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*Original Article*

# Application of Team STEPPS model combined with PDCA nursing model in nursing management of hemodialysis room

Liyan Hu, Lingyan Shen

*Blood Purification Center, Lishui Central Hospital, Lishui 323000, Zhejiang Province, China*

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**Abstract:** Objective: To explore the application value of Team STEPPS model combined with PDCA in nursing management of hemodialysis room. Methods: Altogether 195 patients undergoing dialysis treatment from April 2019 to March 2020 were selected and divided into two groups according to different intervention methods, of which Team STEPPS model combined with PDCA nursing intervention was adopted as the joint group (JG) (109 cases) and PDCA nursing intervention as the control group (CG) (86 cases). The adverse events and the incidence of complications during hemodialysis were observed. Self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were used to evaluate the psychological state. Self-care ability scale and dialysis treatment compliance scale were used to evaluate the self-care ability and compliance. Pittsburgh sleep quality index (PSQI) was used to evaluate sleep quality, and the self-made nursing satisfaction questionnaire was used to evaluate the nursing satisfaction. The quality of life was evaluated according to Quality of life survey (WHOQOL-BREF). Results: The incidence of adverse events and complications in the JG was lower than that in the CG. After intervention, SAS and SDS scores in the JG were better than those in the CG. The self-care ability and treatment compliance of the JG after intervention were higher than those of the CG. The sleep quality of the JG after intervention was better than that of the CG. The sleep quality improvement and nursing satisfaction of the JG after intervention were better than those of the CG. WHOQOL-BREF score of the JG after intervention was higher than that of the CG. Conclusion: Team STEPPS model combined with PDCA for hemodialysis patients can reduce the complications of hemodialysis treatment, improve the treatment compliance and improve the quality of life of patients.

**Keywords:** Team STEPPS model, PDCA nursing, hemodialysis room, value

## Introduction

Hemodialysis is one of the treatment methods for renal replacement in clinical treatment of acute and chronic renal failure patients [1]. Hemodialysis is helps to remove metabolic wastes and excess water accumulated in patients, to correct water, electrolyte and acid-base balance, and to improve renal organ function of patients, and thus to significantly improve the quality of life of patients [2, 3]. However, in the process of maintaining hemodialysis, patients will face a series of challenges and stresses, such as great changes in lifestyle and economic pressure, which seriously affect the psychological health of patients, thus leading to depression and anxiety of patients, affecting the treatment effect, and further reducing the quality of life of patients [4, 5]. Therefore, providing high-quality care for hemodialysis patients plays an important role in improving patients' psychological state and quality of life.

Team STEPPS is a new model to improve team cooperation and medical quality. It emphasizes the integration of team cooperation skills and clinical practice, and improves team performance in medical services by developing communication skills, mutual supervision and mutual support of team members to meet the needs of different patients and to improve medical quality and safety [6-8]. As shown in studies by Lee CT and others [9], the safety of patients is impaired due to medical errors and adverse events related to poor communication with medical service providers. Changing the relationships among team members may

change the cooperative behaviors, which will affect the patient's safety by changing team communication. In addition, in the process of hemodialysis, patients will lose a large amount of nutrients and consume a large amount of physical energy, which is easy to generate hunger and lead to overeating after treatment, thus causing volume load and a series of adverse symptoms [10, 11]. Other studies have shown that [12] the management of Team STEPPS model has established a close relationship with hemodialysis patients, and effective teamwork can improve the satisfaction with nurses and improve nursing quality. Therefore, this study applied Team STEPPS model combined with PDCA nursing intervention to patients. PDCA nursing is a purposely planned nursing mode aiming at patients' psychology, diet and physical and mental health. It can greatly improve the service quality and meet the physiological and psychological needs of different patients [13, 14]. For example, in the studies by Rakes L and others [15], PDCA nursing intervention for children with traumatic brain injury in intensive care unit can effectively improve the treatment compliance of children, thus improving the treatment outcome of children. Other studies have shown [16] that PDCA can improve the whole blood management practice and reduce the number of near-miss.

At present, there is little research on the application of Team STEPPS model combined with PDCA nursing intervention to hemodialysis patients. We will explore the effects of Team STEPPS model and PDCA nursing intervention on patients' psychological stress state, treatment compliance and quality of life improvement, thus providing a high-quality nursing intervention measure for hemodialysis patients.

