

# BMJ Open Continuing medical education and work commitment among rural healthcare workers: a cross-sectional study in 11 western provinces in China

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## Abstract

**Objectives** Continuing medical education (CME) and work commitment are important for rural healthcare workers (RHWs) and rural medical work. The significant association between continuing education and work commitment has been reported in many studies from several different industries. However, very few studies have analysed the association of CME with work commitment among healthcare workers, let alone among RHWs. This study aimed to identify the significance of CME for the work commitment of RHWs (doctors and nurses) in China.

**Design and setting** The cross-sectional study interviewed RHWs from 11 western provinces in China.

**Participants** In total, 4118 RHWs, consisting of 2490 doctors and 1628 nurses who were working clinically, were included in the study.

**Primary outcome measures** Work commitment (ie, the relative importance of work to one's sense of self) focussing on the affective component was the dependent variable, and it included four subdomains: pride, concern, and dedication, extracted by exploratory factor analysis of a 5-point Likert scale, and turnover intent, measured by a dichotomous question. CME (ie, a variety of educational and training activities to maintain, develop or increase knowledge, skills and professional performance and relationships) was the independent variable, including three subdomains: opportunity, participation and expectation, measured by three dichotomous questions.

**Results** Of the 4118 respondents, 91.2% reported insufficient opportunities for CME, 21.3% had never participated in CME and 83.3% had a high expectation of CME. The mean scores of pride in, concern for and dedication to work were 3.54, 3.81 and 3.61 (out of a maximum of 5), respectively, and 30.6% presented turnover intent. After adjusting for gender, age, marriage, education, technical title, income and type of rural healthcare organisation, the multivariate analyses suggested that there was a significant positive association between CME and work commitment among RHWs. RHWs who had a significant high-level work commitment were those who reported a sufficient opportunity for CME ( $\beta$  and 95% CI for pride in, concern for and dedication to work: 0.33, 0.23 to 0.43; 0.19, 0.09 to 0.28; and 0.25, 0.15 to 0.35), had participated in CME ( $\beta$  and 95% CI for pride in, concern for and dedication to work: 0.11, 0.04 to 0.19; 0.09, 0.02 to 0.15; and 0.10, 0.03 to 0.17) and had a high expectation of CME ( $\beta$  and 95% CI for pride in, concern

## Strengths and limitations of this study

- This is the first study, to the best of our knowledge, to analyse the continuing medical education (CME), work commitment and the significance of CME for the work commitment of rural healthcare workers (RHWs) in China.
- This study depended on a large sample of RHWs, who included doctors and nurses working clinically in different types of rural healthcare organisations from 11 western provinces in China.
- The results were based on the self-reported perceptions of RHWs from the western region in China, which might entail bias and cannot be exactly generalisable to RHWs working in economically developed areas in China and other countries.
- The causal relationships of the work commitment of RHWs with CME and other factors could not be determined, as this study was a cross-sectional type.

for and dedication to work: 0.22, 0.15 to 0.30; 0.21, 0.13 to 0.28; and 0.28, 0.20 to 0.36), and having sufficient opportunities for CME significantly increased the odds of having no turnover intent (OR and 95% CI: 1.70, 1.26 to 2.28). Age, marriage, education, technical title, income and type of rural healthcare organisation were significantly associated with the work commitment of RHWs. Differences were observed between rural doctors and nurses in the association of CME with work commitment. **Conclusions** CME has a significant positive association with the work commitment of RHWs in China. RHWs' work commitment should be further improved in future rural health workforce management. In addition, governments, healthcare organisations and professional associations should establish a professional and complete CME system in China to provide sufficient opportunities for CME for RHWs, encourage them to participate and meet their expectations.

## INTRODUCTION

No health without a health workforce has been identified as a universal truth by the WHO.<sup>1</sup> As a key component of health systems, qualified healthcare workers play a central role in delivering quality care and promoting



health for all populations. Internationally, continuing medical education (CME) is an important approach to strengthen and improve the professional competencies of the current health workforce.<sup>2</sup> With the rapid acceleration of medical knowledge in the modern era of medicine, CME is a part of the process of ongoing learning and lifelong education that can keep healthcare workers' medical knowledge base and skills up to date.<sup>3</sup> CME to promote healthcare workers' understanding of rapid-paced medical advances meets not only the obligation of the health workforce to provide high-quality care for patients but also the need for the workers' own professional development.<sup>4</sup> Many previous studies have shown evidence of CME effectiveness in improving healthcare workers' knowledge, capacities or performance and patients' health outcomes.<sup>5-9</sup> However, the CME system also faces challenges, such as various needs or expectations from healthcare workers.<sup>10-15</sup> In China, unlike the USA,<sup>16</sup> Australia<sup>17 18</sup> and European countries,<sup>19</sup> there is not a complete CME system for healthcare workers,<sup>2 20 21</sup> let alone for rural healthcare workers (RHWs). Because the majority of RHWs, especially rural nurses, attained junior college education or below in China, they reported a strong need for CME to upgrade their educational degrees and medical knowledge and skills.<sup>22</sup> Similar findings among rural nurses in China were reported in previous studies.<sup>21 23</sup> In addition, the unique feature of rural medical practice is its scope, which means that the CME needs of RHWs are unique and different from the needs of urban healthcare workers.<sup>24-26</sup>

