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Original Article

Effects of three-level preventive nursing on the safety, protection and prognosis of patients undergoing intracranial aneurysm clipping

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Abstract: Objective: To explore the effects of three-level preventive nursing on the safety, protection and prognosis of patients undergoing intracranial aneurysm clipping. Methods: a total of 75 patients undergoing intracranial aneurysm clipping were enrolled, and randomly assigned to an observation group (n=38) and a control group (n=37) according to a random number table. Patients in the control group were nursed under the routine nursing intervention mode, while patients in the observation group were nursed under the three-level preventive nursing mode. At the end of treatment and discharge, the two groups were scored using the Activities of Daily Living (ADL) scale and neurological function deficit (NFD) scale, and the rate of favorable outcomes, complication rate, hospitalization time, systolic blood pressure, and middle cerebral artery blood velocity of the two groups were recorded. Results: After nursing, the observation group: had a higher ADL score and a lower NFD score than the control group (both $P<0.001$), showed a higher rate of favorable outcomes than the control group (52.63% *vs.* 27.03%, $P<0.05$), and also showed a lower overall complication rate than the control group (42.11% *vs.* 81.08%, $P<0.01$). In addition, the observation group experienced shorter hospitalization time, and lower systolic blood pressure and middle cerebral artery blood velocity than the control group, and the observation group had a low risk ratio of falling out of bed than that of the control group after nursing (81.58% *vs.* 54.05%, $P<0.05$). Conclusion: Three-level preventive nursing can accelerate the recovery of neurological function and activities of daily living of patients undergoing intracranial aneurysm clipping, and is conducive to improving the safety, protection and prognosis of the patients, as well as lowing their complication rate, and earlier discharge.

Keywords: Intracranial aneurysm clipping, three-level preventive nursing, safety, protection, Glasgow outcome, activities of daily living, neurological impairment

Introduction

Intracranial aneurysm is an encephalic angioma-like protrusion due to local vascular abnormalities, tending to cause disability and death. The mortality of hemorrhage for ruptured intracranial aneurysm is about 40%, and that of recurrent hemorrhage is 75%-95% [1, 2]. Intracranial aneurysm clipping is a common treatment method, but it may bring about complications including vasospasm and cerebral infarction for patients when they have unfavorably controlled blood pressure and inappropriate nursing after surgery; which increases the risk of disability and death and compromises the prognosis of the patients [3, 4]. Therefore, during the treatment of intracranial aneurysm clipping, the focus of clinical nursing is to prevent intracranial aneurysm rupture, re-rupture, and other related complications, so as to help patients to smoothly pass through the crisis period, and lower the disability of the patients. In the three-level preventive nursing for intracranial aneurysm clipping, the first-level prevention, also known as causal prophylaxis, is to take effective measures to prevent complications against the pathogenic factors (or risk factors) that may lead to complications before intracranial aneurysm clipping, and its basic principles are "reasonable diet, appropriate

Table 1. Comparison of general information (n, $\bar{x}$±sd)

Group	Observation group (n=38)	Control group (n=37)	χ^2/t	P
Gender (case)			0.112	0.738
Male	16	17		
Female	22	20		
Age (year)	55.3±5.9	55.7±6.2	0.286	0.775
Comorbidities (case)				
Hypertension	18	19	0.119	0.730
Diabetes	7	8	0.120	0.729
Hyperlipidemia	3	3	0.153	0.973
Lesion (case)			0.123	0.989
Anterior communicating artery	17	16		
Posterior communicating artery	10	11		
Middle cerebral artery	9	8		
Other	2	2		

exercise, smoking cessation, alcohol restriction and psychological balance"; the second-level prevention, also known as "three early" prevention, i.e. early detection, early diagnosis, and early treatment, is to make active preparations during the perioperative period of intracranial aneurysm clipping and to take targeted measures according to developed early clinical symptoms to prevent complications; the third-level prevention, also named as clinical prevention, is to take active and effective treatment against complications to prevent disability, promote functional recovery, improve life quality, prolong life span, and lower mortality [5]. Previous studies have revealed that for obese diabetic patients, adult patients with severe hemophilia A, and patients with gestational diabetes mellitus, three-level preventive nursing has provided satisfactory results and has played a positive role in promoting their rehabilitation [6-8]. However, there are few reports on the application of three-level preventive nursing in patients undergoing intracranial aneurysm clipping. Therefore, this study explored the effects of three-level preventive nursing on the safety, protection and prognosis of patients undergoing intracranial aneurysm clipping, and the results are reported as follows.