## Materials and methods

### *General data*

Altogether 195 patients undergoing dialysis treatment in Lishui Central Hospital from April 2019 to March 2020 were selected and divided into two groups according to different intervention methods, in which Team STEPPS model combined with PDCA nursing intervention was adopted as the joint group (JG) (109 cases) and PDCA nursing intervention as the control group (CG) (86 cases). In the JG, there were 61 males and 48 females, aged 38-60 years, with an average of (52.47±8.27) years. In the CG, there were 45 males and 41 females, aged 37-63 years, with an average of (53.18±8.19) years. Inclusion criteria were as follows: all patients had chronic renal failure and applied hemodialysis treatment [17]; all of the patients participated in this study voluntarily; patients had complete clinical general data; patients had no allergy to drugs used in dialysis; patients were voluntarily applied nursing and treatment; patients had no dependence on alcohol and drugs; patients were able to correctly understand the relevant contents of the scale and answer. Exclusion criteria were as follows: patients had other malignant tumors, systemic infection and inflammation, cognitive impairment; patients withdraw from the experiment midway; patients could not actively cooperate with the experiment; patients lost to follow. This study was approved by the Ethics Committee of our hospital. The subjects and their families have signed a fully informed consent form.

### *Nursing method*

The CG only applied PDCA nursing intervention: (1) Nursing plan: The patients' physical state (psychological state, overweight, poor nutrition, and complications) was analyzed, and the treatment plans for various problems were established. After analysis and summary, the best plan was established to carry out nursing intervention on the patients. And the nursing intervention plan was scientifically evaluated to determine whether the goal has been reached. (2) Implementation of nursing intervention: Nursing staff should strengthen routine nursing before, during and after hemodialysis, and also standardize the process of dialysis operation. (3) Complication intervention: During hemodialysis, the blood pressure and respiration of patients should be recorded at intervals, and attention should be paid to patients to observe the complications such as dialyzer reaction and arrhythmia.

The JG adopted Team STEPPS model and PDCA nursing intervention: (1) Nursing planning: The hemodialysis management team was established, the responsibilities of team members were determined, the division of labor was refined, and the unified management measures were clarified for patients' blood vessels. The influencing factors of vascular access complications in hemodialysis were analyzed, the existing problems were summarized, and reasonable and scientific management measures

were formulated. Before dialysis treatment, relevant knowledge was introduced to patients and family members in detail, relevant matters needing attention were explained, answers were given to each patient's questions, health education was strengthened, and the necessity, safety and advantages of hemodialysis were explained in detail, so as to increase the safety and confidence of patients and their families, eliminate the anxiety and fear of patients, improve the self-care ability of patients, and keep them in the best state to actively cooperate with treatment. (2) Physical rehabilitation guidance: Patients were guided to cooperate with effective exercise, drugs, nutrition and other conditions. For example, in order to improve the anemia status of patients, the nursing staff should inform patients to appropriately limit the intake of water and sodium, control the colloid osmotic pressure within an appropriate range, so that the tolerance to water ultrafiltration can be improved, and the body weight will be gradually stabilized. And patients were guided to maintain adequate sleep, regular physical exercise to maintain a happy mood and prevent mood swings. The nutrition doctor would provide dialysis diet nutrition guidance to the patients and urge them to develop regular life and healthy eating habits. (3) Psychological guidance: Most patients would have obvious changes in physical signs after taking anticoagulants and hormone drugs, which will affect their social contact, life and work. Therefore, nursing staff should strengthen psychological guidance for patients, guide patients to establish a correct mentality, keep up with the rhythm of nursing guidance, face up to the physical state after dialysis, and actively deal with diseases. (4) Complication nursing: Nursing staff should improve patients' cognition of vascular access, explain the precautions of vascular access maintenance in detail, and carry out family education at the same time to improve the risk prevention awareness of patients and their families, and teach patients to correctly detect vascular access (temperature, color, pulsation). A vascular access recording scale was established, which included color, temperature and pulsation of vascular access, and was placed in patients' cases for easy handover. (5) Summary: Regular quality work meetings should be held to standardize management work, refine management methods and processes, analyze problems in the nursing process, and timely improve and formulate effective strategies.

