

# The Application of Multidisciplinary Cooperative Complete Management Mode in the Management of Multi-Drug Resistant Tuberculosis Patients

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## Research article

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# Abstract

**Objective:** This study aims to explore the effect of multi-disciplinary cooperative complete management mode in the treatment of multi-drug resistant tuberculosis (MDR-TB).

**Methods:** 280 patients were randomly classified into the observation group (n = 140) and the control group (n = 140). The control group was applied with the routine management mode, while the observation group was applied with the multi-disciplinary cooperative complete management one. The treatment compliance, life quality, treatment completion rate as well as the patient satisfaction in the two groups were observed.

**Results:** The treatment compliance of the observation group was better than that of the control group ( $P < 0.05$ ). The life quality of the observation group was higher than those of the control group ( $P < 0.05$ ). The treatment completion rate of the observation group was higher than that of the control group ( $P < 0.05$ ). The patient satisfaction of the observation group was better than that of the control group ( $P < 0.05$ ).

**Conclusion:** The application of multi-disciplinary cooperative management mode to MDR-TB patients can enhance their treatment compliance, life quality, treatment completion rate and satisfaction degree.

## Introduction

MDR-TB (multi-drug resistant tuberculosis) in China is still stuck in a tough situation due to the lack of unified and standardized management for MDR-TB patients in clinical practice, poor treatment compliance, irregular use of medicine, loss to follow-up, treatment refusal and so on<sup>1-4</sup>. Patients' poor treatment compliance is a major hazardous factor which makes mycobacterium tuberculosis develop resistance to many drugs<sup>5</sup>. Many patients refuse to doctor's home visits for fear of revealing their privacy, and they find it is troublesome and burdensome to take medicines under direct supervision, which leads to the implementation obstacle of taking medicine under supervision<sup>6</sup>. Therefore, more positive management interventions need to be carried out in order to enhance the medication compliance of patients and their awareness rate of relevant knowledge<sup>7</sup>. Aiming to improve the medicine-taken patients' treatment compliance, achieve an early detection of the adverse drug reactions, enhance patients' life quality, change the unhealthy emotions of caregivers and patients, promote patient satisfaction and reduce the transmission of mycobacterium tuberculosis, our hospital has adopted multi-disciplinary cooperative complete management mode in the treatment of MDR-TB and has obtained a favorable effect. Here is our report.

## 1 Materials And Methods

### 1.1 General information

This study chose 280 cases of MDR-TB in Zhejiang Integrated Traditional and Western Medicine Hospital between January 2016 to March 2017 and their TB sputum examination was confirmed as (+) on admission. Besides, rifampicin and isoniazid were tested both ineffective to them. Additionally, they suffered from severe hepatic and kidney dysfunction, cardio-cerebrovascular disease and cognitive impairment. Our study was authorized by Hospital Ethics Committee, and agreed by all patients and their dependent.

The above patients were divided into the control group (n = 140) and the observation group (n = 140) by means of random number table. In the control group, there are 82 males and 58 females, ranging from 25 to 65 years old and the average age is (36.12 ± 3.25) years old. In terms of their education level, 83 cases graduated from primary or middle high school, 45 cases were from senior high school and 12 cases have associate and undergraduate or higher degrees. In the observation group, there are 83 males and 57 females, ranging from 26 to 70 years old and the average age is (38.18 ± 3.27) years old. In terms of their education level, 74 cases graduated from primary or middle high school, 51 cases were from senior high school and 15 cases have associate and undergraduate or higher degrees. The general information comparison of the two groups included gender, age, nationality, occupation, education level ( $P > 0.05$ ). All detailed information is listed in Table 1.