Materials and methods

General data

A total of 75 patients undergoing intracranial aneurysm clipping in The First People's Hospital of Wenling, The Affiliated Wenling Hospital of Wenzhou Medical University from September 2017 to October 2019 were enrolled as research subjects. The inclusion criteria of the patients were as follows: Patients receiving selective operation, patients between 18 and 79 years old, patients without a history of craniocerebral trauma, patients diagnosed with intracranial aneurysm according to cranial computed tomographic scanning and digital subtraction angiography, patients undergoing microsurgical clamping, patients with clear mind and independent judgment ability, patients without communication obstacles, patients with ruptured intracranial aneurysm, and those who signed an informed consent form after understanding the study. The exclusion criteria were as follows: patients with comorbid malignant tumors, blood coagulation dysfunction, or comorbid mental disease, pregnant women, lactating women, patients who were intolerant to surgery, patients suffering from acute cerebrovascular disease within the past 3 months, and those with comorbid cerebral arteriovenous malformation. The enrolled patients were randomly assigned to an observation group (n=38) and a control group (n=37) according to a random number table. The observation group consisted of patients between 45 and 78 years old, and the control group consisted of patients between 42 and 79 years old. There was no significant difference between the two groups in sex, age, complications, and lesion site (all P>0.05), so the two groups were comparable (**Table 1**). This study was approved by the Ethics Committee of The First People's Hospital of Wenling, The Affiliated Wenling Hospital of Wenzhou Medical University.

Methods

Patients in the control group were given routine nursing interventions during the perioperative period as follows: Each patient was subjected to fasting from solids for 6 h before the operation, and were given 75 g anhydrous glucose

(Qilu Pharmaceutical Co., Ltd., China) dissolved in 250 mL warm water 2 hours before the operation. In addition, the nursing staff cleaned the patient's scalp by focusing on the surgical site with a diameter of 15 cm, and then applied 1% lidocaine (Qilu Pharmaceutical Co., Ltd., China) to locally anesthetize the patient and remove the hair in the incision within a diameter of 2 cm. During the operation, the nursing staff closely observed any changes in vital signs of the patient and cooperated with the operation. After the operation, the staff helped the patient lie on their back without a pillow and with their head tiled to one side with continuous oxygen inhalation, and closely monitored their electrocardiogram to observe vital signs. When the patient was awake, the staff raised the head of the bed by 15°-30°. During the 4-6 hrs after the operation, if the patient was awake and did not show abnormalities in their brain CT, the patient was given orally, 40 g Ensure nutrition (Qilu Pharmaceutical Co., Ltd., China) dissolved in 250 mL warm water. After the operation, the patient was given orally nimodipine (Qilu Pharmaceutical Co., Ltd., China) at 40-60 mg/dose, 3-4 times/d, and the nursing staff closely monitored their adverse drug reactions. On the 1st day after the operation, the patient was given a liquid diet, and a sputum elimination machine was employed for sputum elimination. On the 2nd day after the operation, the patient was given common food, and was encouraged to get out of bed.

