


Evaluation of the Spring Seedling Project—Zhaotong Program: A study of a novel continuing medical education program for rural doctors in China

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Funding information

Shanghai Charity Foundation Zhaotong Country Doctor Training Program

Abstract

Objective: To evaluate the effectiveness of the Spring Seedling Project-Zhaotong program, a novel continuing medical education program, to improve the knowledge and skills of rural doctors in China.

Design: An uncontrolled single-group pre- and post-intervention design based on quantitative and qualitative methods.

Setting: Zhaotong is a prefecture-level city located in Yunnan, China.

Participants: A total of 1866 country doctors practising in Zhaotong were enrolled.

Interventions: The Zhaotong program consisted of three stages: remote education, workshops conducted in Zhaotong and field training in Shanghai.

Main outcome measures: The effectiveness of the remote education and Zhaotong workshop stages was assessed based on differences between pre- and post-training test scores. Qualitative comments were collected to assess the experience of country doctors following the Shanghai field training stage.

Results: In total, 1866 country doctors (46.9% males; mean age: 38.2 ± 9.2 years) participated in the program. The average score of the post-training test was higher than that of the pre-training test, both online ($P < .001$) and offline ($P < .001$). In regard to the Zhaotong workshops, with the exception of incisions/suturing, the average scores of cardiopulmonary resuscitation, gynaecological examinations and child growth/development were improved after training ($P < .001$). Qualitative analysis showed that Shanghai field training enhanced understanding of general practice, with the majority of country doctors indicating that they would apply what they learned in daily practice.

Conclusion: This study introduced a comprehensive form of continuing medical education for rural doctors in Zhaotong and proved the effectiveness of this program and also provided a reference point for the future development of continuing medical education.

KEYWORDS

continuing medical education, GP, program evaluation, remote and rural education, rural

1 | INTRODUCTION

Continuing medical education (CME) is intended to update the knowledge, skills and performance of medical practitioners.¹ Together with under- and postgraduate education, CME constitutes the cornerstone of a lifelong learning system.² Appropriate, adequate and comprehensive CME is becoming increasingly necessary to maintain professional standards and fulfil the licensing requirements of GPs.³ Although rural GPs are vital to the availability of primary care in rural areas of developed and developing countries and reportedly have higher CME needs than urban physicians, access to CME can be hampered by the local accessibility; expenses associated with travel, accommodations and participation fees; and increased time off for study.^{4,5}

The public health policy of China has always put emphasis on rural areas and grassroot communities,⁶ as the quality and quantity of GPs are critical to meet the basic medical and public health needs of rural populations.⁷ Although rural doctors in China undertake the duties of GPs, some receive no formal training in general practice.⁸ Therefore, the government of China has aimed to improve the general practice literacy of rural doctors through various CME programs. However, despite the strong demand, there is a relative lack of CME resources in rural areas throughout China, as in other countries.^{5,9} To address this issue, the aim of the Spring Seedling Project, which is based at the Zhu Shanzhu-Gu Jie Rural Practice Ambulatory Training Center and supported by Fudan University (Shanghai, China), is to integrate social resources to improve accessibility to CME by rural GPs in China. The first program of the Spring Seedling Project was conducted in Zhaotong, a prefecture-level city in Yunnan Province.

The CME needs of rural GPs are unique and include not only knowledge of emergency medicine, obstetrics, advanced procedural skills and special knowledge pertinent to specific rural locations,^{4,5,10} but also methods the CME programs organised, for example, lectures, workshops, remote education and practice-based learning.¹¹⁻¹⁴ To date, relatively few studies have reported the effectiveness of CME programs to improve the performance or patient care of rural doctors.⁵ Of these, most have focused on a single course or method.^{15,16} However, in order to improve the professionalism of rural doctors in China as soon as possible, CME providers are beginning to experiment with integrating multiple courses and teaching methods into a single program, such as the Spring Seedling Project-Zhaotong Program.

There were two key aims to this study. First, the effects of the Zhaotong program were analysed to determine whether

What is already known on this subject:

- Rural doctors have unique and strong needs for continuing medical education for the development of professional standards.
- Outcomes of continuing medical education programs have not been effectively evaluated, especially in rural areas of developing countries.

