Original Article
Analysis on application effects of RAID quality improvement model in closed-loop management of central retinal artery occlusion nursing

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Abstract: Objective: This study aimed to analyze the clinical value of applying RAID quality improvement model in closed-loop management of central retinal artery occlusion (CRAO) nursing. Methods: Twelve ophthalmic nurses were trained. Soon afterwards, their related knowledge, operation and scene simulation test scores before and after training were examined and compared. Before and after training, 20 CRAO patients who admitted to the second ward of ophthalmology (Ophthalmology Section 2) of our hospital were included into control group and research group. The former applied routine management, while the latter employed RAID quality improvement model. Results: Before intervention, the ESCA scores and the time window of first-aid of the two groups had no significant difference (all P>0.05). While after intervention, the scores of the research group were dramatically improved; the self-care skills, health knowledge, self-responsibility and self-awareness were obviously higher than those of the control group (all P<0.05); the time window of first-aid in the research group was remarkably shorter than that before intervention, dramatically higher than that in the control group (32.34±8.14 vs. 49.46±8.13; P<0.05). After nursing, the overall satisfaction of patients in the research group (95.00%) was higher than that in the control group (70.00%; P<0.05). Meanwhile, compared with those before training, the examination scores of related knowledge and skills of ophthalmic nurses after training were obviously improved (all P<0.05). The incidence of complications in the research group was 5.00%, while that in the control group was 30.00%. The indexes in the research group were lower than those in the control group, with statistically remarkable differences (P<0.05). Conclusion: RAID quality improvement model is effective in closed-loop management of CRAO nursing, which can effectively improve the quality of nursing for specific diseases and control related indicators. Hence, it's worthy to be promoted.

Keywords: RAID quality improvement model, nursing of central retinal artery occlusion, closed-loop management

Introduction

Central retinal artery occlusion (CRAO) is an ophthalmic emergency that seriously harms visual acuity. It is caused by the occlusion of the central retinal artery that interrupts the blood flow of the retinal artery, which can cause acute retinal ischemia. The clinical manifestations are sudden loss of vision, milky edema of the posterior pole retina and cherry erythema in the macular area. It is a serious complication of hypertension, which seriously endangers human health [1, 2]. We observed the changes of patients' conditions, judged the degree and outcome of retinal damage, and intervened with first-aid nursing in Western medicine, and found that the scope of visual function injury could be reduced [3]. At the moment, there are more and more CRAO patients in China. So, it is necessary to carry out in-depth research on this aspect. The RAID quality improvement model includes four steps: Review, Agreement, Implement and Demonstration [4, 5]. It is still a relatively new management model in China. But, it has been widely used due to obvious advantages in recent years. It can form the standardized and homogeneous management of specific diseases, which can obviously improve the quality of clinical nursing, effectively enhance the level of specialist knowledge and operation skills of ophthalmic nurses, and promote the ability of patients' self-management of ophthalmopathy [6].

Under the background of new medical model, the first-aid nursing in Western medicine mainly gives patients targeted treatment and nursing, and conducts assessment, implementation, planning, result confirmation and diagnosis accordingly. It is a step-by-step and dynamic nursing process. In previous studies, the RAID quality improvement model was not integrated with first-aid nursing in Western medicine. But if the two can be combined organically, the overall care delivery process will be timely dynamic and comprehensive. Therefore, under the application of RAID quality improvement model, this study established a collaborative management model for specialist doctors and nurses, formulated and implemented ophthalmic nurses' training programs, so as to improve the quality of nursing management of special diseases. Now the details are reported as follows.

Materials and methods

General data

In this investigation, from January 2019 to August 2020, 40 CRAO patients who admitted to the second ward of ophthalmology (Ophthalmology Section 2) of the our hospital were selected. Twelve nurses, (28.1±3.5) years old on average, were included.

As to educational background, there are 10 undergraduate students and 2 junior college students. The average length of service was (6.0±2.8) years. From January 2019 to August 2020, the 12 ophthalmic nurses were trained. Then, their related knowledge, operation and scene simulation assessment scores before and after training were examined and compared. Before and after training, 20 CRAO patients who admitted to the Affiliated Hospital of Nantong University were included into control group and research group. The former was applied with routine management, while the latter employed RAID quality improvement model. This study was approved by the Ethics Committee of Affiliated Hospital of Nantong University. All patients volunteered to participate in the experiment and signed an informed consent form.

Inclusion criteria were as follows: (1) patients were 24-79 years old; (2) patients with clear consciousness, certain understanding and learning abilities; (3) patients who volunteered to take part in this study. Exclusion criteria were as follows: (1) patients with severe cardiovascu-

lar and cerebrovascular diseases; (2) patients with cognitive or communication barriers.