Patients in the observation group were given three-level preventive nursing intervention in addition to the routine nursing as follows: (1) The first-level preventive nursing: The nursing staff guided the patients in actively controlling blood pressure, blood glucose, and intracranial pressure, instructed them to quit smoking and drinking to reduce the stimulation from external factors, and instructed and required them to take a light diet to main adequate nutrition intake to keep the bowels open in the meantime to prevent constipation. In addition, the staff communicated more with the patients to ease their negative psychology to reduce the invasion of stressors and stimulation of adverse events in life, so as to protect the patients from external injuries. (2) The second-level preventive nursing: The nursing staff actively assisted the patients to complete routine blood work, CT and other related examinations, cooperated with the patients' preoperative preparation, informed the patients of the operation time, and helped them to receive the operation as soon as possible. In addition, the staff gave 10 mL/kg supplementary colloidal solution (Qilu Pharmaceutical Co., Ltd., China) to the patients before anesthesia induction to prevent a sudden drop of blood pressure, and cooperated with doctors during the operation, closely observed the blood pressure and heart rate of the patients to ensure their safety. During operation, the staff continuously pumped 0.02% nimodipine at 0.10-0.15 mg/kg to prevent vasospasm. (3) The third-level preventive nursing: The staff also observed the peripheral blood circulation of lower limbs in the early stages after the operation and instructed them to make appropriate limb movements to prevent lower limb deep venous thrombosis. In addition, the staff injected a small amount of nimodipine (Qilu Pharmaceutical Co., Ltd., China) in to the patients, observed their heart rate and blood pressure levels, and gave them calcium channel blockers (Qilu Pharmaceutical Co., Ltd., China) as appropriate to prevent cerebral vasospasm. The staff was required to bandage the puncture site of each patient by compression of the femoral artery and gave a hot compress to prevent a hematoma, and also assisted the patient to turn over and patted their back, observed the skin of the compressed parts and massaged the compressed muscles to prevent pressure sores and lung infection. What's more, the staff observed the development of any delayed allergies to the contrast agent, encouraged each patient to drink 1,500-2,000 mL water every day to promote the discharge of the contrast agent, and the staff also propagated knowledge about prevention and protection to improve the patients' protection awareness, and strengthened the psychological intervention with the patients after the operation to prevent the patients from having a rupture again due to emotional excitement, excessive tension, stimulation or sadness. Finally, the staff instructed the patients to carry out limb rehabilitation exercises to prevent muscular atrophy and joint rigidity and promote postoperative functional recovery, and also guided the patients in taking language rehabilitation exercises to restore language function. All patients were treated from admission to discharge.

Table 2. Comparison of ADL and NFD scores ($\bar{x}$±sd, score)

Group	Observation group (n=38)	Control group (n=37)	t	P
ADL score				
Before treatment	34.26±5.33	34.07±5.27	0.155	0.877
After treatment	65.19±11.28	53.37±10.62	4.670	0.000
t	15.283	9.902		
P	0.000	0.000		
NFD score				
Before treatment	15.59±7.61	15.67±7.04	0.047	0.963
After treatment	7.26±2.39	10.39±3.31	4.705	0.000
t	6.438	4.129		
P	0.000	0.000		

Note: ADL: activities of daily living; NFD: neurological function deficit.

Evaluation criteria

Evaluation of neurological function and activities of daily living: With a total score of 100 points, the activities of daily living (ADL) scale covers items including defecating (0-10 points), peeing (0-10 points), grooming (0-5 points), toilet use (0-10 points), eating (0-10 points), moving (0-15 points), movement (0-15 points), dressing (0-10 points), going up and down stairs (0-10 points), and bathing (0-5 points); and a higher score indicates better ADL. With a total score of 45 points, the neurological function deficit (NFD) scale covers consciousness (0-9 points), horizontal gaze function (0-4 points), facial muscles (0-2 points), speech (0-6 points), upper limb muscle strength (0-6 points), hand muscle strength (0-6 points), lower limb muscle strength (0-6 points), and walking ability (0-6 points) based on the modified Edinburgh-Scandinavia stroke scale (MESSS); and a higher NFD score indicates more sever neurological function deficit.

Evaluation of the rate of favorable outcomes: The Glasgow outcome scale (GOS) was employed to score the rate of favorable outcomes, with 5 points for favorable recovery, 4 points for moderate disability, 3 points for severe disability, and 2 points for persistent vegetative state, and 1 point for death. The rate of favorable outcomes of the two groups was compared based on GOS score, and the rate of favorable outcomes of each group was recorded as the number of patients with favorable recovery/the total number of patients in the group * 100%.

Evaluation of complications: The complication rate was compared between the two groups, including cerebral vasospasm, cerebral infarction, infection, vascular stenosis/occlusion, and recurrent hemorrhage.

Evaluation of hospitalization time, systolic blood pressure, and middle cerebral artery blood velocity: The hospitalization time and changes of systolic blood pressure of the two groups were recorded, and the middle cerebral artery blood velocity of each patient in the two groups was determined using the transcranial Doppler sonography before and after nursing.

Evaluation of safety protection effects: The *Fall/Drop Bed Risk Assessment Scale* recommended by the Japanese Nursing Association was adopted to assess the fall/drop out of bed risk. With a total score of 54 points, the scale covers age, past history, consciousness state, senses, physical condition, drug use, excretion, and self-care ability, and uses a score of 5 points or less for low risk, a score of 6-15 points for moderate risk, and a score of 16 points or more for high risk.

