Public Health Action

International Union Against Tuberculosis and Lung Disease
Health solutions for the poor

VOL 8 NO 2 PUBLISHED 21 JUNE 2018

Has TB CARE I sputum transport improved access to culture services for retreatment tuberculosis patients in Zimbabwe?

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http://dx.doi.org/10.5588/pha.17.0117

Setting: Retreatment tuberculosis (TB) patients in Zimbabwe are investigated using microscopy, Xpert® MTB/RIF and culture + drug susceptibility testing (CDST). TB CARE I, a sputum transport service using motorcycles, was introduced to transport specimens between peripheral health facilities and laboratories, including National Reference Laboratories (NRLs).

Objectives: To compare access to CDST and treatment outcomes among retreatment TB patients in facilities with and those without TB CARE I support.

Design: This was a retrospective cohort study.

Results: There were 187 patients from TB CARE I-supported facilities and 116 from non-TB CARE I facilities, with no difference in demographic characteristics. Altogether, specimens from 22 (12%) retreatment TB patients had successful CDST from TB CARE I facilities, which was not statistically significantly different from non-supported facilities (n = 14, 12%; P = 0.94). The median number of days from sputum collection to receipt at the NRL was lower in TB CARE I facilities than in non-supported facilities (median 6, interquartile range [IQR] 4–8 vs. median 8, IQR 6–13.5; P = 0.000). Favourable treatment outcomes were documented in 65% of patients under TB CARE I, significantly more than among patients in non-supported facilities (47%, $P < 0.01$).

Conclusion: The process of sputum specimen collection for CDST was not different between TB CARE I and non-TB CARE I-supported health facilities, apart from a slightly shorter time. Ways to improve the current system are discussed.

Zimbabwe is one of the 14 countries worldwide with a triple burden of tuberculosis (TB), TB-HIV (human immunodeficiency virus) and multidrug-resistant TB (MDR-TB; defined as resistance to at least isoniazid [INH] and rifampicin [RMP]).[1,2] In 2016, the TB-HIV co-infection rate in Zimbabwe was 70%, with TB-HIV co-infected patients having a three-fold risk of retreatment TB.[1,2] Retreatment TB patients are those who have previously received at least 1 month of anti-tuberculosis drugs and have been diagnosed again with TB.[3]

Retreatment TB is a risk factor for drug-resistant TB, including MDR-TB, and it is essential that sputum specimens for such patients are collected and assessed for drug susceptibility to determine whether they can be retreated with first-line anti-tuberculosis medicines or an MDR-TB treatment regimen.[4] Zimbabwe has scaled up Xpert® MTB/RIF technology (Cepheid, Sunnyvale, CA, USA) country-wide for all presumptive TB patients, but current national guidelines still recommend that all retreatment TB patients undergo conventional culture + drug susceptibility testing (CDST) in addition to Xpert.[5] CDST services are offered at two national reference laboratories (NRLs).

The logistics of collecting sputum specimens from the peripheral health facilities and transporting them to NRLs for CDST is challenging. These logistical hurdles are not unique to Zimbabwe, as several African and Asian countries have also reported similar challenges.[6–9] It is not clear where the problems lie, although in all previously reported studies the transportation of sputum specimens from peripheral centres to NRLs has been a major bottleneck.

In the last 10 years, the Zimbabwe National Tuberculosis Control Programme (NTP) and partner organisations have tried several initiatives to ensure that sputum specimens reach the NRLs. The NTP tried SWIFT, a private courier service with tracking mechanisms for sputum shipments, but this was ineffective, as SWIFT does not serve most of the peripheral facilities that have poor road infrastructure. In 2010, the International Union Against Tuberculosis and Lung Disease (The Union) introduced the TB CARE I project to help transport clinical specimens, including sputum specimens, between health facilities and laboratories as part of an integrated health service. TB CARE I has a motorcycle fleet to transport sputum specimens from peripheral health facilities to laboratories for smear microscopy or Xpert testing, including to the NRLs for CDST. This system is supported by environmental health technicians (EHTs), who facilitate the transport of sputum specimens using health facility motorcycles. The impact of this service for retreatment TB patients in terms of access to CDST, more successful CDST results and improved treatment outcomes has not been evaluated.

