Digital health for the End TB strategy: progress since 2015 and future perspectives

Meeting Report

7-8 February 2017

Geneva, World Health Organization

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Table of Contents

Background note 4
1. Why digital health for tuberculosis? 4
2. Objectives of the WHO/ERS consultation of 2017 4
3. Meeting sessions 5
References 25
Acknowledgments 27
Abbreviations & Acronyms 28
Annex 1 - Meeting agenda 29
Annex 2 - List of participants 31

Quotes

"Programme managers, technical agencies and donors have shown increased interest in recent years to invest in innovative digital technologies as a way to enhance efforts to combat tuberculosis. Such bold action needs to be sustained into the future and backed by matching commitment at the highest political level."

Dr Mario Raviglione, Director, WHO Global TB Programme

"The European Respiratory Society is proud to be among the leading professional bodies in respiratory health to support WHO and countries to implement novel technologies and to improve the quality of research to the benefit of our patients"

Dr Guy Joos, President, European Respiratory Society

Background note

1. Why digital health for tuberculosis?

The End TB Strategy of the World Health Organization (WHO) aims to bring the global TB epidemic to an end in the 20 years post 2015(1),(2). Actions envisaged to achieve the targets of this Strategy are in three areas: patient-centred TB care and prevention; supportive policies and systems in which TB care operates; and research. All of these areas could benefit from measures which make current operations more effective or efficient, such as an improved deployment of electronic and mobile phone applications (eHealth / mHealth, collectively known as digital health) with which we are surrounded(3). Any progress within the first decade of the End TB Strategy will rely heavily upon the wider uptake by TB programmes of measures which can exploit "test and treat" approaches available today and which make no assumption about the large scale implementation of revolutionary breakthroughs (e.g. vaccines) in a near future.

Digital health continues to attract interest from programme managers, decision makers, donors and other key actors in TB care and prevention as a means to improve the quality, effectiveness or efficiency of their efforts. In 2015, WHO's Global TB Programme (WHO/GTB) and the European Respiratory Society (ERS) released a joint "agenda for action" to define how different digital technologies could be roped into efforts in achieving the different goals envisaged by the End TB Strategy following a major consultation of interested parties in February of that year (Figure 1)(3),(4). Target product profiles for priority digital health technologies were further elaborated in 2016(5). These events, including a number of associated symposia at major scientific conferences in recent years and parallel work supported by technical and funding partners, successfully advanced the discussion on several leading digital health products. This was particularly instrumental in achieving concrete progress in the areas of medication adherence (such as the development and country implementation of video-observed therapy), electronic recording and reporting (e.g. DHIS2), and diagnostic device connectivity for molecular and conventional platforms. They also led to the development of a collaborative effort to review the study evidence systematically and model the potential of digital technologies when applied at scale.

2. Objectives of the WHO/ERS consultation of 2017

This technical consultation cast a look back over the last two years since the start of the WHO/ERS collaboration, taking stock of progress made and considering future perspectives moving forwards (see agenda at Annex 1). The meeting brought together about 60 experts from a broad cross-section of technical expertise in TB and other major communicable and non-communicable disease programmes, digital health, evidence review, laboratory science, programme management, funding agencies and end-users with a stake in this subject (list of participants at Annex 2). The presentations[1] held over the two days drove the discussion along the four main themes of the meeting, namely:

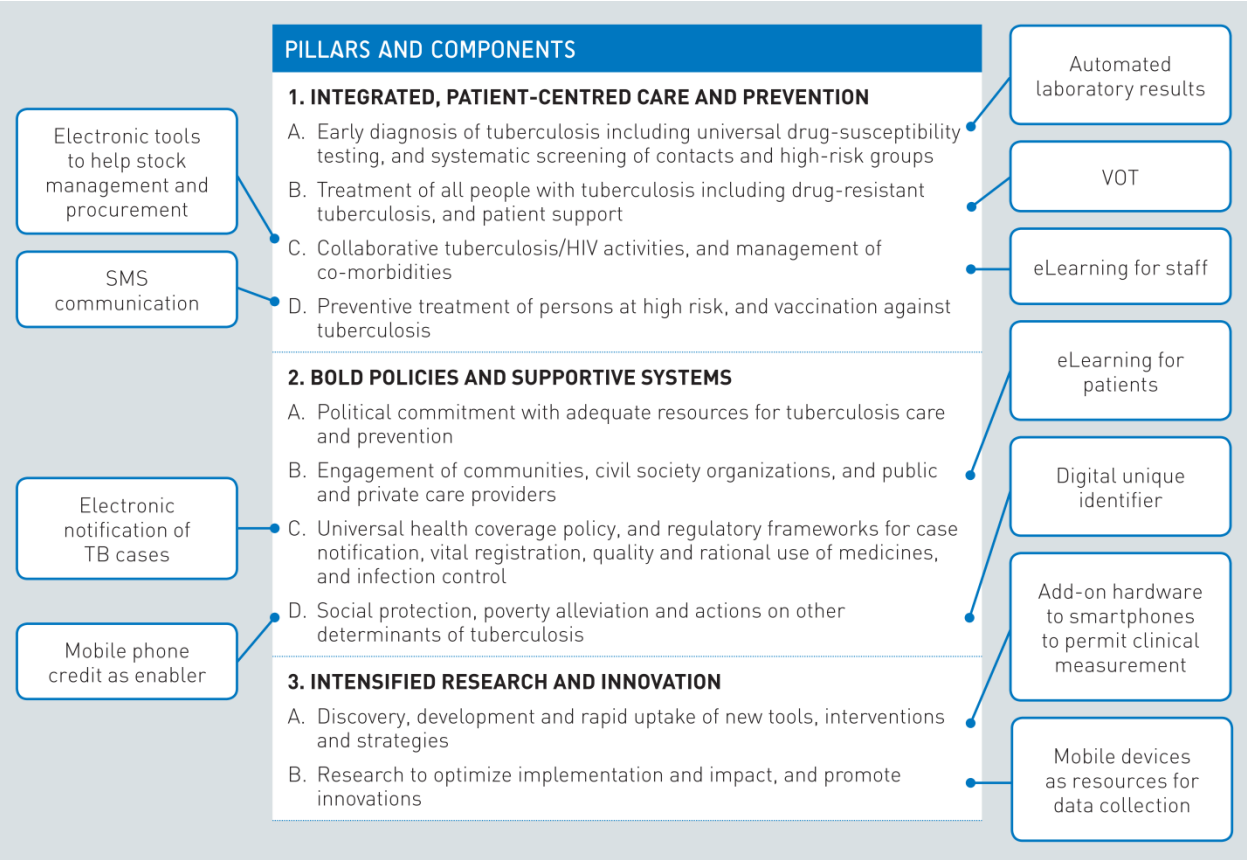
- the evidence for effectiveness and efficiency of digital health interventions in TB treatment adherence and their potential contribution to the End TB Strategy targets;
- the progress made in the development and implementation of technologies covered by the Target Product Profiles (TPP) created by WHO/ERS in 2015-2016;

[1] Accessible at https://www.dropbox.com/sh/1u6oedugmnwk3yo/AADjJkZOOC5MTSX1Wk4-M4zpa

- key novel concepts which could play a role in the future prevention and care of TB and how they could be included in the work plan of the WHO/ERS collaboration
- models for the future support of digital health technologies for TB and other health issues

Abbreviations & acronyms used in this report are explained at the end of this report (page 28)

Figure 1: *Schematic representation of common exemplars of digital health technologies and their potential entry points the End TB Strategy*(3)



3. Meeting sessions

3.1. Main messages from the leadership of the WHO Global TB Programme and the European Respiratory Society

(Mario Raviglione, WHO/GTB; Guy JOOS, Giovanni Battista Migliori, ERS)

In their introductory messages, the Director of WHO/GTB and President of the ERS thanked the numerous technical and funding agencies, national TB programme managers, developers and other stakeholders who have helped WHO to elaborate the digital health agenda for the End TB strategy, particularly in the last two years. The 2017 consultation comes two years after the first one held in February 2015, and highlights the progress made since. Evidence for the effectiveness and efficiency of some of the most common digital interventions applied to improve TB treatment adherence has been

increasingly consolidated in the last few years and while more studies will be needed to help understand the role these technologies can play at different points in patient pathways. Nonetheless, it is important to keep a close watch on the findings in order to help guide implementers on how best to use these technologies. The meeting also provides the first opportunity to assess the progress made in the development of some of the target product profiles (TPPs) and the implementation of technologies like video-supported therapy (VOT), connected diagnostics, and electronic surveillance in countries. It also discusses other concepts which could have an application in TB efforts, such as Massive Open Online Courses (MOOCs) for human resource development, support tools for programmatic implementation of LTBI and the potential for some novel concepts like artificial intelligence and nanotechnology in precision medicine, as well as "drones" as a means of delivering health care in remote settings. I believe that TB could act as a pathfinder for innovative mechanisms which can catalyse the further deployment of leading edge digital technologies for patient needs and large scale impact and which can be applied to other global health issues. The ERS remains deeply committed to supporting digital health interventions in respiratory health (such as eLearning) and has provided exemplary leadership for other professional bodies, and technical and funding agencies to follow, by playing a pivotal role in its support to WHO and to countries to invest in these technologies. This will be important to ensure maximal operationalization of efforts for the End TB Strategy. The outcome of this consultation could contribute importantly to the subjects and deliverables expected in a near future, particularly the Moscow ministerial conference in November and the UN General Assembly in 2018(6).