Statistical analyses

SPSS 25.0 was adopted for statistical analysis. Quantitative data were expressed as the mean ± standard deviation ($\bar{x}$±sd), compared within groups before and after nursing using the paired t test, and compared between groups using the independent-samples T test. Enumeration data were expressed as %, compared between groups using χ^2, and compared within groups before and after nursing using the paired χ^2 test. $P<0.05$ indicates a significant difference.

Results

Comparison of ADL and NFD scores

Before nursing, there was no significant difference between the two groups in ADL and NFD scores (both $P>0.05$). While after nursing, the ADL score of the observation group was higher than that of the control group, and the NFD score of the observation group was lower than that of the control group (both $P<0.001$). See **Table 2** and **Figure 1**.

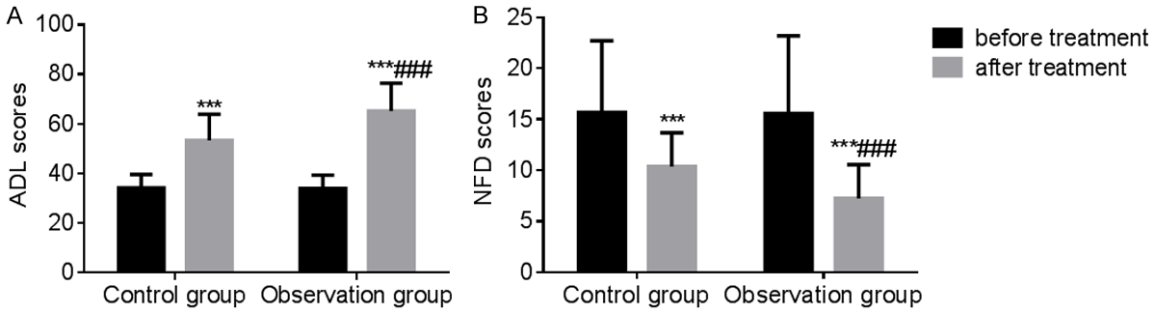

Figure 1. Comparison of ADL and NFD scores. A: Comparison of ADL scores before and after treatment; B: Comparison of NFD scores before and after treatment. Compared with before treatment, ***P<0.001; compared with control group after treatment, ###P<0.001. ADL: activities of daily living; NFD: neurological function deficit.

Table 3. Comparison of the rate of favorable outcomes (n, %)

Group	Good recovery	Moderate disability	Severe disability	Persistent vegetative state	Death	Recovery rate
Observation group (n=38)	20 (52.63)	13 (34.21)	4 (10.53)	1 (2.63)	0 (0.00)	52.63
Control group (n=37)	10 (27.03)	17 (45.95)	7 (18.92)	2 (5.41)	1 (2.70)	27.03
χ^2			5.672			5.121
P			0.129			0.024

Table 4. Comparison of complications (n, %)

Group	Cerebral vasospasm	Cerebral infarction	Infection	Vascular stenosis/occlusion	Re-bleed	Total incidence
Observation group (n=38)	12 (31.58)	1 (2.63)	1 (2.63)	0 (0.00)	2 (5.26)	16 (42.11)
Control group (n=37)	19 (51.35)	3 (8.11)	5 (13.51)	1 (2.70)	2 (5.41)	30 (81.08)
χ^2	3.022	0.293	1.719	0.000	0.237	12.008
P	0.082	0.291	0.082	1.000	0.978	0.001

Comparison of the rate of favorable outcomes

The rate of favorable outcomes of the observation group was 52.63%, significantly higher than that of the control group (27.03%) (P<0.05). See **Table 3**.

Comparison of complications

The total incidence of complications in the observation group was 42.11%, which was lower than that in the control group (81.08%, P<0.01). See **Table 4**.

Comparison of hospitalization time, systolic blood pressure, and middle cerebral artery blood velocity

The observation group experienced shorter hospitalization time and showed lower systolic blood pressure than the control group (both P<0.001). In addition, before nursing, there was no significant difference between the two groups in the middle cerebral artery blood velocity (P>0.05), while after nursing, the middle cerebral artery blood velocity of the observation group was slower than that of the control group (P<0.001). See **Table 5**.