Our study had two aims: 1) to assess whether TB CARE I was associated with improved access to CDST services among retreatment TB patients, and 2) to evaluate whether they had better treatment outcomes in TB CARE I facilities than in non-TB CARE I facilities. For the first aim, the specific objectives were to compare 1) the proportion of sputum specimens reaching NRLs, 2) the time taken from sputum specimen collection to reception at NRLs, and 3) the proportion of specimens with CDST results, among retreatment TB patients from TB CARE I and non-TB CARE I facilities.

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KEY WORDS
sputum specimen transportation; Zimbabwe; retreatment TB; culture and drug susceptibility testing; treatment outcomes

Received 16 December 2017
Accepted 28 March 2018

PHA 2018; 8(2): 66–71

METHODS

Study design

Retrospective cohort study of retreatment TB patients in TB CARE I and non-TB CARE I-supported facilities.

General setting

Zimbabwe is a southern African country with a population of around 13 million.[10] It is divided into Southern and Northern regions, and each region is serviced by an NRL.

Study procedure

All retreatment TB patients (smear- or Xpert-positive, or clinically diagnosed smear-negative) are required to produce one sputum specimen (5 ml) for CDST into screw-capped containers. The containers are triple-packaged using Ziploc® bags (S C Johnson, Racine, WI, USA), and a cold chain is maintained using dry ice packs before transportation to district laboratories. Sputum specimens are transported mainly for smear microscopy and Xpert testing, but also for CDST.[11] Sputum transportation in TB CARE I-supported facilities is systematic, but can be affected by breakdowns and the distance covered by motorcycles. Regardless of these challenges, most facilities are visited regularly, once weekly. Specimens are sent from district laboratories to NRLs using public transport. In Bulawayo and Harare, where the NRLs are located, TB CARE I transports specimens directly to the NRLs. The process of sputum transportation is similar in non-TB CARE I facilities, except that EHTs and facility ambulances, where available, are involved.

Sampling of sites

Two provinces where TB CARE I is not operational were purposively selected. Fourteen sites that notified at least 100 TB patients in 2016 were compiled as the sampling frame from which 10 facilities were randomly selected. The list was reduced to seven during recruitment for logistic reasons. These facilities were matched with TB CARE I-supported facilities based on distance to NRLs and annual TB notifications, with more weighting given to the former. During data collection, some facilities had missing TB registers and recruitment was low: only four facilities in TB CARE I-supported facilities had enough patients to match the seven non-TB CARE I facilities.

Study population

The study population comprised all retreatment TB patients registered from 1 January 2014 to 31 January 2017 in four TB CARE I and seven non-TB CARE I facilities.

Data variables, data sources and data collection

The following data variables were collected: age, sex, HIV status and names of retreatment TB patients, dates of sputum specimen collection and receipt at NRLs, CDST result and treatment outcomes. Sources of data included laboratory information management systems, presumptive TB registers and TB registers. Data were collected in October 2017. Patients were identified from facility registers and were tracked in the NRL registers using names and demographic data.

Analysis and statistics

Anonymised data were double-entered into EpiData v 4.0.1.44 and analysed using EpiData v 2.2.2.186 (EpiData Association, Odense, Denmark) and STATA v 13 (StataCorp, College Station, TX, USA). Numbers and proportions were reported for categorical variables. Normality for continuous variables was assessed using the Shapiro-Wilk test, and the Mann-Whitney *U*-test was used to compare median times from specimen collection to reaching the NRLs. The χ^2 test was used to compare steps in CDST performance and treatment outcomes; the latter are presented as relative risks (RRs) and adjusted RRs (aRRs) between TB CARE I and non-TB CARE I facilities. Levels of significance were set at 5%.

Ethics approval

This study was approved by the Medical Research Council of Zimbabwe, Harare, Zimbabwe, and the Ethics Advisory Group of The Union, Paris, France.

RESULTS

Demographic characteristics and human immunodeficiency virus status of the study participants

The demographic characteristics and HIV status of the participants are shown in Table 1. Of 303 registered retreatment TB patients, 187 (62%) were from TB CARE I facilities. The mean age (38 years ± standard deviation 13) was similar between facilities, and there were no differences with respect to sex. Overall, 97% of participants had documented HIV results, and HIV prevalence was 78%.

