

ORIGINAL RESEARCH

Analysis of the application value of functional status-based personalized nursing in clinical care for acute leukemia

Kebing Wang¹, Yiyu Hu^{1,*}, Yaping Wang¹, Chenlin Hu¹, Wei Ma¹, Min Hu¹, Hailin Zhu¹

¹Department of Hematology, Zhejiang Hospital, 310013 Hangzhou, Zhejiang, China

***Correspondence**hyy_huyiyu999@163.com

(Yiyu Hu)

Abstract

To discuss the functional status-based personalized nursing in clinical care for acute leukemia. 175 patients with acute leukemia were divided into the conventional care group (patients within the group received routine care during chemotherapy for acute leukemia) and the observation group (patients within the group received functional status-based personalized care on the foundation of routine care) according to the method of random number table, and the mental status, quality of life, physical function status and complications during chemotherapy were compared between groups. Compared to the conventional care group following the intervention, the scores of self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were notably decreased in the observation group following the intervention. The scores of quality of life (QOL) and Karl Fischer Physical Functional Status Scale (KPS) were conspicuously increased, and the differences indicate statistical significance ($p < 0.05$); Compared with the conventional care group, the incidence of infection infectious fever, bleeding and ectopic liver function during chemotherapy in the study group were evidently reduced. The differences are statistically significant ($p < 0.05$). The functional status-based personalized nursing can effectively improve the mental status and quality of life, promote the physical function status, and effectively decrease the complications during chemotherapy in patients with acute leukemia, which is a safe and effective nursing model.

Keywords

Acute leukemia; Functional status-based personalized nursing; Mental status; Quality of life; Complication

1. Background

Acute leukemia is a clonal malignant hematopoietic stem cell disease, and its clinical symptoms are mostly manifested as anemia, infection and fever. The disease features with acute and rapid onset, high mortality and various adverse reactions, being listed as one of the top 10 malignant tumors that threaten the health of residents [1, 2]. The treatment of the disease is mainly bone marrow transplantation and chemotherapy, due to the few donors of bone marrow transplantation and high treatment costs, chemotherapy has emerged as the primary treatment for acute leukemia [3]. Prior studies have validated that acute leukemia patients suffer from psychological and physiological pain during chemotherapy, which is accompanied by anemia, bleeding, infection, fever, fatigue, nausea and vomiting as well as anxiety and depression during chemotherapy, seriously affecting the mental status and quality of life of patients [4, 5]. Therefore, seeking a nursing regimen that can effectively reduce the complications in patients during chemotherapy emerges as a hotspot in current studies. As

for the leukemia nursing, there are relevant guidelines abroad, while there is no unified nursing guideline in China before, which is usually presented in the form of self-determined nursing in the hospital. The nursing measures and intervention programs for diverse complications occurred during chemotherapy are relatively general, and the name and content are not uniform [6, 7]. Personalized nursing regimen is a more extensive model in current clinical practice, which has achieved different degrees of nursing effects in the care of each disease [8, 9]. Functional status-based personalized nursing program is a personalized nursing model made for the acute leukemia patients with different physical function status by our hospital. The program summarizes the possible complications during chemotherapy and develops specific interventions. The present study aims at probing the nursing effect of functional status-based personalized nursing model for the acute leukemia patients, and the details are as follows.

TABLE 1. Baseline data comparison of 175 subjects.

