Int J Clin Exp Med 2020;13(2):574-581
www.ijcem.com /ISSN:1940-5901/IJCEM0103174

Original Article

Effect of collaborative nursing model on the compliance, pains and quality of life of patients subject to surgery in spinal tuberculosis after discharge

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Received October 6, 2019; Accepted December 10, 2019; Epub February 15, 2020; Published February 28, 2020

Abstract: Objective: This study was designed to analyze the effect of collaborative nursing model on patients after a surgery for spinal tuberculosis. Methods: 93 patients diagnosed with spinal tuberculosis in our hospital from January 2017 to January 2019 were included as the study objects, retrospectively analyzed and randomized into 2 groups. The observation group (n=47) was postoperatively nursed by the collaborative nursing model while the control group (n=46) was routinely nursed. The 2 groups were compared for off-hospital compliance, pain intensity and quality of life (QOL). Results: (1) The composition ratios of good, intermediate and low off-hospital medication compliance were 42.55%, 48.94% and 8.51% in the observation group, 21.74%, 41.30% and 36.96% in the control group (P<0.05); (2) The complete and partial compliance rates, and noncompliance rate for off-hospital functional exercise were 38.30%, 42.55% and 19.15% in the observation group, 17.39%, 39.13% and 43.48% in the control group (P<0.05); (3) Compared with the control group, the observation group was lower in VAS scores for pains from 1 month to 6 months after surgery (P<0.05), higher in MBI scores for activity of daily living at 1 month, 3 months and 6 months after surgery (P<0.05), and scores of general health (GH), mental health (MH), physical functioning (PF), role emotional (RE), role physical (RP), body pain (BP), social function (SF) and vitality (VT) 3 months after discharge (P<0.05). Conclusion: the application of collaborative nursing model in postoperative nursing patients subject to a surgery for spinal tuberculosis can markedly improve their compliance and quality with alleviated pain intensity after discharge, showing favorable application values.

Keywords: Spinal tuberculosis, surgery, collaborative nursing model, compliance, pain, quality of life

Introduction

Tuberculosis is an infectious disease with a higher incidence in China, and increasingly resistant to many drugs as a result of extensive application of anti-infecting drugs, leading to increased clinical treatment difficulties [1]. Statistical data reveal that, less than 30% of the patients with tuberculosis have access to regular treatment. But fortunately, with the progress in medical technology and improvement in people's health awareness, gradually the remedy rate of tuberculosis rises and the mortality decreases, and the disease is effectively controlled [2]. However, it is also discovered clinically that the control of pulmonary tuberculosis doesn't mean that extrapulmonary tuberculosis, of which, spinal tuberculosis is a kind with higher incidence [3], is also controlled.

Generally, spinal tuberculosis is characterized by kyphosis due to tubercle bacillus, involving the whole spine and resulting in combined paraplegia in some patients [4]. In most cases, spinal tuberculosis is secondary to pulmonary tuberculosis and features slow blood moving in centrum, more cancellous bones attached with less muscles. Therefore, at the initial stage, less obvious symptoms are observed until the patient visits a doctor when the lesions involve the nerve system and severely damage the centrum [5]. Clinically, comprehensive treatment method assisted with surgeries is usually

selected for spinal tuberculosis, which, however, has high nonunion rate and reoccurrence rate that the patients have to gone through a long period of time before recovery. With direct impact on the patients' qualifies of recovery and life, off-hospital compliance is an important point to be addressed [6, 7].

In this study, 93 patients who received surgical treatment for spinal tuberculosis in our hospital were included to explore the application value of collaborative nursing model in postoperative nursing, in order to find new ideas and methods for the nursing intervention of spinal tuberculosis.