Sputum specimen collection and reception at NRLs, and CDST results

The collection of sputum specimens from the health facilities, their reception at the NRL, subsequent growth of *Mycobacterium tuberculosis* and successful CDST results were compared between TB CARE I and non-TB CARE I facilities (Table 2). A significantly greater proportion of sputum specimens was collected for CDST in non-TB CARE I-supported facilities. A greater proportion of sputum specimens reached the NRLs from TB CARE I-supported facilities and then showed positive *M. tuberculosis* culture and CDST, but these differences were not significant when compared with non-TB CARE I facilities.

The time from sputum collection to arrival at an NRL was shorter in TB CARE I facilities than in non-TB CARE I facilities (median 6 days, interquartile range [IQR] 4–8 vs. median 8 days, IQR 6–13.5; $P = 0.0001$).

Specimens from 22 (12%) retreatment TB patients at TB CARE I-supported facilities had CDST results compared to 14 (12%) in non-TB CARE I facilities; the difference was not statistically significant ($P = 0.94$). Where CDST results were available, the majority of specimens were fully drug-susceptible, although respectively 32% and 28% of specimens from TB CARE I- and non-TB CARE I-supported facilities were RMP-resistant or MDR-TB (Table 2).

ACKNOWLEDGEMENTS

This research was conducted through the Structured Operational Research and Training Initiative (SORT IT), a global partnership led by the Special Programme for Research and Training in Tropical Diseases at the World Health Organization (WHO/TDR). The training model is based on a course developed jointly by the International Union Against Tuberculosis and Lung Disease (The Union, Paris, France) and Médecins Sans Frontières (MSF, Paris, France). The specific SORT IT programme that resulted in this publication was implemented by MSF, Brussels Operational Center, Luxembourg, and the Centre for Operational Research, The Union. Mentorship and the coordination/facilitation of these SORT IT workshops were provided through the Centre for Operational Research, The Union; the Operational Research Unit (LuxOR), MSF (Luxembourg); AMPATH (Eldoret, Kenya); The Institute of Tropical Medicine (Antwerp, Belgium); The Centre for International Health, University of Bergen (Bergen, Norway); and The National Institute for Medical Research, Muhimbili Medical Research Centre (Dar es Salaam, Tanzania).

The programme was funded by the United Kingdom Department for International Development (DFID, London, UK), The Union, MSF and La Fondation Veuve Emile Metz-Tesch (Luxembourg). The Global Fund (Geneva, Switzerland) provided financial support for data collection. La Fondation Veuve Emile Metz-Tesch supported open access publication costs. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Conflicts of interest: none declared.

TABLE 1 Demographic characteristics of retreatment TB patients by type of health facility, Zimbabwe, 2014–2017

Characteristic	Number enrolled	TB CARE I facility *n* (%)*	Non-TB CARE I facility *n* (%)*	*P* value
Retreatment TB patients	303	187	116	
Sex				
Male	182	111 (59)	71 (61)	0.75
Female	121	76 (41)	45 (39)	
Age, years				
<15	9	6 (3)	3 (3)	0.35
15–24	37	23 (12)	14 (11)	
25–34	67	43 (23)	24 (21)	
35–44	112	62 (33)	50 (43)	
45–54	46	35 (20)	11 (10)	
55–64	17	10 (5)	7 (6)	
⩾65	15	8 (4)	7 (6)	
HIV status				
Positive	237	155 (83)	82 (71)	0.04
Negative	57	28 (15)	29 (25)	
Not recorded	9	4 (2)	5 (4)	

*Column percentages.
TB = tuberculosis; HIV = human immunodeficiency virus.

Treatment outcomes among retreatment patients

The treatment outcomes of patients registered in TB CARE I-supported and non-supported facilities are shown in Table 3. Overall, 65% of patients under TB CARE I had favourable outcomes, significantly more than among patients registered in non-TB CARE I supported facilities (47%). Adjusted analyses in Table 3 showed no confounding. A flow chart for patients initiated on MDR-TB treatment regimens is shown in the Figure.

DISCUSSION

This is the first study to assess the impact of the TB CARE I transportation service on access to CDST, successful CDST results and treatment outcomes among retreatment TB patients in Zimbabwe. There were some interesting findings.