Table 1  
General Data Comparison of the Two Groups

Data	Total cases (N = 280)	Observation group	Control group	<i>P</i> values
Age (years)				
range	280	26–70	25–65	
Average age	280	38.18 ± 3.27	36.12 ± 3.25	
Gender				0.90
Male	165	83	82	
Female	115	57	58	
Nationality				0.21
Han nationality	213	102	111	
Other nationality	67	38	29	
Occupation				0.14
farmer	166	77	89	
Non-farmer	114	63	51	
Education level				0.54
Primary and middle high school	157	74	83	
Senior high school	96	51	45	
Junior college and above	27	15	12	

## 1.2 Methods

The control group adopted routine management mode: health propaganda and education, medication management and infection control management were provided during hospitalization. Telephone follow-up was given after patients were discharged, and community hospital was responsible for the rest of affairs.

The observation group followed the multi-disciplinary cooperative complete management mode: the hospital management team was responsible for during and after the whole process of hospitalization until the completion of the treatment. Specific operation:

(1) A multi-disciplinary cooperative complete management group consists of 2 doctors, 1 duty nurse, 1 specialized nurse of integrated traditional Chinese and western medicine, 1 clinical pharmacist and 1 psychological consultant. Other major caregivers were also invited to the group.

(2) The admission criteria and job responsibilities for each member were made as follow: **Doctors:** Attending tuberculosis doctors or with higher professional titles who had experience of the treatment and management of MDR-TB patients and who had ever received relevant training were required. Doctors' specific responsibilities include screening the patients who accorded with the admission criteria, communicating with the patients to obtain their agreement, making the patients' treatment plans and addressing the adverse situations during the process of treatment. **Duty nurse:** Duty nurses were bedside nurses who were in charge of patients' daily life during their hospitalization. They were responsible for the investigation of TB-related knowledge and infection control knowledge when patients and primary caregivers were admitted to hospital and discharged from hospital. According to the results of the investigation and the knowledge that remained unknown to patients and caregivers, individual and systematic propaganda and education plan were correspondingly made, including adverse drug reaction monitoring, infection control, daily life activities and so on. They also supervised the patients' medicine-taken in person during hospitalization, observed the adverse drug reactions and assisted patients' infection control. In addition, they were involved in the WeChat group for discharged patients and supervised patients to take medicine by video calls every day, informed patients to do reexamination on time through monthly telephone follow-up, observed and dealt with preliminarily patients' adverse reactions and reported to the doctors in charge, offered guidance to discharged patients for infection control during home-base treatment and organized peer support activities. **Specialized Nurse of integrated traditional Chinese and western medicine:** These nurses were required to implement appropriate Chinese medicine operation technique in line with patients' different symptoms during hospitalization and carried out individual healthy propaganda and education of Chinese medicine. For example, patients with lung yin deficiency syndrome were given auricular-plaster and point-application therapies in order to nourish yin and moisten lung, while sticking therapy was given to improve the common tuberculosis symptoms, such as night sweats and fever. Besides, moxibustion and point massage were applied to address gastric anorexia and gastrointestinal reaction caused by tuberculosis drugs. Discharged patients were provided with knowledge of traditional Chinese medicine and personalized guidance. **Clinical pharmacist:** The clinical pharmacists had received professional training by our hospital and were mainly responsible for solving the questions and doubts related to the drug efficacy and adverse drug reactions. **Psychological consultant:** Consultants with a certificate of psychological consultant and were required to support patients and their chief caregivers psychologically. **Patient's primary caregivers:** Primary caregivers were taught by duty nurses about the knowledge of medicine precautions, adverse drug reaction symptoms and home infection control. These contents were continuously reinforced during patient's hospitalization and would be tested before discharge. They also supervised patients' daily activities at home after patients were discharged, communicated with nurses or doctors about patients' physical conditions and assisted patients with home infection control.

(3) The basic disease information of patients was obtained and personal information file was established, including name, gender, education, family members, tuberculosis-related knowledge, treatment schemes, treatment course and so on.

