Original Article
Effects of preventive care on psychological state and complications in leukemia patients receiving chemotherapy

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Abstract: Objective: To investigate the effects of preventive care on the psychological state and complications in patients with leukemia undergoing chemotherapy. Methods: Retrospectively, 85 patients with leukemia undergoing chemotherapy in Xinchang People's Hospital from April 2019 to September 2021 were collected, including 47 patients who received preventive care as an observation group and 38 patients who received routine care as a control group. The incidence of chemotherapy-related complications, the scores of Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) before and after nursing intervention, and the General Comfort Questionnaire (GCQ) and nursing satisfaction were compared between the two groups. Results: The complication rate in the control group was higher than that of the observation group (P<0.05). The SAS and SDS scores of the control group were higher than those of the observation group after care (P<0.05). The GCQ score of the observation group was higher than that of the control group after care (P<0.05), and the care satisfaction of the control group was lower than that of the observation group (P<0.05). Multivariate Logistic regression analysis showed that age over 65 years old, platelet count less than 50×10^9/L and white blood cell count over 100×10^9/L were risk factors for complications in leukemia patients receiving chemotherapy (P<0.05). Conclusion: Preventive care helps to improve the negative emotions of patients with leukemia undergoing chemotherapy and reduces complications.

Keywords: Preventive care, patients with leukemia undergoing chemotherapy, negative emotions, complications

Introduction

Leukemia is a malignant clonal disease of hematopoietic stem cells [1]. The clonal leukocytes of the patients show a large accumulation of proliferation in the bone marrow and other hematopoietic tissues due to the overproliferation, differentiation disorder, and blocked apoptosis. Invasion of other non-hematopoietic tissues and organs can eventually inhibit the normal hematopoietic function of patients [2, 3]. The common clinical manifestations of leukemia include anemia, bleeding, fever, hepatosplenomegaly and skeletal pain. Data have shown that leukemia accounts for about 3%-5% of the total incidence of cancer, and the incidence tends to increase year by year, with leukemia ranking sixth (male) and eighth (female)

for the total number of deaths, and ranking first in children and adults under 35 years old [4, 5].

Chemotherapy is an effective treatment for leukemia, and the disease-free survival rate can reach over 50%. A long course of regular as well as multi-drug combination chemotherapy have positive significance in reducing the relapse rate of leukemia. With the continuous progress of technologies such as stem cell transplantation and comprehensive chemotherapy in recent years, the treatment effect on leukemia has been notably enhanced [6, 7]. However, clinical practice has also found a high incidence of side effects such as myelosuppression, gastrointestinal reactions, cardiotoxicity, and liver and kidney injury in leukemia patients undergoing chemotherapy, and most patients also have

a high incidence of negative emotions, which to some extent affects the intervention effectiveness and greatly increases the somatic and psychological burden for the patients [8, 9]. Preventive care is one of the active nursing interventions that refers to the manner of collecting active response interventions according to the possible risks to patients during treatment after a comprehensive assessment of their conditions. Several studies have confirmed the positive significance of preventive care in reducing the incidence of complications in patients with chronic diseases [10]. However, at present, there are few preventive nursing studies on leukemia patients receiving chemotherapy, and the existing studies mostly focus on how to improve clinical symptoms. The innovation of this study lies in bringing patients' psychological state into consideration and analyzing the effect of preventive nursing on improving patients' negative emotions, so as to provide a clinical reference for improving prognosis.

Materials and methods

General information

Retrospectively, 85 patients with leukemia undergoing chemotherapy in Xinchang People's Hospital from April 2019 to September 2021 were collected, including 47 patients who received preventive care as an observation group and 38 patients who received routine care as a control group. The study was approved by Xinchang People's Hospital ethics committee.

Inclusion criteria: (1) patients aged 18 years old or older; (2) patients who were diagnosed with leukemia by pathology and bone marrow report with corresponding clinical symptoms; (3) patients who were aware of their disease status and voluntarily accepted the investigation; (4) patients with complete and available clinical data.

Exclusion criteria: (1) patients with psychiatric disorders or communication disorders; (2) patients who had been included in other unfinished clinical studies; (3) patients with other malignancies.

Intervention methods

Patients in the control group received chemotherapy and routine care, which included recording patient information, implementing medication guidance, monitoring the occurrence of complications and conducting interventions, and regularly giving health education to patients.