The proportion of patients with sputum specimens collected for CDST in TB CARE I facilities was lower than for non-TB CARE I facilities; however, while more of the TB CARE I specimens were received at the NRLs, with more showing positive *M. tuberculosis* culture and successful CDST, the holistic picture was not different between the two types of facilities.

For those specimens that reached the NRLs, the time taken to arrive was significantly shorter for TB CARE I facilities, although whether a difference of 3.5 days makes much programmatic difference is questionable. In previous studies in Africa, a shorter time to diagnosis and initiation of treatment did not translate into better TB treatment outcomes.[12,13] The overall proportion of retreatment TB patients who had sputum specimens with successful CDST at NRLs was low, at just over 10%; this was similar in TB CARE I and non-TB CARE I supported facilities. Reasons for this poor result are not clear.

The lack of improvement in the CDST system could be due to several factors. First, there were failures at the peripheral health facility level in collecting sputum specimens for CDST. This type of failure was also found in Malawi,[6] and even when performance-related allowances were provided, the target indicators were never attained.[14] Under TB CARE I, the once-weekly collection of sputum specimens for NRL delivery may not have been sufficient to bring about a significant difference to the service offered by EHTs and ambulances in non-TB CARE I facilities. Anecdotally, breakdowns of motorcycles and fuel shortages also occurred, which would have created operational barriers. The Association of Public Health Laboratories and Médecins Sans Frontières also helped with sputum transportation in both types of health facilities, thus contaminating the distinction between

TABLE 2 Process of collecting and sending sputum specimens from retreatment TB patients to NRLs for CDST by type of health facility, Zimbabwe, 2014–2017

	TB CARE I facility *n* (%)*	Non-TB CARE I facility *n* (%)*	*P* value
Retreatment TB patients enrolled, *n*	187	116	
Patients whose sputum specimens were collected in health facilities for CDST	68 (36)	65 (56)	<0.001†
Patients whose sputum specimens were received at an NRL for culture	58 (85)	50 (77)	0.2‡
Patients whose sputum specimens showed *M. tuberculosis* growth	22 (38)	15 (31)	0.5§
Patients whose sputum specimens showed no growth	25 (43)	31 (65)	0.03§
Patients whose sputum specimens were contaminated	3 (5)	2 (4)	0.8§
Patients whose sputum specimens showed growth of MOTT	5 (9)	0	0.04§
Patients whose culture results were not available	3 (5)	2 (4)	0.8§
Patients who had CDST results	22 (38)	14 (29)	0.3§
Full susceptibility to all drugs	13 (59)	10 (72)	0.7¶
Isoniazid monoresistance	2 (9)	0 (0)	
Rifampicin monoresistance	3 (14)	2 (14)	
MDR-TB	4 (18)	2 (14)	

*Column percentages.
†Denominator = no. of retreatment TB patients enrolled.
‡Denominator = no. of patients whose specimens were collected for CDST.
§Denominator = no. of patients whose specimens were received and cultured at an NRL.
¶Denominator = no. of specimens showing CDST results; χ^2 test for trend.
TB = tuberculosis; NRL = National Reference Laboratory; CDST = culture and drug susceptibility testing; MOTT = mycobacteria other than tuberculosis; MDR-TB = multidrug-resistant TB.

TABLE 3 Treatment outcomes among retreatment TB patients in Zimbabwe by type of sputum specimen transportation system, 2014–2017

	TB CARE I facility *n* (%)*	Non-TB CARE I facility *n* (%)*	RR (95%CI)	aRR (95%CI)†
Favourable outcome	122 (65)	54 (47)	1.40 (1.1–1.8)	1.42 (1.14–1.77)
Cured	71	24		
Completed treatment	51	30		
Unfavourable outcome	65 (35)‡	62 (53)	0.65 (0.5–0.8)	0.66 (0.50–0.86)
Died	19	17		
Lost to follow-up	9	3		
Not evaluated (includes transfer out)	37	42		

*Column percentages.
†Generalised linear regression with a log-link and binomial distribution (binomial log-linear regression) was used to estimate the aRRs while accounting for potential confounding effect of sex, age and HIV status, i.e., none of these factors were significant in both univariate and multivariate analysis.
‡These included two patients with isoniazid monoresistance who had poor treatment outcomes; one died and the other was not evaluated.
TB = tuberculosis; RR = relative risk; CI = confidence interval; aRR = (multivariate) adjusted RR.