Group	case	Mean age	Gender ratio (male/female)	Type of leukemia	
				Acute myeloid leukemia	Acute lymphoblastic leukemia
Conventional care group	87	44.99 ± 18.40	42/45	68	19
Observation group	88	47.48 ± 16.59	52/36	61	27
<i>t/χ²</i> value		0.94	2.058	1.765	
<i>p</i> value		0.349	0.151	0.184	

2. Study subjects and contents

2.1 General information

175 acute leukemia patients who met the study criteria were screened as the study subjects from patients admitted to our hematology department from March 2018 to June 2022. In terms of the random number table, they were divided into two groups: the conventional care group (n = 87) and the observation group (n = 88). The general baseline data of the two groups are shown in Table 1. According to the statistical analysis, there was no evident difference in the baseline data between the two groups with comparability, in addition, there was no significant difference in the basic complications and disease severity of patients. The study was conducted following meeting the standard of the hospital ethics committee with permission. Screening criteria: Patients who are diagnosed as acute leukemia [10] and received chemotherapy for the first time, bone marrow suppression occurs after chemotherapy; Patients who are over 18 years old and have normal spontaneous consciousness and can complete the questionnaire independently; Patients with complete clinical data and voluntarily sign the informed consent form. The excluded criteria: Patients with other malignant tumors, mental disorders; Patients does not want to continue treatment during care and patients with poor nursing compliance that were unable to complete the study.

2.2 Study methods

87 patients in the conventional care group received routine care, health education and nursing intervention for acute leukemia during chemotherapy, such as bed rest as far as possible during chemotherapy, avoiding strenuous exercise, scientific guidance of their healthy diet, comfortable dressing, life rules and scientific medication due to fatigue, nausea and vomiting and other adverse reactions that may occur with the use of chemotherapeutic drugs. Patients in the observation group received functional status-based personalized nursing model. Shuffled patients adopted grading of platelet, granulocyte and complete blood cell count in world health organization (WHO) “grading criteria for bone marrow transplantation” [11], nausea and vomiting, fever as well as constipation as the major evaluation basis for functional

status assessment. Then, the nursing intervention, including emotional management, infection prevention and control, bleeding prevention, and fever treatment, were performed according to the actual functional status. (1) Emotional care: acute leukemia patients not only endure the physical torment disease brought, but also the financial burden of treatment as well as the fear and desperate when faced with death. Sorts of reasons will not only lead to generation of negative emotions of patients, but also result in decreased immune function and poor treatment compliance of patients, thereby influencing the overall effect of treatment. Therefore, for acute leukemia patients, the psychological status of patients is seriously evaluated throughout the entire treatment period, good doctor-patient relationship is established, and the main appeal of patients is listened patiently, thus alleviating or eliminating the disappointment, fear and other psychology through communication. (2) Assisted self-care: patients with limited self-care activities are given targeted assistance in self-care, such as eating (health scientific eating), washing (facial and oral cleaning and collation of related supplies, etc.), bathing, hair care, daily dressing and toileting. (3) Fever nursing: for patients with hyperthermia caused by non-environmental factors, the course, duration and complications of fever should be monitored, the site of infection should be found, and bacterial or fungal sampling and culture should be conducted. The vital signs of patients should be continuously monitored, and cooling treatment should be given in time, such as physical cooling and drug cooling. Such patients should rest in bed absolutely, and clothing should be added timely to keep warm. (4) Infection prevention and control: patients with infection risks should be timely diagnosed, prevented and intervened. In addition to monitoring the symptoms and signs of systemic or local infection, samples should be collected in time. For patients with symptoms, appropriate skin care should be taken to ensure adequate nutrition and fluid intake of patients. Besides, more bed rest is required. Meanwhile, the number of visitors should be limited, and single isolation should be performed to provide personalized intervention according to the type of infection. Digestive system infection: a rational diet program should be made according to the dietary habits, which focuses on the intake of nutrients and avoids irritating foods, etc. If diarrhea occurs, it is also necessary to monitor the patients’