Work commitment, that is, employee commitment or organisational commitment, is important for an organisation, as the success or failure of an organisation is closely related to its' employees' motivation and effort that are often the product of employees' work commitment.<sup>27</sup> Loscocco defined the work commitment as the relative importance of work to one's sense of self.<sup>28</sup> There is widespread evidence of the impact of work commitment among healthcare workers on both individual and organisational performance. Baird *et al* found that the level of work commitment had a positive effect on both patient care and operational effectiveness in hospitals.<sup>29</sup> Attia *et al* identified a significant direct correlation between the work commitment of healthcare workers and perceived caring efficacy.<sup>30</sup> Horwitz reported that the affective commitment of physicians was positively related to improving patient safety culture.<sup>31</sup> Two studies in China found that work commitment was significantly and directly inversely associated with the presenteeism of healthcare workers.<sup>32 33</sup> Other studies have identified predictors for the work commitment of healthcare workers, such as job satisfaction, work environment, career barriers or support and individual or organisational factors.<sup>34-38</sup> The work commitment of RHWs is a matter of concern, especially in China. For example, rural healthcare organisations face more challenges in terms of the retention of RHWs because their working conditions, living conditions and social resources are

worse than those of their urban counterparts.<sup>39</sup> In addition, in China, since the implementation of new healthcare reform in 2009, the workload and work stress of RHWs have gradually increased, which may influence the retention of RHWs.<sup>39</sup> Improving the work commitment of existing RHWs could to a certain extent motivate them to remain in their positions.

There has been much research focussing on different industries about the positive association between training and employees' work commitment.<sup>40-43</sup> However, very limited studies have identified the association between CME and work commitment among healthcare workers, let alone for RHWs. A study conducted in New Zealand and the USA reported a significant positive association between perceived access to training and work commitment among nurses.<sup>44</sup> In addition, it has been recognised that access to CME is a key factor affecting the recruitment and retention of RHWs.<sup>4 24 25</sup> No relevant research has been found in China. RHWs in China are a neglected group that attracts less attention. However, the shortage of qualified healthcare workers is still a challenge in rural China, as is the problem of how to retain the existing RHWs.<sup>39 45</sup> Although the new healthcare reform has drastically improved the standard of medical care at these rural healthcare organisations, RHWs are experienced with common diseases but are relatively unskilled in treating complicated diseases. Particularly, RHWs who are working in township health centres or below may not even have enough experience treating rural residents' common diseases. With the continuous advance of new healthcare reform and the increasing demand for medical services from rural residents in China, the challenges to the medical service ability of RHWs are many and increasing. However, RHWs have limited and lagging access to information about rapid-paced medical advances due to various constraints and further have different and more needs for CME than healthcare workers in urban areas.<sup>11 23</sup> Undoubtedly, both CME and work commitment are important for RHWs and rural healthcare organisations in China. CME can help RHWs update their medical knowledge and skills, thus helping them provide high-quality medical services for rural patients and stay competitive for their professional development. A high level of work commitment of RHWs can ensure that they are willing to work for their healthcare organisations and provide services for rural patients. Moreover, a high level of work commitment of RHWs could to some extent help them cope with the increasing workload and work stress under the continuous advance of new healthcare reform. Therefore, based on existing evidence, it is very valuable to analyse the CME and work commitment among RHWs in China, and our study proposed the hypothesis that there would be a significant positive association between them.

Based on the above, using the data extracted from a large-scale survey among RHWs in western China, this study aimed to analyse the CME and work commitment of RHWs and to further identify the significance of CME for the work commitment of RHWs.

## METHODS

### Study design

The cross-sectional study was a part of a large collaborative research project, 'Situational Analysis and Policy Evaluation of the Deployment and Retention of Human Resources for Health in Rural Western China,' which was jointly supported by the China Medical Board and the WHO.<sup>39 45–48</sup> Eleven western provinces in China, consisting of Shaanxi, Gansu, Guangxi, Kweichow, Inner Mongolia, Ningxia, Qinghai, Sichuan, Tibet, Xinjiang and Yunnan, were included. Led by the principal investigator (PI) at Xi'an Jiaotong University of Shaanxi, 11 provincial steering committees consisting of researchers from local universities were set up to implement surveys in each province. The cross-sectional survey related to this study was conducted simultaneously in all 11 provinces from June to September 2013. Although the survey is currently somewhat out of date, to our knowledge, it was the first and only one that covered rural areas in 11 western provinces, and it was used to analyse the CME and work commitment of RHWs in China. In addition, as there has been little progress in China's CME system for RHWs, our data could still be used to find valuable results. The original questionnaire was first designed by the research team at Xi'an Jiaotong University, validated by other research teams by group discussion and small-scale pre-surveys, and revised and finalised under the agreement of all research teams. Two experts from the WHO also provided technical support for the study design. The formal survey was implemented using the paper version of questionnaires that were filled in by RHWs themselves anonymously, and all respondents provided their oral consent to participate in the survey.

### Setting and participants

The survey was conducted among healthcare workers working in rural healthcare organisations that could provide clinical services. In China, a county is regarded as a rural area in a broad sense. According to the original study design,<sup>39</sup> the RHWs included doctors, nurses, pharmacists, and so on. Healthcare managers or support workers were excluded. In addition, five types of rural healthcare organisations, that is, township healthcare centre (THC), centre for disease control and prevention (CDC), traditional Chinese medical hospital (TCMH), maternity and child healthcare hospital (MCHH) and county general hospital (CGH), were involved.

A three-stage random sampling method was carried out. Under consideration of the study budget and survey duration, the sample size was set by the PI, all co-PIs and two WHO experts. The detailed sampling strategy has been introduced in our previous paper.<sup>39</sup> Specifically, in each province, according to the gross domestic product per capita ranking of all counties, three of them, that is, poor, medium and rich counties, were first randomly selected; second, considering that each county in China generally has several THCs and four county-level healthcare organisations, that is, one CDC, one TCMH, one

MCHH and one CGH, we invited all four county-level healthcare organisations and randomly selected three THCs (if available) to participate in the survey; third, when selecting the RHWs, considering that the number of RHWs differed across the five types of rural healthcare organisations, all RHWs, 30 (if available), 50 (if available), 50 (if available) and 50 (if available) were randomly selected in each THC, CDC, TCMH, MCHH and CGH, respectively. Finally, approximately 6000 RHWs were selected, and 5584 were willing to participate in the survey and finished the questionnaires.<sup>39</sup> Furthermore, as this study focussed on rural doctors and nurses working clinically, 4118 RHWs, including 2490 rural doctors and 1628 rural nurses, were extracted from the original data set and included in this study.

