Application and Research of Family-Participatory Nursing Model in the Treatment of Elderly Patients with Pulmonary Tuberculosis

Xifeng Huang*, Wenli Zhang, Xiaolin Cai

Lanzhou Pulmonary Hospital, Lanzhou, 730046, Gansu, China

278041563@qq.com

*Corresponding Author

Keywords: Family-participatory nursing model; Elderly; Pulmonary tuberculosis; Clinical effect

Abstract: This study aimed to evaluate the effectiveness of a family-participation–based nursing model in the care of elderly patients with pulmonary tuberculosis. Methods: Ninety-eight elderly individuals diagnosed with pulmonary tuberculosis and treated in our hospital between January 2024 and January 2025 were enrolled. Using a random-number table, patients were assigned to either the control group or the intervention group, with 49 cases in each. The control group received standard nursing care, whereas the intervention group was provided with additional family-participatory nursing. Mental health indicators, sputum conversion rates, and quality-of-life scores were assessed before and after the intervention. Nursing satisfaction was also compared between the two groups. Results: Following the intervention, anxiety and depression levels decreased in both groups, with the intervention group demonstrating significantly greater improvement ($P<0.05$). At one and two months after intervention, the sputum negative conversion rate in the intervention group was markedly higher than that of the control group ($P<0.05$). Improvements in psychological, physical, social, and material dimensions of quality of life were also more pronounced in the intervention group (all $P<0.05$). Furthermore, overall nursing satisfaction was significantly higher among patients receiving the family-participatory nursing approach ($P<0.05$).

1. Introduction

Pulmonary tuberculosis is a chronic infectious disease caused by *Mycobacterium tuberculosis*, with a globally increasing number of cases each year. China ranks third in the number of new cases worldwide [1]. With the acceleration of population aging (it is estimated that by 2049, the elderly will account for nearly 30% of China's population), older adults, due to decreased physical fitness and weakened immunity, are more susceptible to tuberculosis infection [2]. Studies have shown that the prevalence of active pulmonary tuberculosis in Chinese adults increases with age, while the awareness rate of tuberculosis knowledge among the elderly is only 47.2%. Poor self-management and low medication adherence increase the risk of developing drug-resistant tuberculosis, making effective interventions urgently needed [3].The family-participatory nursing model involves family members as part of the care team. Under the guidance of professional medical staff, family members jointly participate in patient care and management. Through health education and social support, this model helps improve psychological state, medication adherence, lung function, disease cognition, nutrition, and quality of life among elderly patients with pulmonary tuberculosis [4]. To verify the applicability and effectiveness of this model in our region, we developed a systematic intervention program incorporating team-based education, family member training, and WeChat platform support. This program was applied in the nursing practice of elderly tuberculosis patients to provide empirical evidence for improving the overall rehabilitation level of this population. The results of the study are reported as follows.

  DOI: 10.25236/icetmr.2025.010

2. Data and Methods

2.1 General Information

A total of 98 elderly individuals diagnosed with pulmonary tuberculosis and treated in our hospital between January 2024 and January 2025 were enrolled in the study. Using a random-number table, the patients were allocated into two groups, with 49 participants in each group. All subjects signed informed consent prior to inclusion.

The control group consisted of 29 men and 20 women, aged 61 to 80 years, with an average age of 71.12 ± 8.64 years. The observation group included 27 men and 22 women, aged 60 to 82 years, with a mean age of 73.26 ± 9.55 years. Comparisons of baseline characteristics revealed no significant differences between the two groups ($P > 0.05$). The study protocol received approval from the hospital's ethics committee.

2.1.1 Inclusion criteria:

(1) Diagnosis consistent with the clinical criteria for pulmonary tuberculosis in *Diagnostic Criteria for Pulmonary Tuberculosis (WS 288-2017)*;
(2) Good treatment compliance;
(3) Initial sputum smear positive;
(4) Complete clinical data.