electrolytes, and timely supplement water, electrolytes and corresponding drug intervention; Respiratory tract infection: patients should be instructed to drink more water when they have sore throat and cough. Patients with sputum that is not easy to discharge should take back to assist expectoration or receive atomization inhalation therapy according to the doctor's advice; Oral mucosal damage: patients at risk of oral mucosal damage should promote and maintain the health of oral mucosa and teeth, monitor whether there is tenderness, bleeding, swelling and erosion manifestations in oral mucosa, tongue, gingivopharynx, *etc.*, and monitor the signs of glossitis and stomatitis. Patients should take measures to rinse the mouth before meals, after meals and at bedtime. The appropriate mouthwash should be selected according to the patients' oral pH, or lip lubricant, and the patients acquire scientific guidance to rinse the mouth correctly. Perianal infection: during chemotherapy, patients were instructed to drink more water to prevent constipation and ensure smooth defecation. After defecation, in addition to warm water cleaning, potassium permanganate sitz bath was used every morning and evening to prevent perianal infection. If infected, pus drainage was performed to remove secretions and local necrotic tissue, supplemented by ultraviolet irradiation. Antibacterial drugs were applied according to the doctor's advice. (5) Prevention and treatment of bleeding: for patients at risk of bleeding, the stimulating factors of bleeding should be reduced. The bleeding of patients and the change in the levels of coagulation related indicators should be closely monitored daily. Such patients mostly present with gingival oozing of blood, oral mucosal blood bubbles, epistaxis, skin bleeding, *etc.* This prevention measures include diverse items: the use of soft-bristled toothbrushes, flossing without toothpicks, the use of lip lubricants to prevent dry cracks and oral bleeding; keep the nasal cavity moist and prevent bleeding caused by dry scab of digging secretions; avoid trauma, constipation and so on. Massive bleeding should be treated by fasting and timely establishment of venous access, rapid expansion of blood volume, timely blood transfusion and drug therapy.

2.3 Observational indicator

2.3.1 Assessment of mental status

Self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were employed to measure the anxiety and depression of subjects, respectively [12]. The SAS scale and SDS scale each contained 20 items. Each item adopts a four-level scoring method of 1–4 points, and the score is based on the frequency of occurrence of symptoms in patients. 1–4 represents that the symptoms related to this score do not appear or rarely appear, sometimes appear (a small part of time), appear most of the time and most of the time or always exist, and the symptoms do not disappear. Both scales utilize the percentage system calculation method. The total score of 20 items was finally counted, and the severity of symptoms was proportional to the score. Anxiety was judged by 50 points as the presence or absence. Those who below this score belong to the normal group as no anxiety. 50–60 is mild anxiety, 61–70 is moderate, and a score higher than 70 is severe anxiety. Depression is divided

into a cut-off value of 53–62 for mild depression, 63–72 for moderate depression, and the score higher than 72 for severe depression (There are some items reverse questions when the depression statistical value is counted, and the scoring criteria should be clear).

2.3.2 Assessment of life of quality

Quality of Life Scale for Tumor Patients was applied to evaluate the QOL of patients before and after intervention [13]. This scale includes 12 evaluation items from appetite, spirit, sleep, fatigue, pain to treatment side effects and facial expression. Each evaluation utilizes 1–5 points evaluation method. Higher score indicates the better results. The total score is 60 points. Less than 20 points represents very poor, the points above 20 are divided into a rating scale of 10 points. For example, 21–30 points are rated as poor, 31–40 points are as fair, 41–50 points are rated as good, and 51–60 points are rated as great.

2.3.3 Evaluation of physical functional status

The Karl Fischer Physical Functional Status Scale is utilized to measure the physical function status of patients with acute leukemia [14]. The total score is 60 points, 100 points represent normal physical strength and no symptoms. A score of 0 points represent death, and the scoring scale is also scored on a scale of 10. The 10-point patients are critically ill and close to death. 20 points represent that they are seriously ill and require active supportive treatment in hospital. 30 points represent that patients are seriously unable to take care of themselves. Patients with 40 points are unable to take care of themselves, and need care and assistance. 50 points represent that they often require care of people. Patients with 60 points can take care of most of themselves, occasionally require help from others. 70 points represent that they can take care of themselves but cannot maintain normal life and activities. 80 points represent that they are reluctantly performing normal activities, with some symptoms or signs. Patients with 90 points can perform normal activities, with mild symptoms or signs.