### Variables

According to the objective of this study, only the relevant variables were extracted from the original questionnaire.

The dependent variable was the work commitment of RHWs, which has been conceptualised and measured in various ways.<sup>49</sup> Generally, it includes affective commitment, continuance commitment and normative commitment. This study mainly focussed on affective commitment and measured it by 10 questions, including a dichotomous question and a 5-point Likert scale with nine questions. The dichotomous question used to determine the turnover intent of RHWs was 'do you have the intent to leave your current location in the next year,' answered with either yes or no. For the other nine questions, participants were asked to rate their perceived degree on a scale of 1 (strongly disagree) to 5 (strongly agree), and we conducted exploratory factor analysis to induce dimension reduction. The value of Kaiser-Meyer-Olkin was 0.930, and the p value of Bartlett's test of sphericity was less than 0.001, indicating acceptable construct validity. Then, three subdomains were extracted, which consisted of pride (ie, having pride in work), concern (ie, being concerned for work) and dedication (ie, being dedicated to work). The score of each subdomain was further calculated based on the composite ratings by averaging the responses to each question within these subdomains, and a high score of each of the three subdomains reflected a high-level work commitment of RHWs. Finally, the work commitment of RHWs consisted of four subfactors, including three continuous variables (ie, pride in, concern for and dedication to work) and one binary variable (ie, turnover intent).

The independent variable was the CME of RHWs. In this study, CME was defined as a variety of educational and training activities that served to maintain, develop or increase the knowledge, skills and professional performance and relationships that RHWs used to provide services for patients, the public or the profession. We did not restrict the types, locations, specific contents, time length, funding source, and so on, of the CME the RHWs participated in. Three binary subfactors were used to measure the CME of RHWs. The first was the opportunity

for CME, which asked respondents whether there was sufficient opportunity for CME in their work; the second was the participation in CME, which asked respondents whether they had participated in CME before or not; and the third was the expectation of CME, which asked respondents whether they had a general or high expectation of CME in the future.

In addition to CME, work commitment is reportedly influenced by healthcare workers' individual characteristics, such as age, marriage, education and income.<sup>36 37 50–53</sup>

Based on that, our study introduced seven sociodemographic characteristics of the RHWs as the controlled variables,<sup>39</sup> which included: (1) gender with two groups, that is, female and male; (2) age with three groups, that is,  $\leq 29$  years, 30 to 39 years and  $\geq 40$  years; (3) marriage with two groups, that is, unmarried (never unmarried) and married (ever-married); (4) education with three groups, that is, senior high school or below, junior college and bachelor or above; (5) technical title with three groups, that is, primary (equal to the medical assistant or resident physician), intermediate (equal to the attending physician) and senior (equal to the associate chief or chief physician); (6) income per month with three groups, that is,  $\leq$ US\$247.9 (US dollars), US\$248.0 to US\$413.2 and  $\geq$ US\$413.3; and (7) type of rural healthcare organisations with five groups, that is, THC, CDC, TCMH, MCHH and CGH.

### Statistical analysis

All categorical variables were displayed by counts and proportions. Continuous variables related to the work commitment of RHWs were described by the mean score and SD.

We applied Pearson's  $\chi^2$  tests to assess differences in the proportions of sociodemographic characteristics, CME (ie, opportunity, participation and expectation), and work commitment (ie, turnover intent) between rural doctors and nurses. One-way analysis of variance was used to assess differences in the mean scores of pride in, concern for and dedication to work between rural doctors and nurses. P values are displayed.

Multivariate linear regression models and binary logistic regression models were constructed to analyse the association of the CME of RHWs with their work commitment. Three subfactors of work commitment, that is, pride in, concern for and dedication to work, were set as dependent variables in three linear regression models separately. Moreover, multivariate binary logistic regression models were set up with turnover intent as the dependent variable. In each of these models, all three subfactors of CME, that is, opportunity, participation and expectation, were introduced as independent variables simultaneously, and all controlled variables mentioned above were adjusted in these models. When conducting multivariate linear regression analyses, categorical independent variables and controlled variables were all converted to dummy variables. In addition, all the above analyses were performed for a total sample of RHWs, doctors

and nurses. The  $\beta$  (regression coefficient), 95% CI of  $\beta$  and p value were reported for linear regression analyses. OR, 95% CI of OR and p value were reported when conducting logistic regression analyses. A p value  $<0.05$  was considered to be significant in this study.

All data analyses were performed in the Statistical Package for Social Science 24.0 (SPSS, IBM, Armonk, New York, USA) for MAC.

### Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting or dissemination plans of our research.

## RESULTS

### Characteristics of the sample

Of the 4118 RHWs included in this study, 60.5% (2490) were doctors and 39.5% (1628) were nurses. Table 1 shows the sociodemographic characteristics of the participants.

For the total sample of RHWs, 69.1% were female, 72.2% were younger than 39 years, 75.1% were married or ever married, 30.8% had attained an education of bachelor or above, 70.6% held a primary technical title, 41.5% received an income of US\$248.0 to US\$413.2 per month, 27.2% were working in THCs and 30.0% were working in CGHs. Significant differences were observed between doctors and nurses in these proportions with respect to gender, age, marriage, education, technical title, income per month and type of rural healthcare organisation (all p values  $<0.001$ ). Compared with rural doctors, the nurses presented a significantly higher proportion in the following groups: female,  $\leq 29$  years, unmarried, junior college or below, primary technical title,  $\leq$ US\$413.2 per month and working in CGHs.