Comparison of the risk ratio of falling down/off from bed

Before nursing, there was no significant difference in the risk ratio of falling out of bed between the two groups (P>0.05), while after nursing, the risk ratio of falling out of bed of the observation group was lower than that of the control group (81.58% *vs.* 54.05%, P<0.05). See **Table 6**.

Discussion

Intracranial aneurysm is a common disease, with a prevalence rate of about 2.3% in the gen-

Table 5. Comparison of hospitalization time, systolic blood pressure, and middle cerebral artery blood velocity ($\bar{x}$±sd)

Group	Hospitalization time (d)	Systolic blood pressure (mmHg)	Middle cerebral artery blood velocity	
			Before treatment	After treatment
Observation group (n=38)	12.76±2.25	112.08±11.96	133.52±22.89	97.31±15.38
Control group (n=37)	15.88±3.07	126.72±12.57	134.03±22.35	117.65±18.62
t	5.030	5.168	0.098	5.925
P	0.000	0.000	0.923	0.000

Table 6. Comparison of the risk ratio of falling out of bed (n, %)

Group	Observation group (n=38)	Control group (n=37)	χ^2	P
Before treatment			0.774	0.679
Low risk	8 (21.05)	5 (13.51)		
Moderate risk	20 (52.63)	22 (59.46)		
High risk	10 (26.32)	10 (27.03)		
After treatment			6.739	0.034
Low risk	31 (81.58)	20 (54.05)		
Moderate risk	6 (15.79)	13 (35.14)		
High risk	1 (2.63)	4 (10.81)		
χ^2	28.466	13.886		
P	0.000	0.001		

eral population, and it is more common in women, with a male-female ratio of about 1:1.3 [9]. In this study, the ratio of males to females among the enrolled patients was 1:1.27, which accorded with the epidemiological characteristics of intracranial aneurysms. Due to a long operation time, large amount of trauma, application of drugs including anticoagulants and hormones during the operation, and limited activities of patients after the operation, intracranial aneurysm clipping is prone to bring about various complications and affects the prognosis of patients [10-13].

Patients who receive intracranial aneurysm clipping will undergo surgery, postoperative comprehensive treatment, postoperative functional exercise, and postoperative complications prevention measures [14]. The three-level preventive nursing mode is a simple mode originating from the Neuman's health care system, which is to maintain the stability of patients with targeted methods [15]. It consists of three parts, namely the first-level, second-level and third-level nursing, which correspond to the outermost elastic defense line, the middle normal defense line, and the innermost resistance line, respectively [16]. In this study, the first-level preventive nursing measures mainly included guiding patients in eating reasonably, providing psychological counseling, instructing patients to quit smoking and drinking to develop good living habits to minimize the invasion of stressors and protect the patients from external injuries. The second-level preventive nursing measures mainly included assisting patients to receive diagnosis and operation as soon as possible, helping them complete various examinations, and cooperating with the patients' preoperative preparation to help them receive treatment in a timely manner to prevent deterioration of the disease. The third-level preventive nursing measures mainly included preventing various postoperative complications, avoiding exacerbation of the disease, guiding patients in taking limb rehabilitation exercise and language rehabilitation exercise to promote functional rehabilitation and physical health recovery as soon as possible. The third-level preventive nursing intervention is also called clinical prevention, which contributes to preventing disability, promoting functional recovery, improving life quality, prolonging life span, and lowering mortality. Therefore, the three-level preventive nursing effectively prevented any progressive injury caused by complications in patients undergoing intracranial aneurysm clipping and promoted their recovery by taking symptomatic treatment and rehabilitation measures for them. One related study has concluded that three-level preventive nursing can effectively help patients to improve self-coping ability and compliance behavior and relieve anxiety and depression [15]. Meanwhile, one other study has revealed that three-level preventive nursing contributes to a higher cure rate of oral cancer and a longer survival rate of oral cancer patients [17].