*Outcome measures*

1. Mental state: Self-rating Anxiety and Depression Scale (SAS, SDS) [18] was applied, with a total score of 100 points. A score of 50-70 points indicated mild anxiety and depression, a score of 71-90 points indicated moderate anxiety and depression, and a score of > 90 points indicated severe anxiety and depression. The high score of the patients after evaluation indicated the more serious of anxiety and depression.

2. Hemodialysis stress: Hemodialysis stressor scale (HSS) was applied [19]. The scale included three dimensions of physiological stressors, psychological stressors and social stressors, with a total score of 116 points. The high score was closely related to the high pressure level of the patient.

3. Treatment compliance [20]: Patients actively cooperated with nursing staff to complete relevant operations, followed medical drugs, exercised reasonably and maintained a healthy diet, which was rated as high compliance. Under the guidance of nursing staff, patients could cooperate with treatment, nursing, exercise, and diet, which was rated as compliance. Under the guidance of the nursing staff, the patients still could not cooperate with the treatment and nursing intervention well, which was rated as non-compliance. Total compliance rate = (high compliance + compliance)/total number of cases × 100%.

4. Self-care ability: The exercise of self-care agency (ESCA) was applied [21]. The scale was divided into four dimensions: health knowledge, self-concept, self-care skills and self-care responsibility, with 43 items in each scale and 0-4 points of each item. The high score was closely related to the strong self-care ability of the patient.

5. Weight control effect: After nursing intervention, the patient's weight increase rate was less than 3%, which was assessed as markedly effective, 3%-5% as effective, more than 5% as ineffective. Total effective rate = (markedly effective + effective)/total number of cases × 100%.

6. Incidence of complications: The complications occurred in the nursing intervention process of the two groups of patients were observed and recorded.

7. Quality of life: The World Health Organization Quality of Life Measurement Scale (WHO QOL-BREF) was applied [22] and included four items: social relations, physiology, psychology and environment, with a total score of each item of 100 points. The high score was closely related the better quality of life after intervention.

8. Nursing satisfaction: The self-made satisfaction questionnaire was applied, with a total score of 100 points. The high score was closely related to the high satisfaction with the service.

*Statistical methods*

Spss22.0 (Beijing Easybio Technology Co., Ltd., China) was applied for statistical analysis, and GraphPad Prism 7 was applied to visualize the data pictures in this study. The count data were represented by [n (%)] and compared by chi square test. When the theoretical frequency of chi square test was less than 5, the chi square test of continuity correction was used. The measurement data were represented by mean ± standard deviation (x ± SD) and compared by t test of independent samples. Paired t test was applied for comparison before and after the treatment. When $P < 0.05$, the difference was statistically significant.

## Result

*General data*

There was no significant difference between the two groups in general data such as gender, age, body mass index, average dialysis time, residence, nationality, educational level, smoking history, drinking history, diabetes and disease history ($P > 0.05$). See **Table 1**.

*Comparison of psychological state scores between two groups of patients before and after nursing intervention*

There was no significant difference in SAS and SDS scores between the two groups before nursing intervention ($P > 0.05$). After nursing intervention, SAS and SDS scores of the two groups decreased significantly, and the JG was significantly lower than the CG ($P < 0.05$). See **Table 2**.

*Comparison of HSS scores between the two groups before and after nursing*

There was no significant difference in physiological stressor, psychological stressor and social stressor between the two groups before nursing intervention ($P > 0.05$). Those after nursing intervention were significantly reduced ($P < 0.05$), and those of the JG was significantly lower than those of the CG ($P < 0.05$). See **Table 3**.

*Comparison of treatment compliance between two groups of patients after nursing intervention*

The total compliance rate of patients in the JG after nursing intervention was significantly higher than that in the CG ($P < 0.05$). See **Table 4**.

*Comparison of ESCA scores between two groups of patients before and after nursing*

There was no significant difference in the scores of health knowledge, self-concept, self-care skills and self-care responsibility between the two groups before nursing intervention ($P > 0.05$). After nursing intervention, those of the two groups increased significantly ($P < 0.05$), and those of the JG was significantly higher than those of the CG ($P < 0.05$). See **Figure 1**.

*Comparison of weight control effect between two groups of patients after nursing*

The weight control effect of the JG after nursing intervention was significantly higher than that of the CG ($P < 0.05$). See **Table 5**.

