MEDICAL SCIENCE MONITOR

CLINICAL RESEARCH

e-ISSN 1643-3750
© Med Sci Monit, 2016; 22: 267-275
DOI: 10.12659/MSM.895593

Received: 2015.08.09
Accepted: 2015.09.04
Published: 2016.01.25

Peer Support Training Improved the Glycemic Control, Insulin Management, and Diabetic Behaviors of Patients with Type 2 Diabetes in Rural Communities of Central China: A Randomized Controlled Trial

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Source of support: This study was funded by the Jingzhou City Projects for Science and Technology of Medicine and Health (2014, No. 68)

Background: The efficacy of peer support in Chinese diabetes patients is still uncertain. The purpose of this study was to observe the effects of a peer support program on the outcomes of patients with type 2 diabetes who received community-based insulin therapy in rural communities of central China.

Material/Methods: Two hundred and eight eligible patients with type 2 diabetes were randomly assigned into the traditional training group (control group, n=111) and peer support intervention group (peer group, n=97) between June 2013 and January 2014 in 2 rural communities of Jingzhou area, China. Both groups received 3-month traditional training, followed by another 4-month traditional training or peer support training, respectively. At baseline and 7 months after treatment, the blood glycemic level was evaluated by biochemical detection. Capacities of self-management and knowledge related to insulin usage were assessed by questionnaire survey.

Results: Ninety-seven and ninety patients completed this study in the control group and peer group, respectively. There was no significant difference in age, gender, diabetes duration, insulin usage time, and complications between the 2 groups at baseline (P>0.05). Compared with the control group, peer group patients achieved a more significant decrease in blood glycosylated hemoglobin levels (P<0.05), increase in knowledge related to insulin usage, and increase of diabetes self-management ability (P<0.05).

Conclusions: Peer support intervention effectively improves outcomes of patients with type 2 diabetes in rural communities of central China.

MeSH Keywords: Community Health Nursing • Diabetes Mellitus, Type 2 • Randomized Controlled Trial • Self Care

Full-text PDF: http://www.medscimonit.com/abstract/index/idArt/895593

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Background

Diabetes causes devastating socioeconomic burdens worldwide that lead to morbidity and mortality and are associated with depression, distress, and poor quality of life [1–3]. In addition to the developed countries, the prevalence of diabetes is growing rapidly in developing countries, including China. With the continuous and rapid development of economics in China, people's life-styles tend to be Westernizing, which dramatically increases the prevalence of diabetes, especially type 2 diabetes. An epidemiology investigation showed that in 2010, the overall prevalence of diabetes was about 11.6% in the Chinese adult population; among patients with diabetes, only 25.8% received corresponding treatment, and only 39.7% of them achieved adequate glycemic control [4]. Effectively treating and managing these diabetes patients is becoming a great challenge.

Nurse-led care management improves self-care capacities of diabetes patients [5], but this improvement is often short-lived. In real-life practice, especially in resource-limited settings, these services are not easily delivered. Education on diabetes and standardized self-management of patients (including diet control and sport therapy) are still the basis of diabetes control [6]. Diabetes self-management education (DSME) continuously provides diabetes patients with the knowledge, skills, and ability that are conducive to self-care [7]. DSME can be obtained from healthcare professionals to bring about some improvements in the outcomes (i.e., glycemic control) of patients with type 2 diabetes, but often only in the short-term [8–10]. Ongoing educational support is necessary for these diabetes patients.

Peer support, based on the knowledge and experience of DSME, involves mutual support between patients who similarly suffer from diabetes [11]. Regardless of its various forms, diabetes peer support programs include 4 common key functions: 1) improving self-management capacities in daily life; 2) providing social and emotional support; 3) integrating and linking to clinical caring and community resources; and 4) providing ongoing support [12]. Peer support is reportedly an effective way to improve diabetes care and outcomes. It has been used in the management of diabetes patients, especially in rural areas lacking of healthcare facilities and financial means, with varied results.