### Continuing medical education and work commitment of the sample

Table 2 presents the results of CME and the work commitment of RHWs. In terms of the CME, only 8.8% of total RHWs reported that the opportunity for CME was sufficient, 21.3% had never participated in the CME before and 83.3% had a high expectation of CME. Compared with rural nurses, a significantly higher proportion of doctors disclosed that the opportunity for CME was insufficient (p value  $<0.01$ ), and they had participated in prior CME (p value  $<0.001$ ). No significant difference was observed between rural doctors and nurses for the expectation of CME.

In terms of work commitment, for all RHWs, the mean scores of pride in, concern for and dedication to work were  $3.54 \pm 0.85$ ,  $3.81 \pm 0.81$  and  $3.61 \pm 0.87$  out of a maximum of 5, respectively, and 30.6% reported turnover intent. There were no significant differences between rural doctors and nurses for the scores of pride in, concern for and dedication to work; however, compared with nurses, a significantly higher proportion of rural doctors had a turnover intent (p value  $<0.01$ ).

**Table 1** Sociodemographic characteristics of rural healthcare workers

	Total (n=4118)	Doctors (n=2490)	Nurses (n=1628)	P value
<b>Gender</b>				<0.001
Female	2814 (69.1%)	1239 (50.2%)	1575 (98.1%)	
Male	1259 (30.9%)	1229 (49.8%)	30 (1.9%)	
<b>Age</b>				<0.001
≤29 years	1473 (36.6%)	683 (28.0%)	790 (49.7%)	
30–39 years	1433 (35.6%)	919 (37.7%)	514 (32.3%)	
≥40 years	1119 (27.8%)	833 (34.2%)	286 (18.0%)	
<b>Marriage</b>				<0.001
Unmarried	1013 (24.9%)	484 (19.7%)	529 (32.9%)	
Married	3056 (75.1%)	1978 (80.3%)	1078 (67.1%)	
<b>Education</b>				<0.001
≤Senior high school	853 (20.8%)	385 (15.6%)	468 (28.9%)	
Junior college	1979 (48.3%)	1061 (42.9%)	918 (56.7%)	
≥Bachelor	1262 (30.8%)	1029 (41.6%)	233 (14.4%)	
<b>Technical title</b>				<0.001
Primary	2831 (70.6%)	1584 (65.4%)	1247 (78.5%)	
Intermediate	879 (21.9%)	586 (24.2%)	293 (18.5%)	
Senior	299 (7.5%)	251 (10.4%)	48 (3.0%)	
<b>Income per month (US\$)</b>				<0.001
≤247.9	747 (19.4%)	307 (13.1%)	440 (29.1%)	
248.0–413.2	1600 (41.5%)	968 (41.3%)	632 (41.8%)	
≥413.3	1508 (39.1%)	1069 (45.6%)	439 (29.1%)	
<b>Type of rural healthcare organisation</b>				<0.001
THC	1119 (27.2%)	708 (28.4%)	411 (25.2%)	
CDC	442 (10.7%)	370 (14.9%)	72 (4.4%)	
TCMH	681 (16.5%)	360 (14.5%)	321 (19.7%)	
MCHH	640 (15.5%)	381 (15.3%)	259 (15.9%)	
CGH	1236 (30.0%)	671 (26.9%)	565 (34.7%)	

CDC, centre for disease control and prevention; CGH, county general hospital; MCHH, maternity and child healthcare hospital; TCMH, traditional Chinese medicine hospital; THC, township healthcare centre; US\$, US dollars.

### Multivariate regression analyses

Tables 3 and 4 present the results of the regression equations. For the total sample of RHWs, all three independent variables, that is, opportunity for, participation in and expectation of CME, were significantly associated with RHWs' pride in, concern for and dedication to work (all p values <0.05). Specifically, RHWs who reported a sufficient opportunity for CME ( $\beta$ : 0.33, p value <0.001), had participated in CME before ( $\beta$ : 0.11, p value <0.01) or had a high expectation of CME ( $\beta$ : 0.22, p value <0.001) significantly presented a high level of pride in their work. Similar positive associations of opportunity for, participation in and expectation of CME with RHWs' concern for and dedication to work were identified. In addition, only the opportunity for CME was significantly associated with RHWs' turnover intent; that is, RHWs who reported a sufficient opportunity for CME were more likely to

have no turnover intent (OR: 1.70, 95% CI: 1.26 to 2.28, compared with 'insufficient opportunity for CME').

When conducting regression analyses for rural doctors and nurses separately, both the opportunity for and expectation of CME were significantly associated with the pride in, concern for and dedication to work among doctors and nurses; however, participation in CME was significantly associated with the pride in and concern for work among nurses and with dedication to work among doctors. Moreover, neither participation in nor expectation of CME were associated with the turnover intent of rural doctors or nurses, and the opportunity for CME was significantly associated with rural doctors' turnover intent.

In addition, the results of multivariate analyses suggest that six controlled variables except for gender, that is, age, marriage, education, technical title, income and type

**Table 2** Continuing medical education and work commitment of rural healthcare workers

	Total	Doctors	Nurses	P value
Continuing medical education				
Opportunity				0.002*
Insufficient	3754 (91.2%)	2298 (92.3%)	1456 (89.4%)	
Sufficient	364 (8.8%)	192 (7.7%)	172 (10.6%)	
Participation				<0.001*
No	862 (21.3%)	416 (17.0%)	446 (27.8%)	
Yes	3182 (78.7%)	2026 (83.0%)	1156 (72.2%)	
Expectation				0.795*
General	671 (16.7%)	411 (16.9%)	260 (16.5%)	
High	3342 (83.3%)	2027 (83.1%)	1315 (83.5%)	
Work commitment				
Pride	3.54±0.85	3.52±0.86	3.56±0.84	0.147†
Concern	3.81±0.81	3.81±0.80	3.79±0.81	0.417†
Dedication	3.61±0.87	3.63±0.88	3.59±0.86	0.175†
Turnover intent				
Yes	1178 (30.6%)	755 (32.2%)	423 (28.1%)	
No	2670 (69.4%)	1590 (67.8%)	1080 (71.9%)	

\*Pearson's  $\chi^2$  test.