The results of this study showed that after nursing, the observation group had a higher ADL score and a lower NFD score than the control group, and the rate of favorable outcomes of the observation group was higher than that of the control group (52.63% *vs.* 27.03%). In addition, the overall complication rate of the observation group was lower than that of the control group (42.11% *vs.* 81.08%). These results are consistent with previous reports [18, 19]. The above analysis indicates that three-level preventive nursing is conducive to accelerating the postoperative recovery of patients, reducing postoperative neurological deficits, and improving the prognosis and postoperative daily living ability of patients, which may be due to the following facts: Under the three-level preventive nursing, stronger preventive measures have been taken for patients' physiological, mental, social and spiritual development, and measures have also been taken against brain and other related complications to prevent them from causing damage to patients' body and brain. In addition, under the three-level preventive nursing, various rehabilitation-promoting measures have been adopted, which can eliminate the pressure source affecting the patients' condition or reduce the interference of the pressure source on the patients, contributing to maintaining and promoting the patients' body stability and health, thus improving the patients' prognosis and daily living ability [17].

Blood pressure control is the key point of nursing for patients undergoing intracranial aneurysm clipping, and its effect is closely related to patients' compliance with medical drugs, treatment and nursing, eating habits, living habits, etc. [20]. For patients undergoing intracranial aneurysm clipping, during the spasmodic contraction of great vessels, the distal small vessels usually show compensatory dilatation changes, and the middle cerebral artery blood velocity is high. Furthermore, factors such as cerebral immune inflammatory reactions and vasoconstriction in intracranial aneurysm itself can also increase the middle cerebral artery blood velocity [21]. One related study has revealed that blood flow rate and blood flow impact force play crucial roles in the formation and development of intracranial aneurysms [22]. The results of our study showed that patients in the observation group experienced shorter hospitalization time and showed lower systolic blood pressure and slower middle cerebral artery blood velocity than the control group, which were similar to related reports [23]. These results imply that three-level preventive nursing can accelerate the rehabilitation of patients, shorten their hospitalization time, and improve their middle cerebral artery blood velocity. The effects of the three-level preventive nursing may be due to the fact that three-level preventive nursing is beneficial to reducing the amount of intracerebral hematoma, preventing infection and other brain-related complications, lowering the rate of vasospasm, and alleviating the high middle cerebral artery blood velocity [24]. In addition, the results of our study also showed that the risk ratio of falling out of bed of the observation group was lower than that of the control group after nursing, which was consistent with one previous report [21], indicating that three-level preventive nursing can lower the risk of falling out of bed for patients undergoing intracranial aneurysm clipping and improve the safety protection effect.

To sum up, three-level preventive nursing can accelerate the recovery of neurological function and activities of daily living of patients undergoing intracranial aneurysm clipping, and is conducive to improving the safety, protection and prognosis of the patients, lowing their complication rate, with earlier discharge. However, in this study, the sample size is small and the case type is singular, so we need to expand the sample size to obtain more in depth results.

Disclosure of conflict of interest

None.

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References

[1] Ghani AA, Nayan SAM, Kandasamy R, Ghani ARI and Rosman AK. Assessment of pre- and post-operative cerebral perfusion in anterior circulation intracranial aneurysm clipping patients at hospital sungai buloh using CT perfusion scan and correlations to fisher, navarro