Some randomized controlled trials (RCTs) indicated that peer support training improved the self-management and outcomes of diabetes patients. Assah et al. demonstrated that community-based peer support for 6 months significantly reduced glycosylated hemoglobin (HbA1c), promoted metabolic control (including fasting blood glucose [FBG], cholesterol, high-density lipids, body-mass index [BMI], and diastolic pressure), and improved self-care behaviors in patients with uncontrolled type 2 diabetes in Cameroon [13]. Heisler et al. reported that reciprocal peer support significantly decreased HbA1c levels, promoted insulin starts, and increased diabetes-specific social support better than nurse care management in diabetes patients [14]. Baumann et al. showed peer support improved HbA1c, diastolic blood pressure, and eating behaviors in diabetes 2 patients in rural Uganda [15]. However, some RCT results differ from these widely touted results of peer support. Smith et al. reported that peer support intervention had no significant effect on HbA1c level, systolic blood pressure, total cholesterol concentration, or wellbeing scores of patients with type 2 diabetes in Ireland [16]. Tang et al. showed that 6-month peer-support did not have a significant positive impact on HbA1c levels in South-Asian diabetes 2 patients [17]. A recent RCT showed that group diabetes peer support for 8–12 months only insignificantly improved the HbA1c levels in diabetes 2 patients in rural communities of England [18]. Collectively, these results suggest that the efficacy of peer support treatment is inconsistent, probably depending on the populations and regions with varied socioeconomic development levels, medical resources, and cultural background.

The effectiveness of peer support programs for diabetes patients in Chinese rural communities is unclear. In this study, we performed an RCT study to observe the effect of peer support intervention on HbA1c control, knowledge related to use of insulin, and capacities of diabetic self-management of patients with type 2 diabetes who received community-based insulin therapy in rural communities of the Jingzhou area, China. We hope the results of this study will help establish the acceptability and feasibility of using peer support to improve outcomes of patients with type 2 diabetes who have limited access to healthcare services in rural communities of central China.

Material and Methods

Patients

Six hundred and three patients with type 2 diabetes, diagnosed by the WHO diagnostic criteria for diabetes-1999, including the measurement of the blood glucose levels, clinical manifestation, disease progression, and the diabetes-related autoantibodies and β cell functions [19], were randomly recruited from 2 rural communities in Jingzhou and Shashi Districts of the Jinzhou area, China between June 2013 and January 2014. The inclusion criteria of patients were as follows: 1) patients with type 2 diabetes who received insulin treatment by physicians in the Department of Endocrinology, Jingzhou First Hospital (Jingzhou, China) for reducing blood glucose levels; 2) FBG level <10 mmol/L, 2-h postprandial blood glucose (2h-PG) level<15 mmol/L; 3) had clear thinking and normal cognition; 4) lived in rural community and were able and willing to attend

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peer support training. The exclusion criteria were: 1) patients orally took hypoglycemic agents; 2) patients with unstable mood or psychiatric disease; 3) patients with abnormal cognition abilities; 4) patients with communication disorders; 5) patients with serious diabetes-related complications or other serious diseases that would hamper their substantial participation in this program; 6) illiteracy; 7) patients currently participating in other research programs.

As described in Figure 1, 208 of 603 eligible patients (34.5%) eventually participated in this study. According to the computer-based randomization principle, patients were randomly assigned into the traditional training group (control group) and peer support training group (peer group). This study was approved by the Ethics Committee of Jingzhou First Hospital, and written informed consent was obtained from each patient.

Definitions

Coronary heart disease was defined as vascular stenosis in major coronary arteries by angiography. Hypertension was determined as systolic blood pressure over 140 and/or diastolic blood pressure over 90 mmHg. Renal insufficiency was determined as glomerular filtration rate<60 ml/min/1.73 m^2 [20]. Diabetic retinopathy was determined by fundus photography. Diabetic neuropathy was determined by vibration perception threshold test, monofilament and ankle reflexes.

Traditional training

Diabetes patients received oral and written forms of education of the diabetes-related knowledge, insulin usage, and diabetic behavior control by the professional nursing staff of the Diabetes Health Training Group in the Department of Endocrinology, Jingzhou First Hospital. Lectures were organized for the patients in communities once a week continuously for 3 months. The patients were taught about the insulin pen and its usage, sterilizing, gas exhausting, and injection of insulin by the professional nursing staff from the Diabetes Health Training Group and then learned the related operation techniques. Each patient was assured to receive the training at least once a month.