*Comparison of complications in nursing intervention between two groups of patients*

The total incidence of complications during nursing intervention in the JG was significantly lower than that in the CG ($P < 0.05$). See **Table 6**.

*Comparison of WHO QOL-BREF score between two groups of patients before and after nursing*

There was no significant difference in the scores of social relations, psychology, physiol-

**Table 1.** General data of patients in combination group and CG [N (%)] (x ± sd)

| Classification | JG (n=109) | CG (n=86) | $t/\chi^2$ value | *P* value |
|---|---|---|---|---|
| Gender | | | 0.256 | 0.612 |
| Male | 61 (55.96) | 45 (52.33) | | |
| Female | 48 (44.04) | 41 (47.67) | | |
| Age (years) | 52.47±8.27 | 53.18±8.19 | 0.597 | 0.551 |
| BMI ($kg/m^2$) | 22. 92±3.34 | 22. 92±3.34 | 1.463 | 0.145 |
| Average dialysis time | 18.53±2.28 | 18.94±2.25 | 1.254 | 0.211 |
| Residence | | | 0.239 | 0.624 |
| Urban | 57 (52.29) | 48 (55.81) | | |
| Rural | 52 (47.71) | 38 (44.19) | | |
| Nationality | | | 1.635 | 0.201 |
| Han | 62 (56.88) | 41 (47.67) | | |
| Minorities | 47 (43.12) | 45 (52.33) | | |
| Educational level | | | 0.380 | 0.537 |
| High school or higher | 56 (51.38) | 48 (55.81) | | |
| < high school | 53 (48.62) | 38 (44.19) | | |
| Smoking history | | | 3.578 | 0.058 |
| Yes | 74 (67.89) | 47 (54.65) | | |
| No | 35 (32.11) | 39 (45.35) | | |
| Drinking history | | | 0.399 | 0.527 |
| Yes | 61 (55.96) | 52 (60.47) | | |
| No | 48 (44.04) | 34 (39.53) | | |
| History of diabetes | | | 0.425 | 0.514 |
| Yes | 57 (52.29) | 49 (56.98) | | |
| No | 52 (47.71) | 37 (43.02) | | |
| Disease history | | | 1.933 | 0.748 |
| Diabetic nephropathy | 33 (30.28) | 22 (25.58) | | |
| Chronic glomerulonephritis | 25 (22.94) | 19 (22.09) | | |
| Chronic interstitial nephritis | 21 (19.27) | 15 (17.44) | | |
| Polycystic kidney | 14 (12.84) | 17 (19.77) | | |
| Hypertension Renal Arteriosclerosis | 16 (14.68) | 13 (15.12) | | |

**Table 2.** Comparison of mental state scores between two groups of patients before and after nursing intervention (mean ± SD)

| Group | Number of cases | SAS | | SDS | |
|---|---|---|---|---|---|
| | | Before nursing | After nursing | Before nursing | After nursing |
| JG | 109 | 38.75±7.25 | 32.38±7.02 | 39.37±8.20 | 31.63±7.43 |
| CG | 86 | 39.04±7.21 | 37.47±7.19 | 39.42±8.16 | 37.53±8.13 |
| t | - | 0.278 | 4.974 | 0.042 | 5.281 |
| P | - | 0.781 | < 0.001 | 0.966 | < 0.001 |

ogy, and environment between the two groups after nursing intervention (P > 0.05). After nursing intervention, the scores of social relations, psychology, physiology, and environment in the two groups increased significantly (P < 0.05), and the scores in the JG were significantly higher than those in the CG (P < 0.05). See **Figure 2**.

*Comparison of nursing satisfaction between two groups of patients*

After nursing intervention, the scores of nursing comfort, nursing attitude, nursing satisfaction, health education and nursing operation in the JG were significantly higher than those in the CG (P < 0.05). See **Table 7**.