†One-way analysis of variance.

of rural healthcare organisation, were significantly associated with RHWs' work commitment. RHWs who were  $\geq 40$  years were more likely to have a high level of pride in and dedication to their work (for the total sample and doctors). Rural nurses who were married or ever-married were more likely to have a high level of concern for work. RHWs with an education of bachelor or above were inclined to present a low-level pride in work (for the total sample and doctors) and were more likely to have turnover intent (for the total sample). Rural doctors who held a senior technical title were more likely to have a high level of concern for and dedication to their work, and rural doctors who held an intermediate technical title were more likely to have turnover intent. In terms of income, RHWs who received  $\geq$ US\$413.3 per month were more likely to present a high level of pride in, concern for and dedication to work (for the total sample, doctors and nurses) and were more likely to have no turnover intent (for the total sample and nurses). Compared with RHWs who were working in THCs, those working in CDCs (for the total sample and doctors) were more likely to have a low level of concern for and dedication to work and to have no turnover intent, those working in TCMHs were more likely to have a low level of concern for (for doctors) and dedication to work (for the total sample, doctors and nurses), those working in MCHHs were more likely to have a high level of pride in and concern for work (for the total sample and nurses) and to have no turnover intent (for the total sample and doctors), and those working in CGHs were more likely to have a low level of concern for (for doctors) and dedication to work

(for the total sample and doctors) and to have no turnover intent (for nurses).

## DISCUSSION

To our knowledge, we generate the first evidence on the CME, work commitment and the significance of CME for the work commitment of RHWs in China. A large-scale cross-sectional survey was conducted, and 4118 RHWs, including 2490 doctors and 1628 nurses from five types of rural healthcare organisations in 11 western provinces of China, participated in this study. The study provides relevant experience from China for the growing body of studies on the CME and work commitment of healthcare workers.

The study reported that the vast majority of RHWs in western China considered the opportunity for CME to be insufficient and had a high expectation of CME. Moreover, more than one in five RHWs had never participated in CME before. Given the evidence of the importance of CME to RHWs and rural medical work mentioned at the beginning of this study, all these findings mean that RHWs in western China have very limited access to CME and have a great demand for CME. Consistent with the results in our study, many previous studies have reported that healthcare workers in rural areas have a strong need for CME.<sup>11 12 15 22-24</sup> However, there were many barriers, such as lack of opportunity, heavy workload, lack of time, the high cost of courses and lack of organisational support, that hindered RHWs from participating in CME.<sup>21 22 54 55</sup> In addition, our study found that there were significant

**Table 3** Multivariate linear regression analyses with work commitment (pride in, concern for and dedication to work) as a dependent variable

Dependent variables	Pride in work			Concern for work			Dedication to work		
	Total	Doctor	Nurse	Total	Doctor	Nurse	Total	Doctor	Nurse
Independent variables									
Opportunity for CME									
Insufficient	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Sufficient	0.33 (0.23 to 0.43)***	0.35 (0.22 to 0.48)***	0.28 (0.13 to 0.43)***	0.19 (0.09 to 0.28)***	0.16 (0.03 to 0.28)*	0.20 (0.06 to 0.34)**	0.25 (0.15 to 0.35)***	0.17 (0.04 to 0.31)*	0.33 (0.18 to 0.48)***
Participation in CME									
No	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Yes	0.11 (0.04 to 0.19)**	0.09 (-0.01 to 0.19)	0.14 (0.04 to 0.24)**	0.09 (0.02 to 0.15)*	0.03 (-0.06 to 0.13)	0.14 (0.05 to 0.24)**	0.10 (0.03 to 0.17)**	0.13 (0.02 to 0.23)*	0.07 (-0.03 to 0.18)
Expectation of CME									
General	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
High	0.22 (0.15 to 0.30)***	0.23 (0.13 to 0.33)***	0.22 (0.10 to 0.34)***	0.21 (0.13 to 0.28)***	0.21 (0.11 to 0.30)***	0.19 (0.08 to 0.31)**	0.28 (0.20 to 0.36)***	0.34 (0.24 to 0.44)***	0.19 (0.07 to 0.32)**
Controlled variables									
Gender									
Female	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Male	-0.03 (-0.09 to 0.03)	-0.02 (-0.10 to 0.05)	0.16 (-0.18 to 0.49)	0.01 (-0.06 to 0.07)	0.02 (-0.05 to 0.09)	0.01 (-0.32 to 0.33)	0.05 (-0.01 to 0.12)	0.06 (-0.01 to 0.14)	0.20 (-0.15 to 0.54)
Age									
≤29 years	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
30–39 years	0.07 (-0.01 to 0.15)	0.10 (-0.01 to 0.21)	-0.01 (-0.13 to 0.13)	0.04 (-0.04 to 0.11)	0.07 (-0.03 to 0.18)	-0.04 (-0.16 to 0.09)	0.05 (-0.04 to 0.13)	0.08 (-0.04 to 0.19)	-0.01 (-0.14 to 0.12)
≥40 years	0.13 (0.03 to 0.23)*	0.20 (0.07 to 0.33)**	-0.02 (-0.19 to 0.15)	0.06 (-0.04 to 0.15)	0.10 (-0.03 to 0.22)	-0.01 (-0.17 to 0.15)	0.12 (0.02 to 0.23)*	0.18 (0.04 to 0.31)**	0.03 (-0.14 to 0.20)
Marriage									
Unmarried	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Married	-0.01 (-0.09 to 0.07)	-0.04 (-0.15 to 0.08)	0.03 (-0.09 to 0.15)	0.07 (-0.01 to 0.15)	0.01 (-0.10 to 0.12)	0.15 (0.03 to 0.26)*	0.02 (-0.07 to 0.10)	-0.04 (-0.15 to 0.08)	0.08 (-0.04 to 0.21)
Education									