3.2. Digital health for the WHO End TB Strategy: meeting objectives & milestones since 2015

(Dennis FALZON, Hazim TIMIMI, Ernesto JARAMILLO, Karin WEYER, WHO/GTB)

The introductory presentations highlighted the structure and objectives of the technical consultation. There were three major processes which hallmarked the period 2015 to 2016, namely

- In April 2015 WHO/GTB convened a *Global task force for digital health and TB*(7) to advise it on:
    - the development of digital health products that are aligned to the challenges posed by TB to health care providers and patients;
    - the approach to the review of evidence and best practices for the effectiveness of digital health interventions in TB care and prevention; and
    - how to support WHO Member States to scale up digital health technologies for TB care and control based on existing knowledge

  The experts on the Task force are appointed for two years and the membership will be renewed in 2017.
- A conceptual framework for digital health & TB was used to organise the digital technologies applied to TB under 4 inter-related functions: patient care, surveillance, programme management and eLearning. Through 2015 this framework was further elaborated into an "agenda for action". The "agenda" highlights the strategic direction that WHO has mapped out to integrate digital health into activities to strengthen the preventive and care of different components of the End TB strategy. It also includes commentary on the evidence for the

different interventions and the rationale behind the priority digital products identified for profiling in TPPs

- The TPPs were elaborated and published in mid-2016(5) (Table 1). These TPPs are descriptions of key features and conditions required of the priority digital products in order for them to serve TB programmes in particular. A number of country projects were also started to document the use of the concepts profiled.

In addition to the processes set into motion through the WHO/ERS activities since 2015, the meeting also acknowledged the parallel processes on products not encompassed by the priority TPPs which had been taken forward through separate initiatives. For example electronic medication monitoring has been implemented at very large scale in high TB burden settings like India and China and was the subject of randomised controlled trials(8),(9). Moreover, WHO/GTB has also been involved for several years in the support to national programmes and technical agencies to strengthen patient recording and reporting in aggregated and disaggregated electronic systems for surveillance and logistics management(10). Most recently WHO/GTB has been collaborating with leading technical and funding agencies (the Global Fund to Fight AIDS, TB and Malaria, USAID) to help countries implement DHIS2(11) as a prototype open-source system for the management of aggregated or individual patient data. Its implementation fits within the scope of the surveillance TPPs. Such work opens opportunities to build upon the infrastructure created in order to develop other components, such as laboratory information systems within the ambit of "connected diagnostics" and mortality registries. These technologies can also support patient care, particularly adherence measures (e.g. link between video-supported therapy and electronic registration(12)).

Table 1: *Summary of priority digital technologies defined by TPPs*(5)

Function	***TPP : short description***
Patient care	1. Video-supported treatment (VOT) via mobiles
	2. eHealth portal
Surveillance & monitoring	3. Graphic dashboards
	4. eNotify
	5. eReporting of adverse events of treatment
Programme management	6. Diagnostic device connectivity
eLearning	7. Patient information platform
	8. Web-based training for health care professionals
	9. Clinical decision support systems

Presentations and the ensuing discussions held at the consultation fell into four themes: evidence, country experience, funders' perspectives and future concepts. Two main motifs ran through the meeting discussions, namely :

(1) what evidence exists for effectiveness and/or efficiency and how can it be strengthened ?

(2) what impact is expected at large scale ?

Introductory session 1. Digital health for TB: state of the evidence for adherence

(Richard LESTER, University of British Columbia, Canada)

Tuberculosis programme managers are increasingly taking advantage of the diffusion of affordable mobile electronic devices to address critical challenges in patient care. An updated literature review of studies of the effects on tuberculosis treatment outcome attributable to three digital technologies which can be implemented at large scale: short message service (SMS), video directly-observed therapy (VOT) and electronic medication monitors (e.g., digital pill dispensers). MEDLINE/PubMed, EMBASE, Cochrane Library, Web of Science, clinicaltrials.gov and Global Health were searched in July 2016 for the effect of digital health on cure or treatment completion of active tuberculosis. Given a dearth of published studies the search was extended to unpublished literature. Six geographically-diverse studies that included control groups and provided summary effect estimates were eligible for full review. Three randomized controlled SMS trials showed no statistically-significant effect on cure or treatment completion when compared with local standard TB care. Two observational studies of synchronous VOT reported risk ratios for treatment completion of 1.02 and 1.47 (neither statistically-significant)(13),(14). For medication monitors, one observational study reported an effect on cure (risk ratio=2.3, 95%CI: 1.6-3.4) and one randomized controlled trial reported no statistically-significant effect. Despite interest in applying digital technologies in tuberculosis care, effects have been variable and evidence from implementation studies remains sparse. However, evidence suggests that these technologies might be at least as effective as standard care. Data from ongoing and future research, including non-inferiority studies, are needed to promote practical approaches to optimizing interventions, such as using interactive SMS and blending technologies to achieve large-scale impact.

Introductory session 2. Modelling the potential impact of digital health on adherence measures of TB infection and disease

(Kevin SCHWARTZMAN, McGill University, Canada)

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