Peer support training

Peer supporters: Peer supporters were selected from the diabetes patients in each community. The selection criteria included: 1) patients diagnosed with type 2 diabetes for over 5 years; 2) had well-controlled blood glucose; 3) good at expression and communication; 4) active in health training affairs and were willing to be a leader and organize activities; 5) had basic diabetes-related knowledge and diabetes self-management knowledge. The exclusion criteria were: 1) patients

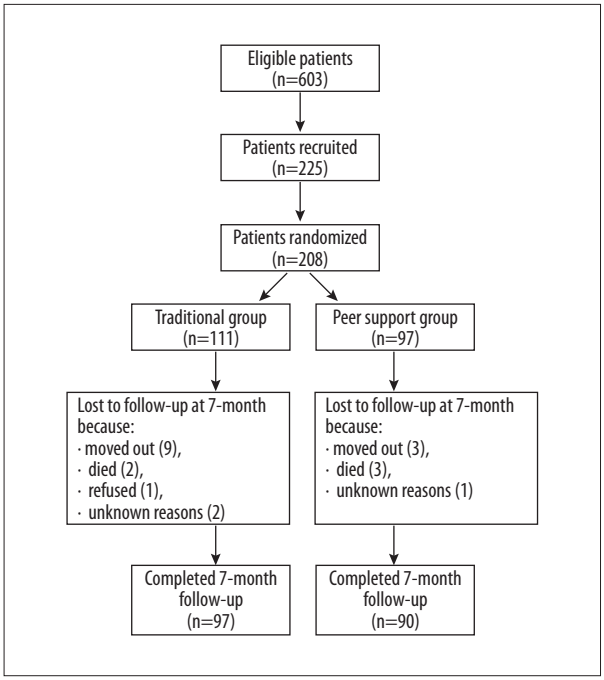

Figure 1. Flow diagram of participants.

with unstable mood or psychiatric disease; 2) patients with abnormal cognition abilities; 3) patients with communication disorders; 4) patients with serious diabetes-related complications or other serious diseases that might hamper their effective work; 5) illiteracy. Peer supporters were trained for 1 hour on Tuesday and Saturday morning by the professional nursing staff from the Diabetes Health Training Group, continuously for 1 month. The training contents included: 1) basic diabetes-related knowledge (e.g., correct understanding of diabetes, hypoglycemia recognition and prevention, and diabetes control criteria; 2) self-management (e.g., blood glucose self-monitoring, diet control and sports therapy; 3) insulin-related education (e.g., insulin treatment, types, effect, and techniques of insulin injection; 4) skills of the activity organization, interpersonal communication and teaching styles; 5) detailed peer support training for diabetes self-management. After the training, the peer leaders were reviewed and underwent practice examination, and those who were qualified were allowed to perform the peer supporting work.

Arrangement of the diabetes health training: Professional nursing staff of the Diabetes Health Training Group regularly communicated with the patients in communities, responding to the health hotline and health-related questions, assisting in related activities, and giving peer support training monthly in communities. Peer supporters were in charge of arranging and managing the community activities in teams and returning feedback on time to the Diabetes Health Training Group staff. These staff evaluated the community activities and discussed with peer supporters the strengths and weaknesses of each

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activity so as to make necessary adjustments to the training plan. There was a meeting for peer supporters at the end of each month for promoting communication among supporters and for further training if they were found deficient in knowledge and self-management capacities of diabetes.

Performance of the peer training: Peer supporters arranged the detailed activities based on the local economics, cultures and healthy care services, etc. On Monday and Wednesday, special lectures and discussion were held by professional nursing staff to teach the diabetes self-management knowledge (including diet control, sport therapy, blood glucose self-monitoring, building a healthy life-style, and matters needing attention with regard to the prevention and treatment of hypoglycemia and diabetes-related complications), and insulin treatment-related knowledge (including the usage of insulin pen, insulin usage and injection methods, insulin and needle storage methods, prevention and treatment for fat hyperplasia at the insulin injection sites, and other complications). Patients also received on-location instruction in the methods of insulin injection. On Saturday, community activities were arranged in teams, including diabetes-related knowledge quizzes, insulin usage-related operation practice competition, "I wanna be the leader"-themed competition, and "Morning exercise for better future"-, "Let's go for a walk in spring"- and "Back to childhood days"-themed games. The activities were in various forms, funny and easy to perform. Participants who performed well received awards. Patients in different teams could exchange and share their experience in the community centers without limit. Some operation training materials, insulin pens, needles, glucometers, health education handbooks (e.g., "food pyramid", "sport management pyramid", and "hand exercises"), food exchange moulds, and food measuring tools were offered for the convenience of their use. All the activities were held on time continuously for 4 months. The detailed peer support training schedules are shown in Table 1.