Methods

Control group: Control group: Patients were treated by routine nursing management, mainly as follows: the patients received conventional nursing for central retinal artery occlusion after admission; meanwhile, the nursing staff should closely observe various indicators of patients, such as vision, intraocular pressure, blood glucose and blood pressure monitoring; drugs that lower intraocular pressure and dilate blood vessels were used; besides, the nurses were arranged to distribute brochures to patients, and provide psychological counseling regularly, so as to reduce their psychological barriers and negative emotions and make them feel more comfortable [7, 8].

Research group: On the basis of the control group, the research group was applied with the RAID quality improvement model, so as to observe patients' conditions in time. The main management measures are as follows:

(1) Review: Under the guidance of relevant leaders, the nurses should analyze the existing problems of nursing together, and then communicate and discuss the rehabilitation in combination with the actual situation, so as to be more familiar with patients' mastery of relevant knowledge and skills; what's more, they should also provide better nursing for patients, and actively understand their feelings during treatment, so as to understand the limitations in treatment and make a better nursing quality improvement plan. In addition, it's necessary to investigate the nursing knowledge of CRAO and assess the related skills of 12 members of the special nursing group; the related knowledge of 20 patients was evaluated. The better their cognitive level, the lower their obstacles were. Through this link, the outstanding problems could be found out.

(2) Agreement: First, the nurses were trained, so as to change their nursing concepts, improve their comprehensive quality, and comprehensively enhance the quality of nursing services. Second, the service attitude of nurses was upgraded comprehensively and the pre-examination of hospital guide platform was strengthened, so as to help patients to seek medical advice in time and accurately. For patients with acute illness or poor prognosis in predictive

analysis, the nurses could be assigned to accompany the whole process to avoid unnecessary influence. Third, ophthalmologists and nursing staff organized two disciplinary meetings. Furthermore, the nursing staff also worked out a preliminary nursing plan, communicated with patients and their families, and revised and improved the nursing plan in time. In addition, many patients might have certain negative emotions due to their own illness or family situation, so the nurses had to communicate with them more to minimize their negative mood.

(3) Implement: (1) The emergency treatment process was optimized. Once CRAO was diagnosed, nitroglycerin was given sublingually during emergency treatment to promote the dilation of central retinal artery. Eyeballs were massaged, blood vessels were dilated, and intraocular pressure and retinal artery perfusion resistance were reduced. In order to shorten the waiting time before hospital, green channel should be established, admission instruction cards should be issued, doctors and nurses should take the initiative to hand over, first-aid awareness should be established, first-aid patients should be given priority, and process implementation training and supervision should be implemented. After admission, retinal hypoxia was relieved and blood vessels were dilated through low flow oxygen inhalation. Venous access was established, alprostadil and puerarin were used according to the doctor's advice. Microcirculation was improved, and intraocular pressure reduced. (2) The quality management team was composed of specialists, head nurses and backbone nurses. The team discussed the investigation results, analyzed the causes, formulated the training plan, implemented the plan and detailed rules, determined the homogenization management method, and defined the responsibilities and work contents. RAID quality management team formulates operational norms, organization and skills training, draws up risk management measures and implements risk training, carries out patient-related health education, drafts specific disease quality evaluation standards, and performs quality control regularly. (3) First aid skills of nurses were improved, special disease training plan was formulated, rescue procedures of central artery occlusion were standardized, and OSCE case training assessment was applied, involving eye massage. The specific method is as follows: At first, close both eyes, and press the eyeball with thenar muscle of palm on the upper eyelid for 5-10 s; the pressure is moderate; then, release the hand immediately for 10-15 s, and repeat for 5-10 times. Intraocular pressure measurement technique and oxygen inhalation operation were examined. Nurses were trained in specialized nursing knowledge through emergency drills, nursing rounds, discussion of difficult cases, radiography reading training, interventional surgery observation etc. (4) The implementation of quality standards was homogenized. The rescue procedures for central retinal artery occlusion and the evaluation standards for nursing quality of special diseases were formulated. The implementation of nursing measures and health education and the writing of nursing records were under quality control. Timely feedback and improvement of nursing measures were carried out, and the homogenization management was implemented. Demonstration: the senior and backbone nurses were organized to discuss, analyze and evaluate nurses' mastery of knowledge and skills related to central retinal artery occlusion, and improve nursing quality after the implementation of raid quality improvement model, so as to find out the problems existed, and correct them in the new round of RAID cycle.

