

Enhancing the management of cross-regional transfer of floating Tuberculosis cases by active follow-up and communication

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Objectives: To analyse the effects of an intervention on cross-regional transfer of tuberculosis (TB) patients among floating population. **Methods:** On 1 October 2008, the 1-year intervention started by strengthening patients' health education, supervising medical treatments at critical phases, assisting in the transference of TB patients and persisting communication with TB dispensaries outside Shenzhen city. Data were collected from the TB patients' registry book and the TB transference and follow-ups recording book. Primary outcomes were compared at the pre-intervention (From 1 October 2007 to 30 September 2008) and intervention periods. **Results:** A total of 1131 floating tuberculosis cases were registered (594 at the intervention period). Compared with those at the pre-intervention period, the rate of patients' informing doctors before leaving Shenzhen increased significantly (61.8% vs. 39.4%), the rate of successful transference mildly improved (60.0% vs. 50.0%), while the rate decreased dramatically for the re-registered patients at TB dispensaries outside Shenzhen (51.5% vs. 93.6%). **Conclusion:** The intervention improves patients' adherence and enhances collaboration between TB dispensaries, establishes more practical mechanisms, which could be useful for TB control in China. However, more efforts should be directed towards improvement of TB control among floating population, especially advocating the economic perspective.

Introduction

Despite the drastic improvements in tuberculosis (TB) control in China,¹ difficulties still exists among floating population. A floating population refers to people who live or work in a city different from the place of their household registration, mostly consisting of migrant workers. According to the sixth Population Census performed in 2010, there were 221.43 million floating person in China, accounting for 16.5% of the total population.² Most of the floating populations live in poor conditions and hard occupational circumstances, and have difficulties to access health-care services as a result of limited health insurance coverage; thus, putting them at increased health risks.^{3–5} Compared with the local residents, the floating population showed significant higher risks in attracting TB,⁶ mastered less TB knowledge, were more likely to delay treatment and gave up seeking medical care,^{7,8} and the cure rate of TB among them was much lower (63.2% vs. 95.1%).⁹

On 1 October 2006, the project of Floating Population Tuberculosis Control was initiated, which was sponsored by the Fifth Round-China Global Fund TB program. The project was planned to be implemented partially in (120) counties from seven provinces in the eastern part of China—Tianjin, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong and Guangdong.^{10,11} In this project, when migrants were detected with TB, they were immediately registered as 'floating TB cases' in the TB dispensary, were treated equally like the local residents and were provided with financial compensations to cover their transportation and food expenses. Up till September 2008, a total of 19 584 active floating TB cases were registered in 60 counties covered by the project, and the cure rate reached up to 86.0%.¹⁰

As a result of the continuous movement of floating TB cases—the diagnosed TB patients moving back and forth between their

new jobs and their homes—the cross-regional transference of TB cases occurred, which posed a major hurdle in treating TB. It was reported that all over China that the transferred-out rate was 3%, which accounted for 50% of unfavourable treatment outcomes.¹² Thus, in the project, the 'Implementation Plan of Tuberculosis Prevention and Control for floating population' was implemented as a general guideline to manage the cross-regional transfer; it is still in its trial period. According to the guideline, when the floating TB cases migrate back to their hometowns or to their newly established homes, their medical records should be transferred to the TB dispensaries there in order to continue their standard treatment. When the courses of treatments are completed, all records are returned back to the TB dispensaries in the initial places where they were firstly diagnosed with TB and registered. However, regional collaboration mechanisms were not well defined in the guideline; thus, collaboration and information-sharing between regional TB dispensaries was limited, making it harder to trace the floating TB cases, and seriously weakening the TB control effects.¹³

In this article, we described the enhancing management methods in one of the eight districts of Shenzhen city (project city covered by the Global Fund to Fight AIDS, Tuberculosis and Malaria)—Nanshan district, and evaluate their effects on patients' transfer and collaboration between TB dispensaries.