What this study adds:

- The Spring Seedling Project-Zhaotong program achieved remarkable results.
- The innovative comprehensive form of the continuing medical education program for rural doctors is particularly instructive.

such a comprehensive CME program with multiple stages and methods could improve the clinical skills of rural doctors in China. Second, experience and knowledge obtained from the Zhaotong program were summarised to provide reference for scholars from other countries for implementation of CME programs for rural doctors.

2 | METHODS

The Zhaotong program consisted of two parts, namely, a manager training module for the directors of township health centres and a rural doctor training module for the country doctors of village clinics. In this study, the effects of the rural doctor training module were evaluated.

2.1 | Study design

This was an uncontrolled single-group pre- and post-intervention design based on quantitative and qualitative methods.

2.2 | Setting

Zhaotong is a prefecture-level city located in north-eastern of Yunnan Province, which is a typical rural area in China.¹⁷ By the end of 2017, the city covered an area of 23 021 km² with a population of 5.537 million. The per capita gross domestic product was 15 119 Chinese yuan (2132 US dollars), which

TABLE 1 Distributions of township health centres, village clinics and country doctors in Zhaotong City

County	Township health centres	Village clinics	Country doctors
Zhaoyang	20	154	554
Ludian	12	89	438
Qiaojia	18	194	423
Yanjing	11	85	365
Daguan	9	78	241
Yongshan	15	142	477
Suijiang	5	49	125
Zhenxiong	29	254	1165
Yiliang	17	133	438
Weixin	10	97	368
Shuifu	4	27	94
Total	150	1302	4688

accounted for about 25% of the national average over the same period (59 660 Chinese yuan/8413 US dollars). There are 150 township health centres in 11 counties of Zhaotong City that supervised 1302 village clinics and 4688 country doctors. The distributions of township health centres, village clinics and country doctors in Zhaotong City are shown in Table 1.

2.3 | Study subjects

A total of 4688 country doctors in Zhaotong City were invited to participate in the Zhaotong program. The inclusion criteria were voluntary participation in the program and no more than two country doctors per village clinic to ensure sufficient representation. The number of participants from each village clinic was limited because CME is widely regarded as part of the daily workload of country doctors, who would rather study during working hours than their own time. Finally, from June 2015 to December 2016, a total of 1866 country doctors from 1302 village clinics were enrolled, accounting for 39.8% (1866/4688) of the total country doctors in Zhaotong City.

2.4 | Training plan for the Zhaotong program

In China, there is a tradition that economically developed coastal provinces and cities assist the underdeveloped central and western regions. Such a long-term relationship exists between Shanghai City and Yunnan Province. The Zhaotong program was fully funded by the Shanghai Charity Foundation, which covered expenses for travel, accommodations and registration fees for country doctors. The Zhaotong program was

conducted in three stages: remote education, workshops conducted in Zhaotong City and field training in Shanghai.

2.4.1 | Remote education

The remote education stage of the Zhaotong program consisted of 100 class hours of video education materials presented online, which focused on theoretical knowledge, covering fundamental skills, diagnoses and treatment modalities of common problems and diseases in internal medicine, surgery, obstetrics/gynaecology, paediatrics, ophthalmology/otolaryngology, dermatology, psychiatry, infectious diseases, emergency medicine, common first-aid methods, rational drug use, traditional Chinese medicine, health care for children, women and older people, nursing skills and health education (Table 2). For those areas with no available online teaching program, compact discs for offline instruction were distributed to and supervised by the township health centres to ensure that all of the participating country doctors viewed the teaching videos. The remote education stage was conducted using presentations from 43 lecturers from Shanghai: one from a university, 32 from university-affiliated medical centres and 10 from community health centres. The online and offline learning lasted for 3 months. All 1866 country doctors who participated in the remote education were required to take an online test or a township health centre-organised offline written test before and after training. Based on the test scores, country doctors were then selected for the next stage of the program.

2.4.2 | Zhaotong workshops

Because of budget constraints, only the top 201 country doctors were selected to participate in the second stage, 5-day workshops held in Zhaotong City. The training contents included procedural skills and first-aid techniques (Table 2). Eight teachers were from university-affiliated medical centres in Shanghai. The training equipment included rented medical simulators. During the Zhaotong workshops, the country doctors were randomly assigned to complete one of four different skill tests before and after the training program prior to enrolment in the next stage of the program, which was also based on test scores.

