Implementation of a transformative learning collaborative training for family doctor teams and managers: a description of participant process and perception

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Research article

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Abstract

Background: The Health Commission of Wuhou reformed its primary care system by implementing a Transformative Learning Collaborative (TLC): a structure that supports shared learning and rapid change among a group of providers or organisations. This paper examines the adaptation of a district TLC to implement, disseminate, and scale up the principles of a District Model for family doctor teams and managers of Community Health Centres (CHCs) in China. We describe TLC as a means of informing training content and evaluated the implementation through participant feedback. Methods: A district TLC was implemented to disseminate a District Model, which included six quality improvement principles and was developed to reform the primary care delivery process. Family doctor teams (n=26, 52 family doctor individuals) and managers (n=13) from thirteen CHCs in a Chinese district participated in the TLC organisation. The TLC process was described, and survey data served to assess the activities and resource usefulness. The perceived implementation enablers and inhibitors were also descriptively analysed. Results: The purpose, content, and process of TLC were described. The implementation included four steps: structure establishment, participants identification, activities implementation, and setting up a feedback system. The survey findings captured family doctors’ and managers’ feedback with regard to preference, needs, concerns, and problems in implementing TLC training. In general, most family doctors and managers indicated that TLC was necessary. All the successfully implemented Plan-Do-Study-Action cycles (77.6%) were applied to the model. Family doctors and managers agreed that coaches, a programme director, and data analysts were useful resources. The top three enablers for successful TLC implementation were managers’ support (93.9%); improvements in self-ability and team-based ability and impacts on participants’ career goals (89.8%), and support from family doctor teams (87.8%). Conclusions: This study offered a guided process for running TLC in the primary care system of China and provided valuable feedback from family doctors and managers regarding TLC training. Challenges were also found for future research and consideration. Our findings suggest that manager support is necessary for collaboration in family doctor teams and that participants play an important role by evaluating learning sessions and providing recommendations for future learning.

Background

China has spent the 10 years since 2009 in reforming its health-care system [1]. As a part of the reform, the Chinese government has made primary health care a priority in its Healthy China 2030 strategy with a series of policies, including establishing a primary health-care-based integrated delivery system [2] by promoting contracted family doctor services [3]: these policies remain a difficult task and require vast changes to the pillar of the entire health-care system, such as building a robust primary care system to improve quality of care, the coordination of health-care providers or organisations, and service efficiency. To achieve these goals, the health commission of Wuhou, China, reoriented the primary health-care system and developed a "District Model" (Figure 1, Appendix 1), which served as a work guide to transform the current system into a patient-centred, family doctor-team-based, holistic, coordinated or integrated, high-quality system with more communication. Wuhou used a Transformative Learning
Collaborative (TLC) methodology to implement, disseminate, and scale up the principles of the District Model, and train qualified health personnel to serve in settings to improve the overall medical service capacity and quality of care in primary care. TLC is an approach to improve the quality of care by allowing staff of local care facilities, such as community health centres (CHCs), to meet and exchange any opinions or concerns that they may have, or to share their experience of best practices. Each TLC can be organised as a short-term (12-15-month) learning system [4].

Reviews of the existing literature have highlighted that TLC methodology has led to impressive results in several large health-care systems in a number of countries. The Department of Veterans Affairs (VA) in the USA was successful in using the collaborative learning model to disseminate Patient Aligned Care Team (PACT) concepts and changes [5], as within the nine-month span it increased the delivery of preventive services [6]. This type of collaborative learning model was also implemented in the Texas Medicaid 1115 Wavier program, which succeeded in reforming the state's safety system [7]. The UK cancer collaborative has saved 400 years of waiting time since its establishment in June 2000 [8]. In Northern New England, a learning collaborative improved the delivery of evidence-based care to pregnant women with perinatal opioid use disorder, and their participants enabled practices to share strategies for incorporating guideline-concordant care into daily practice [9]. Additionally, Glasgow and colleagues [10] discovered that a chronic illness care collaborative achieved great improvements in self-management for both diabetes and heart failure teams. However, these studies had some important limitations in that they did not present the standard processes involved in TLC performance. An observational study from Texas, a delivery system that reformed incentive payment, reported learning collaborative implementation processes for a regional health-care partnership, but could only bridge a few gaps in TLC-related knowledge [7].