Methods

Setting

Nanshan district is located near Hongkong, with a population of 0.99 million, of which 0.49 million are migrants, and its GDP per capita has reached to 25 000 Dollars in 2009.¹⁴ Also, Nanshan is a pilot site for TB control in China, and there are several

Table 1 Comparison of methods in the intervention period in relation to those in the guidelines

	Methods in the intervention	Methods in the guideline
Health education	Standard education list containing key messages A memo signed by the patients to remind them of the necessity in continuing treatments Strengthened at each doctor's visit	Contents of education was not specified; Lack of reminder factor for patients' responsibility towards fighting TB
Supervision	Collect full patients' contacts information and their families (local and hometown) to make sure successful follow-up One doctor supervises regular intake of medications by patients and timely doctor's visit to discovering potential transfer	None
Transfer assistance	Contact information of TB dispensaries, information about free TB treatments at local places Active and regular follow-up for all patients	Follow-up was only required when emigrant without notification
Communication with TB dispensaries	Live internet-based communication (QQ [®]) Regular follow-up of patients' situation	Seldom communication between TB dispensaries

international TB control projects that are taking place, such as the multidrug resistance tuberculosis control (in 2006) and the tuberculosis control among floating population (in 2007) sponsored by Fifth Round-China Global Fund TB program. In Nanshan, a three-tier TB fighting network is established: TB dispensary—Hospitals—Community Health Centers (CHCs). All suspected pulmonary TB patients are diagnosed at a single government-owned TB dispensary, which is in charge of the district TB control. Hospitals and clinics refer the suspected patients to the TB dispensary. After being diagnosed, all patients are decentralized and treated in the closest CHCs by trained lay health professionals (HPs) using DOTs strategies. For the smear-positive cases, HPs at the CHCs directly observe the intake of medications during the whole course of treatment; while patients with smear-negative results are subjected to direct supervision over their intake of their medications during the intensive period, and later they commence to visit their HPs and receive medications on monthly basis in the continuous phase. Medications are free and consist of 6-month standard regimen for newly treated cases (2 months intensive phase of HRZE—isoniazid, rifampicin, pyrazinamide and ethambutol, followed by 4 months of continuous phase of HR) and 8-month regimen for re-treated (2 months intensive phase of HRZE, followed by 6 months of continuous phase of HR). Supervisory physicians in the TB dispensary regularly distribute the medications to the CHCs, check the treatment cards (the concordance of medications remaining and records, the regularity of medication intake and timeliness of recording by HPs) and interview patients (query adverse drug reactions, remind timely revisiting their doctors and so on).

Design and study participants

From 1 October 2007 to 30 September 2008 (pre-intervention period), the management on cross-regional transfer of TB patients took place according to the guideline that was stated in the project. And On 1 October 2008, an intervention was adopted to strengthen the management of floating TB. The intervention commenced and lasted for one year as described below (And the differences between the methods in the guideline and those in the intervention were showed in Table 1). All the registered pulmonary TB patients among the floating population in Nanshan district were considered as study participants. In this article, a 'floating population' means people without Shenzhen household registration and has lived in Shenzhen at least for 3 months. The status of TB patients who migrated out of Shenzhen to other cities in China

was defined as a 'cross-regional transfer'. The primary outcomes were rates of patients' informing doctors before leaving, successful transfer and re-registration.

Intervention

The intervention contained: (1) strengthening patients' health education on adhering to anti-tuberculosis medications; (2) supervising critical treatment courses to timely discover potential transfer; (3) assisting in transferring TB patients; and (4) continuous communication and sharing information with the TB dispensaries where patients were transferred (See Figure 1A in Supplementary Appendix).

Strengthening patients' health education

Once a patient was diagnosed with TB, a physician in Nanshan's TB dispensary provided a standard face-to-face health education about TB, including knowledge about TB, free TB treatment policy, DOTs strategy and most importantly the necessity of adhering to TB treatment. At the end of the educational period, each patient was required to sign a memo about avoiding unnecessary migration and informing the dispensary doctor before leaving Shenzhen city. Also, with each monthly visit to the doctor at the dispensary during the treatment course, the deliverance of health education was further strengthened for patients.

