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Study of Predictive Nursing Intervention Based on Causal Analysis in Patients with Radiotherapy of Nasopharyngeal Carcinoma

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Abstract

This study aimed to evaluate the effectiveness of causality analysis-based predictive nursing interventions in reducing complications and improving outcomes among nasopharyngeal carcinoma (NPC) patients undergoing radiotherapy. A randomized controlled trial was conducted with 96 NPC patients admitted between November 2021 and November 2023. Participants were divided into Group A (routine care, n = 48) and Group B (predictive nursing intervention, n = 48). Group B received causality analysis-guided interventions targeting oral mucositis, psychological support, and early rehabilitation. Outcomes included oral mucosa grading (WHO criteria), cancer fatigue (Piper Fatigue Scale), psychological state (HAD scale), sleep quality (AIS), mouth-opening difficulty incidence, oral pain (NRS), and nursing satisfaction. Post-intervention, Group B showed significantly lower proportions of severe oral mucosa grades (Grade III/IV: 6.25% vs. 58.34% in Group A, P < 0.001), reduced cancer fatigue scores (Group B: 1.40–2.57 vs. Group A: 2.84–3.87, P < 0.05), and improved psychological state (anxiety: 6.18 vs. 10.32; depression: 5.89 vs. 8.54, P < 0.001). Group B also had lower mouth-opening difficulty incidence (35.42% vs. 56.25%, P = 0.041), reduced oral pain scores at weeks 3–9 (2.10–5.01 vs. 2.54–6.86, P < 0.05), and higher nursing satisfaction (95.83% vs. 77.08%, P = 0.007). These findings suggest that predictive nursing interventions based on causality analysis effectively mitigate radiotherapy-related complications, enhance psychological well-being, reduce oral pain, and improve patient satisfaction in NPC patients. Larger multicenter studies with extended follow-up are needed to validate these findings.

Keywords: Nasopharyngeal Cancer, Radiotherapy, Causal Analysis, Predictive Care

Introduction

Nasopharyngeal cancer is a serious harm to human health of the malignant tumor, the treatment method now is radiation therapy, to kill tumor cells as the main means [1, 2]. In the process of killing tumor cells, radiotherapy will cause damage to normal tissues, causing oral mucositis, radioactive skin damage, nausea, vomiting and other side effects [3]. Therefore, preventing or alleviating the oral mucosal damage after radiotherapy through effective nursing intervention is the key to improve the efficacy of radiotherapy in NPC. Routine nursing generally helps patients and their families to understand the disease and treatment-related knowledge by explaining the disease-related knowledge and precautions, but it is difficult for patients to pay attention to it in practice, and the intervention effect is not ideal. The causal analysis-based nursing intervention method is easy to operate, is a commonly used risk factor, and is used in clinical operations and epidemiological studies with good results. The use of predictive nursing intervention in the treatment of patients can not only ensure the treatment safety of patients, but also reduce the harm caused by treatment to the minimum [4]. However, there are still few relevant studies related to the application of predictive nursing intervention based on causal analysis in radiotherapy patients with nasopharyngeal cancer. Therefore, we selected 96 patients with nasopharyngeal cancer who had received radiotherapy as the research object, hoping to make corresponding treatment plans for clinical practice and provide theoretical basis and reference, which is reported as follows.

Data and Methods

General Information

This study followed the ethical principles of the Declaration of Helsinki and was approved by the Medical Ethics Committee of Hechi People's Hospital (Approval No.: [2021] No.001). All patients participating in the study signed a written informed consent to specify their voluntary participation and details of the study.

The 96 patients with NPC radiotherapy admitted in our hospital were taken as the study objects. The cases were included from November 2021 to November 2023, and were divided into Group A (48 cases) and Group B (48 cases), and were grouped according to the random number table method. Among them, group A was 22 to 68 years, mean (48.76 ± 4.23); pathological classification: 29 squamous cell carcinoma, 19 non-keratinized cell carcinoma; 33 males and 15 women; 25 radiotherapy: three-dimensional conformal radiotherapy, 15 IMRT and 8 conventional radiotherapy [5]. In Group B, 31 males and 17 females; aged 22 to 69 years, mean (49.04 ± 4.21); pathological classification: 30 squamous cell carcinoma, 18 non-keratinized cell carcinoma; radiotherapy: 27 three-dimensional conformal radiotherapy, 14 IMRT, and 7 conventional radiotherapy. Between the two sets of relevant statistics, P> 0.05 is comparable.

Inclusion, Exclusion, Shedding, and Criteria

Inclusion Criteria: Diagnosis met the relevant diagnostic criteria for NPC in the Diagnosis and Treatment of NPC and treated with radiotherapy; those with clear consciousness and normal communication ability; indications for radiotherapy treatment; informed consent for the study; radiotherapy for 9 weeks or more [6].