2.4.3 | Shanghai field training

The top 31 country doctors were selected to participate in a 2-week practice-based training program conducted in Shanghai City (Shanghai field training). The trainees were successively assigned to an urban community health centre and a suburban centre during the 2-week training period. In

TABLE 2 Specific teaching contents of the three stages of the Zhaotong program

Items	Contents	Time allocation
Remote education		
(1st stage)		
Fundamental skills	Medical record writing, physical examination, gynaecological examination	4 h
Diagnoses and treatment modalities of common problems and diseases		
Internal medicine	Anaemia, fever, chest pain, dyspnoea, hypertension, coronary heart disease, myocardial infarction, heart failure, arrhythmia, pulmonary heart disease, pneumonia, asthma, chronic bronchitis, chronic obstructive pulmonary disease, bronchiectasis, silicosis, gastroesophageal reflux disease, peptic ulcer, liver cirrhosis, urinary tract infection, nephritis, renal failure, diabetes, thyroid dysfunction, transient ischaemic attack, cerebral infarction, rheumatoid arthritis	32 h
Surgery	Abdominal pain, neck and shoulder pain, low back pain, skin and soft tissue infection, appendicitis, inguinal hernia, breast diseases, anorectal diseases, prostate diseases	7 h
Obstetrics	Clinical process and management of labour process, postpartum care	1 h
Gynaecology	Gynaecological acute abdomen, cervicitis and vaginitis, abnormal vaginal bleeding, myoma of uterus, ovarian cyst	4 h
Paediatrics	Neonatal jaundice, abdominal pain, diarrhoea, anaemia, congenital heart disease, pneumonia, malnutrition, rickets, paediatric infectious diseases	8 h
Ophthalmology/ otolaryngology	Ocular trauma, infectious eye diseases, corneal foreign body, glaucoma, cataract, nose trauma, epistaxis, rhinitis, tonsillitis, acute epiglottitis, ear trauma, sudden deafness, otitis media	8 h
Dermatology	Eczema, herpes zoster, urticaria, cutaneous fungal infection, psoriasis	2 h
Psychiatry	Insomnia, anxiety, depression	4 h
Infectious diseases	Insect-borne infectious diseases, parasitic infection, bacillary dysentery, tuberculosis, hepatitis, sexually transmitted disease, AIDS, infectious disease management	9 h
Emergency medicine and common first-aid methods	Drowning, poisoning, bites and stings, asphyxia, hemothysis, pneumothorax, hypoglycaemia, fixation and translocation of fractures, trauma management, cardiopulmonary resuscitation	6 h
Rational drug use	Rational use of antibiotics, rational use of hormones, principles of paediatric medication	4 h
Traditional Chinese medicine	Traditional Chinese medicine techniques (eg acupuncture, cupping therapy and massage)	2 h
Health care for children, women and older adults	Contraception, preconception and prenatal care, immunisations, child growth/development, health services for the aged	6 h
Nursing skills	Venous transfusion, intracutaneous injection, subcutaneous injection, intramuscular injection	2 h
Health education	Principles and methods of health education	1 h
Zhaotong workshops		
(2nd stage)		
Procedural skills	Thoracentesis, abdominocentesis, debridement, incision/suturing, urethral catheterisation, gynaecological examination, Pap smear sampling, child growth/development measurement, usage of ophthalmoscope	4.5 d
First-aid techniques	Cardiopulmonary resuscitation, the Heimlich manoeuvre	0.5 d
Shanghai field training		
(3rd stage)		
General outpatient clinic	Consultation skills, doctor-patient communication, tertiary prevention principles of chronic diseases and individualised patient education skills	4 d
Geriatric ward	Comprehensive geriatric assessment and hospice care	1 d
Home visits	Family-based health care, analysing family structure and team-working skills	2 d
Public health departments	Applying health promotion and disease prevention strategies, maternal and child health care, and health screen of the elderly	3 d

addition, each received one-on-one tutoring by the directors of the corresponding departments of the community health centres. The country doctors participated in rotations, which included the general outpatient clinic, geriatric ward, home visits and public health departments (Table 2). Shanghai field training was conducted in a total of 16 community health centres in Shanghai City that were chosen to participate in the program after comprehensive evaluation by the project team.