Materials and methods

Materials

93 patients who have been diagnosed with spinal tuberculosis and received surgical treatment in our hospital from January 2017 to January 2019 were included as the study objects, retrospectively analyzed and randomized into 2 groups. The age range, disease course and BMI were 34-68, 2-22 months, and 17-24 kg/m^2 in the observation group (n=47), 35-70, 4-23 months and 18-24 kg/m^2 in the control group (n=46). (1) Inclusion criteria: patients included complied with the diagnosis criteria of spinal tuberculosis [8] and have been surgically treated by the same medical team with the same method; they had an age below 80 and no cognitive or communication disorders. Based on their free will to participate in the study being approved by the ethics committee, an informed consent was provided by patients in person or by their guardians. (2) Exclusion criteria: some patients were excluded as they had nontuberculous spinal diseases, mental disorders and severe dysfunctions in heart, liver and kidney concurrently, and low compliance.

Methods

After surgery, the control group was routinely nursed and provided with a health handbook before being discharged. The notes after discharge were introduced to them in details, and patients were required for further consultations 3 months and 6 months after discharge or in case of prominent discomforts. In addition, paramedics called them once 3 months and 6 months after discharge for follow-up to learn about their recovery and give necessary guides.

After surgery, the observation group was applied with the collaborative nursing model. Specifically, paramedics evaluated the patients and their family members first to find out any possible problems in nursing and formulate a nursing plan with them. In such a process, the theoretical knowledge, specific implementation methods, and advantages of the collaborative nursing model were explained to patients and their family members. In addition, regular home follow-ups were arranged to check for patients' recovery, and guide them to correct any problems face to face. The specific processes are as follows.

Strengthening health education

The collaborative nursing model has a higher requirement on patients' self-nursing capacity which shall be improved with compliance during nursing. Paramedics provided patients with health education during nursing to help them master more knowledge on health, and comply with doctor's advices voluntarily for recovery exercises. Concretely speaking, paramedics intervened with patients' medication by introducing them the types of therapeutic methods, administration and dosage, adverse reactions and general treatment methods, as well as notes in the use of drugs. Patients were specially reminded of not adjusting the dosage or withdrawing from the drug administration without approval. Furthermore, intervention with patients' life was also necessary that patients were ordered to stay in bed for 2 months absolutely, during which, some functional exercises may be taken in bed. Out-of-bed activities and loading were prohibited. Methods of skin massage and helping the patients turn over were known to their family members, and patients were also required to wear the waist belt and corsage in case of out-of-bed activities.

Implementing compliance intervention

Patients shall insist on taking drugs after surgery to maintain the overall efficacy. For this reason, their postoperative compliance in medication will directly affect the postoperative recovery quality. However, as patients are discharged, their medication is beyond the supervision of paramedics. In such a case, family members play a very important role. In the present study, paramedics made a detailed introduction of each drug, including the admin-

istration, dosage, frequency and course of treatment, and repeatedly advised family members to be the supervisor of patients on regular drug use with detailed records which provided a basis for paramedic in follow-up.

Implementing recovery intervention

This process also demands higher compliance and active participation of family members to properly help and supervise over patients. (1) Patients were guided for exercise of pulmonary functions progressively, which shall not cause any fatigue. Before exercise, patients knocked at the chest and pat on the back. They were also guided of correct coughing and thorough cleanup of respiratory tract, including half-closed lip respiration, abdominal respiration and deep respiration with resistance. (2) Patients were guided for exercise of extremities' muscles, including muscle exercise and straight-leg rising. The first exercise contains multiple times of long contraction of muscle groups, isotonic muscular force exercise and rotatory movements of hands every day. (3) Training on lumbar and dorsal muscles: the training was practiced many times in a day in arch bridge or flying swallow posture, of which, the former applies to beginners or patients with weaker strength in psoas, and the latter fits for patients who are more capable with their lumbar and dorsal muscles.

Conducting follow-up intervention

Follow-up intervention was given via telephone calls, WeChat reminders, clinical and home follow-ups. Telephone calls were made 4 times a month in the first 3 months after patients were discharged, and 2 times monthly in the subsequent 3 months. Health knowledge was shared on WeChat every week. Some patients from whom no effective information was collected on the phone were required for clinical or home follow-ups for face-to-face exchanges to learn about and solve their problems.