Exclusion Criteria: surgical treatment or concurrent chemotherapy; estimated survival of less than 1 year; patients with severe organ dysfunction and coagulation dysfunction; patients with infectious or infectious diseases; patients with other malignant tumors; pregnant or lactating women.

Drop-off criteria for withdrawal from the investigator.

Excluding criteria for serious adverse events; while participating in other trial investigators.

Methods

Group 1.3.1 A give routine care, including regular health education, psychological care, diet guidance, life care, observation and prevention of complications, etc., mainly for patients with knowledge of radiotherapy and oral mucosa reaction oral education, let patients keep emotional stability, positive treatment of oral inflammation, keep oral hygiene, eat more digestive rich food, pay attention to bed rest, protect the radiation field skin, if radioactive stomatitis, can use lidocaine + dexamethasone + saline mixed gargle, symptomatic analgesic treatment, etc.

Group B: gave a predictive care intervention based on causal analysis based on group A, (1) Causality analysis: the expert group composed of attending physicians, chief nursing staff and general responsible team leader, Retrospectively investigated the etiology of radioactive mouth sores and its complications, And the status of radiotherapy in NPC patients in recent years, Using the method of causality analysis, Find out the causes of oral radiation damage and its complications: 1 Oral environment: Due to the effect of radiation, The internal environment of the oral cavity has changed, Caused the disorder of the microorganisms, Bacteria will breed and multiply in the mouth, Thus causing stomatitis and related complications; 2 Resistance: During radiotherapy, The damaged salivary glands, oligoptyalism, The amount of immunoglobulin in the saliva was decreased, Thus leading to the decreased resistance of the oral mucosa, Cause stomatitis and related complications; 3 Radiotherapy: In recent years, With the differences in radiotherapy methods, The serious incidence of stomatitis and related complications is also increasing; Among the above factors, Except for resistance that care cannot solve, Everything else can be adjusted.(2) Formation of predictive nursing intervention based on causal analysis: 4 After the causal analysis, the responsible leader of the attending doctor and the nursing staff or the nursing staff will explain the cause of radioactive stomatitis, let the relevant nursing staff refer to the data about radiotherapy for stomatitis and related complications, and give some of the more controllable and less risky nursing methods in these data to the nursing staff or the total nursing leader; 5 The nursing staff will assist the attending physician to review and summarize the nursing measures.(3) The implementation of predictive nursing intervention based on causal analysis, 6 To evaluate the negative emotions of NPC patients with radiotherapy, fully implement clinical health knowledge, understand the relevant knowledge of radiotherapy and possible side effects, so that patients can have a correct understanding of the treatment methods and disease. We should communicate with patients actively, listen to the requirements of patients, understand the impact of various factors in the progression of the disease on the patient's mental health, and analyze their negative emotions. Relevant knowledge should be actively publicized to patients, so that they understand the importance of oral hygiene and health care, and the comprehensive treatment of patients, and the purpose, method and effect of their implementation should be explained in detail. Answer patients' questions in time, guide patients with successful treatment cases, let patients get rid of fear, rejection and anxiety, and enhance the confidence of patients. 7 It is recommended that patients with radiotherapy wear soft cotton clothes as much as possible, prepare their mouth before radiotherapy, and go to the hospital regularly. Pay attention to oral hygiene every morning and evening, treat the inflammation of the gums in time, and treat the metal braces should be removed in time, and pay attention to gargle before and after meals. In patients with ulcer and painful symptoms, intravenous antibiotics and analgesic medication may be given. At the same time, attention should be paid to the secretions and tumor necrosis tissue in the nasopharyngeal cavity, and the bilateral nasal cavity with 0.9% sodium chloride solution. 8 During this period of treatment, we must eat high-calorie, high-protein, easily digestible food, drink more water, and eat more semi-liquid diet, which can not only improve the curative effect, but also promote the better repair of the tissue. At the same time, targeted treatment should be carried out for the damage degree of the oral mucosa. If the salivary glands appeared more serious injury, if there is a dry mouth, must drink more water. During radiotherapy, we should rest more, eat more nutrition, and keep warm to avoid cross-infection after a cold. 9 According to the possible complications in the treatment process, we should pay attention to control the area of irradiation, try not to be exposed to the sun,

and do not wipe with coarse towels and soap. If the patient has more severe oral pain, lidocaine and other analgesics can also be used. If oral cavity ulcer appeared unbearable symptom, can use the drug such as lidocaine, 0.9% sodium chloride solution, gentamicin to undertake ultrasonic atomization inhalation, can reduce pain so. If there is a strong sense of pain and itching, you can apply borneol, calamine cleaning agent, beat, etc., but also to keep the local clean. The concept of early rehabilitation is integrated into the nursing work of patients to ensure that patients can return to normal life after treatment.

Both groups were intervened until the end of patient radiotherapy.

Observing Indicators

After the intervention, the oral mucosa grade of the two groups according to the World Health Organization (WHO): Grade 0: normal oral mucosa; Grade I: local mild congestion and pain; Grade: Patients have moderate pain and need to take medication; Grade: Patients will have strong pain, which would affect eating; Grade: inability to eat, bleeding, ulcer and necrosis [7].