2.1.2 Exclusion criteria:

(1) Presence of other major systemic diseases;
(2) Inability to complete regular follow-up;
(3) Presence of psychiatric disorders;
(4) Presence of other malignant tumors;
(5) Family members unable to cooperate in caregiving.

2.2 Methods

The control group received routine nursing care, including standard guidance on medication use, exercise training, and sputum management, with regular follow-up after discharge.

The intervention group received family-participatory nursing in addition to the routine care described above. The specific measures included the following:

2.2.1 Staff education stage:

A family-participatory nursing team was established, consisting of physicians, nursing staff (including the researchers), nutritionists, and psychological counselors. Through literature review and data collection, the team developed the workflow for family-participatory nursing in elderly pulmonary tuberculosis patients and compiled two manuals: *Health Education Handbook* and *Caregiver Protection Handbook*. All team members received standardized training to ensure uniform guidance for both patients and their families.

2.2.2 Education for patients and families:

(1) A "Family-Participatory Nursing Classroom" was established with a structured syllabus covering: the importance and precautions of correct and standardized anti-tuberculosis medication use; personal protective measures; correct sputum collection; cough etiquette; hand hygiene; respiratory function exercises; and nutritional support. These topics were taught in a hands-on manner during hospitalization, and instructional videos were created for repeated viewing.

(2) An evaluation checklist was developed to assess caregivers' understanding of the educational content.

(3) Components of family-participatory nursing:

a) Caregivers supervised patients to take anti-tuberculosis medication on time and in a standardized manner;

b) Caregivers guided patients in daily respiratory function training;

c) Caregivers accompanied patients in appropriate physical activity—mainly walking—with exercise intensity adjusted to avoid fatigue;

d) Following meal plans provided by the nutritionist, caregivers ensured a balanced and reasonable diet;

e) Caregivers monitored the patient's condition and performed simple care when necessary (e.g., fever management);

f) Caregivers provided emotional companionship and communication to offer psychological support;

g) Caregivers accompanied patients for regular follow-ups, including a chest X-ray at the second-month follow-up to evaluate the effectiveness of family-based infection-control measures developed by the research team.

2.2.3 Establishment of a WeChat-based information platform:

(1) Personal WeChat accounts were created for one-on-one follow-up after discharge. Educational content included disease-related knowledge (etiology, clinical symptoms, signs of exacerbation), the importance of medication adherence, possible side effects and precautions of anti-tuberculosis drugs, reminders for medication check-ins, and video-recorded respiratory exercises led by caregivers. Real-time communication was maintained with patients and caregivers to observe psychological status, provide positive guidance, and reduce negative emotions.

(2) A WeChat group was established where professional medical staff answered patients' and families' questions, creating a supportive community for mutual communication and encouragement.

2.3 Observation Indicators

The following indicators were compared between the two groups before and after the intervention:

2.3.1 Mental health status:

The levels of anxiety and depression were assessed using standardized anxiety and depression rating scales. The scores were positively correlated with symptom severity. An anxiety score ≥50 points and a depression score ≥53 points were considered indicative of anxiety and depression symptoms [5].

2.3.2 Sputum negative conversion rate:

Morning sputum samples were collected at 1 month and 2 months after intervention and sent to the laboratory within 2 hours for *Mycobacterium tuberculosis* culture. The sputum negative conversion rates of the two groups were compared based on culture results [6].

2.3.3 Quality of life improvement:

Quality of life was evaluated before intervention and at 2 months after intervention using the Short Form Health Survey (SF-36). The scale includes four dimensions—psychological function, physical function, social function, and material well-being—each scored out of 100 points. Higher scores indicate better quality of life.

2.3.4 Nursing satisfaction:

At 2 months after intervention, a self-designed nursing satisfaction questionnaire developed by our hospital was distributed to patients. The questionnaire included items such as nursing participation fluency and nursing attitude, with a total score of 100 points. Scores ≥90 indicated "very satisfied," 60–89 indicated "satisfied," and <60 indicated "dissatisfied." Total satisfaction rate = (very satisfied + satisfied).

