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Using electronic monitors and a smartphone app to improve treatment adherence of new pulmonary tuberculosis patients in Tibet, China

Submission date
25/10/2018

Recruitment status
No longer recruiting

Registration date
09/11/2018

Overall study status
Completed

Last Edited
09/02/2024

Condition category
Infections and Infestations

[X] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
Treatment non-adherence is a big threat in tuberculosis (TB) control as it may lead to emergence of drug resistance. Directly observed treatment (DOT) is a strategy to improve treatment adherence. However, it's difficult to implement it in Tibet, a poor region in China, due to lack of infrastructure and human resources, mountain area and severe weather conditions. This study aims to pilot and then evaluate the effectiveness of an intervention package to improve treatment adherence of new pulmonary TB patients in this region. The study will also explore operational questions regarding feasibility, acceptability and sustainability of the interventions.

Who can participate?
Newly diagnosed pulmonary TB patients aged 15 years or older, who are starting on standard 6 /7 months short-course chemotherapy and managed as outpatients

What does the study involve ?
Participants are randomly allocated to one of two groups. All participants in both groups are treated and managed according to the WHO DOTS program and the China National Tuberculosis Control Program (NTP) Guideline, which is the required routine practice. In the intervention group, patients use an electronic monitor box to pack their TB medicines. The electronic monitor can also remind patients of taking medicines. The monitor also records and reports to the server when the box is opened. One of patient's family members plays a role as family supporter who provides psychological support and helps patients to use the smartphone app when necessary. TB doctors and patient treatment supervisors, i.e., normally village doctors, manage and support patients through a mobile social software called WeChat and use the treatment adherence data from the server. In the control group, patients only use electronic monitor boxes, which have no reminding function, to pack their TB medicines. They also have a treatment supervisor as required by the NTP guideline, but not the family supporter. There are no other interventions in addition to routine practice.

What are the possible benefits and risks of participating?
The interventions aim to improve patients' treatment adherence which is supposed to further

improve their treatment outcomes. All patients receive standard treatment regiments and the management strategy following the national TB guideline. The additional actions in this trial, i.e., using a (silenced) e-monitor and smartphone app, do not alter current practice and will have no potential harm to the participants.

Where is the study run from?
Currently as of 25/01/2022:
The study will be conducted in Shigatse, Tibet, China. The leading centres are the University of Toronto, and the Shigatse Centre for Disease Control and Prevention (CDC). The six collaborating centres are local CDC and hospital in Samzhubze District, Sa'gya County, Gyangze County, Tingri County, Bainang County, and Ngamring County which are TB units managed under the supervision of Shigatse CDC.
Previously as of 18/06/2019:
The study will be conducted in Shigatse, Tibet, China. The leading centres are the University of Toronto, and the Shigatse Centre for Disease Control and Prevention (CDC). The three collaborating centres are Samzhubze District CDC, Sa'gya County CDC and Gyangze County CDC, which are TB units managed under the supervision of Shigatse CDC.
Previously:
The study will be conducted in Shigatse, Tibet, China. The leading centres are the University of Toronto, and the Shigatse Centre for Disease Control and Prevention (CDC). The two collaborating centres are Samzhubze District CDC and Sa'gya County CDC, which are TB units managed under the supervision of Shigatse CDC.

When is the study starting and how long is it expected to run for?
September 2018 to October 2021

Who is funding the study?
The study is supported by the TB REACH programme based in the Stop TB Partnership. All electronic monitors are provided free of charge from the Beijing FLOW Company.

Who is the main contact?
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2. Dr Jun Hu
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
TB REACH, Grant number: STBP/TBREACH/GSA/W6-5

Study information

Scientific Title
Improving new pulmonary tuberculosis (TB) patients' treatment adherence through electronic monitors and a smartphone app in Tibet: a randomized controlled trial

Study objectives
Treatment adherence of TB patients would be improved through interventions using electronic monitors and a smartphone app, as compared to patients who do not have the reminder and smartphone app functions activated in their electric monitors (e-monitor). The intervention with e-monitor and app powered patient-provider communication would be feasible and sustainable in Tibet that to be used for future scale-up.

Ethics approval required
Old ethics approval format

Ethics approval(s)
1. Office of Research Ethics at the University of Toronto, 14/09/2018, ref: 36569
2. Ethics Review Committee of the Tibet Centre for Disease Control and Prevention, 03/08/2018, ref: 006

Primary study design
Interventional

Study design
Interventional prospective unblinded multicentre pragmatic individual randomized controlled trial

Study type(s)
Other

Health condition(s) or problem(s) studied
Pulmonary tuberculosis

Interventions
Patients will be randomized to either the intervention or control arms in a 1:1 ratio at the time of their diagnosis using an envelope with a computer-generated randomized number.

In both the intervention arm and the control arm, all patients will be treated and managed according to China National Tuberculosis Control Program (NTP) Guideline, which is the required routine practice in local areas. The standard therapy includes isoniazid, rifampin, ethambutol, pyrazinamide for 2 months (3 months for sputum smear-positive patients whose sputum smears have not converted to negative at the end of 2 months), followed by isoniazid and rifampin for 4 months, under daily fix-dose-combination (FDC). Patients will visit the public TB dispensary at least every two months to meet with their TB doctor and fill their medicines in the e-monitor box.