2.4.4 | Quality control

During online classes, there was a single random check-in in every hour and the trainees needed to register within 30 seconds. For those who did not register, no class credit was awarded. The offline learning courses were supervised by the township health centres and the country doctors were required to report their study progress monthly. Only those who finished all 100 hours of online classes or offline learning were permitted to take the test. For the Zhaotong workshops, class tutors were assigned by the Zhaotong City Health Bureau and were responsible for the management of attendance, teaching and assessment. For the Shanghai field training of the program, in addition to one-on-one tutoring, the project team arranged experts who conducted extra field supervision.

2.5 | Measures and outcome factors

Three methods were used to assess the dimensions of knowledge, skills and subjective cognition. The pre- and post-training test scores of the remote education and Zhaotong workshops of the program were adopted as the outcome factors for quantitative analysis. These scores were compared to determine whether the first two stages had effectively enhanced the knowledge and skills of country doctors. For the remote education stage, the pre- and post-training tests included the same 100 single-best answer multiple-choice questions, but in different orders of choices and questions. The questions were issued by the instructors based on the content of each lecture according to the standard of one question per class hour to ensure that the questions covered all of the lecture content. Each correctly answered question was awarded one point, for a total possible score of 100 points. The participants were allotted 120 minutes to complete the test. The four different skills used to evaluate the effectiveness of the Zhaotong workshops included incision/suturing, cardiopulmonary resuscitation, gynaecological examination and child growth/development. The study participants were required to complete the same skill test before and after the training session. Each assessment was performed and scored by the corresponding instructor in

accordance with pre-defined score sheets, which consisted of three domains: appropriate preparation of patients and supplies, important steps in the corresponding procedure and communication skills. Each test had a total possible score of 100 points with a time limit of 10 minutes. A panel of six experts reviewed the questions and score sheets. For the remote education and Zhaotong workshop stages of the program, the participants were not told that the questions and skills were the same until the post-training test was administered.

For qualitative analysis, each trainee was required to complete a written report on their experience with the Shanghai field training stage within 2 weeks of training completion. There was no limit to the number of words. The reports were used as text data to assess the impact of this stage on the subjective cognition of the participating country doctors.

2.6 | Statistical analysis

Statistical analysis was performed using SPSS software (version 12.0; SPSS Inc). Continuous data are expressed as the mean \pm standard deviation, while discrete data are expressed as the number and ratio. The independent or paired *t* test was used for comparisons of mean values between different groups. The chi-squared test was used to compare categorical variables. Cohen's *d* was used to indicate the effect size for the comparison between two means. A probability (*P*) value of $<.05$ was considered statistically significant.

Two research team members performed qualitative analysis of the Shanghai field training reports, which were randomly selected until information saturation. Opinions repeatedly occurring in the reports were coded, reviewed and discussed using the thematic framework method until consensus was reached.

2.7 | Ethics approval

The study protocol was approved by the Ethics Committee of Zhongshan Hospital affiliated to Fudan University (approval no. B2020-040R).

3 | RESULTS

3.1 | General information

The average age of the 1866 country doctors who participated in the remote education stage was 38.2 ± 9.2 years and 46.9% (875/1866) were males. The country doctors who were selected to participate in the Zhaotong workshops were younger and had completed more years of formal education ($P = .008$), but with less experience in practice as country