Continued



**Table 3** Continued

Dependent variables	Pride in work			Concern for work			Dedication to work		
	Total	Doctor	Nurse	Total	Doctor	Nurse	Total	Doctor	Nurse
≤Senior/high school	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Junior college	-0.04 (-0.12 to 0.03)	-0.04 (-0.15 to 0.17)	-0.06 (-0.16 to 0.05)	-0.01 (-0.08 to 0.06)	-0.01 (-0.11 to 0.10)	-0.02 (-0.13 to 0.08)	0.04 (-0.04 to 0.12)	0.01 (-0.10 to 0.13)	0.04 (-0.07 to 0.15)
≥Bachelor	-0.15 (-0.24 to -0.06)**	-0.18 (-0.31 to -0.06)**	0.02 (-0.13 to 0.17)	-0.02 (-0.10 to 0.06)	-0.03 (-0.14 to 0.09)	0.06 (-0.09 to 0.20)	-0.01 (-0.10 to 0.08)	-0.06 (-0.19 to 0.06)	0.16 (-0.01 to 0.31)
Technical title									
Primary	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Intermediate	-0.06 (-0.14 to 0.02)	-0.06 (-0.16 to 0.04)	-0.03 (-0.17 to 0.11)	0.01 (-0.07 to 0.08)	0.01 (-0.08 to 0.10)	-0.01 (-0.14 to 0.13)	0.02 (-0.06 to 0.10)	0.05 (-0.05 to 0.15)	-0.02 (-0.16 to 0.13)
Senior	0.08 (-0.04 to 0.20)	0.11 (-0.02 to 0.25)	-0.05 (-0.36 to 0.26)	0.08 (-0.04 to 0.19)	0.13 (0.01 to 0.26)*	-0.02 (-0.32 to 0.27)	0.12 (-0.01 to 0.24)	0.16 (0.02 to 0.30)*	0.03 (-0.29 to 0.35)
Income per month (US\$)									
≤247.9	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
248.0-413.2	0.02 (-0.06 to 0.10)	0.02 (-0.10 to 0.14)	0.02 (-0.10 to 0.13)	0.07 (-0.01 to 0.15)	0.11 (-0.01 to 0.13)	0.02 (-0.09 to 0.13)	0.09 (0.01 to 0.18)*	0.15 (0.03 to 0.27)*	0.02 (-0.10 to 0.14)
≥413.3	0.18 (0.09 to 0.26)***	0.14 (0.01 to 0.26)*	0.27 (0.13 to 0.40)***	0.19 (0.10 to 0.27)***	0.16 (0.04 to 0.27)**	0.28 (0.15 to 0.41)***	0.16 (0.07 to 0.25)**	0.16 (0.03 to 0.28)*	0.21 (0.08 to 0.35)**
Type of rural healthcare organisation									
THC	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)	1 (ref)
CDC	-0.03 (-0.13 to 0.08)	-0.04 (-0.16 to 0.08)	0.03 (-0.21 to 0.26)	-0.11 (-0.21 to -0.01)*	-0.15 (-0.26 to -0.04)**	-0.01 (-0.23 to 0.22)	-0.13 (-0.24 to -0.03)*	-0.17 (-0.29 to -0.05)**	0.01 (-0.24 to 0.24)
TCMH	-0.06 (-0.15 to 0.03)	-0.05 (-0.17 to 0.08)	-0.07 (-0.21 to 0.06)	-0.08 (-0.17 to 0.01)	-0.13 (-0.24 to -0.01)*	-0.02 (-0.15 to 0.11)	-0.16 (-0.25 to -0.07)**	-0.12 (-0.25 to -0.01)*	-0.20 (-0.34 to -0.06)**
MCHH	0.10 (0.01 to 0.20)*	0.04 (-0.08 to 0.16)	0.21 (0.07 to 0.36)**	0.10 (0.01 to 0.19)*	0.04 (-0.08 to 0.15)	0.21 (0.07 to 0.35)**	-0.01 (-0.10 to 0.09)	-0.09 (-0.21 to 0.03)	0.14 (-0.01 to 0.29)
CGH	0.01 (-0.07 to 0.08)	-0.01 (-0.11 to 0.11)	0.01 (-0.11 to 0.13)	-0.06 (-0.13 to 0.02)	-0.11 (-0.21 to -0.01)*	-0.01 (-0.13 to 0.10)	-0.11 (-0.19 to -0.03)**	-0.13 (-0.24 to -0.02)*	-0.10 (-0.22 to 0.02)

Continued



**Table 3** Continued

Dependent variables	Pride in work			Concern for work			Dedication to work		
	Total	Doctor	Nurse	Total	Doctor	Nurse	Total	Doctor	Nurse
The numbers in the cells are $\beta$ (regression coefficients) and 95% CIs of $\beta$ . ***p value <0.001, **p value <0.01, *p value <0.05. CDC, centre for disease control and prevention; CGH, county general hospital; CME, continuing medical education; MCHH, maternity and child healthcare hospital; ref, reference; TCMH, traditional Chinese medicine hospital; THC, township healthcare centre; US\$, US dollars.									

differences in the perceived opportunity for and participation in CME between rural doctors and nurses. A higher percentage of rural doctors than rural nurses considered the opportunity for CME to be insufficient, and a higher percentage of rural nurses than rural doctors had never participated in CME. All these findings suggest that more rural-relevant CME should be provided for rural doctors and nurses in China to meet their needs and encourage them to participate and improve their competencies.