2.4 Statistical Analysis

Data analysis was performed using SPSS 27.0 software. Categorical data were analyzed using

the chi-square (χ^2) test. Continuous data were expressed as mean ± standard deviation ($\bar{x} \pm s$) and analyzed using the *t*-test. A *P* value <0.05 was considered statistically significant.

3. Results

3.1 Comparison of Mental Health Status before and After Intervention between the Two Groups

Before the intervention, there were no significant differences in anxiety and depression scores between the two groups (P > 0.05). After the intervention, both anxiety and depression scores were significantly lower in the intervention group than in the control group (both P < 0.05). Details are shown in Table 1.

Table 1 Comparison of Mental Health Status Before and After Intervention

Group	**Anxiety Score**		**Depression Score**	
	Before	After	Before	After
Control group (n=49)	49.67±5.85	47.22±3.67	52.65±4.21	48.74±5.17
Intervention group (n=49)	49.56±4.76	43.32±4.25△	51.95±3.38	42.93±3.91△
t value	0.102	4.862	0.908	6.274
P value	0.919	0.000	0.367	0.000

Note: Compared with the control group, △*P*<0.05.

3.2 Comparison of Sputum-Negative Conversion Rates between the Two Groups

At one month and two months after the intervention, the sputum-negative conversion rate in the intervention group was significantly higher than that in the control group (*P*<0.05). Details are shown in Table 2.

Table 2. Comparison of Clinical Efficacy between the Two Groups [n (%)]

Group	1 Month After Intervention	2 Months After Intervention
Control group (n=49)	27(55.10)	37(75.51)
Intervention group (n=49)	43(87.76)△	48(97.96)△
χ^2 value	12.800	10.731
P value	0.000	0.001

Note: Compared with the control group, △*P*<0.05.

3.3 Comparison of Quality-of-Life Improvement between the Two Groups before and after Intervention

Before the intervention, there were no significant differences between the two groups in psychological function, physiological function, social function, or material well-being scores (P > 0.05). After the intervention, all four domain scores—psychological, physiological, social, and material—were significantly higher in the intervention group compared with the control group (all P < 0.05). Details are shown in Table 3.

Table 3 Comparison of Quality-of-Life Improvement between the Two Groups Before and after Intervention ($\bar{x} \pm s$, points)

Group	**Psychological Function**		**Physiological Function**		**Social Function**		**Material Well-being**	
	Before	After	Before	After	Before	After	Before	After
Control group (n=49)	64.54±4.82	76.48±5.03	63.23±4.51	78.54±6.02	61.55±4.32	77.65±5.82	62.92±4.83	79.32±5.54
Intervention group (n=49)	64.58±4.91	85.52±5.99△	63.26±4.54	86.68±7.43△	61.57±4.35	87.11±6.46△	62.98±4.99	88.61±7.32△
t value	0.041	8.090	0.033	5.959	0.023	7.616	0.061	7.084
P value	0.968	0.000	0.974	0.000	0.982	0.000	0.952	0.000

Note: Compared with the control group, △*P*<0.05.

3.4 Nursing Satisfaction Outcomes: A Comparative Analysis of the Two Groups

Post-intervention data revealed distinct satisfaction patterns across groups. For the control group (n=49), 20 participants (40.82%) reported being "very satisfied" with nursing care, 20 (40.82%) indicated "satisfied," and 9 (18.37%) expressed "dissatisfied." In contrast, the intervention group (n=49) demonstrated higher satisfaction levels: 32 participants (65.31%) were "very satisfied," 16 (32.65%) "satisfied," and only 1 (2.04%) "dissatisfied." Overall, the intervention group achieved a 97.96% total satisfaction rate (48/49), markedly surpassing the control group's 81.63% (40/49). This disparity proved statistically significant ($\chi^2 = 7.127$, $P = 0.008$, $P < 0.05$).