Evaluation indicators

Main indicators: (1) By using the questionnaire designed by the Affiliated Hospital of Nantong University, we concluded that the Cronbach's α coefficient and Spearman-Brown split-half reliability coefficient were 0.93 and 0.85, respectively. Four dimensions of self-concept, self-care responsibility and skills, and health knowledge were compared between the two groups before and after nursing. Each dimension was 50 points, and the higher the score, the stronger the self-care ability was [9]. (2) The first-aid time data of both groups were collected, and the time window of first-aid before and after intervention were compared. (3) When patients were discharged from hospital, nurses evaluated the nursing job satisfaction by self-made questionnaire. It mainly focused on nursing work attitude, professional level, care degree, diagnosis and treatment environment and skills. It was divided into three standards: satisfied, basically satisfied and dissatisfied. The nursing satisfaction = (satisfied + basically satisfied)/total cases ×100% [10]. (4) The scores of nurses' related knowledge and skills assessment before and after intervention were com-

Table 1. Comparison of basic conditions ($\bar{x} \pm sd$)

Group	Gender (male/female)	Age (years)	Weight (kg)	Course of disease (d)
Research group (n=20)	14/6	68.1±15.8	72.6±12.4	9.12±3.57
Control group (n=20)	12/8	69.5±13.6	73.1±12.6	8.87±3.91
t/χ^2	0.370	1.365	2.248	2.019
P	0.548	2.687	1.123	0.758

Table 2. Comparison of self-care ability ($\bar{x} \pm sd$, scores)

Group	Self-care skills	Health knowledge	Self-responsibility	Self-awareness
Control group (n=20)				
Before intervention	15.61±2.41	16.31±3.41	14.31±3.63	13.45±3.21
After intervention	25.26±2.31*	38.47±3.64*	15.35±2.04*	23.56±4.12*
Research group (n=20)				
Before intervention	15.84±2.63	16.87±3.57	14.67±3.67	13.42±3.36
After intervention	33.48±5.46*,#	45.86±5.98*,#	25.34±2.34*,#	36.54±4.56*,#

Note: compared with the same group before intervention, *P<0.05; compared with the control group after intervention, #P<0.05.

pared with the data collected during the review and demonstration.

Secondary indicators: (1) The occurrence of complications of patients one month after nursing was recorded, and the incidence was calculated. The incidence of complications = (total number of complications)/total number of cases ×100%.

Statistical analysis

All research data were analyzed by SPSS 22.0, and the measurement data were measured by Normality test. Those who obeyed normal distribution were expressed as mean ± standard deviation ($\bar{x} \pm sd$). The inter-group comparison was assessed via independent-samples t test, while the intra-group comparison before and after nursing was analyzed via paired-t test. The counting data were represented by number/percentage (n/%) and analyzed by chi-square test. P<0.05 meant the difference was statistically marked.

Results

Comparison of basic conditions between two groups of patients

There was no obvious difference in gender, age, weight and course of disease between patients

(P>0.05). They were comparable, and the specific situation is shown in **Table 1**.

Comparison of self-care ability between two groups of patients

Before intervention, there was no remarkable difference in the ESCA scores between the two groups (all P>0.05). While after intervention, the scores were dramatically improved. The self-care skills (33.48±5.46), health knowledge (45.86±5.98), self-responsibility (25.34± 2.34) and self-awareness (36.54±4.56) of the research group were higher than those of the control group (25.26±2.31, 38.47±3.64, 15.35±2.04, 23.56±4.12, respectively; all P< 0.05). The specific scoring results are shown in **Table 2** and **Figure 1**.