In terms of the work commitment of RHWs, the mean scores of pride in, concern for and dedication to work were  $3.54 \pm 0.85$ ,  $3.81 \pm 0.81$  and  $3.61 \pm 0.87$  out of a maximum of 5, respectively. Moreover, 30.6% of RHWs had turnover intent. These results indicate that the work commitment of RHWs was not very high, which is consistent with Labrague *et al's* study that found rural nurses in the Philippines had moderate work commitment.<sup>56</sup> Given the evidence that the work commitment of RHWs contributes to their work performance, improving RHWs' work commitment should be a long-term task for rural healthcare organisations. In addition, a significant difference was observed in that a higher percentage of rural doctors than rural nurses had turnover intent, which indicates that rural doctors might have less work commitment than nurses. A similar finding was reported by Attia *et al* that nurses had significantly higher work commitment ( $32 \pm 5.1$ ) than doctors ( $29.8 \pm 4.6$ ) in Egypt.<sup>30</sup> These results might encourage rural healthcare organisations to focus more on doctors to enhance their work commitment.

Our study identified a significant positive association of CME with the work commitment of RHWs in China, validating our previous hypothesis. Specifically, the opportunity for, participation in and expectation of CME had a significant positive association with RHWs' work commitment. Providing more opportunities for CME, increasing the participation in CME, and fulfilling the expectation of CME were associated with increasing pride in, concern for and dedication to work among RHWs; specifically, the association of the opportunity for CME with the work commitment among RHWs was the strongest. In addition, a sufficient opportunity for CME perceived by RHWs was significantly associated with a 70% increase in the odds of having no turnover intent. One potential explanation for the positive association between CME and the work commitment of RHWs was that the CME in rural healthcare organisations could fulfil RHWs' needs to update their medical knowledge and skills and improve their medical service capacities and personal human capital, which might make them more willing to work for their institutions. However, RHWs' participation in and expectations of CME were not associated with their turnover intent. Currently, very limited studies have been conducted to identify the significance of CME for the work commitment of healthcare workers, let alone for RHWs. Consistent with the results in our study, Swedberg *et al* reported that healthcare assistants who had received on-the-job training had a high level of perceived responsibility for work in Sweden,<sup>9</sup> Brunetto *et al* found that

**Table 4** Multivariate binary regression analyses with turnover intent as a dependent variable

Dependent variable	Turnover intent (0=yes, 1=no)		
	Total	Doctor	Nurse
Independent variables			
Opportunity for CME			
Insufficient	1 (ref)	1 (ref)	1 (ref)
Sufficient	1.70 (1.26 to 2.28)**	2.18 (1.42 to 3.34)***	1.22 (0.79 to 1.87)
Participation in CME			
No	1 (ref)	1 (ref)	1 (ref)
Yes	0.95 (0.79 to 1.15)	0.93 (0.72 to 1.21)	0.99 (0.75 to 1.30)
Expectation of CME			
General	1 (ref)	1 (ref)	1 (ref)
High	1.02 (0.83 to 1.26)	0.98 (0.75 to 1.28)	1.15 (0.82 to 1.62)
Controlled variables			
Gender			
Female	1 (ref)	1 (ref)	1 (ref)
Male	0.94 (0.80 to 1.12)	1.08 (0.89 to 1.31)	0.85 (0.33 to 2.15)
Age			
≤29 years	1 (ref)	1 (ref)	1 (ref)
30–39 years	0.90 (0.72 to 1.12)	0.85 (0.64 to 1.14)	0.94 (0.67 to 1.33)
≥40 years	1.27 (0.97 to 1.67)	1.30 (0.91 to 1.84)	1.07 (0.67 to 1.72)
Marriage			
Unmarried	1 (ref)	1 (ref)	1 (ref)
Married	0.96 (0.77 to 1.19)	1.09 (0.81 to 1.47)	0.79 (0.57 to 1.11)
Education			
≤Senior high school	1 (ref)	1 (ref)	1 (ref)
Junior college	0.85 (0.69 to 1.04)	0.84 (0.62 to 1.13)	0.89 (0.66 to 1.19)
≥Bachelor	0.70 (0.56 to 0.89)**	0.74 (0.54 to 1.03)	0.87 (0.57 to 1.33)
Technical title			
Primary	1 (ref)	1 (ref)	1 (ref)
Intermediate	0.81 (0.65 to 1.01)	0.75 (0.57 to 0.97)*	0.99 (0.66 to 1.48)
Senior	0.86 (0.62 to 1.21)	0.94 (0.64 to 1.37)	0.54 (0.23 to 1.26)
Income per month (US\$)			
≤247.9	1 (ref)	1 (ref)	1 (ref)
248.0–413.2	0.96 (0.77 to 1.18)	0.85 (0.62 to 1.16)	1.14 (0.84 to 1.56)
≥413.3	1.39 (1.10 to 1.77)**	1.22 (0.88 to 1.69)	1.79 (1.21 to 2.65)**
Type of rural healthcare organisation			
THC	1 (ref)	1 (ref)	1 (ref)
CDC	1.67 (1.25 to 2.24)**	1.68 (1.21 to 2.34)*	1.86 (0.91 to 3.81)
TCMH	0.99 (0.78 to 1.26)	0.93 (0.68 to 1.27)	1.07 (0.74 to 1.54)
MCHH	1.35 (1.06 to 1.72)*	1.46 (1.06 to 2.00)*	1.24 (0.84 to 1.83)
CGH	1.19 (0.97 to 1.45)	1.00 (0.76 to 1.31)	1.41 (1.02 to 1.96)*

The numbers in the cells are ORs and 95% CIs of ORs.