A few studies have reported TLC processes utilised in China and useful resources, in addition to enablers and inhibitors to the implementation of TLC from participants’ perspectives, as well as lessons learned through TLC training, particularly in the area of primary care systems. Furthermore, TLCs are commonly used in clinical settings worldwide. However, their potential as a scale-up method in China's primary health-care systems has remained unexplored thus far. Family doctor teams’ and managers’ from CHCs assessments on the matter are also unclear.

This study takes the initiative to review the use of the TLC methodology in educating family doctor teams and CHC's managers with regard to the improvement and transformation of health care delivery in primary care systems. This paper also reports findings from a quantitative study that assessed overall evaluations, useful resources, district implementation enablers and inhibitors as means of delivering training and activities for improvement. The knowledge acquired during this process is also discussed to provide relevant information to others who are considering this method and to help produce large-scale improvements.

**Methods**
Study area

All 13 CHCs in Wuhou District in south-west Chengdu of Sichuan Province, China were engaged in this transformative initiative. The population of Wuhou is approximately 181.03 million, and has experience in undertaking national-level pilot transformative programmes, namely, the national general practitioners service model reform pilot and the national primary health care system comprehensive reform pilot. Low quality of care, insufficient coordination, and high burden of the growing challenge of non-communicable diseases still exists in this district [11].

Primary health care is provided by CHCs, and both curative and preventive services are integrated to provide a comprehensive experience for patients, for example: prevention of communicable, non-communicable diseases, and emergency events including vaccination, health education and care for high-risk patients and population. Curative services are provided for common ailments, including maternal care, well-baby care, mental care, elderly care, amongst others. These services are served by family doctor teams [12] consisting of one general practitioner, one to two nurses, and one public health physician; each team has a team leader. There are usually six to eight family doctor teams in each CHC according to its service population, and teams are under the leadership of one chief manager and one or two associate managers.

Study design and study population

We examined the adaptation of a district TLC from June 2017 to June 2018 for family doctor teams and managers of CHCs in Wuhou District, China, and reviewed TLC as a means of informing training content. We first defined the implemented district TLC process into four steps: 1) establish the TLC's organisation structure; 2) identify participants; 3) implement TLC activities; and 4) establish a district TLC feedback system. Second, we conducted a survey (District Transformative Learning Collaborative Follow-up Survey, see Appendix 2) to evaluate the TLC implementation by considering feedback in terms of overall evaluations of TLC activities, resources' usefulness, and perceived enablers and inhibitors regarding the district implementation.

Prior to the enrolment to district TLC, the health commission of Wuhou promoted the course online and stated that every CHC would be able to enrol two family doctor teams at most and one manager (CHC's chief manager or associate manager) in the course. Consequently, a total of 26 teams sent emails and participated in the TLC organisation. In total, 65 individuals (52 family doctor team members and 13 managers) were involved in the district TLC. Data were collected after the TLC and were open only for family doctor teams; subsequently, 49 team individuals responded to the questionnaire.

Statistical analysis

SPSS® programme version 21 was used for data management and statistical analyses. Results are presented as descriptive statistics with numbers and percentages.

Description of district TLC process
Establishing TLC's organisation structure

Given the well-documented success of collaboratives, the district TLC organisation was set to implement activities, provide resources, and collect feedback (Figure 2). A District Collaborative Leadership Team (DCLT) designed the intervention by considering available resources, scale of desired change, and complexity of the District Model. A programme director was recruited from among the health commissions of Wuhou to set overarching goals, identify potential areas for improvement, and develop training content. The DCLT recruited a quality improvement advisory group from home and abroad, who were able to provide resources and opportunities for participants to expand their quality improvement knowledge, obtain expertise for issue solution, and provide opportunities for learning. Further, the DCLT recruited district project coordinators, coaches, and faculty predominately from within the Wuhou primary care system who had outstanding leadership and teaching skills, and who agreed to lead the effort as a collateral duty. Five district project coordinators (one for five to six teams) coordinated events, collected data, and tracked improvement progress of teams. Five coaches (one for five to six teams) led teaching calls, evaluated the performance of teams, and provided feedback. Faculty members are those who made great progress in a specific topic, share the best practices, and offer their experience to participants in shared learning sessions. Two data analysts provided support on metrics and analysed metric data, such as monthly progress reports.

Identifying participants

The DCLT provided guidance on identifying teams and managers at each CHC in order to send them to district TLC meetings, and they were divided into two groups: managers and family doctor teams.