TABLE 3 General information of 1866 country doctors

Feature	Selected for Zhaotong workshops (n = 201)				Not selected for Shanghai field training (n = 170)				Total (n = 201)				Not selected for Zhaotong workshops (n = 1665)				Total (n = 1866)				t/ χ^2 value	P value						
	Selected for Shanghai field training (n = 31)		Not selected for Shanghai field training (n = 170)		Total (n = 201)		Not selected for Zhaotong workshops (n = 1665)		Total (n = 1866)		Not selected for Zhaotong workshops (n = 1665)		Total (n = 1866)		Not selected for Zhaotong workshops (n = 1665)		Total (n = 1866)											
	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)	Number	Percentage (%)										
Age (y)	34.7 ± 6.7		35.8 ± 7.2		35.6 ± 7.2		38.5 ± 9.4		38.2 ± 9.2		5.241 ^a	<.001 ^a	0.784 ^b		0.114 ^a	.736 ^a	0.005 ^b	.941 ^b	5.777 ^a	<.001 ^a	2.475 ^b	.018 ^b	4.179 ^a	<.001 ^a	0.639 ^b	.524 ^b		
Sex																												
Male	14	45.2	78	45.9	92	45.8	783	47.0	875	46.9																		
Female	17	54.8	92	54.1	109	54.2	882	53.0	991	53.1																		
Years of schooling	12.9 ± 1.5		12.2 ± 1.3		12.3 ± 1.4		11.7 ± 1.4		11.8 ± 1.4																			
Years of practising as country doctor	9.2 ± 7.1		10.1 ± 7.2		10.0 ± 7.2		12.3 ± 9.0		12.0 ± 8.8																			

^aComparison between the country doctors who were and were not selected for the Zhaotong workshops.

^bComparison between the country doctors who were and were not selected for the Shanghai field training.

doctor than those who were not selected ($P < .001$). There were no significant differences in age, sex and years in practice between country doctors selected for the Shanghai field training stage and those who were not selected (Table 3).

3.2 | Remote education

Of the 1866 country doctors, 52.7% (983/1866) completed the online classes. Of these, 96.4% (948/983) completed the online post-training test with an average score of 48.7 ± 14.0 , which was significantly higher than the pre-training test score ($P < .001$). Of the 1866 participants, 883 (47.3%) used the offline videos. Among these, 99.7% (880/883) completed the offline written test with an average score of 50.8 ± 10.6 points, which was also significantly higher than the pre-training test scores ($P < .001$; Table 4).

3.3 | Zhaotong workshops

All country doctors who were selected for the Zhaotong workshops (n = 201) participated in the skills assessment before and after training. With the exception of incision/suturing, the average scores of the other three items were higher after training than before ($P < .001$; Table 4).

3.4 | Shanghai field training

Of the 11 reports included for analysis, 45.5% (5/11) were submitted by male trainees. Most country doctors described their learning gains in terms of general care, family doctor system, doctor-patient relationships and health education, which can be summarised as an increased understanding of general practice concepts. Many country doctors also realised their own shortcomings through the training and expressed their willingness to study further in order to better serve their patients in the future. These viewpoints were concluded as practising what they learnt in Shanghai. The core viewpoints and subjects of the trainees are shown in Table 5.

4 | DISCUSSION

The first World Rural Health Conference conducted by the World Organization of Family Doctors was held in Shanghai in 1996, which marked the beginning of Chinese participation in global rural health development.¹⁸ In the years that followed, rural health pioneers have greatly promoted the development of the rural primary care system in China.¹⁹ Country doctors, formerly called barefoot doctors, are unique primary care providers in China who are

Items	Pre-training score	Post-training score	<i>t</i> value	<i>P</i> value	Cohen's <i>d</i>
Remote education					
Online (n = 948)	39.1 ± 7.4	48.7 ± 14.0	19.113	<.001	0.791
Offline (n = 880)	43.9 ± 8.9	50.8 ± 10.6	14.544	<.001	0.700
Total (N = 1828)	41.4 ± 8.5	49.7 ± 12.5	23.868	<.001	0.751
Zhaotong workshops					
Incision/suturing (n = 50)	64.2 ± 17.7	66.9 ± 28.7	0.566	.286	0.108
Cardiopulmonary resuscitation (n = 50)	67.4 ± 22.5	84.1 ± 22.1	3.744	<.001	0.749
Gynaecological examination (n = 50)	23.9 ± 21.1	79.1 ± 9.8	16.777	<.001	3.018
Child growth/development (n = 51)	42.4 ± 14.0	78.6 ± 22.1	9.882	<.001	1.869
Total (N = 201)	49.4 ± 25.9	77.2 ± 22.5	11.488	<.001	1.140

TABLE 4 Pre- and post-training test scores (mean ± standard deviation) of the country doctors enrolled in remote education and Zhaotong workshops

basically GPs working in rural areas.²⁰ As the main force of rural GPs, however, their service capability is not strong and often insufficient to satisfy the needs of rural populations.²¹ CME can enhance the clinical, managerial and professional skills of rural doctors through CME, as well as offer training to become qualified GPs, which are important issues to the Chinese government and society.²² The Spring Seedling Project-Zhaotong program was an useful attempt to explore a new model for the training of rural doctors, and many valuable experiences had been gained through this program.