## Discussion

Hemodialysis is a kind of blood purification technology [23]. It mainly refers to the process of drawing the patient's blood out of the body,

**Table 3.** Comparison of HSS score between two groups of patients before and after nursing (mean ± SD)

| Group | Number of cases | Physiological stressors | | Psychological stressors | | Social stressor | |
|---|---|---|---|---|---|---|---|
| | | Before nursing | After nursing | Before nursing | After nursing | Before nursing | After nursing |
| JG | 109 | 10.82±2.34 | 8.36±3.01 | 16.32±3.45 | 15.25±3.74 | 10.47±3.04 | 9.86±3.16 |
| CG | 86 | 11.06±2.38 | 13.26±3.26 | 16.64±3.38 | 20.61±3.89 | 10.93±3.06 | 13.28±3.09 |
| t | - | 0.705 | 10.880 | 0.648 | 9.762 | 1.046 | 7.577 |
| P | - | 0.481 | < 0.001 | 0.517 | < 0.001 | 0.296 | < 0.001 |

**Table 4.** Comparison of treatment compliance after nursing intervention between two groups of patients [n (%)]

| Group | Number of cases | High compliance | Compliance | Non-compliance | Total compliance rate |
|---|---|---|---|---|---|
| JG | 109 | 71 (65.14) | 32 (29.36) | 6 (5.50) | 103 (94.50) |
| CG | 86 | 25 (29.07) | 40 (46.51) | 21 (24.42) | 65 (75.58) |
| t | - | - | - | - | 14.421 |
| P | - | - | - | - | 0.001 |