(4) Operation procedures:

### **Admission of patients**

**Attending doctor:** Formulate treatment plans, etc.

**Duty nurse:** Send out *Questionnaire on Knowledge of Tuberculosis in Drug Resistant Patients and Caregivers*; get to know patients' and their caregivers' knowledge of tuberculosis and infection control; formulate personalized and systematic propaganda schemes.

**Specialized nurse of integrated traditional Chinese and western medicine:** [Develop appropriate techniques for individualized traditional Chinese medicine].

**Clinical pharmacist:** Solve patient's doubts and questions about medicine.

**Main caregivers:** Be enquired for the patients' information,



### **During hospitalization**

**Attending doctor:** Formulate examination and treatment schemes according to the project requirements.

**Duty nurse:** Formulate and carry out personalized and systematic propaganda scheme; supervise patients to take medicine in person, notice and deal with adverse drug reactions and control infection.

**Specialized nurse of integrated traditional Chinese and western medicine:** Offer health-keeping guidance of traditional Chinese medicine.

**Clinical pharmacist:** Solve doubts and questions about medicine.

**Main caregivers:** Acquire the knowledge about tuberculosis, infection control and adverse drug reaction monitoring.



### **Preparations before discharge**

**Duty nurse:** Responsible for home infection control education; teach caregivers how to conduct patients taking medication supervision, how to observe the adverse drug reactions and how to make return visits; set up “WeChat group for patients”.

**Psychological consultant:** Offer psychological support to patients.



### **After hospitalization**

**Attending doctor:** Formulate examination and treatment schemes in line with the project requirements; [make an appointment for return visits]; solve questions and doubts about the treatment.

**Duty nurse:** In charge of the management of “WeChat group for patients”; monitor patients taking medicine via video calls; spread the knowledge of infection control; remind patients of return visits; handle adverse drug reactions and organize peer support activities.

**Psychological consultant:** Offer psychological support to patients.

**Specialized nurse of integrated traditional Chinese and western medicine:** Offer health-keeping guidance of traditional Chinese medicine.

**Clinical pharmacist:** Solve relevant doubts and questions of patients about medicine.

**Main caregivers:** Report patients’ situation; supervise patients to take medicine and carry out infection control.

## **1.3 Observation indexes**

### **1.3.1 Treatment compliance**

The treatment compliance was observed between the two groups. Patients in the groups who could take anti-tuberculosis medicine properly and regularly according to the treatment scheme, actively cooperate with the treatment, reexamine regularly on blood routine, hepatic and renal function, CT images of lungs and sputum examination were considered to have good treatment compliance. On the contrary, patients in the groups who failed to do those mentioned above were regarded as having poor treatment compliance.

### **1.3.2 Evaluation of life quality**

Medical Outcomes Study Short-form 36 (MOS SF-36) created by American Medical Institute was adopted to evaluate patients' life quality. The form includes 8 dimensions and 36 items: physiological roles, physiological functions, health conditions, body pain, social functions, vitality, emotional functions, mental health. The total score is ranging from 0 to 100, the higher score shows a better life quality<sup>8</sup>.

### **1.3.3 Treatment completion rate**

Patients' treatment completion rate was observed in terms of whether patients had finished the whole treatment processes or ended the treatment due to adverse drug reactions, treatment failure, lost to follow-up and other aspects (such as returning to their local place for treatment).

### **1.3.4 Patient satisfaction**

The investigation table of satisfaction degree designed by our hospital was adopted to evaluate the mode from five aspects: very satisfied, satisfied, barely satisfied, okay, not satisfied.

## **1.4 Statistical method**

All data were processed by SPSS 22.0 software. The measurement data and enumeration data were analyzed by using *t*-test and  $\chi^2$ -test.  $P < 0.05$  was considered statistically significant.

## **2. Results**

### **2.1 Comparison of treatment compliance**

Treatment compliance was 87.1% in the observation group and 60.0% in the control group, the differences being statistically significant between the two groups ( $P < 0.001$ ). See Table 2.