Implement TLC activities

Learning sessions (LSs) were highly interactive events and the most important activities during TLC: participants meet face-to-face every four to six months to discuss successes, barriers, challenges, and share best practices [4]. Here, family doctor teams were the main speakers, as they had the closest encounters with the addressed topic or problems. Because of the complexity of the District Model, three strategical LSs were established by the DCLT from June 2017 to June 2018. The activities were categorised into two groups according to the characteristics of the participants and can be found in Figure 3: one was tailored towards managers and another towards family doctor teams.

One-day LS1 was initiated in June 2017, initially for managers, and focused on topics such as annual goals and tasks for family doctor teams, overviews of the program, the District Model, and TLC concepts. Project management resources including human resources, incentives, and a problem-solving tool were also included. Participants were able to use massive human resources according to TLC’s organisation structure; incentives were introduced to provide sufficient motivation for special needs, which included financial and non-financial incentives. Managers and teams are more likely to receive a good remuneration if they improve their abilities and attract more patients to contracted personalised family doctor services after training (financial). They were also motivated, because of self-improvement and
career training (non-financial). In addition, the tool named ‘Plan-Do-Study-Action (PDSA) cycle’ was provided for participants to learn how to apply key ideas for change to their organisations in a series of testing cycles. Family doctor teams learned the same theoretical system as managers, while studying baseline data analysis (descriptions and data analysis for different performing teams), deciphering supportive resources, and allocating time for future topic selections.

Two-day LS2 was held in January 2018. Day One’s learning content focused on Patient-Centred Medical Home (PCMH) concepts and the VA’s experience in implementing PCMH for both managers and teams. Day Two’s primary learning topics centred on team redesigning: redesigning the roles and tasks within teams, standardising the core process of clinic flow for certain disease management, and improving communication. At the end of each day, a predetermined time was allocated to select future topics. Five months later, another two-day LS3 was instituted to discuss two topics within teams: care coordination and management, and holistic and high-quality care. Faculty members shared the best practices for strengthening self-management to help patients manage their conditions, increasing planned appointment care, and managing patients with chronic illnesses, such as diabetes and hypertension, which are the two most prevalent chronic diseases in China: the primary health-care system is facing performance issues in its management and treatment of these diseases [21]. Teams met in learning sessions wherein coaches worked together to discuss future plans and learning content. During LS3, the managers were given information on how to encourage teams to learn new concepts, change consciousness, emphasise information-based technology in supporting team services and management, and improve and optimise Hospital Information System (HIS) catering to team services.

In between these learning sessions were ‘action periods’ (AP), which were equally important. After each LS, all teams engaged in Plan-Do-Study-Action (PDSA) [13] activities. A PDSA cycle consisted of: 1) ‘Planning’ objectives, questions, predictions, and the circle itself (who, what, where, when); 2) ‘Doing’ by carrying out the plan, documenting problems, noting unexpected observations, and beginning to analyse the data; 3) ‘Studying’ by completing the data analysis, comparing the data to predictions, and summarising the acquired knowledge; and 4) ‘Acting’, which involved refining changes based on what can be learnt from the activity, contemplating on which changes can be made, and preparing to run the next circle.

Teams participating in TLC performed ‘teach back’ lessons to the members of ‘home’ teams who were not trained by LS. Facility-based teams and managers met to exchange ideas, identified mutually agreed upon potential areas of change, and developed and practised clear PDSAs in their local settings. Each team was assigned a coach and expected to participate in coach-facilitated monthly phone calls, and daily or weekly morning gatherings. Teams worked with coaches, who could assess a team’s knowledge, while helping them develop more creative ideas, use better skills and resources, and recognise whether they are doing well or not.

*Establishing a district TLC feedback system*
The DCLT also established a feedback system to track the process of TLC implementation, identify potential problems, and help make improvements in implementing activities. Teams were required to write standardised monthly reports and provide feedback by answering the following questions: 1) how many PDSA cycles did you test?; 2) Did those PDSAs succeed, are they a work-in-progress, or did they completely fail? If they failed, please state the reasons and possible solutions; and 3) Can you offer some advice on district TLC? These monthly reports thus provided an assessment on the effectiveness of PDSA circles. Overall, 116 attempted PDSAs were collected from 288 monthly reports: 77.6% (n=90) were successfully implemented, while 22.4% (n=26) were work-in-progress. All successful PDSAs focused on the six principles of the District Model. Additionally, the three main pieces of advice from the teams were as follows: 1) There needs to more time to allow teams to fully implement and test PDSA cycles in their facilities; 2) It would be better to extend time for learning sessions, three to four days for example, as two days is too short a period to learn vast amounts of content; and 3) More time is needed to be set aside for team discussion after sharing best practices.

