

Early Nursing Intervention in Children with Viral Meningitis

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Abstract

Aim: To explore the effect of a WeChat peer education program in children with severe viral meningitis combined with respiratory failure. **Design:** Retrospective cohort study. **Methods:** Patients who had severe viral meningitis combined with respiratory failure, were admitted to the hospital from March 2017 to June 2018, and who received the WeChat-based nursing intervention were included. Patients who received routine nursing were used as controls. The family's emotional state, self-care ability, and rehabilitation were analyzed. **Results:** There were 37 patients in the WeChat group (19 boys (51.3%) and 18 girls (48.7%); mean of 5.1 ± 2.4 years of age) and 37 controls (20 boys (54.1%) and 17 girls (45.9%); mean of 5.9 ± 2.4 years of age) (all $P > 0.05$). After nursing, improvements in the self-assessed anxiety score and self-assessed depression score were better in the WeChat group (anxiety: -29.2% vs. -20.3% , $P = 0.015$; depression: -25.2% vs. -15.4% , $P = 0.009$). After nursing, the improvements in the condition management ability scale and condition management difficulty scale scores were better in the WeChat group (ability: $+80.5\%$ vs. $+44.4\%$, $P = 0.001$; difficulty: $+58.4\%$ vs. $+37.8\%$, $P = 0.003$). After nursing, the improvement in the Fugl-Meyer score was better in the WeChat group ($+138.0\%$ vs. $+53.0\%$, $P < 0.001$). **Conclusion:** Early nursing intervention combined with WeChat peer education can improve the emotional state of children with severe viral meningitis combined with respiratory failure and their caregivers. **Impact:** Viral meningitis is associated with a good prognosis, but central nervous system complications can be observed. Early intervention is the key to a good prognosis. Internet-based nursing and coaching can improve self-efficacy and care ability in patients with various conditions, as well as improve the emotional state of the children and their caregivers. The research might have an impact on any children's hospital that deals with viral meningitis.

Keywords

Societies, Nursing, Early Intervention, Educational, Meningitis, Viral, Child

1. Background

Internet-based nursing and coaching can improve self-efficacy and care ability in patients with various conditions. Viral meningitis is associated with a good prognosis, but central nervous system complications can be observed. Early intervention is the key to a good prognosis. Therefore, internet-based nursing and coaching could be used to manage children and their caregivers during viral meningitis. This is of international relevance since different forms of viral meningitis are found all over the globe.

Viral (aseptic) meningitis in children is a common infectious disease, mainly caused by infections with enteroviruses and arbovirus. In the United States, about 75,000 cases occur each year, with the vast majority occurring in children [1]. In China, enterovirus is the main cause of viral meningitis [2] [3]. In temperate regions, the incidence increases during summer and early fall, but is constant in tropical and subtropical areas [4]. The risk factors include young age, immunodeficiency, male gender, physical exercise, contact with affected children, and contact with contaminated water [5].

Viral meningitis is associated with a good prognosis, but central nervous system complications such as seizure, amnesia, syndrome of inappropriate antidiuretic hormone secretion, behavioral disorders, and speech delay can be observed [2] [6] [7]. Respiratory failure is a common complication, especially when the infection is from enterovirus 71, and is associated with high disability and mortality rates. It requires timely intervention to improve prognosis [8] [9] [10]. This is particularly important in China because of repeated outbreaks of enterovirus 71 [11] [12]. Early intervention can effectively improve prognosis [13].

Early nursing intervention emphasizes prevention and foresight. WeChat peer education is a nursing method emphasizing communication and sharing concepts and behavior skills among patients. Previous studies showed that internet-based nursing and coaching can improve self-efficacy and care ability in patients with various conditions [14]-[20].

2. Methods

Aims

The aim of this study was to explore the effect of this WeChat peer education program in children with severe viral meningitis combined with respiratory failure. The hypothesis was that an internet-based peer education program could improve the mental states of children with meningitis and that of their caregivers.

Design and participants

This was a retrospective cohort study of patients who had severe viral menin-

gitis combined with respiratory failure admitted to the hospital from March 2017 to June 2018 and who received the WeChat-based nursing intervention.