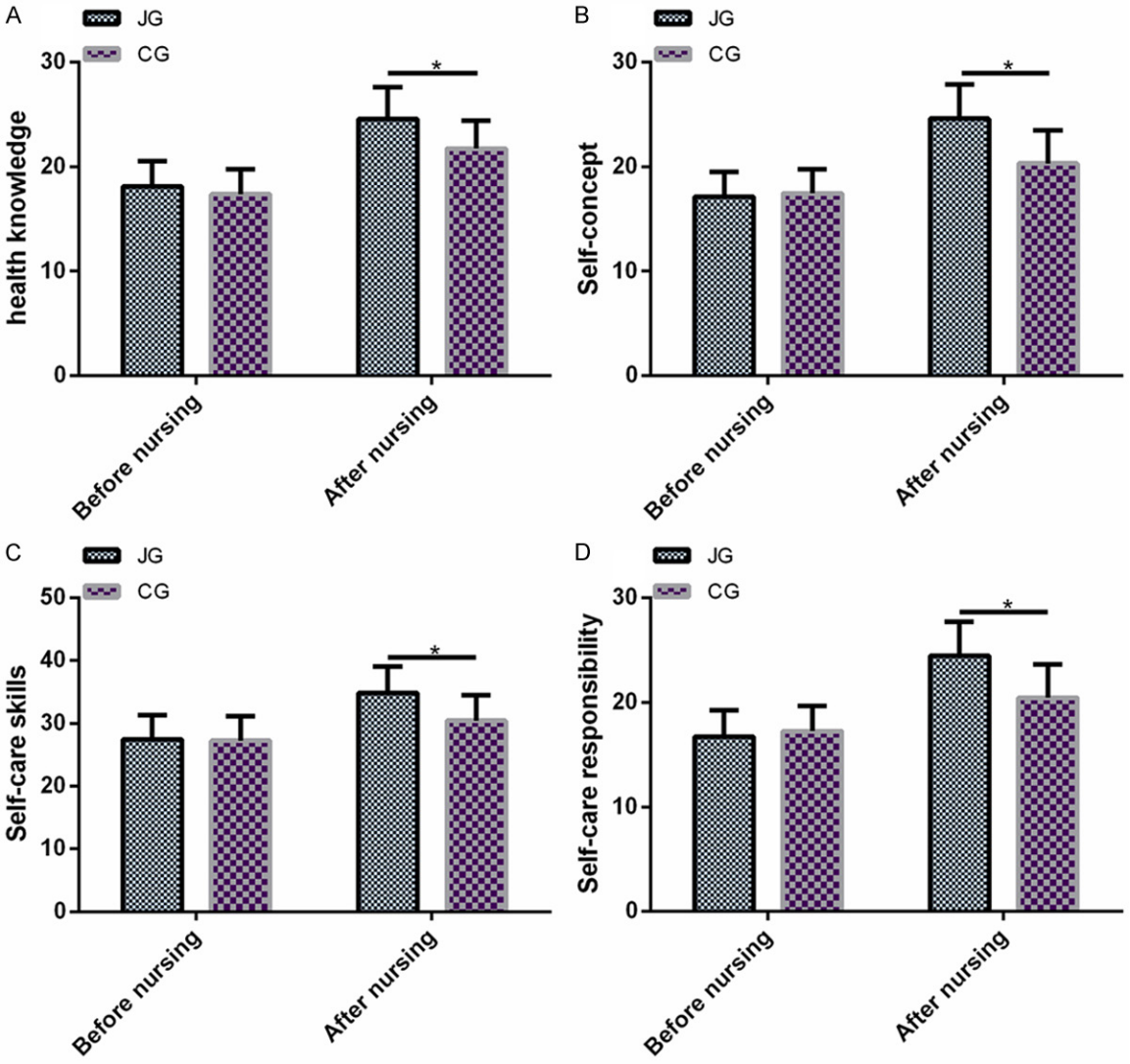

**Figure 1.** Comparison of ESCA scores between the two groups before and after nursing. A: Comparison of health knowledge scores between the two groups before and after nursing. B: Comparison of self-concept scores between the two groups before and after nursing. C: Comparison of self-care skill scores between the two groups before and after nursing. D: Comparison of self-care responsibility scores between the two groups before and after nursing. Note: * indicates comparison of the two groups, $P < 0.05$.

**Table 5.** Comparison of weight control effect between two groups of patients after nursing [n (%)]

| Group | Number of cases | Markedly effective | Effective | Ineffective | Total effective |
|---|---|---|---|---|---|
| JG | 109 | 69 (63.30) | 35 (32.11) | 5 (4.59) | 104 (95.41) |
| CG | 86 | 23 (26.74) | 40 (46.51) | 23 (26.74) | 63 (73.26) |
| t | - | 25.781 | 4.212 | 19.190 | 19.190 |
| P | - | < 0.001 | 0.040 | < 0.001 | < 0.001 |

**Table 6.** Comparison of complications in nursing intervention between two groups of patients [n (%)]

| Group | Number of cases | Fistula hemorrhage | Thrombosis | Skin allergy at puncture site | Needle slippage | Edema at puncture site | Total incidence |
|---|---|---|---|---|---|---|---|
| JG | 109 | 1 (0.92) | 2 (1.83) | 1 (0.92) | 1 (0.92) | 3 (2.75) | 8 (9.30) |
| CG | 86 | 5 (5.81) | 4 (4.65) | 4 (4.65) | 3 (3.49) | 7 (8.14) | 23 (21.10) |
| t | - | 3.865 | 1.279 | 2.682 | 1.581 | 2.868 | 5.005 |
| P | - | 0.049 | 0.258 | 0.101 | 0.208 | 0.090 | 0.025 |

exchanging substances with dialysate in the dialyzer to eliminate metabolic wastes in the patient's body, correcting the electrolyte and acid-base balance disorders of the patient, and then returning the blood to the body [24-26]. Although hemodialysis keeps countless patients alive, it also brings a series of negative effects. For example, it brings psychological barrier to the patient, which will lead to complications and has severe impact on the quality of life and prognosis of the patient [27, 28]. Therefore, strengthening the clinical nursing of hemodialysis patients is of great significance as it reduces the complications of patients and improves the quality of life.

In this study, we applied Team STEPPS model combined with PDCA nursing to interfere with the treatment compliance, psychological state and quality of life of hemodialysis patients, and found that the patient's condition was significantly improved after the combined intervention. Kargar Jahromi M and others have previously shown that nursing intervention for chronic kidney dialysis patients could improve the cognitive function of patients, reduce the psychological state of patients with depression and anxiety, and thus improve the health status of patients [29]. It has also been shown by Liu YM and othersthat in patients undergoing hemodialysis, nursing intervention could significantly improve the fatigue and depression of patients' self-perception [30]. This is similar to the results of our study. We have applied different psychological counseling according to the patient's personality, psychological quality and condition and included SAS and SDS scoring scales to evaluate the psychological state of the two groups of patients after intervention. The results showed that the SAS and SDS scores of the patients in the JG were significantly lower than those in the CG, indicating that the Team STEPPS model combined with PDCA nursing intervention for hemodialysis patients can eliminate the tension of the patients during dialysis treatment and reduce the depression and anxiety of the patients. After observing the HSS scores of the patients, we found that the HSS scores of the patients in the JG were significantly lower than those in the CG, indicating that the pressure level of the patients decreased and the mental health level improved compared with that before the intervention. We speculated that the patients may have learned to actively face the disease and can improve their bad emotions after psychological counseling and intervention by the nursing team. Therefore, Team STEPPS model combined with PDCA nursing intervention can significantly improve the psychological state