Supervision over the course of treatment

One designated doctor supervised all TB treatments in the 100 CHCs in Nanshan district. Once the interruption of medicine occurs or non-timely doctors' visit was found, the supervisor doctor first contacted patients by phone ('as all contact information was collected at the first visit, including patients' telephone numbers, mobile phone numbers, addresses in Shenzhen and at their hometowns; as well as contact information of patients' relatives'). If the patient was not available, the supervisor doctor notified the HPs immediately at the CHCs to follow-up by performing home visits.

Assisting in transferring patients

(1) Patients who already informed doctors before leaving: before each patient migrated out of Shenzhen to another city, the responsible physician provided the patient with all the contact information about the TB dispensary in the destination city. Then, a formal 'Tuberculosis patient's transfer list' (shortly as 'formal

Table 2 Characteristics of all TB patients among floating population at pre-intervention and intervention periods

	Pre-intervention (n = 537)	Intervention (n = 594)	Total (n = 1131)	χ^2	P-value
Gender				0.210	0.647
Male	321 (59.8)	363 (61.1)	684 (60.5)		
Female	216 (40.2)	231 (38.9)	447 (39.5)		
Age				6.654	0.155
15~24	193 (35.9)	235 (39.6)	428 (37.8)		
25~34	220 (41.0)	218 (36.7)	438 (38.7)		
35~44	85 (15.8)	87 (14.6)	172 (15.2)		
45~54	16 (3.0)	32 (5.4)	48 (4.2)		
≥ 55	23 (4.3)	22 (3.7)	45 (4.0)		
Treatment				1.839	0.175
New cases	526 (98.0)	574 (96.6)	1100 (97.3)		
Retreated cases	11 (2.0)	20 (3.4)	31 (2.7)		
Diagnosis				0.451	0.502
Smear positive	243 (45.3)	257 (43.3)	500 (44.2)		
Smear negative	294 (54.7)	337 (56.7)	631 (55.8)		

list' hereafter) was provided to the patient before departure, and to the aimed TB dispensary through email or by fax. The list contained each patient's basic information, diagnosis, sputum smear test results and treatment plans. Also, every transferred patient was supplied with medications that could last several days; depending on the distance from Shenzhen to the destination city. After patients had transferred-out of Shenzhen, follow-ups on each patient occurred at 1 week interval for the first month, and twice at the second month until the patient had arrived to the aimed TB dispensary.

(2) Patients leaving without informing: once a patient has already been found emigrated, follow-ups by telephone calls to the patient and/or home visit were immediately implemented. Also, the formal list was sent to the TB dispensary at the patient's hometown and requested assistance for the follow-ups on the specific patient. The follow-ups on patients were as the same as when tracing patients who already informed doctors before their departures. If a patient was found that had already arrived to another city rather than hometown, then the formal list was sent to the new TB dispensary.

If there was failure in contacting the patient within 2 months after emigrating, then the patient was recorded as a 'lost' case.

Continuous communication with the targeted TB dispensaries

Besides supplying the formal list to the TB dispensaries at the week of transfer, the doctors at Nanshan TB dispensary maintained in contacting the targeted TB dispensaries at regular intervals (1 week at the first migrated month and 2 weeks at the second month) until patients arrived to the dispensary and continued their treatment. Communication continued between Nanshan TB Dispensary and the TB dispensaries where the transferred patient received the treatments at the end of second month, fifth month and sixth month (or at the end of course) of treatment course to attain the treatment outcomes. Also, a live internet communication was established between TB dispensaries using Tencent QQ[®] software, to share more detailed information.