Patients in the observation group received additional preventive care, and specific measures, as follows. First, infection control and prevention were given. By reviewing the literature, asking physicians and reviewing past medical records, the types of infections that leukemia chemotherapy patients are prone to, including oral infections, perianal infections and respiratory infections, were targetedly intervened. (1) Oral infection prevention: Before chemotherapy, the patients gargled sodium bicarbonate solution and nystatin solution for about 5 min, 3 times a day. If patients had oral ulcers and obvious pain, they were suggested to first use lidocaine for pain relief, and then rinse again. The patients were informed of the importance of oral care and asked to regularly check their oral conditions during chemotherapy. They should timely inform nurses if there were signs such as pressure pain, bleeding and swelling. (2) Prevention of perianal infection: Patients were instructed to perform perianal cleansing daily. The cleaning solution was potassium permanganate solution (1:5000), 20 minutes a day. Patients were advised to eat more vegetables and fruits, keep stool unobstructed, and avoid forced defecation causing anal fissure, which may increase the risk of infection. At the same time, nurses regularly checked the patients for perianal infection, and if found, the infection was timely reported to the doctor and actively dealt. (3) Prevention of nursing tract infection: The nurses kept the air unobstructed in the patient's room and ventilate it regularly every day. Appropriate restrictions were placed on patient visitors. If the patients' white blood cell level was found to be below the standard range, they were prescribed antibiotics. (4) Prevention of gastrointestinal reactions: During chemotherapy, patients were given additional gastrointestinal protection and anti-vomiting drugs (such as ondansetron) as prescribed. At the same time, patients were supplemented with vitamins, proteins, and other nutrients. Spicy and stimulating food was avoided, and patients were suggested to clean their oral cavity shortly after eating. (5) Hemorrhage prevention: The symptoms of increased intracranial pressure such as vomiting and nausea were recorded during chemo-

therapy. Also, the bleeding tendency of patient's gingiva and nasal mucosa was observed regularly. The patients were asked to observe their urine color, and timely intervention was given if there was any bleeding. Second, psychological intervention was conducted. In addition to the above-mentioned physical nursing interventions, attention was also paid to the psychological care. (1) Nurses actively communicated with patients to understand their thoughts and worries. For some patients with anxiety and depression symptoms, verbal comfort and encouragement was provided first. If the patients did not get better, a psychologist was included to give psychological intervention to the patients, with the aim of enhancing patients' confidence in the treatment and improving their treatment compliance. (2) Social support was enhanced for patients, including patients' families or relatives, who were informed about the importance of psychological support during treatment, and they were taught how to enlighten patients in daily life, how to guide patients to establish confidence in treatment, how to identify psychological problems, and how to seek help from medical workers, so as to build family and societal support and protection for patients. (3) Regular follow-ups were carried out by telephone, WeChat, video chat and follow-up visit, to know the psychological state of patients. If there was a psychological issue, the patients and their families were suggested to actively seek professional help in time.

Observation indicators and assessment criteria

The main observation indexes: (1) The incidence of complications and adverse reactions such as oral infection, perianal infection, gastrointestinal reaction, mucocutaneous hemorrhage, and respiratory tract infection, during the intervention were recorded and compared between the observation group and control group. (2) The psychological state was evaluated before the intervention, 15 days after intervention, 1 month after intervention, and 2 months after intervention with the used of Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) [11]. The SAS scale consists of 20 items, with a score of 69 or more indicating severe anxiety, 60-69 indicating moderate anxiety, and 50-59 indicating mild anxiety. The SDS scale consists of 20 items,

with a total score of 0.7 or more for major depression, 0.6-0.69 for moderate depression, and 0.5-0.59 for mild depression. (3) General Comfort Questionnaire (GCQ) was used to evaluate the comfort level in patients after intervention [12]. The questionnaire includes 28 items including dimensions of physical (5 items), psychological (11 items), social (6 items) and environmental (6 items) comfort, using a 4-point scale, with higher scores representing better comfort levels. (4) Multivariate Logistic regression analysis was used to explore the risk factors of complications in the patients.

Secondary outcome measures: The nursing satisfaction was evaluated by questionnaire survey. Satisfaction degree was divided into three levels: very satisfied, satisfied and dissatisfied. Satisfaction rate = cases of (very satisfied + satisfied)/total number of cases × 100%.