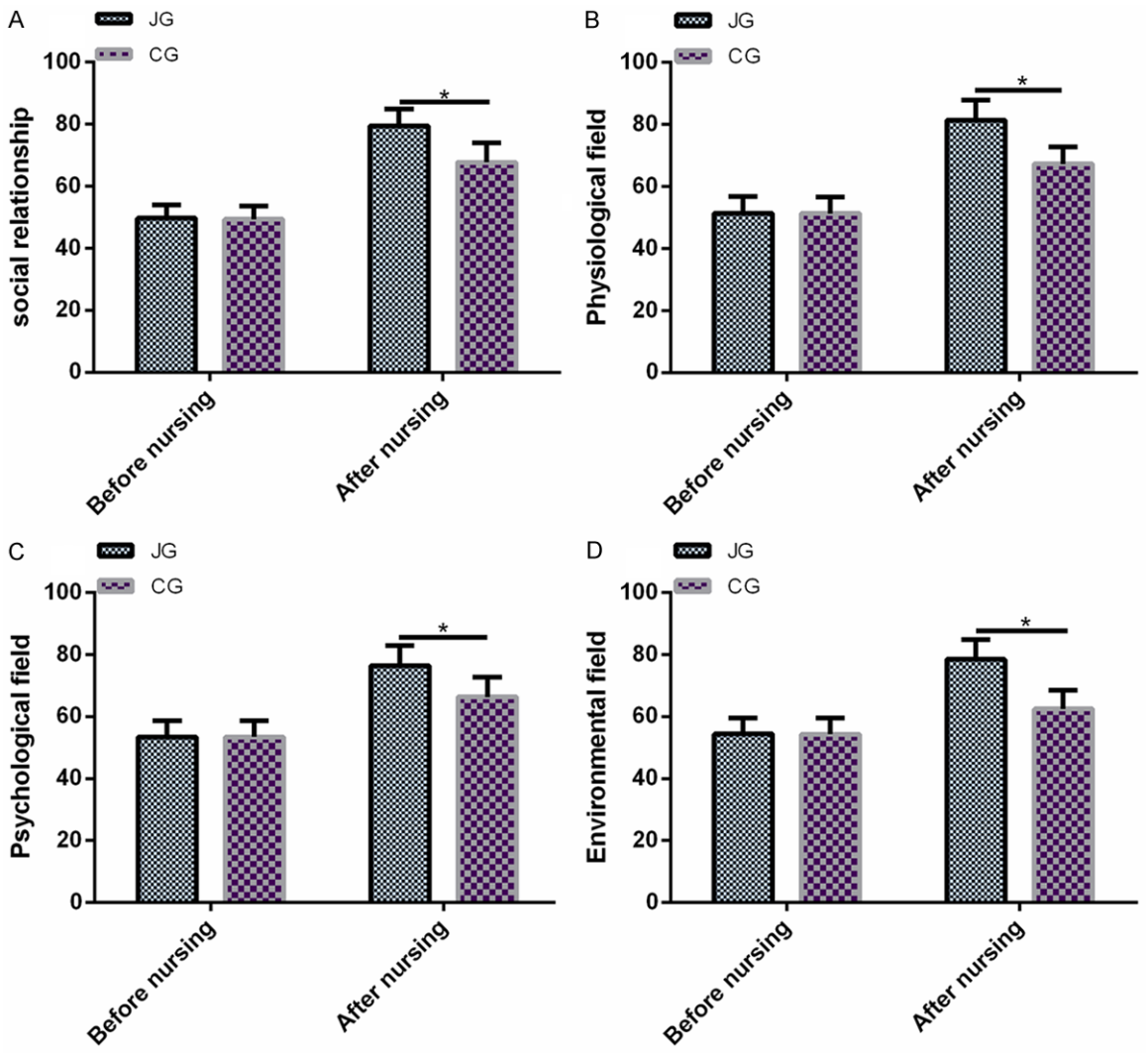


**Figure 2.** Comparison of WHO QOL-BREF scores between the two groups before and after nursing. A: Comparison of social relationship scores between the two groups before and after nursing intervention. B: Comparison of scores in psychology between the two groups before and after nursing intervention. C: Comparison of physiology scores between the two groups before and after nursing intervention. D: Comparison of environment scores between the two groups before and after nursing intervention. Note: * indicates comparison of the two groups, $P < 0.05$.