TB CARE I and non-TB CARE I facilities. Finally, TB CARE I does not send specimens directly to the NRLs, except in Harare and Bulawayo. In peripheral facilities, a public service oversees specimen referral from the district laboratories to the NRLs. Thus, most specimens undergo smear microscopy and Xpert,[11] but the logistics of sending specimens and the longer diagnostic times at the NRLs may act as disincentives to sending specimens for CDST.

Second, in the few samples with successful CDST, a small proportion were INH-monoresistant and around one third were RMP-resistant/MDR-TB. It is therefore crucial to obtain DST results for retreatment TB patients to inform appropriate treatment. INH monoresistance may be associated with poorer treatment outcomes,[15] and the World Health Organization (WHO) recommends that high levels of INH resistance indicate a change from RMP + INH in the continuation phase to RMP + INH + ethambutol.[16] RMP-resistant/MDR-TB must be diagnosed, and treatment requires an appropriate second-line anti-tuberculosis regimen, as advised by the WHO.[17,18]

Third, although overall treatment success was consistent with national results for this population,[1,2] TB CARE I facilities recorded better treatment outcomes than non-TB CARE I facilities. The reasons for this are unclear, and may have nothing to do with the sputum transportation and CDST services at NRLs. The difference may be explained by the quality of care in health facilities, especially considering the high proportions of patients who died and were not evaluated in non-TB CARE I facilities. Deaths may have been due to undiagnosed and untreated drug-resistant TB or associated untreated HIV infection.

The study had several strengths. We traced patients from registration to their sputum specimens reaching the NRLs and to CDST results. Baseline demographics of patients were similar between the two groups. The reporting of this study was also in line with STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.[19] There were, however, several limitations. There was poor documentation of treatment outcomes (hence the large number of patients not evaluated) and other data that were crucial for our study. Some facilities had registers missing for previous years, making it difficult to sample a large number of retreatment TB patients. We have no information to explain why some sputum specimens were never collected or why some never reached the NRLs. We also do not know whether specimens collected under TB CARE I were actually transported by TB CARE I motorcycles, as there are no tracking mechanisms to monitor this or to disaggregate specimens collected either for Xpert testing or for direct smear microscopy. There is a need for more detailed documentation to better understand the processes at work. We also did not document whether HIV-positive patients were on antiretroviral therapy.

This study has important programmatic implications. The collection of sputum specimens and their transportation to NRLs for CDST does not function well, despite the presence of public and private sputum transport services. A 2014 study in the Harare and Manicaland Provinces of Zimbabwe confirms this finding,[20] and, as discussed earlier, the same problem has been highlighted in several other countries with no apparent solutions to issues that plague this activity.[6–9] Sputum transportation needs harmonisa-