Data collection and analysis

For each transferred patient, general information (such as age, gender and hometown), types of diagnosis, types of treatment and months of treatment received were collected from the TB patients' registry book; and migration information, e.g. follow-up situations and transfer results, were extracted from the TB transference and follow-ups recording book. Statistical analysis was performed using SPSS for Windows Version 12.0 (SPSS, Chicago, IL, USA). Variables were analysed in a descriptive method, and Chi-square test was used to detect the effects of

intervention on patients' transfer and the behaviour of TB dispensaries. Logistic regression was used to detect the intervention impact on patients' adherence and TB dispensaries collaboration, adjusting for variables of age, gender, types of diagnosis, types of treatment and months of treatment received. Statistical significance level (α) was set at 0.05. And indicators were defined as following:

- Rate of transfer = No. of transferred/No. of total registered.
- Rate of informing before leaving = No. of informed/No. of total transferred.
- Rate of successful transfer = No. of successfully transferred/No. of total transferred.
- Rate of re-registration = No. of patients re-registered by the TB dispensaries/No. of successfully transferred.

Results

A total of 537 floating pulmonary tuberculosis cases were registered at the pre-intervention period (from 1 October 2007 to 30 September 2008) and 594 cases at the intervention period (from 1 October 2008 to 30 September 2009) at Nanshan District. There were no statistically significant differences between pre-intervention period and intervention period among variations in gender, age, types of diagnosis and types of treatments (See Table 2).

There were 94 cases (17.5%) that migrated out of Shenzhen at the pre-intervention period, and showed no decline during the intervention period (110 cases, 18.5%). The population came from 21 provinces in China, of which more than half were from Sichuan, Hunan, Hubei (cross-province floating population) and Guangdong (inter province migrants). Most transference of TB patients occurred at 0–2 months of medication treatment course, which accounted for 64.2% of all migrated cases; and most of them were transferred back to their own hometowns. The transfer-out occurred mostly from November to January (a period covering Chinese Spring Festival) at the pre-intervention period, and from April to June at the intervention period. Figure 1 shows detailed transfer at each month within the 2 years.

At the pre-intervention period, among the 94 migrated TB cases, 37 cases (39.4%) informed doctors before leaving; only 47 cases (50.0%) had successful transfer to the TB dispensaries and continued their treatment, of which 44 cases (93.6%) were re-registered, 2 cases changed to self-paid treatment, and only 1 case was treated as the original treatment. At the intervention period, the informed rate improved significantly where 68 cases (61.8%) reported their leaving ($\chi^2 = 10.233$, $P = 0.001$); and 66 cases (60.0%) were successfully transferred, even though there was no statistical significance ($\chi^2 = 2.051$, $P = 0.152$). And most

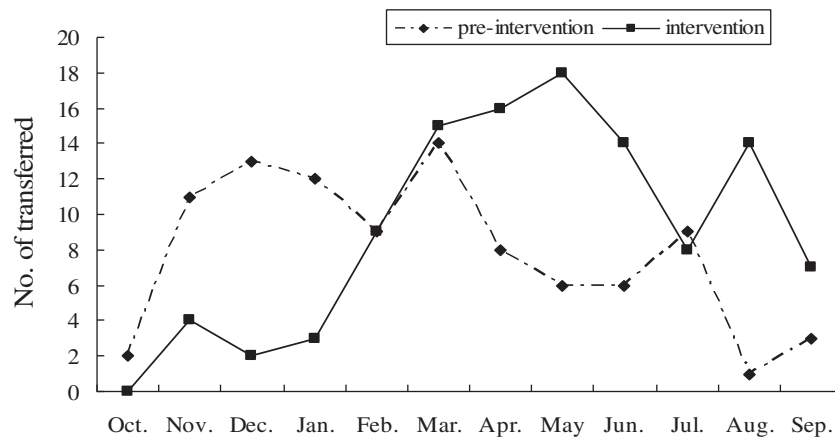


Figure 1 Monthly transfer of floating TB patients at pre-intervention and intervention periods