Results

Survey Results

Participants’ characteristics

Overall, 77.6% of the participants were team members, while team leaders within family doctor teams accounted for 22.4%. Only 6.1% had worked less than a year in regional CHCs, while 32.7% had been employed for more than 10 years.

Overall evaluation of TLC activities

A total of 87.8% of respondents reported that the TLC was necessary for implementing the patient-centred and integrated care team initiative. Additionally, the format was helpful (85.7%); respondents obtained expected information (91.9%), shared successful strategies (85.7%), and found TLC to be a good networking tool (73.5%). The provided resources and tools were considered useful in implementing changes (87.8%), and TLC was helpful for setting team aims and conducting PDSAs (85.7%) (Table 1).


**Table 1. Overall evaluations of TLC activities**

| Item                                                                 | Scale / n (%)                  |
|----------------------------------------------------------------------|--------------------------------|
| was necessary for implementing the patient-                        | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
| ed and integrated care team initiative                             | 16 (32.7)        | 27    | 6 (12.2) | 0 (0.0)  | 0 (0.0)        |
| TLC format was appropriate for implementing change strategy       | 13 (26.5)        | 29    | 7 (14.3) | 0 (0.0)  | 0 (0.0)        |
| provided my team and I with opportunities to                        | 19 (38.8)        | 26    | 4 (8.1)  | 0 (0.0)  | 0 (0.0)        |
| from other teams and share acquired edge                           |                  |      |          |          |                |
| provided my team and I with opportunities to                       | 13 (26.5)        | 29    | 7 (14.3) | 0 (0.0)  | 0 (0.0)        |
| successful strategies                                               |                  |      |          |          |                |
| provided my team and I with opportunities to                       | 9 (18.4)         | 27    | 13 (26.5)| 0 (0.0)  | 0 (0.0)        |
| work with other teams                                               |                  |      |          |          |                |
| provided adequate resources and tools to be                        | 16 (32.7)        | 27    | 6 (12.2) | 0 (0.0)  | 0 (0.0)        |
| 1 with the facility’s team                                          |                  |      |          |          |                |
| helped my team set clear and mutually                            | 12 (24.5)        | 30    | 6 (12.3) | 1 (2.0)  | 0 (0.0)        |
| able aim statements                                                |                  |      |          |          |                |
| helped me conduct PDSA cycle tests of change                       | 27 (55.1)        | 15    | 7 (14.3) | 0 (0.0)  | 0 (0.0)        |
| facility                                                            |                  |      |          |          |                |

**Usefulness of TLC resources**

All respondents reported the provided resources as being useful, while the coaches were most useful (85.7%), followed by the TLC director (83.7%) and data analysts (81.6%) (Table 2).
Table 2. Usefulness of TLC resources

| Item                    | Very Useful | Useful | Moderately Useful | Not Useful |
|-------------------------|-------------|--------|-------------------|------------|
| The programme director  | 12 (24.5)   | 29 (59.2) | 8 (16.3)          | 0 (0.0)    |
| The work guide          | 10 (20.4)   | 29 (59.2) | 10 (20.4)         | 0 (0.0)    |
| Coordinators            | 11 (22.4)   | 26 (53.1) | 12 (24.5)         | 0 (0.0)    |
| Coaches                 | 9 (18.4)    | 33 (67.3) | 7 (14.3)          | 0 (0.0)    |
| Monthly reports         | 6 (12.3)    | 30 (61.2) | 13 (26.5)         | 0 (0.0)    |
| Data analysts           | 13 (26.5)   | 27 (55.1) | 9 (18.4)          | 0 (0.0)    |

*Enabling and inhibiting factors of district TLC implementation*

The most common enablers included managers’ support from the facility (93.9%), improvements in self/team-based ability and impact on career goals (89.8%), and support of the family doctor team (87.8%). Our research reported no implementation inhibitors (Table 3).
Table 3. Enabling and inhibiting factors of district TLC implementation