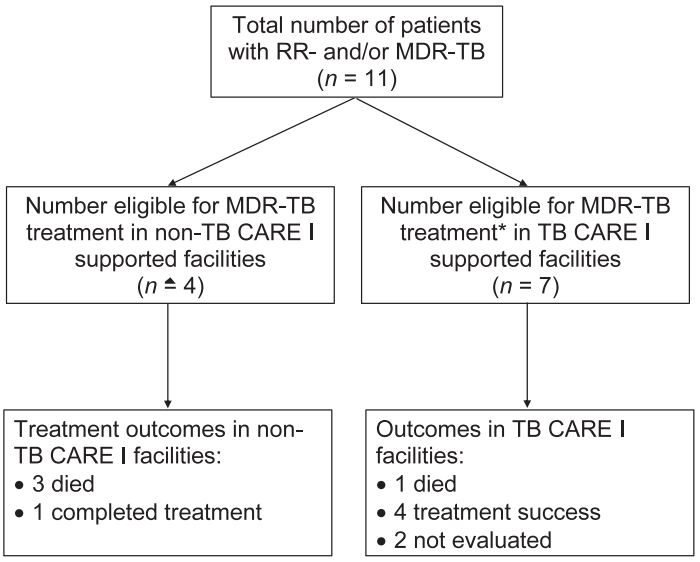

FIGURE A flow chart of retreatment TB patients who were initiated on an MDR-TB treatment regimen in Zimbabwe using a sputum specimen transportation system (2014–2017). *All sputum smear-positive patients were initiated on a first-line (2HRZE/4HR) TB treatment regimen pending culture and DST results. For patients diagnosed using Xpert® MTB/RIF, all patients with RMP-resistant TB were initiated on a standardised treatment regimen (6KmLvxCsEthZ/14LvxCsEZ). Patients were switched to individualised treatment when the results of second-line DST were available. MDR-TB = multidrug-resistant TB; H = isoniazid; R, RMP = rifampicin; Z = pyrazinamide; E = ethambutol; DST = drug susceptibility testing; Km = kanamycin; Lvx = levofloxacin; Cs = cycloserine; Eth = ethionamide.

tion and good financial and material resources to ensure efficient specimen referral linkages between peripheral facilities, district laboratories and NRLs.[11]

As previous studies have shown high sensitivity and specificity of Xpert compared with phenotypic CDST under programme settings,[21–23] we question the need for CDST at NRLs to confirm RMP-resistant TB. The proportion of CDST specimens that did not show growth of *M. tuberculosis* is also a matter of concern, and processes at the NRLs need to be monitored and improved if CDST is to continue and be trusted. New molecular diagnostic technology is now available with Xpert® MTB/RIF Ultra (Cepheid), which shows higher sensitivity than Xpert® MTB/RIF; the WHO has recently recommended that this new assay be used as a replacement for Xpert MTB/RIF.[24]

We believe that the Xpert assay should be the initial diagnostic test in all retreatment TB patients in Zimbabwe; sputum specimens from these patients should be sent to the nearest Xpert testing centres. This system needs to be closely monitored, with an important programmatic indicator being the MTB/RIF results on all sputum specimens from retreatment TB patients. Electronic reporting systems and dedicated focal personnel might speed up the process of getting the results back to peripheral facilities.[11] For those with RMP-resistant TB, specimens could then be sent to NRLs to assess resistance to second-line anti-tuberculosis drugs to help diagnose pre-extensively drug-resistant (XDR; MDR-TB with additional resistance to at least one fluoroquinolone OR to one second-line injectable drug) or XDR-TB (MDR-TB with additional resistance to any fluoroquinolone AND one of the injectable second-line drugs). This diagnostic field is rapidly advancing. A new automated, cartridge-based assay has been developed to detect mutations associated with resistance to INH, fluoroquinolones and aminoglycosides, and this looks promising as a future point-of-care test to guide therapeutic decisions for patients with TB.[25]

In conclusion, among retreatment TB patients in Zimbabwe, the system of collecting and transporting sputum specimens to NRLs for CDST was not different between TB CARE I and non-TB CARE I facilities, except for a slight reduction in time taken in the former. Treatment outcomes were better among patients in TB CARE I-supported facilities, but these cannot be attributed to the CDST system. Either more effort is required to strengthen CDST performance, or a more concerted move needs to be made to expand molecular technology.