Observation indices

(1) Off-hospital medication compliance: Morisky Medication Adherence Scale (MMAS-8-item) [9] with 8 items was used to investigate patients' medication frequency. For the first 7 questions, 0 point is assigned if the answer is "yes" and 1 point for an answer of "no", and for the 8th question, a 5-grade point system is applied at 1, 0.75, 0.50, 0.25 and 0.00, representing "never", "occasionally", "sometimes", "always" and "all". The questionnaire has a full score of 8. Low compliance corresponds to a score at or below 6, moderate compliance 6-8, and good compliance 8.

(2) Off-hospital functional exercise compliance: patients were asked for duration, times and methods of functional exercise every day. Complete compliance: patients can take all recovery exercise advised by the doctor on time and with quantity guaranteed every day; partial compliance: patients can take all recovery exercise advised by the doctor on time and with quantity guaranteed subject to supervision of their family members; noncompliance: patients fail in the recovery exercise advised by the doctor, increasing or decreasing amount of exercise without authorization, regardless of their family members' supervision.

(3) Pain intensity: patients were evaluated for pain intensity with visual analogue scale (VAS) [10] 1 month, 2 months, 3 months, 4 months, 5 months and 6 months after the surgery. It is a 10 cm movable scale on which 0 indicates no pain and 10 represents severe pain.

(4) Activity of daily living: The modified Barthel index (MBI) [11] was used for evaluation 1 month, 3 months and 6 months after surgery. The scale consists of items such as walking (45 m on the flat ground), stair activity, feeding, transfer between bed and chair, dressing (including tying up), embellishment (washing face, combing hair, brushing teeth, and shaving face), toileting, showering, and control of bowel movements. From a total score of 100, patients with a score at or below 20 completely depend on others in their life, patients with a score between 20 and 40 (inclusive) depend on others in 70% of the cases, patients with a score between 40 and 60 (inclusive) depend on others in 50% of the cases, and patients with a score over 60 can basically take care of themselves.

(5) Quality of life: SF-36 [12] was used to evaluate patients when they were discharged and 3 months after discharge. The scale consists of 8 dimensions, i.e., general health (GH), mental health (GH), physical functioning (PF), role emotional (RE), role physical (RP), body pain (BP), social function (SF), and vitality (VT). Each

Table 1. Comparison between the observation group and the control group in general materials ($\bar{x}$ ± sd)/[n (%)]

Material		Observation group (n=47)	Control group (n=46)	t/X^2	*P*
Gender	Male	25 (53.19)	27 (58.70)	0.286	0.593
	Female	22 (46.81)	19 (41.30)		
History of smoking	Yes	17 (36.17)	18 (39.13)	0.087	0.768
	No	30 (63.83)	28 (60.87)		
Age (y)		48.76±10.34	49.21±10.54	0.208	0.836
Course of disease (y)		10.53±3.64	11.49±3.59	1.280	0.204
BMI (kg/m^2)		20.42±2.19	20.46±2.23	0.087	0.931

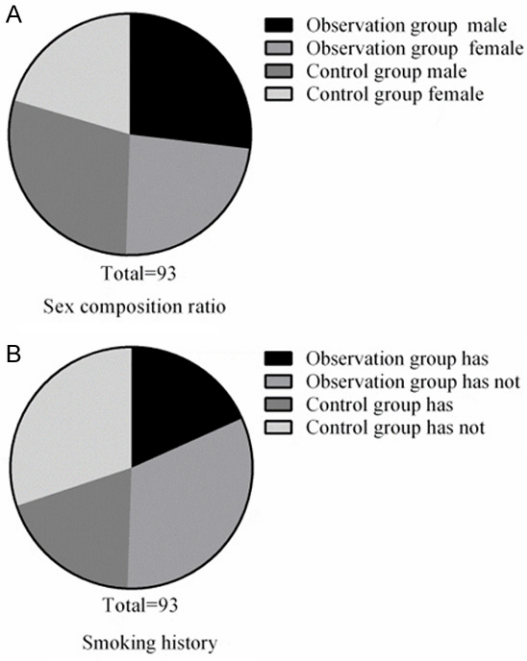

Figure 1. Comparison between the observation group and the control group in gender and smoking history. No significant difference was observed between the 2 groups in composition ratios of males, females, and patients with or without smoking history (*P*>0.05).

dimension is assigned with a full score of 100 and its score is positively associated with the quality.