Statistical methods

SPSS 24.0 software was used to process and analyze the data. Kolmogorov-Smimov test was used to test the normality of quantitative data, and variance test or t test was used to test the indexes that obeyed the normal distribution. The results were indicated by ($\overline{x} \pm s$). Chi-square test was used for comparisons in qualitative data. $P < 0.05$ was set as the significance level. GraphPad Prism 8.3 was used for figure plotting.

Results

Comparison of general clinical information between the two groups

General clinical data such as sex, age, and body mass index were compared between the control group and observation group, and no notable difference was found ($P > 0.05$), suggesting that the control group and observation group were comparable. See **Table 1** and **Figure 1**.
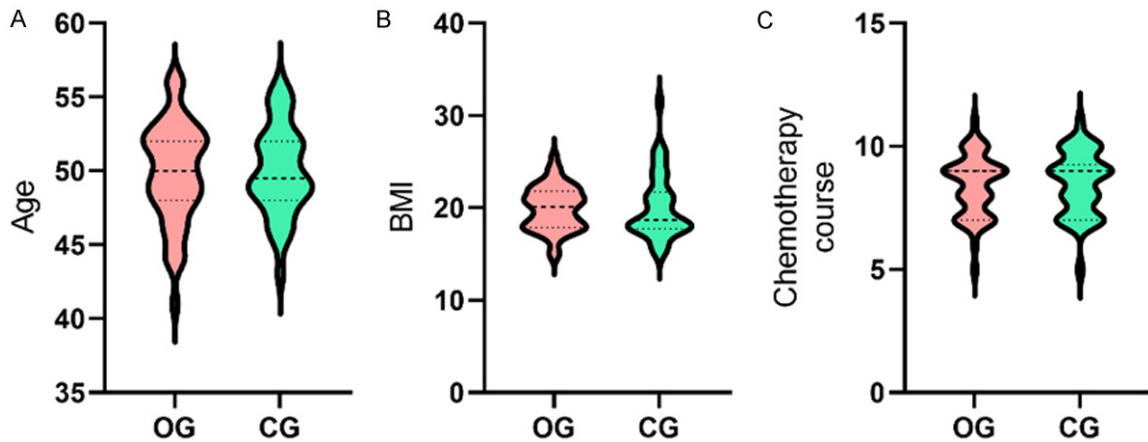
Comparison of incidence of complications between the two groups

The adverse reactions such as oral infection, perianal infection, gastrointestinal reaction, mucocutaneous hemorrhage and respiratory tract infection were counted in both groups. The comparison showed that the incidence of adverse reactions in the observation group was

**Table 1.** Comparison of general clinical information between the two groups ($\bar{x} \pm s$)/[n (%)]

General clinical information		Observation group (n = 47)	Control group (n = 38)	t/χ^2	P
Sex	Male	26	20	0.805	0.061
	Female	21	18		
Average age (years)		49.88±3.35	50.02±2.99	0.201	0.841
Body mass index (kg/m^2)		20.00±2.37	20.11±3.55	0.171	0.865
Average course of chemotherapy (months)		8.36±1.23	8.47±1.29	0.401	0.689

Figure 1. Comparison of general clinical data between the two groups. There was no notable difference between the observation group (OG) and the control group (CG) in terms of age (A), body mass index (BMI) (B), or chemotherapy course (C) (P>0.05).

Table 2. Comparison of complication rates between the two groups [n (%)]

Group	n	Oral infection	Perianal infection	Gastrointestinal reactions	Mucocutaneous hemorrhage	Respiratory tract infection
Observation group	47	2 (4.26)	3 (6.38)	4 (8.51)	3 (6.38)	6 (12.77)
Control group	38	9 (23.68)	9 (23.68)	11 (28.95)	11 (28.95)	12 (31.58)
χ^2	-	7.040	5.187	6.039	7.776	4.455
P	-	0.008	0.023	0.014	0.005	0.035
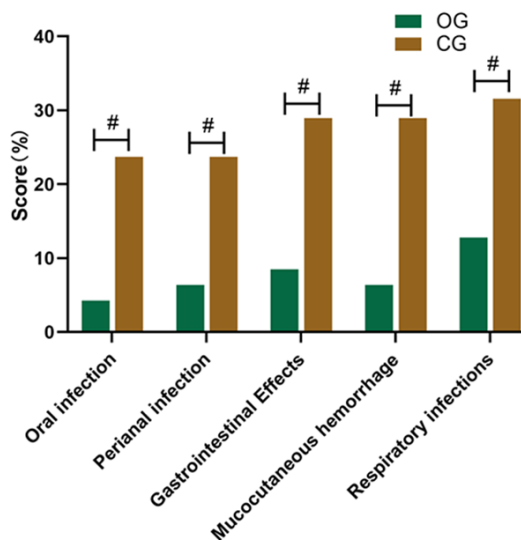
Figure 2. Comparison of the incidence of complications between the two groups. The incidences of oral infection, perianal infection, gastrointestinal reaction, mucocutaneous hemorrhage and respiratory infection in the control group (CG) were higher than those in the observation group (OG). #P<0.05.