In the intervention arm, 1) patients will use FLOW e-monitor box to pack FDC medicines, which can also remind patients of taking medicines and record the date and time of each opening at the server; 2) patients and/or their family members will be invited to set up the WeChat, a mobile social software, using their smart phones, and connect with their TB doctor and treatment supervisors; 3) a family supporter will be selected in consultation of the patient. The supporter will provide psychological support, and help patients use smartphone or WeChat. The supporter will be chosen from their family members during the recruitment or the first home visit by township hospital staff; 4) patients will receive continuing support from the family supporter, village doctor/ treatment supervisor, and doctors through WeChat; 5) patients will be opted to receive video observed treatment (VOT) when adherence is poor or problematic. Healthcare workers in district TB dispensaries, township hospitals and village clinics will receive training on a revised operational NTP guideline that incorporates using the e-monitor box, WeChat, and VOT. Interventions will last for 6 months.

In the control arm, patients will use a silenced (no reminding function) FLOW e-monitor box to pack their FDC medicines. There are no other actions being taken in addition to routine practice. Treatment supervisors, normally village doctors, are advised to visit patients once a week according to the National Tuberculosis Control Guideline, but they will decide the frequency of visit by their own and contact patients through traditional means, i.e. physical visits or phone calls.

Intervention Type
Mixed

Primary outcome(s)
Rate of poor adherence measured per month across the 6/7 months of standard WHO DOTS program for new pulmonary TB patients. It will be calculated from monthly-level data for each patient indicating the number of doses missed per month, with poor monthly adherence defined as the patient having missed ≥20% of doses per month (equivalent to missing ≥6 out of 30 doses in a month).

Key secondary outcome(s)
1. The patient-level percentage of total doses missed over 6/7 months of treatment (calculated as a percentage value for each patient based on the total number of doses missed out of the total possible number of doses), measured using treatment adherence records reported by the e-monitor box and triangulated by pill count after 6 months
2. The patient-level binary indicator of overall poor adherence (defined as ≥ 10% of total doses missed, based on the National Tuberculosis Control Program definition of non-adherence), measured using treatment adherence records reported by the e-monitor box and triangulated by pill count after 6/7 months
3. The patient-level WHO standard definitions of TB treatment outcomes, measured using cohort management tables after 6/7 months as a percentage of all patients in the cohort,

including:
3.1. Treatment completion/success, measured using cohort management tables after 6/7months
3.2. Patient loss-to-follow-up rate, measured using cohort management tables after 6/7 months
3.3. Poor treatment outcomes (defined as death, treatment failure or patient loss-to-follow-up), measured using cohort management tables after 6/7 months
3.4. Sputum conversation rate, assessed using cohort management tables after 2 months

Completion date
31/10/2021

Eligibility

Key inclusion criteria
1. Newly diagnosed pulmonary TB patients that is managed at outpatients
2. Aged 15 years or older

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Total final enrolment
276

Key exclusion criteria
1. Having communication impairment (mental, visual, auditory or speech)
2. Having any family members living in the same household that have already been enrolled into the trial

Date of first enrolment
26/11/2018

Date of final enrolment
31/03/2021

Locations

Countries of recruitment
China

Study participating centre

Samzhubze District Center for Disease Control and Prevention, and Samzhubze District Hospital
Shigatse
China
857000

Study participating centre
Sa'gya County Center for Disease Control and Prevention, and Sa'gya County Hospital
Shigatse
China
857800

Study participating centre
Gyangze County Center for Disease Control and Prevention, and Gyangze county hospital
Shigatse
China
857400

Study participating centre
Tingri County Center for Disease Control and Prevention, and Tingri county hospital
Shigatse
China
857400

Study participating centre
Bainang County Center for Disease Control and Prevention, and Bainang county hospital
Shigatse
China
857400

Study participating centre
Ngamring County Center for Disease Control and Prevention, and Ngamring county hospital
Shigatse
China
857400

Sponsor information

Organisation
Shigatse Centre for Disease Control and Prevention

ROR
https://ror.org/04wktzw65

Funder(s)

Funder type
Government

Funder Name
Stop TB Partnership

Results and Publications

Individual participant data (IPD) sharing plan
The anonymised patient level data and statistical code generated during and/or analysed during the current study will be available upon reasonable request to Prof. Xiaolin Wei (xiaolin.wei@utoronto.ca) or Dr. Jun Hu (sunnyhj@163.com) after all papers of this study have been published and within 5 years after the trial ended. The data can only be used for research purpose and shared with research organization/qualified researchers. Consent for data use will be obtained during patient recruitment. Confidential agreement has to be signed between applicant and local CDC before data sharing according to local policy requirements.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		31/01/2024	09/02/2024	Yes	No
Protocol article	protocol	16/05/2019	20/05/2019	Yes	No