All patients had viral meningitis diagnosed according to [1] [5] [21]: 1) clinical suspicion of meningitis; 2) evidence of meningeal inflammation on cerebrospinal fluid (CSF) analysis; 3) exclusion of bacterial meningitis; and 4) polymerase chain reaction (PCR) analysis of stool and/or CSF samples for the detection of the virus. The inclusion criteria were: 1) viral meningitis combined with respiratory failure diagnosed by multiple clinical examinations; 2) without unconsciousness or mental disorder; and 3) no cognitive and mental disorder in family members (those who take care of the children). The exclusion criteria were: 1) combined with other severe organ or nervous system diseases; 2) epidemic encephalitis B; 3) herpes virus encephalitis; or 4) mumps encephalitis.

The same inclusion/exclusion criteria were used for the selection of a control group among the children and families that did not receive the WeChat-based nursing program.

Early and WeChat-based nursing

The patients in the control group (Routine group) were treated with routine nursing, mainly including disease observation, routine psychological nursing and health education, monitoring vital signs, specific nursing, enhanced patrol, sputum suction and turning over, and medication following the physicians' advice.

Based on routine nursing, patients in the WeChat group received early nursing intervention combined with WeChat peer education. The program's content included the following points. 1) Early psychological intervention. Implement psychological intervention for encephalitis early recovery of children, children with early detection and to assess the psychological state, to children, with the attitude of enthusiasm, kindly communicate with children, at the same time through friendly calling, and physical contact with children develop relationships, eliminate children resistance, improve the treatment adherence and cooperation degree, enhance patients self care ability, and confidence, Strengthen the communication with children and their parents, get active cooperation with children and their parents, promote the early physical rehabilitation of children. 2) Early cognition intervention. Aiming at disease and treatment, cognitive education was performed on the children's family, developing health education seminars regularly to illustrate purpose of viral meningitis complicated with respiratory failure cause, and told the routine preventive measures and matters needing attention, disease characteristics, key points of treatment and processing procedure, and for families, raise the question of patience answers and Suggestions to solve appropriately, obtain its support, promote their cognitive level and care ability. 3) Early rehabilitation guidance. Soft music and children's stories were played in the wards regularly to stimulate children by language. During the acute period, gentle massage was given to exercise the joints passively. During the remission stage, active exercise and balance training were implemented. The skin of the patients was stimulated with cold, warm, and hot temperatures to train them to distinguish all kinds of warmth. Assist children with active train-

ing. These activities were performed twice a day, 10 - 30 min each time.

The WeChat peer education. Parents who have good interpersonal relationships and are popular and willing to participate will be selected as peer educators, trained and qualified by doctors and nursing staff. On the basis of cases, knowledge level of parents of children with grouping, peer educators as a guide to form a parent WeChat group, formed “to help the team”, about a group of four children, the WeChat groups based on problem oriented method discussed WeChat group in their respective groups, discuss the theme of rehabilitation knowledge subject, the knowledge of life subject and case sharing, etc., The implementation process lasted for 4 weeks. The nursing staff would read the WeChat group message records of each group irregularly every week, supervise the chat content, guide nursing and rehabilitation according to the existing problems and conclusions discussed, and urge each other to carry out rehabilitation activities and review.

Data collection

Anxiety and depression

Before and after the nursing process, the emotional states of the family members were routinely evaluated using the self-rating anxiety scale (SAS) and self-rating depression scale (SDS) [22] [23]. In both scales, 50 was the cutoff value, light anxiety/depression was 50 - 59, moderate was 60 - 69, and severe was >69 [24].

Family care capability

Family care capability was evaluated using the condition management ability scale (CMAS), which includes 12 items [25] [26]. Higher scores indicate better care capability. The condition management difficulty scale (CMDSD), which includes 14 items, was used to assess the care difficulty [25] [26]. Higher scores indicate that the care process was more difficult. The evaluation was performed once before and after nursing.

Rehabilitation

Child rehabilitation condition was evaluated using the simplified Fugl-Meyer mobility function scoring before and after nursing. The evaluation includes three items: joint activity and pain, motion function, and sensory function. Higher scores indicate better rehabilitation [27].

Ethical considerations

Ethics approval was obtained from the Ethics Committee of XXX Hospital. The need for individual consent was waived.

Data analysis

Data were processed using Microsoft Excel (Microsoft, Redmond, WA, USA) and analyzed using SPSS 20.0 (IBM, Armonk, NY, USA). Continuous variables are presented as mean \pm standard deviation and were tested using the Student t-test. Categorical variables are expressed as n (%) and were tested using the chi-square test. P values < 0.05 were considered statistically significant.