lower than that in the control group, with a significant difference (P<0.05). See **Table 2** and **Figure 2**.

Analysis of psychological state during the intervention in the two groups

The SAS and SDS scales were used to evaluate the psychological state in the two groups before the intervention, 15 days after intervention, 1 month after intervention and 2 months after

Table 3. Comparison of Self-Rating Anxiety Scale scores during the intervention between the two groups ($\overline{x} \pm s$)

| Group	n	Pre-intervention	Intervention 15 d	Intervention for 1 month	Intervention for 2 months
Observation group	47	68.01±4.38	53.58±3.44[#]	49.68±5.29[#]	52.12±3.82[#]
Control group	38	68.88±3.96	64.17±3.09[#]	59.82±4.16[#]	56.46±4.26[#]
t	-	1.007	14.761	9.645	4.946
P	-	0.317	<0.001	<0.001	<0.001

Note: compared to pre-intervention, [#]P<0.05.

Table 4. Comparison of Self-Rating Depression Scale scores during the intervention between the two groups ($\overline{x} \pm s$)

Group	n	Pre-intervention	Intervention 15 d	Intervention for 1 month	Intervention for 2 months
Observation group	47	0.63±0.15	0.50±0.10[#]	0.49±0.12[#]	0.45±0.11[#]
Control group	38	0.67±0.14	0.59±0.11[#]	0.60±0.12[#]	0.54±0.20[#]
t	-	1.259	4.125	4.202	2.634
P	-	0.212	<0.001	<0.001	0.010

Note: compared to pre-intervention, [#]P<0.05.
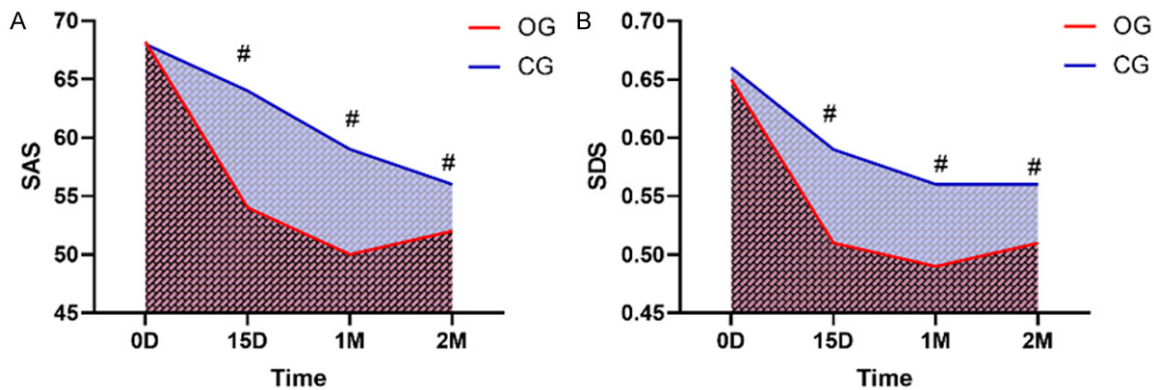
Figure 3. Analysis of psychological state in the two groups. Comparison showed that the differences between the observation group and the control group in Self-Rating Anxiety Scale (SAS) (A) and Self-Rating Depression Scale (SDS) (B) were not significant (P>0.05) before the intervention. In contrast, the SAS and SDS scores in the control group were higher than those in the observation group at 15 days, 1 month, and 2 months after intervention (P<0.05). Comparing between the observation group and the control group. [#]P<0.05.

intervention. The results showed that there was no notable difference in SAS and SDS scores between the two groups before intervention (P>0.05). At the latter 3 time points, the SAS and SDS scores in the control group were notably higher than those in the observation group (P<0.05). See **Tables 3**, **4** and **Figure 3**.