Unlike previous CME programs, the Zhaotong program employed a staged progressive approach. Due to geographical dispersion and the lack of convenient transportation, the first stage of the program was conducted remotely in order to include more country doctors at a relatively low cost. In fact, remote education has become one of the most active forms of training.⁵ Many institutions use blogs, vodcasts, social media and even video conferences to encourage interactions and discussions during learning.²³ With the application of these new methods, the effect of remote education has also been improved. During the second stage, in order to match the theoretical knowledge in remote education, the program design included training in various procedural skills and workshops were conducted to emphasise the importance of practical abilities. Similarly, rural GPs in South Africa are also required to engage in CME programs in order to enhance skills in essential surgical techniques and procedures.²⁴ Finally, the best trainees were selected to go to Shanghai to receive field training, which not only fully engaged enthusiasm, but also provided the best trainees with the opportunity to practise in relatively developed areas.

Regarding the CME programs of rural GPs, absenteeism and missed examinations were the most common problems encountered, which might be related to several factors. For

instance, the contents and approaches did not meet the needs of rural doctors, or because of time conflicts between work and study.^{10,14} However, among the 1866 country doctors who participated in the remote education stage, more than 96% completed the online or offline examination. The reasons for the high participation rate might include the following. First, the willingness of the trainees to learn was increased by ensuring that the training contents were what the trainees wanted to learn, which was assessed through surveys conducted in advance. Second, part of this program was conducted online in order to reduce time and costs. Third, quality control schemes, such as multilevel sign-in and supervision, as well as other effective management measures were applied, at various stages of the program. Finally, the Shanghai Charity Foundation provided funds for country doctors to participate in the Zhaotong program, which reduced the economic burden and improved participation in training.

In this program, both the remote education and Zhaotong workshops stages significantly improved the examination scores. As compared with the pre-training test score, the average score increased by 20.0% ([49.7-41.4]/41.4) and 56.3% ([77.2-49.4]/49.4) in each stage, thereby confirming that the knowledge and skills of country doctors could be enhanced through appropriate CME programs. In terms of training items, the main focus of the Zhaotong workshops was to improve common clinical operation skills and also provide a simulation learning opportunity to maximise training effectiveness.

There was also an increased competency effect after the Shanghai field training stage, which was an important innovation of this program. The opportunity to participate in practice-based training in Shanghai was extremely valuable for the participating country doctors. However, because of budget constraints, only 1.7% (31/1866) of the country

TABLE 5 Examples of core opinions of country doctors enrolled in Shanghai field training

Subject	Core opinions
Deepening the understanding of general practice concepts	(Country doctor 1) 'Every patient of my teacher is his contracted patient' (Country doctor 2) 'Family doctor, home visit, team site, etc, all of the services are inseparable from long-term harmonious communication between doctors and patients', 'the connection and interaction among community health service centers, superior hospitals, community neighborhood committees and clinics are strong and powerful' (Country doctor 4) 'In the general outpatient clinic, I learned the clinical features, treatments, referral, life guidance and communication skills for the patients with hypertension, mental illness and other diseases', 'by public health training, I learned health education methods and skills in terms of healthy lifestyles such as reasonable diet, proper exercise, and improved sleep' (Country doctor 6) 'Teach us a lot of ways to deal with the relationship between doctors and patients, so that we are not passive as before' (Country doctor 8) 'Family doctors are close friends of patients', 'appropriate techniques of Traditional Chinese medicine (TCM) are easy to operate because of its simplicity and low price and welcomed by general public; these techniques should be promoted in grassroots medical units' (Country doctor 11) 'If a disease can be treated with oral medicine, then injection should be avoided', 'family doctors provide better care for paralyzed patients. They are friends of the patients; they understand the actual situation of the patients, and guide patients to recover'
Practising what they learnt	(Country doctor 3) 'Try to be a qualified, competent GP' (Country doctor 4) 'Grasp the opportunity that general practice quickly develops in China, make efforts to improve the level of general medical service so that rural residents can truly benefit from basic public health equalization and basic medical services' (Country doctor 5) 'Make me realize that I have a lot of deficiencies', 'I should impart health knowledge including knowledge of chronic diseases to general public', 'change my work way from passive to active' (Country doctor 7) 'Profoundly recognize my shortcomings, and I will do my best in future, learn from best ones and improve my professional skills' (Country doctor 8) 'I will bring what I have learned in Shanghai back to Zhaotong to serve my patients better' (Country Doctor 10) 'After this training, I realized that I have too many shortcomings. In the future work, I will do my best to improve my medical knowledge and standardize the operation to better serve patients'