Statistical analysis

Statistical analysis was performed with SPSS22.0. Measurement data were expressed as mean ± standard deviation, while intergroup and intragroup comparison studies were carried out through independent-samples T test. Enumeration data were expressed as [n (%)], intergroup and intragroup comparison studies were carried out through X^2 test. ANVOA was used for analysis of multi-point comparison in the study. *P*<0.05 was considered as statistically significant difference.

Results

Comparison between the observation group and the control group in general materials

The two groups had no statistical difference in composition ratios of males and females, mean age, mean course of disease, composition ratios of patients with and without smoking history, and BMI (*P*>0.05) (**Table 1** and **Figure 1**).

Comparison between the observation group and the control group in off-hospital medication compliance

After discharge, the rate of good medication compliance in the observation group was significantly higher than that of the control group, and the rate of low medication compliance was significantly lower than that of the control group (P<0.05), but the rate of moderate medication compliance had no significant difference in two groups (P>0.05, **Table 2**).

Comparison between the observation group and the control group in off-hospital functional exercise

After discharge, the compliance rate of functional exercise in the observation group was significantly higher than that of the control group, and the non-compliance was significantly lower than that of the control group (P<0.05), but the partial compliance had no significant difference in two groups (P>0.05, **Table 3**).

Comparison between the observation group and the control group in postoperative pain intensity

After surgery, the 1-month, 2-month, 3-month, 4-month, 5-month and 6-month VAS scores were 5.75±1.64, 4.83±1.23, 3.37±1.06, 3.02±0.86, 2.76±0.54 and 2.02±0.41 in the observation group, 6.84±1.49, 5.72±1.29, 4.43±1.27, 3.89±0.95, 3.54±0.68 and 2.87±0.53 in the control group (P<0.05, **Figure 2**).

Table 2. Comparison between the observation group and the control group in off-hospital medication compliance [n (%)]

Group	n	Good compliance	Moderate compliance	Low compliance
Observation Group	47	20 (42.55)	23 (48.94)	4 (8.51)
Control Group	46	10 (21.74)	19 (41.30)	17 (36.96)
t		4.609	0.547	10.760
P		0.032	0.460	0.001

Table 3. Comparison between the observation group and the control group in off-hospital functional exercise compliance [n (%)]

Group	n	Complete compliance	Partial compliance	Noncompliance
Observation group	47	18 (38.30)	20 (42.55)	9 (19.15)
Control group	46	8 (17.39)	18 (39.13)	20 (43.48)
X^2		5.045	0.113	6.412
P		0.025	0.737	0.011

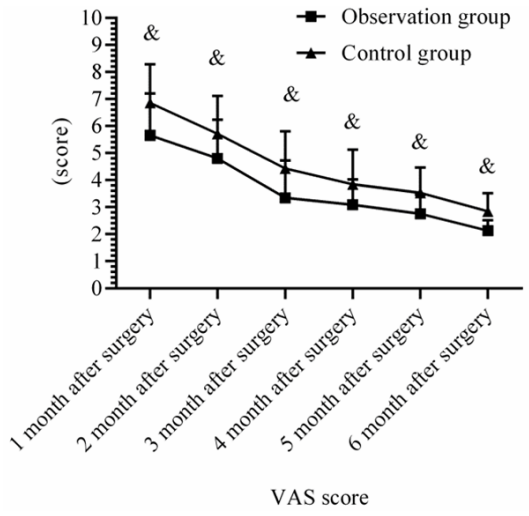

Figure 2. Comparison between the observation group and the control group in VAS score. As compared with the control group, the observation group yielded lower VAS scores in the 1 month, 2 months, 3 months, 4 months, 5 months and 6 months after surgery (P<0.05). & represents P<0.05 as compared between the 2 groups at the same time point.