2.3.4 Investigation on complications during chemotherapy

The incidence of infection (respiratory tract infection, intestinal infection), infectious fever, bleeding (pulmonary hemorrhage, gastrointestinal bleeding) and ectopic liver function were statistically analyzed and compared between the two groups during chemotherapy.

2.4 Statistical analysis

The raw data were summarized and analyzed in tables, and the software version was SPSS 23.0 (IBM Corp., Armonk, NY, USA). Kolmogorov Smirnov test was employed for normality test, mental status and QOL scores were described by mean \pm standard deviation, the measurement data that conformed to normal distribution were compared using two independent samples *t*-test. The chi-square test was used to compare the data of number statistics. $p < 0.05$ differences have statistical significance.

3. Results

3.1 Comparison of mental status between groups

The SAS and SDS scores of the Conventional care and Observation groups were not statistically significant prior to intervention ($p > 0.05$). However, after nursing intervention, both the SAS and SDS scores in the two groups were decreased. In particular, the SAS and SDS scores in the observation group were lower than that in the conventional care group ($p < 0.05$). The details were displayed in Table 2.

3.2 Comparison of QOL and functional status scores between groups

There were no significant differences in QOL and KPS scores between the Conventional care and Observation groups prior to intervention ($p > 0.05$). After intervention, the QOL and KPS scores of the Conventional care and Observation groups were significantly increased. In particular, the QOL and KPS scores of the observation group were significantly higher than those of the conventional care group ($p < 0.05$), as shown in Table 3.

3.3 Comparison of complications during chemotherapy between groups

In comparison with the conventional care group, the incidence of infection, infectious fever, bleeding and ectopic liver function in patients in observation group during chemotherapy was evidently reduced, and the differences indicated statistical significance ($p < 0.05$). The specific outcomes were demonstrated on Table 4.

4. Discussion

As the global cancer survey data shows, the incidence and mortality of leukemia in China are increasing year by year. According to incomplete statistics, the annual incidence of leukemia in China was 6700/10,000 in 2018, of which acute leukemia is predominant. In China, the number of cases of acute leukemia patients is increasing at a rate of nearly 40,000 cases per year [15, 16]. Acute leukemia has an acute onset, and rapid progression and is often life-threatening. The pathogenesis of this disease is complicated and remains obscure. Relevant studies have implied that the occurrence of this disease may also be related to multiple factors, such as the environment, body immune status in addition to genetic factors [17–19]. Chemotherapy is the optimal therapeutic regimen, but chemotherapy drugs often cause adverse side effects such as bone marrow suppression, anemia, nausea and vomiting, fatigue, and organ dysfunction, which seriously threaten the life safety of patients [20]. Previous studies have discovered that the quality of care greatly impacts the QOL score and comfort in leukemia patients following chemotherapy [21, 22].

As for the nursing of acute leukemia patients, related nursing guidelines have emerged abroad, mainly including environmental management, infection prevention, patient practice and fever evaluation and management [23, 24]. At present, there are no nursing guidelines for the care of acute leukemia in

China, but with the development of nursing medicine, numerous nursing models have emerged in clinical practice. These nursing models have achieved varying degrees of effectiveness in acute leukemia, but they have been statistically found to target one or more aspects of patient care, such as reducing infection and relieving fatigue, such as reducing infection, and relieving fatigue [25–27]. Although they have a certain effect, in general they have certain limitations. Functional status-based personalized nursing model conducted personalized nursing intervention based on the patient's current physical function status, which is highly targeted and comprehensive. This personalized nursing model has been applied to the nursing of other diseases [28, 29], no association with acute leukemia has been reported to date. Therefore, the current study attempts to explore the nursing value of this model in acute leukemia.