Data collection and outcome measurement

The primary end point was the blood level of HbA1c, a commonly used measurement of glycemic control [21]. The secondary outcomes were the knowledge related to the use of insulin and capacities of diabetic self-management. Data were collected at baseline and at 7 months post-intervention for both traditional training and peer support groups. The questionnaire data were collected by a trained member of the Diabetes Health Training Group, including age, gender, diabetes time, insulin usage time, complications, glucose monitor, knowledge of diabetes, and self-management capacity. Height, weight, and BMI were measured according to the standard procedures. HbA1c was measured using a Glycohemoglobin Analyzer (Arkray Medical Electronics Co. Ltd., Kyoto, Japan). FBG, 2h-PG, triglyceride (TG)' and total cholesterol (TC) were measured using a Biochemical Analyzer (Olympus, Tokyo, Japan).

Statistical analysis

The data were analyzed using SPSS 15.0 software (SPSS Inc. Chicago, IL, USA). The results are expressed as mean ± standard deviation. The patients' basic characteristics, diabetes control data (including HbAc1, FBG, 2h-PG, TG, TC, hypoglycemia probability and BMI), knowledge about the insulin usage, and diabetes self-management were analyzed. The mean values of these parameters at baseline or 7 months after the treatment and the changes after and before the treatment between the 2 groups were compared using unpaired t-test. The mean values between 7 months and baseline in both the two groups were compared using pair t-test. For the comparison of the percentages of these parameters, chi-square test was used. $P<0.05$ represented statistical significance.

Results

Basic characteristics

Of the 603 eligible patients contacted, 225 were recruited, and 208 (male 106, female 81, aging 40–70 years) were eventually enrolled into the control group (111) and peer group (97), respectively. At 7 months, 187 patients completed the study; 97 in the control group and 90 in the peer group. Table 2 shows there was no significant difference in age, gender, duration of diabetes, duration of insulin usage, and the comorbidity and complications related to diabetes between the 2 groups ($P>0.05$).

Diabetes control

At 7 months, the levels of HbA1c, FPG, 2h-PG, TG, incidence of hypoglycemia, BMI and TC were significantly decreased in the peer group compared with the control group ($P<0.05$). Control group patients had a mean HbA1c of 8.43% at baseline, which decreased insignificantly to 8.11% by 0.32% at 7 months after the training ($P>0.05$). In contrast, peer support patients significantly decreased the mean HbA1c, from 8.45% at baseline to 7.85% (by 0.60%) at 7 months ($P<0.05$). In addition, the decrease of the mean HbA1c between 7 months and baseline was more significant in the peer group compared with the control group ($P<0.05$). Similarly, the levels of FPG, 2h-PG, BMI, and TC decreased insignificantly in the control group ($P>0.05$) but decreased significantly in the peer group ($P<0.05$). In addition, the decrease of these levels was more significant in the peer training group ($P<0.05$) (Table 3). TG and incidence of hypoglycemia were significantly decreased from baseline to 7 months after the education in both groups ($P<0.05$), but were decreased more significantly in the peer training group ($P<0.05$) (Table 3).

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Table 1. Arrangement of monthly themed activities for peer support training.

The first month	1) Knowledge about diabetes and the related acute and chronic complications
	2) Hypoglycemia awareness and hazards prevention methods
	3) Blood-glucose self-monitoring method, blood-glucose standard and the usage of glucometers
	4) "Morning exercise for a better future"-themed games
The second month	1) Insulin administration methods and matters need attention
	2) Adverse effects after the administration of insulin and related solutions
	3) Subcutaneous insulin injection techniques
	4) "Back to childhood days"-themed games
The third month	1) Healthy diet for diabetes patients
	2) Properly diet collocation
	3) Following "manual measurement method", and "food measuring tool" to guide daily food intake
	4) "I'm a healthy dietitian"-themed recreational cooking competition
The forth month	1) Sport therapy for diabetes
	2) Explanations of "sport management pyramid"
	3) Diabetes and obesity
	4) "Fellows, let's move" – themed recreational games

Table 2. Basic characteristics of the patients.