4. Discussion

Elderly patients with pulmonary tuberculosis generally have insufficient self-health management abilities, which are mainly manifested in poor treatment adherence, irregular medication use, and frequent interruptions in therapy. These factors directly contribute to persistently high drug resistance rates and unsatisfactory treatment outcomes in this population. Existing research [7] indicates that the drug resistance rate in China's elderly tuberculosis cohort reaches 32.53%, markedly exceeding rates observed in the broader population. Additionally, age-specific physiological traits—including diminished organ function and slowed drug metabolism—render older adults with tuberculosis more vulnerable to adverse drug reactions, which in turn compromises treatment outcomes [8]. As population aging accelerates rapidly, elderly tuberculosis has emerged as a critical yet complex priority within China's tuberculosis prevention and control framework, necessitating effective interventions to tackle this urgent public health challenge.

The family-participatory nursing model integrates family members into the nursing team. Under the professional guidance and education of nurses, family members actively participate in various aspects of patient care. This model emphasizes health education and social support provided by healthcare professionals, while encouraging family involvement in care planning and management throughout the rehabilitation process, maintaining close communication with professionals. This approach has shown significant potential in improving the treatment and recovery outcomes of elderly tuberculosis patients .

This study's results demonstrated that post-intervention, levels of both anxiety and depression exhibited more pronounced decreases in the intervention group relative to the control group, with statistical significance observed for both ($P < 0.05$).Additionally, the rate of sputum-negative conversion at one and two months post-intervention was markedly higher among patients receiving family-participatory nursing ($P < 0.05$). These results demonstrate that involving family members in the care process can substantially ease emotional distress in elderly patients with pulmonary tuberculosis and enhance sputum conversion outcomes. This practical experience offers meaningful support for developing standardized, family-centered tuberculosis management strategies in regions with limited medical resources, such as Gansu.

Based on the structured intervention framework in this study, it is recommended that the establishment of a regional family prevention standard should focus on several key areas. First, a unified *Caregiver Protection Manual* should be developed to standardize isolation measures and disinfection procedures, thereby reducing the risk of infection among family members . Second, a standardized training and assessment system should be implemented using a combination of "mini-lectures + videos + checklists" to ensure accurate mastery of protective skills. Finally, a remote guidance and supervision mechanism should be established via the WeChat platform to provide continuous professional support to families living in dispersed or rural areas. These measures will help build a hospital–family–community tri-level protection network that effectively reduces tuberculosis transmission risks among key populations .

The results additionally revealed that patients in the intervention group attained significantly higher scores across the psychological, physical, social, and material domains of quality of life compared to their counterparts in the control group (all $P < 0.05$). Moreover, patients who underwent the family-participatory nursing model showed a marked increase in overall nursing care

satisfaction ($P < 0.05$). Collectively, these observations imply that this nursing approach not only improves various facets of patients' quality of life but is also favorably received and highly regarded by care recipients.

The success of this model lies in its establishment of a multidimensional and systematic support system. Rather than simply transferring nursing responsibilities to family members, the study began with a *staff education stage* to unify and standardize care procedures, ensuring scientific consistency and homogeneity of intervention. Subsequently, through structured *family education sessions*, checklist-based evaluations, and video-based training for key nursing skills, efficient and standardized knowledge transfer was achieved for both patients and caregivers. This process transformed caregivers from passive assistants into quasi-professional care providers equipped with practical skills and knowledge—an essential foundation for the success of the intervention.

Caregivers were able to accurately supervise medication adherence, guide respiratory training, and assist with balanced nutrition, directly improving patients' compliance and physical health indicators—likely explaining the significant improvement in physiological function scores in the intervention group. At the same time, this model greatly enhanced patients' psychological well-being and social functioning. Elderly tuberculosis patients often experience anxiety and depression due to disease stigma and long-term isolation, leading to diminished social interaction. In this model, caregivers were explicitly encouraged to "chat with patients and provide emotional support," while real-time psychological counseling via the WeChat platform offered continuous emotional comfort and stress relief. The established WeChat group not only served as a professional consultation channel but also became a supportive community for peer interaction and encouragement, breaking the social isolation of patients and restoring their sense of belonging and confidence in recovery. Thus, the superior psychological and social function scores in the intervention group directly reflect the comprehensive psychological and social support provided by this model.