Comparison of GCQ scores after care between the two groups

The comparison showed that the scores of physical, psychological, social and environmental dimensions in the GCQ scale were notably lower in the control group than in the observation group after care, with significant differences (P<0.05). See **Table 5** and **Figure 4**.

Comparison of patient care satisfaction between the two groups

The nursing satisfaction of the two groups was evaluated and compared. The results showed that the nursing satisfaction rate of the patients in the observation group was 95.74% (45/47), which was significantly higher than 81.58% (31/38) in the control group (χ^2 = 4.454, P = 0.035).

Table 5. Comparison of General Comfort Questionnaire scores after care between the two groups ($\bar{x} \pm s$)

Group	n	Physiologic	Psychological	Social	Environmental
Control group	47	14.32±2.06	27.08±3.93	15.62±3.04	15.08±2.55
Observation group	38	11.39±2.39	22.15±2.92	12.71±2.58	11.77±1.89
t	-	6.068	19.466	4.690	6.656
P	-	<0.001	<0.001	<0.001	<0.001
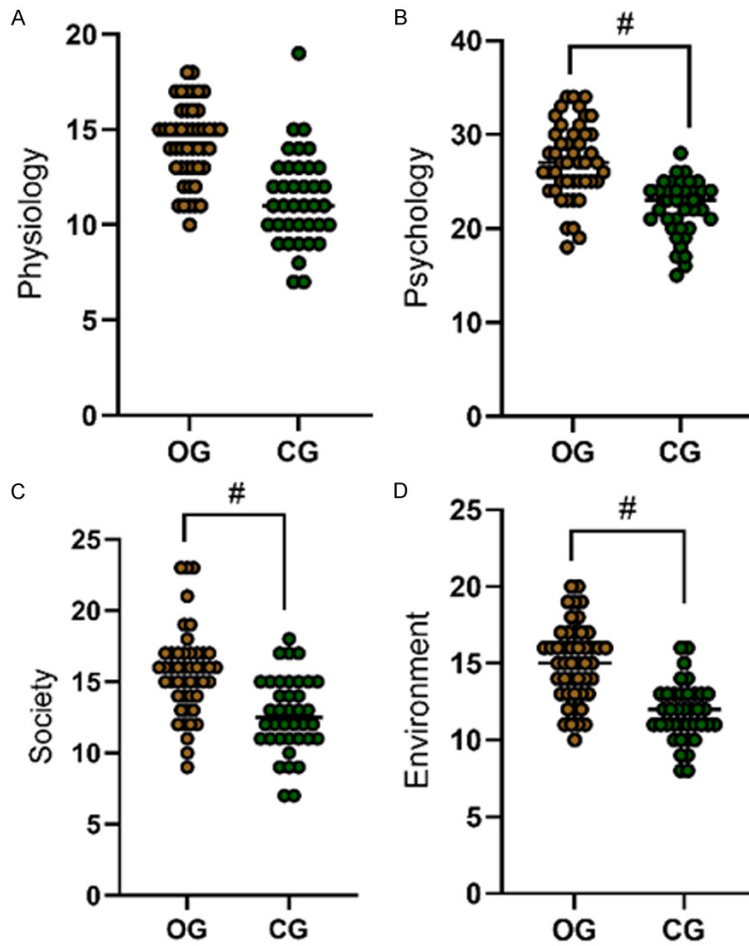
Figure 4. Comparison of General Comfort Questionnaire (GCQ) scores between the two groups after care. The scores of the dimensions of physical (A), psychological (B), social (C) and environmental (D) comfort in the GCQ after care were significantly lower in the control group (CG) than in the observation group (OG). Comparing between the observation group and the control group. #P<0.05.

Analysis of risk factors of chemotherapy complications

Multivariate Logistic regression analysis showed that age over 65 years old, platelet count less than 50 × 10⁹/L and white blood cell count over 100 × 10⁹/L were risk factors for complications in patients with leukemia (P<0.05). See **Table 6**.