| Item                                                                 | Scale / n (%)          |
|----------------------------------------------------------------------|------------------------|
| Fulness of skills/behaviours                                        | 41 (83.7) 8 (16.3) 0 (0.0) |
| Understanding level of district model                              | 40 (81.6) 9 (18.4) 0 (0.0) |
| Opportunities to practice and use the learned skills                | 36 (73.5) 12 (24.5) 1 (2.0) |
| Opportunities to practice and use the learned skills                | 40 (81.7) 8 (16.3) 1 (2.0) |
| Opportunities to practice and use the learned skills                | 46 (93.9) 3 (6.1) 0 (0.0) |
| Opportunities to practice and use the learned skills                | 43 (87.8) 6 (12.2) 0 (0.0) |
| Opportunities to practice and use the learned skills                | 39 (79.7) 9 (18.3) 1 (2.0) |
| Productivity of my family doctor team                              | 40 (81.7) 8 (16.3) 1 (2.0) |
| Support                                                             | 36 (73.5) 12 (24.5) 1 (2.0) |
| Act on my career goals                                             | 44 (89.8) 5 (10.2) 0 (0.0) |
| Recognition/awards received for improvements                       | 37 (75.5) 12 (24.5) 0 (0.0) |
| Lability of assistance (coaching)                                   | 42 (85.7) 7 (14.3) 0 (0.0) |
| Improvements in self-ability and team-based activity               | 44 (89.8) 5 (10.2) 0 (0.0) |

Discussion

The use of TLC has not yet been reported in the context of primary care systems in China. Thus, our initiative centred on attempting a TLC to facilitate reforms and improvements in the primary care delivery process.

In TLC activities, much of the focus was allocated to teaching teams the PDSA cycle, particularly since Nembhard [14] demonstrated that this useful tool was one of the top six features that participants viewed as most helpful for improvement. Thus, family doctor teams were encouraged to learn to solve problems
using this tool in their daily work at their local facility. Aside from the theoretical teaching of PDSA, teams were given allocated time periods to discuss the Plan (P) aspect, with additional coaching offered at the end of the LS. After face-to-face LS, all teams would test PDSAs in action periods at their local facility. At these times, teams could invite assigned coaches to provide support (directive and prescriptive feedback), which was similar to the VA procedure [15]. In addition, coach-team relationships were viewed as valuable, as they frequently resulted in more creative ideas, better use of staff, skills, and resources, and increased motivation.

Moreover, a feedback system was established to collect information on the PDSAs of each team to analyse data, make suggestions, and sustain improvements. Advice from teams suggested that the design of TLC activities needs to be adjusted and that transformation needed more time. Survey results suggested that a majority of participants reported overall positive evaluations for TLC implementation, and almost all participants agreed that it provided opportunities to share successful strategies, skills, and learn from others. Additionally, participants agreed that certain resources were especially useful, including coaches, the programme director, and data analysts. This indicates that participants benefited from coaches’ involvement during learning sessions. Insights, goals, and directions made by the programme director were also considered helpful, and participants cared about their improvement reported by data analysts during TLC activities. Further, the top three enablers were identified: managers’ support, improvements in self-ability and team-based ability, and impact on participants’ career goals. These factors could have guided the following TLC activities and facilitated the organisation's shaping into a patient-centred and integrated care system utilising family doctor teams.

Our experience in TLC establishment is summarised as follows. Support from managers and their engagement is necessary, and this is well-documented in the literature [16,17,18,19]. Further, managers need to have enough time for discussions with family doctor teams. In this study, the daily or weekly team gatherings explored what work needed to be done, the required time, what kind of work should be prioritised, and who was going to perform the tasks. Without managers’ support, the groups may have encountered major obstacles in their improvement goals. Additionally, participants play important roles in evaluating LS and providing recommendations for future learning. At the end of each meeting, participants were asked to specify which topics they wished to address in order to improve TLC activities. This was to ensure that teams constructed the topics themselves to communicate their experience and challenges. Their feedback, during and at the end of LS, not only contributed to developing content for future LS but also concentrated managers’ efforts on which policy tools and guidelines are required to develop, support, and further sustain implementation.

The first year of design, development, and implementation of Wuhou’s collaborative project has also seen some challenges, which came from poor coach-team relationships after learning sessions, a lack of common metrics, and inconsistency in participation. Because of the traditional TLC framework, which is a learning system over a 12-to-15-month period, the learning sessions were designed to occur only three time. However, after face-to-face learning in TLC meetings, the teams did not engage and maintain linkage with coaches. This may be the result of the DCLT having recruited existing staff in the district,
thus the staff needed to shift to teams’ facilities and shoulder extra work. The TLC also struggled with a lack of common metrics: for example, a reform initiative involving family doctor team-based care, which would facilitate care for chronic diseases such as hypertension; process metrics, such as the proportion of patients assigned to a family doctor team, the numbers of annual visits by patients assigned to a team, or the numbers of medicines prescribed; and outcome metrics, such as the percentage of hypertension patients’ blood pressure control under 140mmHg (systolic blood pressure) and 90mmHg (diastolic blood pressure), or to what extent the prevalence of hypertension was reduced? The inconsistency of participation due to conflict between learning and working also posed some challenges. Participants who were less engaged may have affected both the team dynamics during discussion and the learning outcomes.