Validity, reliability and rigor

No tool was developed for this study. The SAS has been validated for the Chi-

nese population, with a Cronbach's α of 0.78 and a split-half reliability of 0.75 [28]. The SDS has been validated for the Chinese population, with a Cronbach's α of 0.76 and split-half reliability of 0.75 [29]. The CMAS has been validated for the Chinese population, with a Cronbach's α of 0.7 - 0.90 [30].

3. Results

Characteristics of the patients

A total of 74 patients were included: 37 in the WeChat group (19 boys (51.3%) and 18 girls (48.7%); mean of 5.1 ± 2.4 years of age; the length of stay was 3 - 22 days, with an average of (10.23 ± 1.59) days; education background: 5 junior high school students, 10 senior high school students, 13 junior college students, 9 bachelor degree or above), and 37 in the Routine group (20 boys (54.1%) and 17 girls (45.9%); mean of 5.9 ± 2.4 years of age; the length of stay was 3 - 20 days, with an average of (10.08 ± 2.14) days; Education background: 6 junior high school students, 10 senior high school students, 12 junior college students, 9 bachelor degree or above). There were no significant differences between the two groups regarding sex, age, and parents' education (all $P > 0.05$) (Table 1).

Family emotional state

There were no significant differences in SAS and SDS scores between the two groups before nursing (both $P > 0.05$). After nursing, the SAS and SDS scores were significantly reduced in both groups, but the decrease was more significant in the WeChat group (SAS: -29.2% vs. -20.3% , $P = 0.015$; SDS: -25.2% vs. -15.4% , $P = 0.009$) (Table 2).

Family care capability

There were no significant differences in CMAS and CMDS scores between the two groups before nursing (both $P > 0.05$). After nursing, the CMAS and CMDS scores were significantly improved, and those in the WeChat group were significantly better than in the Routine group (CMAS: $+80.5\%$ vs. $+44.4\%$, $P = 0.001$; CMDS: $+58.4\%$ vs. $+37.8\%$, $P = 0.003$) (Table 3).

Table 1. Characteristics of the patients.

Variables	WeChat (n = 37)	Routine (n = 37)	P
Sex, n (%)			
Male	19 (51.3)	20 (54.1)	>0.999
Female	18 (48.7)	17 (45.9)	
Age (years)	5.1 ± 2.4	5.9 ± 2.4	0.156
Parents' education, n (%)			
Junior high degree	5 (13.5)	6 (16.2)	
Senior high degree	10 (27.0)	10 (27.0)	0.988
College degree	13 (48.1)	12 (32.4)	
Undergraduate or higher	9 (24.3)	9 (24.3)	

Table 2. Family emotional state comparison before and after nursing.

Variables	WeChat (n = 37)	Routine (n = 37)	P (inter-group)
SAS			
Before	61.7 ± 5.3	61.7 ± 5.4	0.874
After	43.7 ± 2.2 ^{ab}	49.2 ± 2.3 ^a	0.015
P (intra-group)	0.001	0.013	
SDS			
Before	59.2 ± 4.2	59.2 ± 4.2	0.796
After	44.3 ± 1.3 ^{ab}	50.1 ± 2.1 ^a	0.009
P (intra-group)	<0.001	0.008	

All data are shown as mean ± standard deviation (SD) of the score. SAS: self-rating anxiety scale; SDS: self-rating depression scale. ^aP < 0.05 compared with pre-nursing; ^bP < 0.05 compared with the Routine group.

Table 3. Care capability comparison before and after nursing between the two groups.

Variables	WeChat (n = 37)	Routine (n = 37)	P (inter-group)
CMAS			
Before	31.3 ± 3.4	31.3 ± 3.4	0.127
After	56.5 ± 1.2 ^{ab}	45.2 ± 2.1 ^a	0.001
P (intra-group)	<0.001	0.001	
CMDS			
Before	18.5 ± 3.0	18.5 ± 3.0	0.201
After	29.3 ± 1.2 ^{ab}	24.9 ± 2.2 ^a	0.003
P (intra-group)	0.001	0.009	

All data are shown as mean ± standard deviation (SD) of the score. CMAS: condition management ability scale; CMDS: condition management difficulty scale. ^aP < 0.05 compared with pre-nursing; ^bP < 0.05 compared with the Routine group.