Discussion

Leukemia is characterized by rapid onset, severe symptoms, poor prognosis, high malignancy, and frequent recurrence. Patients have to endure not only the physical damage but also a huge mental burden [13]. It has been pointed out that some leukemia patients, under the fear of disease recurrence and great economic pressure, may lose confidence in treatment, which has a negative impact on the progress of clinical intervention [14]. It was also found that the incidence of anxiety and depression in leukemic patients was as high as 80%. Most patients complained that anxiety and depression had an impact on the treatment, and adverse reactions during chemotherapy would aggravate their adverse emotions [15].

In this paper, we studied the effect of preventive care on the psychological and emotional well-being and complications of patients with leukemia during chemotherapy. The results showed that the incidence of oral infections, perianal infections, gastrointestinal reactions, mucocutaneous hemorrhage and respiratory infections was significantly lower in the observation group receiving preventive care than in the control group receiving routine care. This suggests that preventive care helps

Table 6. Analysis of risk factors for chemotherapy complications in patients with leukemia

Factor	Logistic regression	Standard error	Wald value	P	OR	95% CI
Age >65 years	0.623	0.253	5.542	0.006	1.589	1.212-3.265
Platelet count <50 × 10^9/L	0.326	0.119	8.541	0.016	1.365	1.056-2.215
White blood cell count >100 × 10^9/L	0.721	0.326	5.126	0.005	2.155	1.212-4.122

to reduce the incidence of complications during chemotherapy in leukemic patients. In a controlled study of 90 leukemic patients, it was noted that infections were a common complication during chemotherapy in leukemic patients, and could adversely affect the progress of treatment, and active nursing interventions could help to reduce the incidence of complications [16]. A previous study found that preventive care reduced the incidence of complications in leukemic patients (53.26% vs. 12.41%, P<0.05), which is similar to the results of this study [17]. Unlike traditional passive nursing, preventive nursing is active and focuses on nursing prior to disease, that is, risk factors should be checked before the occurrence of complications, so as to prevent complications [18]. This can reduce the incidence of complications and enhance the treatment experience. This is reflected in the higher nursing satisfaction score in the observation group than in the control group, indicating that preventive care enhances patient satisfaction and fosters a harmonious nurse-patient relationship [19].

In addition, the study found that patients in the observation group had lower SAS and SDS scores than those of the control group after the intervention, suggesting that preventive care can improve patients' negative emotions. Some scholars have found that preventive care can reduce the incidence of complications thereby improving negative emotions [20]. Another dynamic follow-up of 50 leukemic patients found that lower incidence of complications during chemotherapy notably reduced patients' anxiety and depression scores, and that the incidence of complications was negatively associated with the SAS score [21]. According to our analysis, the direct reason for the improvement of anxiety and depression in the observation group is the reduction of complications, with indirect benefits related to psychological intervention. Psychological intervention improved patients' self-confidence in treatment, which is also an important factor affecting patients' mood. In addition, family members of patients were included in the study. Theyprovided better social support for the patients, which helped to improve patients mood. Finally, a comparison of the GCQ scores also confirmed this view, as the scores of physical, psychological, social and environmental dimensions in the GCQ in the control group were lower than those of the observation group, possibly because of the reduction in the incidence of complications and negative mood during the intervention [23]. The results of multivariate analysis showed that age over 65 years old, platelet count less than 50 × 10^9/L and white blood cell count over 100 × 10^9/L were risk factors for complications in patients with leukemia (P<0.05). A follow-up study of 90 patients with leukemia found that older individuals had a higher rate of complications while receiving chemotherapy, and more attention should be paid to patients who have an abnormal platelet count [24]. We believe that older age would lead to decreased immunity and thus more adverse reactions during chemotherapy. Platelets are involved in the process of coagulation and hemostasis. An abnormal count can cause adverse effects on the coagulation system of patients and increase the incidence of events such as bleeding and infection. Preventive intervention is recommended for such patients to reduce the incidence of complications.

In conclusion, preventive care can help to improve the negative emotions and reduce complications of patients, which is worthy of clinical promotion. In this study, cluster analysis was used to compare and analyze the influence of preventive nursing on the mood and complications of leukemia patients during chemotherapy. A cluster study was used in data analysis, which is beneficial to the accuracy of data. All these are advantages of this study. But this study also had some limitations. (1) Because of the small sample size and single-center cases, the representativeness of the results

was somewhat limited. (2) In terms of evaluation indicators, due to the influence of time, manpower, and resources, the indicators observed in this study cover only the patients' psychological state and complications. It is proposed to include more objectively representative indicators later to enhance the study results.

Disclosure of conflict of interest

None.

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