\*\*\*p value <0.001, \*\*p value <0.01, \*p value <0.05.

CDC, centre for disease control and prevention; CGH, county general hospital; CME, continuing medical education; MCHH, maternity and child healthcare hospital; ref, reference; TCMH, traditional Chinese medicine hospital; THC, township healthcare centre; US\$, US dollars.

satisfaction with training among nurses was significantly associated with their work commitment in Australia<sup>57</sup> and Bartlett *et al* reported a significant positive association

of perceived access to training with the work commitment of nurses in New Zealand and the USA.<sup>44</sup> A study based on a randomised controlled design conducted in

the USA indicated a significant decrease in annual turnover among direct support professionals in community support settings for individuals with intellectual and developmental disabilities who received competency-based training.<sup>58</sup> Kadam *et al* found that training opportunity was an important factor influencing the retention of the health workforce in rural and remote areas of India.<sup>59</sup> In addition, similar evidence about the positive association of training with employees' work commitment was reported in related studies from several different industries.<sup>40–43</sup> However, a British study found no evidence of a relationship between the continuing professional education of nurses and their work commitment.<sup>50</sup> Another study in Canadian industries indicated that employer-provided training was related to higher turnover, which might be because increasing training could improve workers' competitiveness in the open job market.<sup>60</sup>

Furthermore, the study found a difference in the association of CME with work commitment between rural doctors and nurses. Participation in CME was significantly associated with rural nurses' pride in and concern for work and associated with rural doctors' dedication for work. Moreover, only the opportunity for CME was significantly associated with rural doctors' turnover intent, and a sufficient opportunity for CME perceived by rural doctors was significantly associated with a 118% increase in the odds of having no turnover intent. No related studies were found. These findings suggest that a variety of different measures should be implemented for rural doctors and nurses, for example, providing more opportunities for CME, especially for rural doctors, and encouraging participation in more CME activities, especially for rural nurses. In addition, it is important to establish a professional and complete CME system for RHWs in China. A related rural professional regulation authority should be set up in China to facilitate better overall training for RHWs coupled with appropriate ongoing CME.

In addition to the CME, six individual characteristics were identified by multivariate analyses as factors that were significantly associated with work commitment among RHWs. The first factor was age. Older RHWs ( $\geq 40$  years), especially doctors, were more likely to present a high level of pride in and dedication to work, which was consistent with the studies of Miedaner *et al*<sup>36</sup> and Drey *et al*.<sup>50</sup> This might be because compared with younger RHWs, older RHWs had a deeper and longer relationship with their medical institutions. The second was marriage; married rural nurses were more likely to present a high level of concern for work. Kodama *et al* similarly reported that married nurses were 2.07 times more likely to have high work commitment in Japan.<sup>51</sup> The third factor was education. RHWs who held a bachelor's degree, especially doctors, were more likely to present a low level of pride in their work and were more likely to have turnover intent. An Iranian study also indicated that healthcare workers who held a higher education degree reported a lower score of organisational commitment.<sup>37</sup> The technical title was the fourth factor. Having a senior technical

title was significantly associated with a high level of rural doctors' concern for and dedication to work. The fifth factor was income per month. RHWs who received a high level of income per month ( $\geq$ US\$413.3) were more likely to have a high level of work commitment, which corresponded well with previous studies.<sup>52–53</sup> Income is assumed to be essential to health service delivery.<sup>39</sup> Of these six significant individual characteristics, the association of income with the work commitment of RHWs was the strongest. In addition, the type of rural healthcare organisation was the last factor. RHWs working in county-level healthcare organisations, such as CDCs, TCMHs and CGHs, were more likely to present a lower level of work commitment. No related evidence was found in previous studies. All these results suggest that RHWs with specific characteristics associated with a low-level work commitment deserve more attention in future rural health workforce management.

Several limitations of our study should be addressed. First, the survey was conducted in 2013, and the data are somewhat out of date, which means that it cannot provide the most recent research findings. Second, this study mainly focussed on the affective commitment of RHWs and could not provide an overall depiction of the work commitment of RHWs. Third, CME was defined as a general concept in this study, and the types, locations, specific contents, time length, funding source, and so on of CME were not included in this study; therefore, it might lend itself to any hypothesis about the nature of the CME. Fourth, because of the limited subdomains for the CME and work commitment set in the questionnaire, we could not conduct a very sufficient measurement of all aspects of them and their relationship among RHWs in China. Fifth, although the sample size is large, it could not fully and accurately reflect the CME and work commitment of RHWs; moreover, some findings might not apply well to the RHWs working in other regions of China, as this study was conducted in 11 provinces in western China. Sixth, although the survey was anonymous, RHWs might still feel compelled to report better ratings with the CME and work commitment, which might bring some bias. Seventh, as it was a cross-sectional study, a causal relationship between CME and the work commitment of RHWs could not be concluded.

## CONCLUSION

This is the first study in China to analyse the significance of CME for work commitment among RHWs. RHWs reported a poor experience with CME and a high expectation of it, and their work commitment was not very high. A significant positive association of CME with the work commitment of RHWs was identified; specifically, a sufficient opportunity for CME, previous participation in CME and a high expectation of CME were significantly associated with a higher level of pride in, concern for and dedication to work among RHWs, and a sufficient opportunity for CME was associated with lower odds of

having turnover intent. RHWs' work commitment should be further improved in future rural health workforce management in China. Governments, healthcare organisations, professional associations, and so on, should establish a professional and complete CME system for RHWs, including setting up a related rural professional regulation authority, providing sufficient opportunities for CME for RHWs, encouraging them to participate and meeting their expectations. In addition, RHWs who were young, unmarried and highly educated, who had a low technical title and income per month and who worked in a CDC, TCMH or CGH should be given more attention because they were more likely to have a low work commitment.

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