Wuhou district continues to carry out transformative learning collaborative activities to disseminate the model throughout CHCs. This model can establish and support all future TLCs. We believe that health providers will benefit from this initiative by improving participants’ knowledge and skills, and the healthcare system can attain valuable medical services and system improvements in converting to a patient-centred, family doctor team-based, holistic, coordinated, and high-quality and care with a more communicative initiative.

Implications and Limitations

The results of this study can: present researchers or programme directors with a guided process for running TLC when seeking to expand implementation with regard to a specific topic plan; support the identification of important enablers associated with successful implementation of TLC for consideration; and help design TLC activities that can improve doctor teams’ knowledge and skills, while the system as a whole can improve in terms of the quality, access, and efficiency of its services.

There are some possible limitations in this study. First, our sample size was small and geographically limited; thus, the people who responded to our survey questions may not have formed a truly random sample and also may not reflect the general population of China. Second, there was very little research regarding the use of TLC in China, and our discussion may have been limited in this respect. Third, as the whole programme is launched by the health commission of Wuhou, the participants are likely to give positive feedback to the implementation of TLC, and thus, our paper may overestimate the success of TLC from participants perspective.

Conclusions

Transformative learning collaborative methodology, as part of a district initiative to reform China’s primary care system, was successfully implemented. This study discusses the development, adaptation, and challenges for implementing TLC with family doctor teams and managers in CHCs. Regarding TLC activities, teams reported positive feedback and definitive benefits. They were also able to understand and master problem-solving tools within the TLC. Moreover, we were able to identify enablers associated with successful implementation. As Wuhou district continues to disseminate the District Model through
its CHCs, this collaborative training method may continue to be an effective way to manage a small number of administrators, faculties, and coaches across a large population.

It is necessary for future studies to examine the following points. First, the efficacy of TLC as a training method across a large population remains unclear. One way to examine how TLC functions in this context is to examine its efficacy in the context of provincial or prefecture-level cities in China. Another approach is to verify TLC as a training and quality improvement method throughout China or other nations. Second, the progress made by family doctors and managers after utilisation of the TLC training needs to be verified. For example, it is important to examine whether the quality of diabetes or hypertension management improves or whether any efficient primary care workflows have been established. The extent to which patients involve themselves in self-management in health care and so on may also be examined.

**Abbreviations**

TLC: Transformative Learning Collaborative; PACT: Patient Aligned Care Team; PCMH: Patient-Centred Medical Home; District Collaborative Leadership Team (DCLT); VA: Department of Veterans Affairs; CHC(s): Community Health Centre(s); HIS: Hospital Information System; PDSA(s): Plan-Do-Study-Action(s); LS(s): Learning Session(s)

**Declarations**

**Ethical approval and consent to participate**

The ethical review committee at the Department of Health and Family Planning Bureau of Wuhou approved this study. The Technology and Information Department ethics also approved the study protocol (2017/A08).

To collect feedback on the programme, participants are asked to complete an online survey after the learning sessions and were informed that the survey responses would be totally anonymous to ensure confidentiality, written informed consent was obtained from each participant at enrollment and additional verbal informed consent was obtained before face-to-face training from all participants ensuring those who wish to opt out. These procedures were approved by the ethical review committee at the Department of Health and Family Planning Bureau of Wuhou.

**Consent to publish**

Not applicable

**Availability of data and materials**

The datasets used or analysed during the current study are available from the corresponding author on reasonable request.
Competing interests

The authors declare that they have no competing interests.

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Authors’ Contributions

PC and DL conceptualised the idea. PC performed the analyses and wrote the original draft of the manuscript. DL and HL critically revised the manuscript. YH provided resources. All the authors read and approved the final manuscript.

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**Additional File Legends**

Appendix 1: Six Principles of the District Model

Appendix 2: District Transformative Learning Collaborative Follow-up Survey

**Figures**

![Figure 1. District Model of Wuhou](image)

**Figure 1**

District Model of Wuhou
Figure 2. District TLC’s Organisational Structure

Figure 2

District TLC's Organisational Structure
**Figure 3. Transformative Learning Collaborative Implementation Process in Wuhou District**

LS = Learning Session; AP = Action Period; PDSA = Plan-Do-Study-Act.

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- Appendix1.pdf
- Appendix2.pdf