Table 3 Intervention effects on transfer of floating TB patients

Indicators ^a	Pre-intervention, n (%)	Intervention, n (%)	Total, N (%)	χ^2	P-value	OR ^b (95% CI)
Transferred	94 (17.5)	110 (18.5)	204 (18.0)	0.196	0.658	/
Informed before leaving	37 (39.4)	68 (61.8)	105 (51.5)	10.233	0.001	2.152 (1.177 ± 3.933)
Successful Transferred	47 (50.0)	66 (60.0)	113 (55.4)	2.051	0.152	/
Re-registered	44 (93.6)	34 (51.5)	78 (69.0)	22.759	<0.001	0.025 (0.005 ± 0.135)

a: Rate of transfer=No. of transferred/No. of total registered; Rate of informing before leaving=No. of informed/No. of total transferred; Rate of successful transfer=No. of successfully transferred/No. of total transferred; Rate of re-registration=No. of patients re-registered by the TB dispensaries/No. of successfully transferred.

b: Adjusted for variables of age (dummed as: ' ≤ 24 years old'=0, ' $25-34$ '=1, ' ≥ 35 '=2), gender, types of diagnosis, types of treatment and months of treatment received.

importantly, the rate of re-registration at the TB dispensaries had decreased from 93.6% to 51.5% ($\chi^2=22.759$, $P<0.001$). After adjusting for age, gender, types of diagnosis, types of treatment and months of treatment received, it showed that patients who reported their leaving in the intervention period were 2.152 times as those in the pre-intervention, and there were only 0.025 who re-registered (Table 3).

Discussion

Interruption of treatment among TB patients in floating populations not only results in a low cure rate—causes spread of the original source of infection, but also leads to the occurrence of multiple drug resistant-TB. Presently, researches concerning mobilized population with TB in China are focusing mainly on the epidemic, case detection and the treatment effects.^{13,15-18} However, the interventions on cross-regional transfer are seldom studied, which is an important impact on the effects of treatments. In low or middle TB prevalence countries—such as in Europe and America—TB screening for immigrants occurs at the entrance of each country,¹⁹ or overseas before emigrating,²⁰ as well as the follow-ups are adapted to control TB among migrants. However, such measures are not practical for internal migration and are costly, especially for countries with poor resources.^{21,22} In this study, more applicable mechanisms were established for cross-regional transfer of floating populations with TB by introducing a multi-targeted intervention through strengthening patients' health education, supervising over treatment courses, assisting patients' transfer and persisting communication with TB dispensaries. The intervention improved patients' adherence to the treatment protocols ('rate of informing dispensaries before leaving increased significantly'), as well as strengthened the collaboration between different regional TB dispensaries ('rate of re-registered decreased'). The experience might be able to

benefit the tuberculosis control within the project of Floating Population Tuberculosis Control, as well as the whole TB control in China.

Despite doctors have repeatedly emphasized on the necessity of treatment continuity in Shenzhen, the transfer-out of TB patients witnessed no decrease (17.5% vs. 18.5%), which could be related to the economic burdens known as the structure factors for patients' adherence; and it is out of patients control and the health service providers.²³ Many floating patients with TB had experienced high medical costs during TB treatment, which was one of the biggest barriers to TB care.²⁴ Very few patients in Shenzhen are covered by the Shenzhen urban basic health insurance for workers or 'Shenzhen rural-to-urban workers insurance'. Also, the TB floating population will always lose or leave their temporary jobs. Without economic support from the authorities, this group of patients will not be able to afford housing, transportation and other basic living expenses, despite the existing free TB treatment policy (which merely covers part of the treatment fees) and the reimbursement of food and transportation (only about 20 USD a month); thus, forcing them to return to their own hometowns to receive family support. Even, a study in China on the effects of modern National TB Control Program (NTP) with DOTs strategy illustrated that NTP had shifted patient's expenditures only from post-diagnosis to pre-diagnosis, and patients continued to suffer from heavy economic burdens.²⁵ With the global economic crisis that took place at the end of 2008 and lasted till the beginning of 2009, many companies faced bankruptcy or reduced their productions; thus, inflicted enormous unemployment especially among the labour-heavy industries. This large number of floating population were forced indirectly to return back to their own hometowns including the TB patients, as it is shown in Figure 1 that the ascending number of transfer had happened from April to June in 2009, but not in the Chinese traditional Spring Festival period.