Table 2  
Comparison of treatment compliance [n (%)]

Group	n	Good compliance	Poor compliance	Compliance rate
Observation group	140	122	18	87.1%
Control group	140	84	56	60.0%
$\chi^2$ values	26.52			
<i>P</i> values	< 0.0001			

## 2.2 Comparison of the improvement of life quality

The score of patients' life quality after treatment in the observation group was (91.03 ± 16.58), while the control group was (72.36 ± 13.08). The life quality in two groups was significantly higher than before, and the score of the observation group was significantly higher than that of the control group ( $P < 0.05$ ). See Table 3.

Table 3  
Comparison of life quality [ $\bar{X} \pm s$ , score]

Group	n	Before treatment	After treatment
Observation group	140	58 ± 12.02	91.03 ± 16.58 <sup>□□</sup>
Control group	140	56 ± 11.14	72.36 ± 13.08

## 2.3 Comparison of treatment completion rate

The treatment completion rate was 95% in the observation group and 72.1% in the control group, the differences being statistically significant between the two groups ( $P < 0.0001$ ). See Table 4.

Table 4  
Comparison of treatment completion rate [n (%)]

Group	n	Completed treatment	Stopped treatment	Treatment failure	Loss to follow-up	others	Treatment completion rate
Observation group	140	133	1	1	1	4	95.0%
Control group	140	101	12	14	3	10	72.1%
$\chi^2$ values	28.52						
<i>P</i> values	< 0.0001						

## 2.4 Comparison of patient satisfaction

Patient satisfaction rate was 97.1% in the observation group and 77.1% in the control group, the differences being statistically significant between the two groups ( $P < 0.05$ ). See Table 5.

Table 5  
Comparison of patient satisfaction rate [n (%)]

Group	n	Very satisfied	Satisfied	Barely satisfied	Okay	Not satisfied	Satisfaction rate
Observation group	140	136	3	1	0	0	97.1%
Control group	140	108	6	10	9	7	77.1%
$\chi^2$ values	27.58						
$P$ values	< 0.0001						

### 3 Discussion

Patients with tuberculosis are required to take medicine on a full-course and regular basis due to the long courses of tuberculosis with the chronic and delayed features. Besides, the problems of discharged patients' treatment compliance emerged, such as missing doses, stopping taking medicine or missing the re-examination appointments. Compared with the non-drug resistant tuberculosis, treatment of drug resistant tuberculosis (especially multi-drug resistant TB, MDR-TB/extensively drug-resistant TB, XDR-TB) requires more drug combinations, which means lower efficacy, long-course therapy and worse tolerance. On average, only 22–26% of the XDR-TB patients in the world successfully completed anti-tuberculosis therapy<sup>9</sup>. At present, drug resistant tuberculosis has become one of the most important public health issues, which has a negative effect on the global containment of tuberculosis by 2035 and the elimination of tuberculosis by 2050 proposed by World Health Organization (WHO). According to the 2017 Global Tuberculosis Report released by WHO, the incident number of tuberculosis in the world reached 10,400,000 in 2016, among which new cases of MDR-TB and rifampicin drug resistant tuberculosis were 600,000 and new cases of XDR-TB reached 30,000<sup>10</sup>. However, the current management mode of MDR-TB patients has hit a bottleneck. For example, it is difficult to improve patients' treatment compliance and completion rate. Therefore, it is very urgent to explore a new management mode to better ensure patients' successful treatment, hence reducing public health hazard.