**Table 7.** Comparison of nursing satisfaction between two groups of patients [n (%)]

| Group | Number of cases | Nursing comfort | Nursing attitude | Nursing satisfaction | Health education | Nursing operation |
|---|---|---|---|---|---|---|
| JG | 109 | 18.37±2.23 | 18.87±2.47 | 18.67±2.34 | 18.53±2.17 | 18.38±2.19 |
| CG | 86 | 13.68±2.18 | 13.83±2.19 | 13.28±2.05 | 13.76±1.78 | 12.28±1.28 |
| t | - | 14.730 | 14.860 | 16.860 | 16.470 | 22.920 |
| P | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

and stress state of patients. This is also similar to the research of Kargar Jahromi M and Liu YM, which showed that effective nursing intervention can improve the psychological state of patients with hemodialysis, so that patients can better receive and cooperate with hemodialysis. The study also compared the treatment compliance rate of the two groups. The results showed that the total compliance rate of the patients in the JG was significantly higher than

that in the CG, which indicated that Team STEPPS model combined with PDCA nursing intervention could readjust the psychological state of the patients and strengthen the patients' compliance with treatment, thus better improving the treatment outcome of the patients. This is also similar to the study results of Kim ES [31]. Nursing intervention for hemodialysis patients, such as education and cognitive behavioral intervention, can effectively improve the compliance.

Some studies have shown that [32] giving health plan to hemodialysis patients can improve the patients' self-care scores and can improve the patients' self-care behavior by improving their cognition, attitude and strengthening behavioral factors. The results of our research showed that the ESCA score of patients in the JG after intervention was significantly higher than that in the CG, indicating that strengthening the patients' awareness of diseases and hemodialysis treatment can improve the patients' self-management and self-care ability. This is similar to the above research results, indicating that effective nursing for hemodialysis can guide patients to improve their self-care and self-management ability. Moreover, the weight control effect of the JG after the intervention was significantly higher than that of the CG, indicating that Team STEPPS model combined with PDCA nursing intervention can help patients understand better their knowledge of weight self-control, which enables patients to develop healthy eating habits and actively control weight. Some studies show that [33] chronic kidney patients will have a series of complications and adverse reactions during dialysis treatment, and nursing intervention can prevent disease-related complications and improve the living conditions of patients. The incidence of complications in the JG was significantly lower than that in the CG after the intervention, indicating that Team STEPPS, as a team cooperation model, can supervise nursing staff, enable nursing staff to better standardize the nursing operation of hemodialysis, enrich the theoretical knowledge of nursing staff, and improve the nursing skills of nursing staff at the same time, thus reducing the complications during hemodialysis treatment. Some studies have shown that [34] the quality of life of patients with advanced renal diseases receiving dialysis treatment is impaired, which will affect different parts of patients' life. This study showed that the WHO QOL-BREF score of patients in the JG after treatment was significantly higher than that in the CG, indicating that the Team STEPPS model combined with PDCA nursing intervention could improve the psychological state of patients, reduce the incidence of complications, improve the patient's condition, thus improving the life treatment of patients. Finally, the study also evaluated the satisfaction of the two nursing modes. The results showed that the satisfaction of Team STEPPS model combined with PDCA nursing intervention was higher than PDCA nursing, suggesting that Team STEPPS model combined with PDCA nursing is an intervention mode with high satisfaction.

Although this study confirmed that Team STEPPS model combined with PDCA nursing intervention has a better effect on hemodialysis, there are still some limitations in this study. For example, we did not analyze the risk factors affecting the curative effect of hemodialysis patients, and the number of people involved in the study is small, which need to be supplemented in future studies to further support the conclusions of this study.

To sum up, Team STEPPS model combined with PDCA nursing intervention for hemodialysis patients can improve the psychological state of patients, reduce complications of hemodialysis treatment, improve the treatment compliance of patients, and improve the quality of life of patients.

## Disclosure of conflict of interest

None.

**Address correspondence to:** Lingyan Shen, Blood Purification Center, Lishui Central Hospital, No. 289 Kuo Cang Road, Liandu District, Lishui 323000, Zhejiang Province, China. Tel: +86-0578-2285280; E-mail: shenlingyan758@163.com

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