doctors were selected for Shanghai field training through rigorous evaluations. Nevertheless, their roles as 'seeds' in rural areas should not be ignored. The qualitative analysis of the training reports showed that country doctors paid more attention to the differences in clinical work approaches, such as family doctor services and personalised health education, which highlighted the unique characteristics of general practice and the aspiration to improve service models to better benefit local populations after training. However, from the descriptive language, the majority of the participating country doctors had not mastered the basic concepts of general practice due to the lack of using relevant professional terminology in the descriptive responses, especially in preventive and continuous care, suggesting that CME programs targeting Chinese rural doctors should start with basic theories.

4.1 | Limitations

Several potential limitations should be noted. As a one-group pre- and post-test design, the major limitation of the Zhaotong program was the lack of a control group. Although this design was relatively easy to implement, it was not possible to generalise whether the improved performance of the country doctors after training could be totally attributed to

the role of this program due to the unmeasured confounders, such as maturation, as knowledge will naturally increase with such programs. Of course, a limitation of any CME, such as the Zhaotong program, which included a large number of trainees, is the difficulty of forming a suitable control group. However, in future training, a crossover design or modified true control post-test-only design should be considered to ensure that no trainee is denied the learning experience in future training. Second, the effectiveness of the evaluation methods in this program was insufficient, as only four items were selected from many training skills as assessment items in the second stage, and a qualitative method was used rather than a generic scoring method, such as mini-clinical evaluation exercise or objective structured clinical examination, in the third stage. In addition, further follow-ups are needed to evaluate the actual long-term effectiveness of the Zhaotong program in regard to improvements to local primary health care.

5 | CONCLUSIONS

The Spring Seedling Project-Zhaotong program presents new ideas for the training of rural GPs in China through an innovative CME model. The program achieved good responses

and provided a good reference point for similar programs in the future.

ACKNOWLEDGEMENTS

The authors would like to thank Shanghai Charity Foundation; Zhaotong Municipal People's Government of Yunnan Province; Shanghai Municipal Health and Family Planning Commission; Shanghai Medical College of Fudan University; Zhongshan Hospital Fudan University; Community health centres of the following towns or districts in Shanghai: Hongqiao Street, Fenglin Street, Kangjian Street, Xujiahui Street, Changfeng Street, Gumei Town, Weifang Town, Tangqiao Town, Xidu Town, Nanqiao Town, Qingcun Town, Fengcheng Town, Nanxiang Town, Anting Town Huangdu, Jiading Town Street and Waigang Town.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

AUTHOR CONTRIBUTIONS

Gu Jie and Zhu Shanzhu participated in the design of this study, and they both performed the data analysis and definition of intellectual content. Chen Taojian and Tang Juntao carried out the study. Pan Zhigang, Gong Jian, Shou Juan and Yang Hua carried out literature search, data acquisition and manuscript editing. Du Zhaohui performed the manuscript review. All authors read and approved the final manuscript.

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How to cite this article: Gu J, Zhu S, Chen T, et al. Evaluation of the Spring Seedling Project—Zhaotong Program: A study of a novel continuing medical education program for rural doctors in China. *Aust J Rural Health*. 2020;28:434–442. <https://doi.org/10.1111/ajr.12659>