Multi-disciplinary cooperative complete management mode is realized by a team made up of medical staff from different disciplines and professional background, and it demonstrates a new orientation of exploration and development for medical institutions in China. By means of this mode, multi-faceted nursing knowledge propaganda, education and instructions can be provided for patients, which forms a set of systematic, standardized and comprehensive nursing procedures and aims to improve patients' awareness of their diseases, regulate patients' behavior in order to promote their treatment efficacy and enhance patients' treatment compliance and life quality<sup>11</sup>. The mode always puts patients under the

limelight in clinical work and plays a highly important role in improving medical quality as well as patients' satisfaction on condition that patients' medical safety is guaranteed<sup>12</sup>. The application of the team's management on patients with chronic diseases has showed that patients' negative sentiments, life quality can be effectively improved<sup>13</sup>, and transfer treatment and continual care can also be improved<sup>14</sup>. Consequently, we introduced the mode into the management of MDR-TB patients, which turned out that these patients benefited a lot from the mode: their treatment compliance, completion rate and life quality were considerably promoted.

Multi-disciplinary cooperative complete management mode presents a new care management mode, which has achieved great application effect overseas. However, there are few domestic researches about this mode<sup>15</sup>. Compared with the conventional nursing pattern of tuberculosis, this mode has the following characteristics: ☐ Stage: In terms of in-hospital and out-hospital, patients can be ensured to take medicine on a regular basis and complete the designated treatment course on time; ☐ Continuity: The whole nursing process is carried out by the management group which is established upon admission. The seamless connection makes the nursing care service continual and effective and decreases the potential information leakage; ☐ Richness: The establishment of personal files, drug use instructions, regular assessment, health education and so on are added based on nursing care in the mode; ☐ Diversity of forms: The forms of follow-up include various ways, such as phone calls, home visits and out-patient clinic follow-up. Multi-media, health booklets and bedside education are contained in health education. Sending texts, telephone enquiry and on-site supervision are applied to supervise patients taking medicine. The researches by Cao Maotao<sup>16</sup>, Luo Shizhen<sup>17</sup> and Zhang Huayan<sup>18</sup> revealed that multi-disciplinary cooperative complete management mode can effectively regulate MDR-TB patients' treatment habits, improve patients' health knowledge level and medication compliance in order to further facilitate the improvement of prognosis, which produces a noticeable curative effect and deserves clinical application and expansion.

Multi-disciplinary cooperative complete management mode is a new model in which multi-disciplinary cooperation and complete management mode are effectively integrated together. Many professional medical staff in the team have complementary backgrounds and skills, and they are encouraged to involve in a dynamic process of collaborating and communicating with each other. In this way, multiple guarantee can be ensured and team members can better meet patients' multi-faceted needs in a more effective, professional and comprehensive manner<sup>19</sup>. In this study, the multi-disciplinary mode could avoid the singleness and poor pertinency of the traditional one and effectively combine the merits of both the new mode and the traditional one so as to optimize its advantages. The application of multi-disciplinary cooperative complete management mode in the management of MDR-TB patients provides an interactive platform in which doctors and patients, patients and main caregivers can communicate with each other. Professional nursing care was provided throughout the whole process of treatment, and disease-related knowledge which patients failed to grasp after discharge, and the knowledge of infection control, health education and self-regulation were provided in particular for the purpose of helping

patients get continuous, seamless and professional treatment and care, which ultimately aimed to control disease, improve the curative effect as well as life quality.

The establishment of the systematic and coherent procedures of multi-disciplinary cooperative complete management mode has resulted in a practical and workable implementation plan and patient-centered approach. The application of multi-disciplinary collaborative intervention in MDR-TB patients is beneficial to patients' recovery and is worthy of clinical promotion and application. Admittedly, the application of the mode in the management of MDR-TB patients is only a preliminary study. As medical staff with multiple professional backgrounds are required in the mode, which is fairly complicated and needs considerable economic investment. Thus, policy-wise top-level design and a wider, deeper and multi-center study are in urgent need.

## Declarations

## Founding

Zhejiang TCM Science and Technology Plan Project (Project No.: 2016za157)

## Competing interests

The authors declare that they have no potential conflicts of interests.

## Availability of data and materials

The data and materials in the current study are available from the corresponding author on reasonable request.

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