Time window of first-aid before and after intervention in both groups

Before intervention, there was no marked difference in the time window of first-aid between the two groups (P>0.05). After intervention, the emergency time window of the research group was shorter than that before intervention, and the research group (32.34±8.14) was better than that of the control group (49.46±8.13; P<0.05). The specific results are shown in **Table 3** and **Figure 2**.
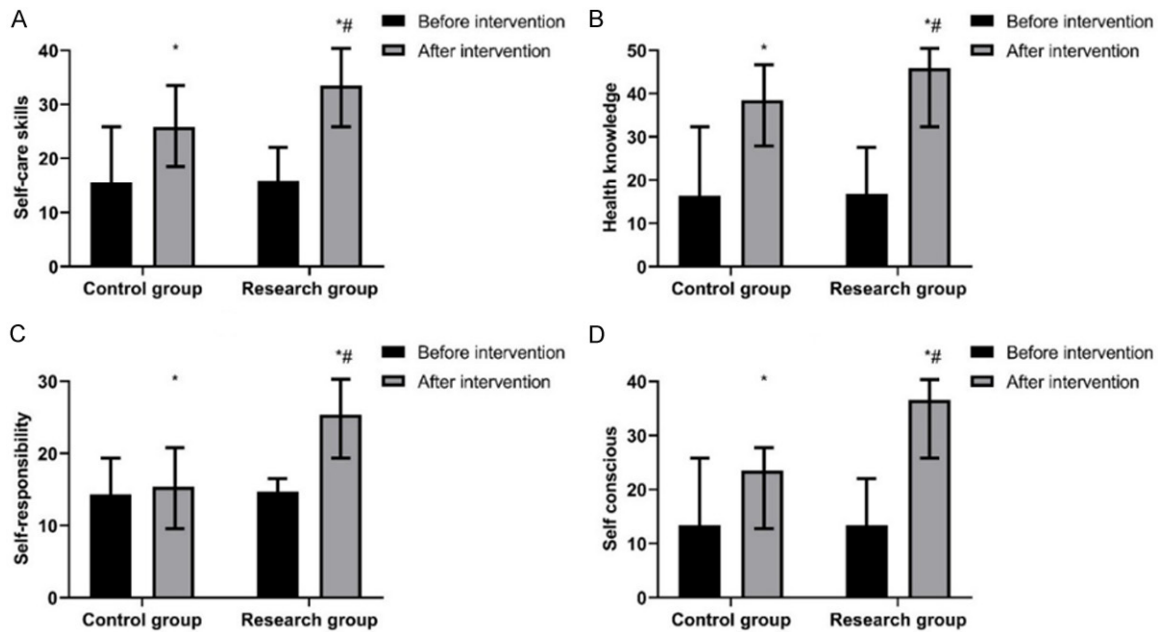
Figure 1. Self-care ability scores of two groups of patients. A: Self-care skills; B: Health knowledge; C: Self-responsibility; D: Self-awareness. Compared with the same group before intervention, *P<0.05; compared with the control group after intervention, #P<0.05.

Table 3. Time window of first-aid before and after intervention (s)

Group	Before intervention	After intervention
Control group (n=20)	51.24±9.74	49.46±8.13
Research group (n=20)	52.24±9.64	32.34±8.14
t	0.326	6.645
P	0.746	0.000

Figure 2. First aid time window before and after intervention in both groups. Compared with the same group before #intervention, *P<0.05.

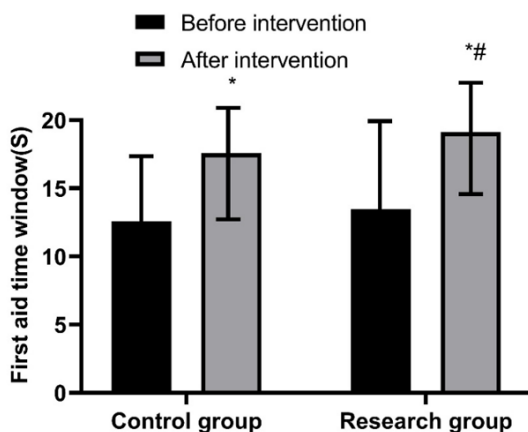*Comparison of nursing satisfaction between two groups of patients*

After nursing, the overall satisfaction of patients in the research group was 95.00%, which was higher than 70.00% in the control group (P<0.01). The specific results are shown in **Table 4.**

Comparison of examination results of related knowledge and skills of ophthalmic nurses before and after training

Before training, there was no marked difference in the examination scores of related knowledge and skills of ophthalmic nurses (all P>0.05). While after training, the scores of related knowledge (100.56±9.14) and skill examination (30.47±6.56) were obviously improved compared with those before training (all P<0.01). The specific scoring results are shown in **Table 5** and **Figure 3**.

Comparison of incidence of complications between two groups of patients

The incidence of complications in the research group was 5.00%, while that in the control

Table 4. Comparison of nursing satisfaction

Group	Very Satisfactory	More satisfactory	No Satisfactory	Overall satisfaction
Research group (n=20)	15	4	1	19 (95.00%)
Control group (n=20)	7	7	6	14 (70.00%)
χ^2				4.621
P				0.005

Table 5. Comparison of examination results of related knowledge and skills of ophthalmic nurses before and after training ($\bar{x} \pm sd$)

	n	Before training	After training
Related knowledge	12	95.62±12.33	100.56±9.14[**]
Skills of liaison nurses	12	22.56±4.59	30.47±6.56[**]