Patients' motivation, knowledge and beliefs played a critical role in adhering to treatment protocols.²³ Health education mainly addresses personal barriers concerning knowledge and understanding of treatment requirements. Through standardizing health education content, critical knowledge would not be missed by doctors in TB dispensary and is clearly transmitted to patients. Requiring patients to sign a memo containing a reminder to adhere to treatment may allow patients to have a sense of self-efficacy as well as empowering patients to take active participation in the treatment.

If patients migrated without reporting before their departure then it will be very hard to trace these patients in floating populations ('since they usually change their mobile phone numbers after migrating to the new cities to save communication fees'). Among the useful suggestions, the TB dispensaries should take into consideration: establishing an effective supervision over the treatment courses, which is essential in detecting the potential transfer; and also thorough comprehensive collection of contact information may assist in tracing patients. Though the rate of success of transfer only increased a little (50.0% vs. 60.0%), this could be related to many other factors besides patients' adherence, i.e. treatment at private hospitals or clinics without TB-reporting system and/or inactive follow-up by the TB dispensaries.

Providing the addresses and contact information of local TB dispensaries to TB patients may improve the access to TB health services; thus, avoiding a certain proportion of delay and giving-ups of treatment. It was considered that regular follow-ups after transferring-out by doctors at TB dispensary could be a reminder and motivation for patients to continue TB treatment. Also it was believed that through regular communication between patients and doctors when following ups might assist in establishing patients' trust in doctors, which was another critical impact factor for patients' adherence to medications. A study in Senegal had already illustrated that patient's outcomes was improved through strengthened counselling and communication between health staff and patients, decentralization of treatment, patient choice of directly observed treatment supporter and reinforced supervision.²⁶

Re-registration rate is a critical indicator that reflects the collaboration between the TB dispensaries in different regions. Patients can be re-registered when they have already received <1-month medication or there is interruption in the treatment for at least 2 months;¹¹ otherwise it is illegal to do so. Part of illegal re-registration is done by the TB dispensaries because of the high pressures inflicted on doctors to reach their targets—the project had set up a yearly goal for each TB dispensary to detect specific numbers of patients, manage and cure. Since there is a lack of coordination, the TB dispensaries in different regions scramble for patients and illegally re-register them, leading to the inaccurate statistics of tuberculosis epidemic and the interruption of treatments.

During the whole study period, the TB dispensaries out of the project areas were unfamiliar with or unaware of the manipulation of managing the cross-regional transfer TB patients. At the intervention period, with continuous communication, lively sharing of information and guidelines, collaborations were gradually established, which was reflected on the decreased rate of re-registration from 93.5% to 51.5%. Hence, NTP should develop a guideline for the management of cross-regional transfer-out patients, based on the guideline of the project of Floating Population Tuberculosis Control and experiences from pilot areas.

Limitation

This study only observed outcomes of an intervention period for 1 year. A further study is needed to analyse the long-term effects. Secondly, we did not include the clinic outcome indicators, such as cure rate, since we could not acquire them if the patient is lost. However, it is without any doubt that the outcome will not be

sound if a patient receives no standard treatment and the successful treatment rate has reached 86% under standard treatment,¹⁰ which makes the successful transfer rate indirectly reflect the treatment outcomes of patients.

Conclusion

By strengthening patients' health education about TB, supervising the treatment course, regularly tracing patients and continuously communicating with the TB dispensaries, the intervention methods improve patients' compliance and enhance collaboration between TB dispensaries. However, more efforts should be done to improve the management of TB patients among floating populations, especially from economic perspectives.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

What are already known on this topic:

- Presence of tuberculosis among the floating population is a major challenge for TB control in China.
- Lacking collaboration and coordination between TB dispensaries, the cross-regional transfer of floating TB cases mostly results in interruption of treatment, causes spread of the original source of infection, posing a major hurdle in treating TB.

What this study adds:

- Economic factor plays an important role in cross-regional transfer of floating tuberculosis patients.
- By strengthening patients' health education about TB, supervising the treatment course, assisting in patients' transference and persisting communicating and information sharing between the TB dispensaries, compliance of patients is improved and collaboration between TB dispensaries is enhanced.

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