References

1 World Health Organization. Global tuberculosis report, 2017: Tuberculosis Country Profiles. WHO/HTM/TB/2017.23. Geneva, Switzerland: WHO, 2017.
2 World Health Organization. Global tuberculosis report, 2016: Tuberculosis Country Profiles. WHO/HTM/TB/2016.13. Geneva, Switzerland: WHO, 2016.
3 World Health Organization. Definitions and reporting framework for tuberculosis —2013 revision. WHO/HTM/TB/2013.2. Geneva, Switzerland: WHO, 2013.
4 World Health Organization. Treatment of tuberculosis: guidelines. 4th ed. WHO/HTM/TB/2009.420. Geneva, Switzerland: WHO, 2010.
5 Ministry of Health and Child Care. National TB guidelines for Zimbabwe. Harare, Zimbabwe: Ministry of Health and Child Care, 2016.
6 Harries A D, Michongwe J, Nyirenda T E, et al. Using a bus service for transporting sputum specimens to the Central Reference Laboratory: effect on the routine TB culture service in Malawi. Int J Tuberc Lung Dis 2004; 8: 204–210.
7 Kilale A M, Ngowi B J, Mfinanga G S, et al. Are sputum specimens of retreatment tuberculosis reaching the reference laboratories? A 9-year audit in Tanzania. Public Health Action 2013; 3: 156–159.
8 Qi W, Harries A D, Hinderaker S G. Performance of culture and drug susceptibility testing in pulmonary tuberculosis patients in northern China. Int J Tuberc Lung Dis 2011; 15: 137–139.
9 Tharu M B, Harries A D, Goel S, et al. Screening retreatment tuberculosis patients for drug resistance in mid-west Nepal: how well are we doing? Public Health Action 2014; 4: 60–65.
10 Zimbabwe National Statistics Agency (ZIMSTAT & Macro ICF, Inc) Zimbabwe Population National Census 2012. Harare, Zimbabwe: ZIMSTAT, 2012. www.zimstat.co.zw/sites/default/files/img/National_Report.pdf. Accessed April 2018.
11 Global Laboratory Initiative. Global Laboratory initiative guide to TB specimen referral system and integrated networks. Geneva, Switzerland: GLI Working Group Secretariat, 2018. http://www.stoptb.org/wg/gli/. Accessed April 2018.
12 Theron G, Zijenah L, Chanda D, et al. Feasibility, accuracy, and clinical effect of point-of-care Xpert MTB/RIF testing for tuberculosis in primary-care settings in Africa: a multicentre, randomised, controlled trial. Lancet 2014; 383: 424–435.
13 Cox H S, Mbhele S, Mohess N, et al. Impact of Xpert MTB/RIF for TB diagnosis in a primary care clinic with high TB and HIV prevalence in South Africa: a pragmatic randomised trial. PLOS Med 2014; 11: e1001760.
14 Harries A D, Salaniponi F M, Nunn P P, Raviglione M. Performance-related allowances within the Malawi National Tuberculosis Control Programme. Int J Tuberc Lung Dis 2005; 9: 138–144.
15 Van der Heijden Y F, Karim F, Mufamadi G, et al. Isoniazid-monoresistant tuberculosis is associated with poorer treatment outcomes in Durban, South Africa. Int J Tuberc Lung Dis 2017; 21: 670–676.
16 World Health Organization. Treatment of tuberculosis. Guidelines for treatment of drug-susceptible tuberculosis and patient care. WHO/HTM/TB/2017.05. Geneva, Switzerland: WHO, 2017.
17 World Health Organization. Guidelines for the programmatic management of drug-resistant tuberculosis. 2011 update. WHO/HTM/TB/2011.6. Geneva, Switzerland: WHO, 2011.
18 World Health Organization. WHO treatment guidelines for drug-resistant tuberculosis. 2016 update. WHO/HTM/TB/2016.04. Geneva, Switzerland: WHO, 2016.
19 von Elm E, Altman D G, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Bull World Health Organ 2007; 85: 867–872.
20 Charambira K, Ade S, Harries A D, et al. Diagnosis and treatment of TB patients with rifampicin resistance detected using Xpert® MTB/RIF in Zimbabwe. Public Health Action 2016; 6: 122–128.
21 Boehme C C, Nabeta P, Hillemann D, et al. Rapid molecular detection of tuberculosis and rifampin resistance. N Engl J Med 2010; 363: 1005–1015.
22 Boehme C C, Nicol M P, Nabeta P, et al. Feasibility, diagnostic accuracy, and effectiveness of decentralised use of the Xpert MTB/RIF test for diagnosis of tuberculosis and multidrug resistance: a multicentre implementation study. Lancet 2011; 377: 1495–1505.
23 van Kampen S C, Tursynbayeva A, Koptleuova A, et al. Effect of introducing Xpert MTB/RIF to test and treat individuals at risk of multidrug-resistant tuberculosis in Kazakhstan: a prospective cohort study. PLOS ONE 2015; 10: e0132514.
24 World Health Organization. WHO Meeting Report of a Technical Expert Consultation: non-inferiority analysis of Xpert MTB/RIF Ultra compared to Xpert MTB/RIF. WHO/HTM/TB/2017.04. Geneva, Switzerland: WHO, 2017. http://www.who.int/tb/publications/2017/XpertUltra/en/ Accessed April 2018.
25 Xie Y L, Chakravorty D T, Amstrong S L, et al. Evaluation of a rapid molecular drug susceptibility testing for tuberculosis. N Engl J Med 2017; 377: 1043–1054.