Note: Compared with the same group before training, [**]P<0.01.
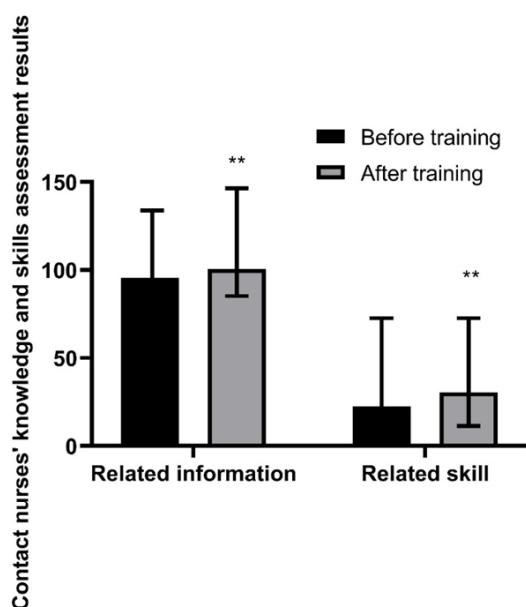
Figure 3. Comparison of relevant knowledge and skills assessment results of contact nurses before and after training. Compared with before training, [**]P<0.01.

group was 30.00%. The indexes of the former were lower than those of the latter. The differences were statistically remarkable (P<0.05). The specific results are shown in **Table 6** and **Figure 4**.

Discussion

At current stage, there are more and more CRAO patients in China [11, 12]. Patients may have complications, and their mental health will also be affected, which seriously influences the quality of life [13, 14]. In the past nursing process, because all kinds of information were provided by patients voluntarily, the nursing was not timely, and the conditions became very vague. Under the traditional nursing mode, patients can't grasp some nursing instructions timely and accurately [15, 16]. Thus, in order to provide better closedloop management for nursing in CRAO patients, the nurses must combine the actual situation and carry out effective nursing intervention [17, 18].

In the RAID quality improvement model, through the review, we found the weak points of ophthalmic nurses' knowledge and skills, patients' cognition of the disease and the deficiencies in the emergency process. It provides reference for making targeted training plans [19]. Collaboration is the premise to ensure the effective operation of the team. The working mode of the team can attract the participation of the staff of subfamily room, to give full play to the advantages of collaborative management between doctors and nurses. It also can stimulate the learning interest of ophthalmic nurses. They'd like to help each other, and improve their specialty knowledge and skills, so as to better serve patients. Through the implementation of training and process reengineering, special disease nursing measures and total quality control were put into effect. This study shows that after training, the examination results of related knowledge and skills of ophthalmic nurses are improved compared with those before training [20, 21].

After intervention, the self-care skills of the research group were dramatically higher than those of the control group. After nursing, the overall satisfaction of patients in the research group (95.00%) was remarkably higher than that in the control group (70.00%). The incidence of complications in the research group was 5.00%, while that in the control group was 30.00%. The indexes of the research group

Table 6. Comparison of incidence of complications between two groups of patients

Group	Secondary ocular neovascularization	Complication rate
Research group (n=20)	1	1 (5.00%)
Control group (n=20)	6	6 (30.00%)
χ^2		4.329
P		0.038
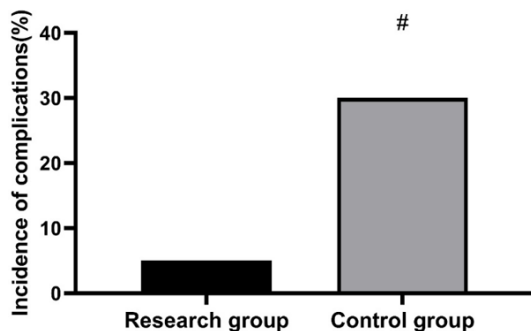
Figure 4. Comparison of incidence of complications between both groups. Compared with control group, #P<0.05.

were lower than those of the control group, with vital differences (P<0.05). It reveals that the RAID quality improvement model can standardize the homogenization management of CRAO treatment, to achieve the purpose of improving the treatment cognition and compliance of patients. Each index was analyzed, then the effect of raid project implementation was demonstrated, and finally the evaluation standard, routine and process of nursing quality for special diseases were formed.

Nevertheless, because this study only investigated part of the contents, the scope involved is relatively small. The exploration on the management of chronic disease is still not deep enough, and further research will be made in the future application.

To sum up, RAID quality improvement model is effective in the closed-loop management of CRAO nursing, which can improve patients' self-care ability, effectively shorten the time window of first-aid and reduce the occurrence of complications. Therefore, it is worthy of application and promotion.

Disclosure of conflict of interest

None.

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