Comparison between the observation group and the control group in activity of daily living

Through both groups attained an increase in MBI scores from the 1st month to the 3rd month, and from the 3rd month to the 6th month (P< 0.05), the observation group excelled the control group on this regard (P<0.05, **Table 4**).

Comparison between the observation group and the control group in quality of life

At discharge, the scores for GH, MH, PF, RE, RP, BP, SF and VT had no significant difference in two groups (*P*>0.05). 3 months after discharge, the scores for GH, MH, PF, RE, RP, BP, SF and VT in the observation group were obviously higher than those of the control group (*P*<0.05, **Figures 3** and **4**).

Discussion

Spinal tuberculosis has the highest incidence amongst tuberculosis in bone joints, and contributes to about 50% in the tuberculosis of bones and joints of the whole body [13]. Clinically it is found that only about 1/5 of patients with spinal tuberculosis have typical magnifications in early stage of onset, and the rest are in a severe condition when the disease is diagnosed. Surgery is an important therapeutic method against this disease [14]. It removes the lesions to alleviate patients' conditions, but demands a longer time for the surgical wound to heal, and requires the patients to receive regular chemotherapy and insist on functional exercise [15]. In the studies by Yao et al [16] and Kilborn et al [17], most patients with spinal tuberculosis failed to comply with doctors' advices to various degrees after discharge, and were less compliant in medication and functional exercise, which severely affected their postoperative recovery and increased the possibility of spinal tuberculosis reoccurrence and even resulted in the risk of disability. Therefore, active postoperative nursing is very important to patients receiving surgical treatment for spinal tuberculosis.

Muheremu et al [18] proved in their study that the medication compliance of patients with tuberculosis may have a direct association with its reoccurrence rate, indicating that the improvements in patients' self-management level play a key promoting role in their compliance, while in the study of Wouda et al [19], it was demonstrated that patients' active participation in postoperative functional exercises was major means of slowing down the disease's

Table 4. Comparison between the observation group and the control group in activity of daily living at different time points ($\bar{x}$ ± sd, score)

Group	n	1 month after surgery	3 months after surgery	6 months after surgery
Observation group	47	25.46±3.38	53.65±4.96*	68.75±5.47*,&
Control group	46	21.31±2.78	45.34±4.28*	58.75±5.13*,&
t		6.459	8.642	9.089
P		0.000	0.000	0.000

Note: *P<0.05 as compared with the conditions 1 month after surgery, and &P<0.05 as compared with the conditions 3 months after surgery.

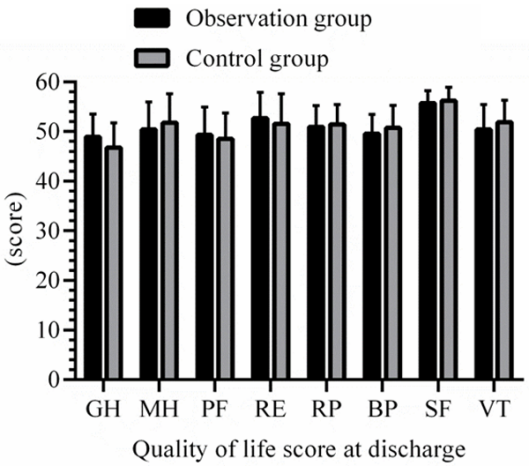

Figure 3. Comparison between the observation group and the control group in quality of life upon discharge. The 2 groups had no significant difference in scores of GH, MH, PF, RE, RP, BP, SF and VT upon discharge (P>0.05).

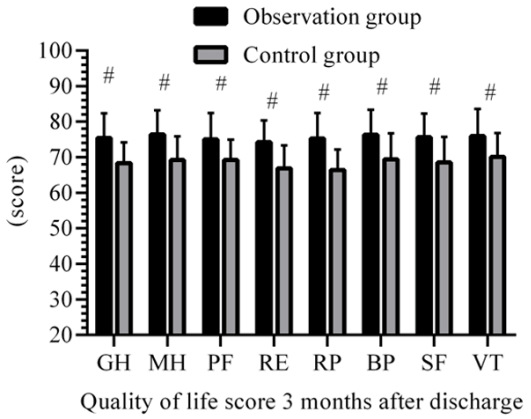

Figure 4. Comparison between the observation group and the control group in quality of life 3 months after discharge. Compared with the control group, the observation group yield higher scores of GH, MH, PF, RE, RP, BP, SF and VT 3 months after discharge (P<0.05). # indicates that P<0.05 as compared between the 2 groups for the same index.