and WFNS scores. Malays J Med Sci 2017; 24: 47-58.
[2] Kazantsev AN, Tarasov RS, Anufriev AI, Burkov NN, Shabaev AR and Ruban EV. Simultaneous operation in a patient with stenosis of the extracranial portion and an intracranial aneurysm of the internal carotid artery. Angiol Sosud Khir 2017; 23: 107-111.
[3] Ito Y, Yamamoto T, Ikeda G, Tsuruta W, Uemura K, Komatsu Y and Matsumura A. Early retreatment after surgical clipping of ruptured intracranial aneurysms. Acta Neurochir (Wien) 2017; 159: 1627-1632.
[4] Kim JH, Kim CH and Lee CY. Efficacy of Arachnoid-Plasty on chronic subdural hematoma following surgical clipping of unruptured intracranial aneurysms. World Neurosurg 2017; 104: 303-310.
[5] Liu J, Liu W, Dai YQ, Zhou JN and Chen F. Application of newman system model in nursing of patients with coronary heart disease. Zhongguo Yiyao Daobao 2015; 41-44.
[6] Xu Y and Wang Y. Application feasibility and effect analysis of tertiary prevention in community-based exercise therapy for obese diabetic patients. Chin Rem Clin 2019; 19: 3313-3315.
[7] Lian XY, Li KX, Hua BL and Zhao YQ. Tertiary prophylaxis for single-center adult patients with severe hemophilia A in Beijing. Zhongguo Yixue Kexueyuan Xuebao 2015; 37: 398-401.
[8] Yu YY, Luo GC and Que XH. Effectiveness analysis of community continuous nutrition management pathway in tertiary prevention of gestational diabetes. J Chin Physician 2018; 20: 531-534.
[9] Dmytriw AA, Phan K, Salem MM, Adeeb N, Moore JM, Griessenauer CJ, Foreman PM, Shallwani H, Shakir H, Siddiqui AH, Levy EI, Davies JM, Harrigan MR, Thomas AJ and Ogilvy CS. The pipeline embolization device: changes in practice and reduction of complications in the treatment of anterior circulation aneurysms in a multicenter cohort. Neurosurgery 2020; 86: 266-271.
[10] Wilde H, Twitchell S, Reese J, Guan J, Eli IM, Karsy M, Taussky P, Grandhi R, Schmidt RH and Couldwell WT. Evaluation of disease severity and treatment intensity as cost drivers for ruptured intracranial aneurysms. Acta Neurochir (Wien) 2020; 162: 157-167.
[11] Muskens IS, Hertgers O, Lycklama À Nijeholt GJ, Broekman MLD and Moojen WA. Outcomes of retreatment for intracranial aneurysms - a meta-analysis. Neurosurgery 2019; 85: 750-761.
[12] Qiu SQ, Zhuang JM, Zhou X, Yin RX, Liu ZQ, Ma F, Li JY and Sun J. Characteristics and influencing factors of breakthrough bleeding in patients with severe hemophilia A in Chinese. J South Med Univ 2017; 37: 1391-1395.
[13] Swiatnicki W and Komunski P. Intraoperative fluorescein videoangiography in cerebral aneurysm surgery - a preliminary study. Pol Merkur Lekarski 2019; 47: 183-186.
[14] Wei YF, Zhan XW, Lan N and Luo CQ. Influence of three levels of preventive nursing intervention under Newman health system model on male patients with newly diagnosed reproductive system tumor. Quankehuli 2018; 16: 582-584.
[15] Zhong DQ, Qian CR, Shen YY, Zeng CQ and Zhang Q. Design and application of Three-Stroke prevention health education program. Huli Guanli Zazhi 2016; 16: 755-757.
[16] Zhang P, Zhang CY, Wang AH and Yan YP. Tertiary prevention and clinical implementation of oral cancer. Shiyong Kouqiang Yixue Zazhi 2018; 34: 430-432.
[17] Sai Kiran NA, Kiran Kumar VA, Kumar VA and Agrawal A. Microsurgical clipping of distal basilar trunk aneurysm during adenosine-induced profound hypotension. Asian J Neurosurg 2019; 14: 1214-1217.
[18] He CM and Zhang M. Prevention and treatment strategies for diabetic nephropathy: tertiary prevention integrated treatment. Chin J Pract Intern Med 2017; 37: 195-198.
[19] Bhatia KD, Kortman H, Orru E, Klostranec JM, Pereira VM and Krings T. Periprocedural complications of second-generation flow diverter treatment using Pipeline Flex for unruptured intracranial aneurysms: a systematic review and meta-analysis. J Neurointerv Surg 2019; 11: 817-824.
[20] Jagetia A, Bishnoi I, Setia V, Kumar P, Sachdeva D and Srivastava AK. An institutional experience of fenestrated T-Bar clip use in the management of intracranial aneurysms. Neurol India 2019; 67: 1323-1326.
[21] Taksler GB, Pfoh ER, Stange KC and Rothberg MB. Association between number of preventive care guidelines and preventive care utilization by patients. Am J Prev Med 2018; 55: 1-10.
[22] Aoki T, Yamamoto R and Narumiya S. Targeting macrophages to treat intracranial aneurysm. Oncotarget 2017; 8: 104704-104705.
[23] Ni XX, Zhang L, Lin DC and Lin YL. Application of three-grade prevention and nursing in caring hematological malignancies patients with oral mucositis during perichemotherapy. Chin J Mod Nurs 2017; 23: 977-980.
[24] Chen YM, Sun XM and Di RJ. Effect of tertiary preventive nursing intervention on anxiety, depression and self-care ability in patients with spinal cord injury under the Newman health system model. Qilu Huli Zazhi 2019; 25: 22-25.