patients in the control group received the standard of care, whereas 569 patients in the intervention group received treatment support through a digital health platform. A total of 13.1% of patients in the control group (70 patients) had unsuccessful treatment outcomes, as compared with 4.2% of patients in the intervention group (24 patients) (P<0.001). I bars indicate standard errors.

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Disclosure forms provided by the authors are available with the full text of this letter at NEJM.org.

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