progress and reducing physical disability. Furthermore, Desnos et al [20], based on results from their study, suggested that patients' failure to take recovery exercises according to the doctor's advices contributed to the negative impact on compliance, pain and cognitive degree. In the present study, the observation group was applied with the collaborative nursing model for postoperative nursing of spinal tuberculosis with joint efforts from the patients and their family members. Such a model not only reduces the burdens on paramedics but also improves the overall nursing effects as both patients and their family members are involved. As compared with the control group, observation group demonstrated higher good medication compliance rate and complete compliance rate of recovery exercise, and lower rates of low medication compliance and non-compliance of recovery exercise (P<0.05), indicating that the nursing guided by collaborative nursing model can effectively improve patients' compliance in medication and recovery exercise after a surgery of spinal tuberculosis, and their recovery quality. Through analysis, the application values of collaborative nursing model are reflected in points that under this model, paramedics can timely find problems in patients and give more targeted interventions. In recovery exercise, the collaborative nursing model gives power to the force of patients and their family members, improves patients' self-management level by comprehensive health education. They would be more compliance under the supervision of family members, and the recovery exercise would be more high-quality [21].

Postoperative pain control quality is subject to factors such as treatment, patients and services [22]. Pain is a normal physiological reaction when the body is defending and protecting itself. But persistent pain will directly affect and slow down healing [23], as supported by Gao et al [24] who found in their study that active postoperative recovery exercise significantly contributed to alleviation of pains, acceleration of healing speed and reduction of postoperative complication incidence. In the present study, it was demonstrated that compared with the control group, the observation group was lower in VAS scores of pain from the 1st month

to the 6th month and higher in MBI score for activity of daily living 1 month, 3 months and 6 months after surgery (P<0.05), indicating that nursing under the guide of collaborative nursing model can significantly relieve patients from pain, which helps patients to be involved in more daily activities to improve their activity of daily living. The participation and supports from family members in the collaborative nursing model also effectively improve patients' confidence in recovery and pain threshold, and alleviate pains. Li et al [25] studied that postoperative recovery mainly aimed to reduce the risks of disability and reoccurrence, help patients recover the original functional status to the largest extent, and reduce their dependence so that family members are less loaded. The application of collaborative nursing model can motivate patients in recovery exercise and improve their persistence as the pain is alleviated in this process, which effectively reinforce patients' activity ability.

Quality of life is evaluated from aspects such as physiology, psychology, and society, and is an important indicator to judge the effects of nursing intervention. Patients with spinal tuberculosis are subject to the impact from age, educational background and economic level in quality of life. As a chronic consumption disease, spinal tuberculosis takes a longer period to recover, which can be shortened by improvements in patients' quality of life [26]. In the present study, the observation group reported higher 3-month scores in GH, MH, PF, RE, RP, BP, SF and VT than the control group (P<0.05), indicating that the application of collaborative nursing model can improve the quality of life of patients with spinal tuberculosis upon their discharge. The underlying reasons shall be that the model results an elevation in patients' compliance that they can follow doctor's advices in recovery exercise and yield better quality, and accordingly, their quality of life is improved.

In conclusion, the application of collaborative nursing model in the postoperative nursing of patients who received surgery in spinal tuberculosis has good application values that it can markedly elevate patients' compliance in medication and recovery exercise, alleviate pain intensity, and improve patients' living ability and quality of life. However, with a retrospective nature, the study failed in advanced selection of study objects, enlargement of sample size, acquisition of more representative results and their comprehensive analysis. The future studies shall depend on larger sample size and more aspects, and be more in-depth and forward-looking to obtain more scientific and representative study results, and to provide more guides on the intervention of patients with spinal tuberculosis.

Disclosure of conflict of interest

None.

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