Furthermore, the integration of modern information technology served as a catalyst for the successful transformation from traditional to continuous nursing care. The WeChat-based information platform developed in this study facilitated one-on-one medication check-ins, video-based respiratory training, personalized health guidance, and group support—effectively extending intensive in-hospital care seamlessly into the home setting. This "online + offline" model not only enhanced supervision and continuity of care after discharge but also improved healthcare professionals' monitoring efficiency and patient convenience, thereby significantly increasing overall satisfaction with nursing services.

Notably, this study placed great emphasis on caregiver protection education and included chest X-ray follow-ups to evaluate the effectiveness of family-based infection control measures. This approach reflects a model that not only focuses on patients but also shows genuine care for caregivers, adding a deeper sense of humanistic value and sustainability.

In summary, the application of the family-participatory nursing model effectively improves emotional well-being and sputum negative conversion rates among elderly patients with pulmonary tuberculosis. The establishment and promotion of this standardized approach can enhance the quality of home care, improve patients' overall quality of life, and form a three-tier protection network of *hospital guidance–family care–community supervision*. This model has been widely accepted by patients and provides a feasible and practical strategy for reducing household tuberculosis transmission risks in regions such as Gansu.

5. Conclusion

Incorporating family-participatory nursing into the management of elderly pulmonary tuberculosis patients can substantially reduce adverse emotional symptoms, enhance sputum conversion, support recovery, and improve overall quality of life. The higher satisfaction rate further indicates that this nursing model has strong clinical value and is worth broader implementation.

Acknowledgements

Gansu Provincial Department of Science and Technology, Application and Research of Family-Participatory Nursing Model in the Treatment of Elderly Patients with Pulmonary Tuberculosis, 24JRRA763.

References

[1] Wu Yuanhao, Dong Ning, Wei Xiaowen, et al. Effect of family-participatory rehabilitation exercise on elderly patients with pulmonary tuberculosis [J]. *Military Nursing*, vol.42, no.9, pp.49-52, 2025.

[2] Liang Yuting. Effect of health education combined with family-participatory nursing on the quality of life of elderly patients with pulmonary tuberculosis [J]. *Marriage and Health*, vol.28, no.9, pp.62-63, 2022.

[3] Ma Zhixia. Discussion on the experience of hospital–community–family continuous nursing for elderly patients with pulmonary tuberculosis [J]. *Chinese Journal of Geriatric Health Medicine*, vol.18, no.4, pp.139-140, 2020.

[4] Cai Jing, Zhu Tiebin, Zhang Yan. Influencing factors and nursing interventions of treatment compliance among elderly patients with pulmonary tuberculosis [J]. *International Journal of Infectious Diseases*, vol.9, no.3, pp.179-180, 2020.

[5] Guo Ying, Zhang Li, Liu Yu. Application of family-centered nursing model in elderly patients with pulmonary tuberculosis [C] // *Proceedings of the 5th Shanghai International Nursing Conference*, 2022, pp.7–8.

[6] Wang Huijuan, Li Jing, Liu Xiaohui, et al. Study on the status and influencing factors of depression in newly diagnosed pulmonary tuberculosis patients based on a random forest model [J]. *China Medical Herald*, vol.21, no.25, pp.81-86, 2024.

[7] Gao Rongrong, Du Caimei, Meng Guoping. Construction of a comprehensive family nursing intervention model based on volunteer service for susceptible Uygur populations with pulmonary tuberculosis in rural areas [J]. Health Home, no.5, pp.146-148, 2022.

[8] Jiang Liyuan, Tang Yuelu, Wei Zhouhui, et al. Effect of family-cooperative nursing combined with multimedia health education on elderly patients with pulmonary tuberculosis [J]. *Clinical Nursing Research*, vol.33, no.12, pp.33-35, 2024.