	The control group (n=97)	Peer support group (n=90)	P values
Age (years)	56.34±7.94	57.51±5.96	>0.05
Gender			
Male (n/%)	56 (57.7%)	50 (55.6%)	>0.05
Diabetes time (months)	16.45±8.47	18.24±4.65	>0.05
Insulin usage time (months)	3.89±2.87	3.01±1.95	>0.05
Comorbidity			>0.05
Coronary heart disease (n/%)	15 (15.5%)	10 (11.1%)	
Hypertension (n/%)	46 (47.4%)	50 (55.6%)	
Renal insufficiency (n/%)	2 (2.1%)	1 (1.1%)	
Cerebral infarction (n/%)	5 (5.2%)	3 (3.3%)	
Hyperlipidemia (n/%)	51 (52.6%)	58 (64.4%)	
Complications related to diabetes			>0.05
Diabetic retinopathy (n/%)	46 (47.4%)	40 (44.4%)	
Diabetic neuropathy (n/%)	4 (4.1%)	6 (6.7%)	

Awareness of knowledge related to the usage of insulin

Table 4 showed that compared with the control group, peer group exhibited significant improvement, not only in each item of the knowledge related to the insulin usage at 7 months, but also the changes of these items between the 7-month post-treatment and baseline (P<0.05). Of note, for items of "regular sources of the sterilized things", "validity period check of the sterilized things", "correct choice and rotation of the injection site", and "needle replacement before each injection",

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Table 3. Diabetes control of patients between the traditional training and the peer support training groups.

	Traditional training group			Peer support training group		
	Pre-education	Post-education	Change	Pre-education	Post-education	Change
HbA1c (%)	8.43±0.47	8.11±0.51	0.32	8.45±0.39	7.85±0.41#,&	0.60§
FPG (mmol/L)	7.21±2.56	6.98±2.54	0.23	7.04±2.69	6.03±1.06#,&	1.01§
2h PG (mmol/L)	8.75±3.79	8.58±3.61	0.17	8.58±3.61	7.96±2.12#,&	0.62§
Incidence of hypoglycemia (%)	45 (46.39)	30 (30.93)*	15	50 (55.56)	17 (18.89)#,&	43§
TG (mmol/L)	10.13±3.13	8.85±2.21*	1.28	11.32±3.32	3.11±1.51#,&	8.21§
TC (mmol/L)	6.31±3.12	6.24±2.67	0.07	5.98±2.14	4.72±2.21#,&	1.26§
Incidence of hypoglycemia (%)	45 (46.39)	30 (30.93)*	15	50 (55.56)	17 (18.89)#,&	43§
BMI (kg/m^2)	28.21±3.99	27.98±4.76	0.23	28.39±4.21	25.63±5.82#,&	2.76§

HbA1c – glycosylated hemoglobin; FBG – fasting blood glucose; 2h-PG – 2h-postprandial blood glucose; TG – triglyceride, TC – total cholesterol. * P<0.05 compared with pre-education in traditional training group; # P<0.05 compared with pre-education in peer training group; & P<0.05 compared with post-education in control group; § P<0.05 compared with the changes between 7-month and baseline in traditional training group.

Table 4. Awareness of knowledge related to the usage of insulin between the traditional training and the peer support training groups.