The current study compared the conventional care model of chemotherapy with the functional status-based personalized nursing model in acute leukemia patients, and the mental status, QOL score, physical function status score, and the occurrence of complications during chemotherapy in patients in pre- and after-intervention states. As exhibited by the outcomes, the two nursing models had a significant effect on the SAS and SDS scores related to the mental status of patients, but the anxiety and depression scores of patients in the observation group improved better, indicating that targeted emotional intervention could effectively improve the adverse emotions of patients. The scoring results also further confirmed that adverse emotions such as anxiety and depression are common in acute leukemia patients receiving chemotherapy [30]. The results showed the importance of early detection and communication. Moreover, the results of QOL score and physical function status scores manifested that the improvement of QOL score and physical function status of patients in the observation group improved better, which may be due to the comprehensive nursing model enabling patients to better cooperate with treatment and clarify the significance of scientific nursing. Additionally, for the nursing staff, better identification of nursing content will meet the nursing needs of different patients, thereby improving the nursing awareness. The resulting incidence of complications during chemotherapy indicated that the incidence of infection, fever, bleeding, and ectopic liver function of patients in the observation group was significantly decreased. It revealed that the implementation of early prevention of complications, and early intervention of existing complications can effectively reduce the occurrence of complications. In this study, the mental status, QOL score, physical function status and incidence of partial complications in patients were discussed and verified the nursing effect of functional status-based personalized nursing program on acute leukemia during chemotherapy. Nevertheless, its mechanism, and the impact on other aspects, such as serological parameters and anemia of patients remain unclear. It is necessary to further expand the study samples and conduct in-depth study to investigate.

TABLE 2. Mental status comparison between groups.

Group	Cases	SAS (score)		SDS (score)	
		Pre-intervention	Post Intervention	Pre-intervention	Post Intervention
Conventional care group	87	56.99 ± 8.14	47.93 ± 7.37	60.92 ± 8.21	49.69 ± 6.68
Observation group	88	59.27 ± 8.13	38.74 ± 5.87	59.80 ± 9.05	40.28 ± 5.39
<i>t</i> value		1.860	9.132	0.857	10.259
<i>p</i> value		0.065	0.000	0.393	0.000

SAS: Self-rating anxiety scale; SDS: and self-rating depression scale.

TABLE 3. Comparison of QOL score and KPS score between groups.

Group	Cases	QOL (score)		KPS (score)	
		Pre-intervention	Post Intervention	Pre-intervention	Post Intervention
Conventional care group	87	44.75 ± 8.36	53.31 ± 8.77	55.66 ± 9.68	63.06 ± 9.11
Observation group	88	42.80 ± 9.54	62.86 ± 7.76	55.10 ± 10.01	71.14 ± 9.10
<i>t</i> value		1.438	0.379	7.634	5.863
<i>p</i> value		0.152	0.705	0.393	0.000

QOL: quality of life; KPS: Karl Fischer Physical Functional Status Scale.

TABLE 4. Comparison of complication rate between groups during chemotherapy (n (%)).

Group	Case	Infection	Infectious fever	Bleeding	Ectopic liver function
Conventional care group	87	59 (67.82)	56 (64.37)	49 (56.32)	30 (34.48)
Observation group	88	38 (43.18)	42 (47.73)	31 (35.23)	22 (25.00)
χ^2 value		10.746	4.917	7.845	1.884
<i>p</i> value		0.001	0.027	0.005	0.17.

5. Conclusions

To summarize, functional status-based personalized nursing model can effectively avoid the damage caused by insufficient and excessive care to patients, eminently improve the mental status of patients, QOL score and physical function status score, and better lower the incidence of complications.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

KBW and YYH—designed the research study. KBW, YYH, YPW, CLH, WM, MH and HLZ—performed the research. KBW, YYH, YPW, CLH, WM, MH and HLZ—analyzed the data. KBW and YYH—wrote the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Zhejiang Hospital (Approval no. 2016(62K)). Written informed consent was obtained from a legally authorized representative(s) for anonymized patient information to be published in this article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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