Contexte : Les patients tuberculeux en retraitement au Zimbabwe bénéficient d'un bilan par microscopie, Xpert® MTB/RIF et culture + test de pharmacosensibilité (CDST). TB CARE I, un service de transport des crachats recourant à des motos, a été introduit afin de transporter les échantillons entre les structures de santé périphériques et les laboratoires, notamment les Laboratoires Nationaux de Référence (NRL).
Objectif : Comparer les structures avec et sans soutien de TB CARE I, l'accès au CDST et les résultats du traitement parmi les patients en retraitement.
Schéma : Etude rétrospective de cohorte
Résultats : Il y a eu 187 patients de structures soutenues par TB CARE I et 116 patients de structures non soutenues par TB CARE I, sans différence en termes de caractéristiques démographiques. Au total, les échantillons de 22 patients (12%) TB en retraitement ont eu un CDST réussi dans les structures TB CARE I, ce qui n'a pas été très différent des patients des structures non soutenues (n = 14, 12% ; P = 0,94). Le nombre médian de jours depuis le recueil de crachats jusqu'à la réception au NRL a été plus faible dans les structures TB CARE I que dans les structures non soutenues (médiane = 6, intervalle interquartile [IQR] 4–8 contre médiane = 8, IQR 6–13,5 ; P = 0,0001). Des résultats favorables du traitement ont été documentés chez 65% des patients sous TB CARE I, ce qui a été significativement plus élevé que chez les patients dans les structures non soutenues (47% ; $P <$ 0,01).
Conclusion : Le processus de recueil d'échantillons de crachats pour le CDST n'a pas mis en évidence de différence entre les structures de santé soutenues I et non soutenues par TB CARE I, en dehors d'un délai légèrement plus court. On discute des manières d'améliorer le système actuel.

Marco de referencia: La investigación de los pacientes en retratamiento por tuberculosis (TB) en Zimbabwe comporta el examen microscópico, la prueba Xpert® MTB/RIF y el cultivo con pruebas de sensibilidad a los medicamentos (CDST). Se introdujo el servicio TB CARE I, que consiste en la utilización de motocicletas para el transporte de las muestras de esputo de los establecimientos periféricos de salud a los laboratorios, incluidos los Laboratorios Nacionales de Referencia.
Objetivos: Comparar el acceso al CDST y el desenlace terapéutico de los pacientes en retratamiento atendidos en los establecimientos que cuentan con el servicio TB CARE I y los centros sin este apoyo.
Método: Fue este un estudio de cohortes retrospectivo.
Resultados: Participaron en el estudio 187 pacientes de centros que contaban con el servicio TB CARE I y 116 pacientes de centros sin este apoyo, cuyas características demográficas eran equivalentes. En conjunto, las muestras de 22 pacientes en retratamiento (12%) de establecimientos con respaldo del servicio TB CARE I obtuvieron resultados adecuados del CDST a los medicamentos; esta proporción fue equivalente a la de muestras de los centros sin el servicio de transporte (n = 14, 12%; P = 0,94). La mediana del número de días entre la recogida del esputo y la recepción en el Laboratorio Nacional de Referencia fue inferior en los establecimientos con el servicio TB CARE I que en los centros desprovistos del mismo (mediana 6 días, amplitud intercuartílica [IQR] 4–8 contra 8 días, IQR 6–13,5; P = 0,0001). Se documentaron desenlaces terapéuticos favorables en el 65% de los pacientes cubiertos por el servicio TB CARE I; esta proporción es significativamente más alta que en los pacientes de los establecimientos que no contaban con este apoyo (47%; $P <$ 0,01).
Conclusión: No se observaron diferencias en el proceso de recogida de muestras de esputo para CDST los medicamentos en los establecimientos que contaban o no con el respaldo del programa TB CARE I, con la excepción de un lapso de transporte un poco más corto en los primeros. En el artículo se discuten diversas formas de mejorar el sistema vigente.

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e-ISSN 2220-8372
Editor-in-Chief: Dermot Maher, MD, Switzerland
Contact: pha@theunion.org
PHA website: http://www.theunion.org/what-we-do/journals/pha
Article submission: http://mc.manuscriptcentral.com/pha