	Traditional training			Peer support training		
	Pre-education	Post-education	Change	Pre-education	Post-education	Change
Regular sources of the sterilized things (n/%)	60 (61.86)	70 (72.16)	10 (10.30)	53 (58.89)	83 (92.22)#,&	30 (33.33)§
Validity period check of the sterilized things (n/%)	31 (31.96)	37 (38.14)	6 (6.18)	35 (38.89)	57 (63.33)#,&	22 (24.44)§
Identification of different types of insulin (n/%)	30 (30.93)	45 (46.39)*	15 (15.46)	28 (31.11)	64 (71.11)#,&	36 (40)§
Correct usage of different types of insulin (n/%)	48 (49.48)	60 (61.86)*	12 (12.38)	45 (50.00)	78 (86.67)#,&	33 (36.67)§
Proper use of insulin pen (n/%)	45 (46.39)	67 (69.07)*	22 (22.68)	48 (53.33)	86 (95.56)#,&	38 (42.23)§
Correct choice and rotation of the injection site (n/%)	36 (37.11)	45 (46.39)*	9 (9.28)	29 (32.22)	59 (65.56)#,&	30 (33.34)§
Sterilizing before each injection (n/%)	35 (36.08)	60 (61.86)*	25 (25.78)	38 (42.22)	80 (88.89)#,&	42 (46.67)§
Needle replacement before each injection (n/%)	3 (3.09)	5 (5.15)	2 (2.06)	6 (6.67)	15 (16.67)#,&	9 (10.00)§
Correct sterile operation (n/%)	20 (20.62)	31 (31.96)*	11 (11.34)	26 (28.89)	48 (53.33)#,&	22 (24.44)§
Correct insulin injection (n/%)	37 (38.14)	53 (54.64)*	16 (16.50)	39 (43.33)	72 (80.00)#,&	33 (36.67)§

* P<0.05 compared with pre-education in traditional training group; # P<0.05 compared with pre-education in peer training group; & P<0.05 compared with post-education in control group; § P<0.05 compared with the changes between 7-month and baseline in traditional training group.

significant improvement was only found in the peer support group (P<0.05). For items of "identification of different types of insulin", "correct usage of different types of insulin", "proper use of insulin pen", "sterilizing before each injection", "correct sterile operation", and "correct insulin injection", both groups showed significantly improvement at 7 months compared with baseline (P<0.05), but the improvement was more significant in peer group (P<0.05). No significant increase in the frequency of needle changing for each injection of insulin was found in the control group (P<0.05), which may be related to

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Table 5. Diabetic self-management of patients between the traditional training and the peer support training groups.

	Traditional training			Peer support training		
	Pre-education	Post-education	Change	Pre-education	Post-education	Change
Eating regularly with controlled amount (n/%)	12 (12.37)	30 (30.93)*	18 (18.56)	15 (16.67)	41 (45.56)#,&	26 (28.89)§
Reasonable diet types (n/%)	9 (9.28)	31 (31.96)*	22 (22.68)	8 (8.89)	58 (64.44)#,&	50 (55.55)§
Reasonable exercise types (n/%)	5 (5.15)	28 (28.87)*	23 (23.72)	5 (5.56)	63 (70)#,&	58 (64.46)§
Enough exercise time (n/%)	3 (3.09)	19 (19.59)*	16 (16.50)	6 (6.66)	41 (45.56)#,&	35 (38.90)§
Regular self-monitoring of the blood glucose (n/%)	2 (2.06)	27 (27.83)*	25 (25.77)	4 (4.44)	37 (41.11)#,&	33 (36.67)§

* P<0.05 compared with pre-education in traditional training group; # P<0.05 compared with pre-education in peer training group; & P<0.05 compared with post-education in control group; § P<0.05 compared with the changes between 7 month and baseline in traditional training group.

the low incomes and education of the patients from Chinese rural communities. However, this condition was greatly corrected by peer support training because the frequency of the needle changes for each injection of insulin was significantly increased at 7 months after the treatment (P<0.05).

The capacities of diabetes self-management

Diet control, sports therapy, and blood glucose self-monitoring are vital for the management of the patients with diabetes [22,23]. Table 5 shows that for "eating regularly with fixed amount", "reasonable dies type", "reasonable exercise type", "enough exercise time", and "regular self-monitoring of the blood glucose", peer group patients exhibited significantly better improvement at 7 months compared with control group patients (P<0.05). Both groups significantly improved these items of the diabetic behaviors at 7 months (P<0.05); however, the peer training group showed more significant improvement than the traditional training group (P<0.05).

Discussion

In Chinese rural communities, given the fact of the growing diabetes population, low-income and less-education for patients and shortage of professional healthcare, diabetes care and education are facing huge challenges. To improve diabetes care and outcomes, new effective and feasible approaches extremely need to be developed in Chinese rural communities [24]. Ongoing DSME is crucial for patients with diabetes to maintain effective self-management throughout a lifetime of diabetes [25]; however, due to shortage of resources, it is not consistently delivered in most of the health care settings in China, especially in rural communities. Peer support programs, involving the mutual help, supervision and mutual encouragement, integrate the hospital resources, communities, peer supporters and patients together, which can deepen the diabetes education and management timely into daily lives of the patients. Since most of patients with type 2 diabetes in China mainly adopt self or community-based outpatient treatment, the present RCT study observed if the peer support could improve the effect of self-management education on the outcomes of the community-based diabetes patients.