Child rehabilitation condition

There was no significant difference in the Fugl-Meyer score between the two groups before nursing (P > 0.05). After nursing, the score was significantly increased in both groups, and the increase was more significant in the WeChat group (+138.0% vs. +53.0%, P < 0.001) (**Table 4**).

4. Discussion

Viral meningitis is a common acute infectious disease in the central nervous system [31], and can be associated with respiratory failure, especially the patients infected with enterovirus 71 [8] [9] [10], which is endemic in China [11] [12]. Internet-based nursing and coaching can improve self-efficacy and care ability in patients with various conditions [14]-[20]. The aim of the present study was to

Table 4. Rehabilitation comparison between the two groups

Variables	WeChat (n = 37)	Routine (n = 37)	P (inter-group)
Joint activity and pain			
Before	25.6 ± 1.2	25.6 ± 1.2	0.431
After	53.3 ± 2.2 ^{ab}	38.1 ± 2.3 ^a	<0.001
P (intra-group)	<0.001	<0.001	
Motion function			
Before	33.0 ± 0.3	33.0 ± 0.4	0.372
After	81.3 ± 2.2 ^{ab}	58.3 ± 2.3 ^a	<0.001
P (intra-group)	<0.001	<0.001	
Sensory function			
Before	7.2 ± 1.0	7.2 ± 1.0	0.428
After	13.2 ± 2.4 ^{ab}	9.2 ± 3.2 ^a	0.002
P (intra-group)	<0.001	0.001	
Total score			
Before	64.0 ± 3.2	64.0 ± 3.2	0.271
After	152.3 ± 2.3 ^{ab}	97.9 ± 2.1 ^a	<0.001
P (intra-group)	<0.001	<0.001	

All data are shown as mean ± standard deviation (SD) of the score. ^aP < 0.05 compared with pre-nursing; ^bP < 0.05 compared with the Routine group.

explore the effect of a WeChat peer education program in children with severe viral meningitis combined with respiratory failure. The results suggest that early nursing intervention combined with WeChat peer education can improve the emotional state of children with severe viral meningitis combined with respiratory failure and their caregivers.

Early nursing intervention emphasizes advanced nursing and that appropriate nursing should be given to anticipate the possible problems during treatment of children and family, which promotes rehabilitation of patients [32]-[37]. WeChat peer education is based on commonality between peers. The inclusion of patients in the help teams can effectively improve the behavior of the patients by mutual communication and help in different diseases [38] [39] [40]. In this study, we found that early nursing intervention combined with WeChat peer education in patients with severe viral meningitis combined with respiratory failure in children had multiple values: 1) effective improvement in anxiety and depression of families; 2) improvement in care ability and reduction in care difficulty; and 3) promotion of rehabilitation. Ren *et al.* [39] showed that WeChat health education improved the self-management of patients on dialysis. Dong *et al.* [38] showed that a WeChat education program combined with conventional nursing could improve the glycemic control and self-care abilities of diabetic pa-

tients. Similar results were observed in patients with uterine myoma [40]. Liu *et al.* [41] showed that WeChat could be used to extend health care services to the patients' homes, improving parents' knowledge of the perioperative care of their children.

Severe viral meningitis combined with respiratory failure can lead to negative emotions in the family, and child anxiety will extend recovery time, and members' self-efficiency will be decreased [42]. Early nursing intervention and communication using WeChat can alleviate negative emotions of family and patients, improving the care of children, and leading to rapid rehabilitation.

5. Limitations

This study has limitations. This was a retrospective study with a small sample size and no follow-up. The present study was carried-out using WeChat, which is most popular in China but not elsewhere, and the intervention was designed based on the cultural, psychosocial, and medical characteristics of Chinese patients, thereby limiting the generalizability of the results.

6. Conclusion

Early nursing intervention combined with WeChat peer education can effectively improve the negative emotion of children's families with severe viral meningitis combined with respiratory failure, increase care capability, and promote rehabilitation. The data support our pre-study hypothesis, *i.e.*, that an internet-based peer education program can improve the mental states of children with meningitis and that of their caregivers. The conceptual model used in this study was adequate to guide the study. Additional investigations are needed to explore further the clinical value of early nursing intervention combined with WeChat peer education in children with severe viral meningitis and respiratory failure.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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