The efficacy of the diabetes peer support in the self-management of the patients with type 2 diabetes is not consistent. Although some RCT studies showed positive roles of peer support training in patients with type 2 diabetes in Cameroon [13], USA [14], and rural Uganda [15], other RCT studies showed negative results in Ireland [16], South Asia [17], and British rural communities [18]. The present study showed that peer support training significantly decreased the HbA1c and blood glucose levels, and increased knowledge related to the usage of insulin and the capacities of diabetic self-management in central China's rural communities. In addition, the improvement was greater with peer support training than traditional education. These results are consistent with those previously reported [13–15]. This study will provide evidence for the use of the peer support training to achieve satisfactory improvement for patients with type 2 diabetes in Chinese rural communities where the levels of income, education, and the health care services are limited.

This study showed that after peer support training, patients with type 2 diabetes gained a more comprehensive understanding of diabetes. The patients learned how to collocate food properly to control calorie intake daily through "food pyramid", "manual measurement method", "food measuring tool", and

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food exchange method, and gained more interest in self-management of diet. They also learned to adopt "sport management pyramid" and other methods to do moderate and effective exercises daily. Patients could also regularly self-monitor their blood glucose to get rapid feedback on their glycemic control. As a result, BMI, HbA1c levels of TC, cholesterol, FBG, and postprandial blood glucose of patients were significantly decreased after the peers support training.

More and more diabetes patients are adopting the insulin treatment plan. As recommended by the Chinese Diabetes Society of the Chinese Medical Association, the newly-diagnosed diabetes patients receive short-term insulin intensive treatment to protect the pancreatic islet, control blood glucose, and suppress the progression of diabetes and occurrence of diabetes complications [26]. However, compared with the oral drug treatment plan, subcutaneous insulin injection is not easy to do, which might otherwise cause adverse effects like injection site pain or induration. In addition, irregular injection or sudden withdrawal of insulin, due to deficiency of insulin use-related knowledge, would probably lead to failure of blood glucose control and aggravation of disease, and even result in diabetic ketoacidosis, which can be life-threatening [27]. This appears to be more serious in rural areas where the patients receive less education, have lower incomes, and lack access to necessary healthcare services. This study indicated that, compared with patients receiving traditional education training, patients after the peer support training cared more about the medical device sources and sterilization during the insulin therapy plan, significantly improved subcutaneous insulin injection techniques, and gained more understanding of types and correct use of insulin and of the adverse effects after insulin injection. They learned how to prevent and deal with the consequences of incorrect use of insulin. All these achievements could enhance the effectiveness and security of the insulin treatment plan.

There are few studies reporting the care and education of the Chinese diabetes population. Huang et al. showed that peer education significantly increased the traditional health education effect of elderly type 2 diabetic patients in China, enhancing their self-management ability and treatment compliance, promoting improved lifestyles, and greatly reducing cardiovascular risk factors [28]. However, this was not an RCT study. Xie et al. proposed RCT protocols of peer support for patients with diabetes 2 in Chinese rural communities to observe the acceptability and feasibility of improving diabetes self-management [29]; however, these related results have not been published yet. In addition, China is very big country with the world's largest population and multiple ethnicities, and with varied levels of development in different areas; peer support training has never been tried on the diabetes 2 patients in the central China. In this RCT study, we confirmed the efficacy of peer support training in the outcomes of patients with type 2 diabetes in rural communities of central China. To the best of our knowledge, this is be the first RCT study in China to observe the treatment efficacy of peer support training in type 2 diabetes.

This study is not without limitations. The sample size is limited, and the peer support treatment course of 4 months is not long. In the next, study with larger sample size and longer treatment period, we will try to verify these results.

Conclusions

Our study indicates that 4-month peer support training achieved a satisfactory effect on diabetic behavior, knowledge related to diabetes, and self-management of patients with diabetes in rural communities of central China. These results will provide the basis for the use of peer support training in the treatment of patients with type 2 diabetes in China.

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