Cancer fatigue before, after intervention at the end of the intervention, two groups of patients with cancer fatigue using the Chinese version of Piper fatigue revised self-assessment scale (RPFS) (sensory, behavior, cognitive or emotional, emotional four aspects) evaluation, all aspects of 0~10 points, the higher the score, the more serious cancer fatigue [8].

Psychological state and sleep quality before and after the intervention, hospital anxiety and depression scale (HAD) was used to evaluate anxiety and depression, mainly including anxiety and depression [9]. The score range of each dimension is 0-21 points, and the higher the psychological state of anxiety and depression; the insomnia scale (AIS) to evaluate the sleep quality of the two groups is 0-13 points, when the higher the score, the worse the sleep quality [10].

Occurrence of mouth opening difficulties After the end of intervention, the occurrence of mouth opening difficulties in two groups was evaluated by reference to tumor radiotherapy: Grade I: limitation of mouth opening in patients; patients have difficulties in dry feeding; grade: patients need nasal feeding, total incidence = sum of occurrence cases of each grade / total cases 100%. [11]

Oral pain in the 1,3,6 and 9 weeks of intervention, the pain number score (NRS) was used to evaluate the oral pain of chemotherapy [12]. The score ranges from 0 to 10 points. The higher the score, the worse the oral pain.

After the intervention, the nursing satisfaction questionnaire was very satisfactory: 90~100 points; satisfaction: 60-90 points (excluding 90 points); dissatisfaction: less than 60 points. Satisfaction =1-dissatisfaction, and the cronbach's α coefficient was 0.798.

Statistical Methods

The calculation and analysis of all data in this paper were conducted with SPSS software (software version 26.0), and P <0.05 was calculated (indicating statistically significant differences). Measurement data (tested by S-W method, all conform to normal distribution) are tested by t, () is the representation, count data is tested by χ 2, [example (%)] is the representation, grade data is tested by rank sum test in Z.

Results

Comparison of the Oral Mucosal Grade Between the Two Groups After the intervention, compared with group A, the proportion of patients with oral mucosa grade was lower in group A, and the proportion of patients with grade I and grade were higher (P <0.05). See Table 1.

Table 1: Comparison of the oral mucosal grade between the two groups [n (%)]

group	Example number	Level 0	Level 1	Level 2	Level 3	Level 4
A group	48	0(0.00)	15(31.25)	5(10.42)	17(35.42)	11(22.92)
B group	48	0(0.00)	29(60.42)	16(33.33)	3(6.25)	0(0.00)
Z	-	5.513				
P	-	<0.001				

Comparison of the Two Groups

Compared with the pre-intervention, the cancer fatigue score decreased in both groups after the intervention, and was lower in group B (P <0.05). See Table 2.

Table 2: Comparison of two groups (, points)

time	group	Example number	Behavioral aspects	Emotional aspect	Feel the aspect	Cognitive or emotional aspects
Before the intervention	A group	48	5.45±0.59	6.84±0.56	7.13±0.78	6.98±0.65
	B group	48	5.41±0.56	6.89±0.60	7.19±0.80	7.02±0.66
-	t	-	point three four one	point four two two	point three seven two	point two nine nine

-	P	-	point seven three four	point six seven four	seven one one	point seven six five
After the intervention	A group	48	3.87±0.52*	2.87±0.44*	3.17±0.57*	2.84±0.35*
	B group	48	2.57±0.51*	1.67±0.52*	1.92±0.23*	1.40±0.37*
-	t	-	twelve point three six six	twelve point two zero five	fourteen point zero nine zero	nineteen point five eight eight
-	P	-	<0.001	<0.001	<0.001	<0.001

Note: * P <0.05.

Comparison of Psychological Status and Sleep Quality Between the Two Groups

Compared with pre-intervention, anxiety, depression and sleep quality scores decreased after the intervention, and were lower in group B (P <0.05). See Table 3.

Table 3: Comparison of psychological status and sleep quality of the two groups (, points)

time	group	Example number	anxious	depressed	sleep quality
Before the intervention	A group	48	14.76±1.03	13.02±0.72	8.84±0.66
	B group	48	15.01±1.11	12.97±0.71	9.01±0.69
-	t	-	one point one four four	point three four three	one point two three four
-	P	-	point two five six	point seven three three	point two two zero
After the i ntervention	A group	48	10.32±0.45*	8.54±0.63*	6.43±0.82*
	B group	48	6.18±0.36*	5.89±0.47*	4.07±0.73*
-	t	-	forty nine point seven seven two	twenty three point three five eight	fourteen point eight nine three
-	P	-	<0.001	<0.001	<0.001

Note: * P <0.05.

Comparison of the Occurrence of Mouth-opening Difficulty between the Two Groups

After the intervention, the overall incidence of mouth opening difficulties was lower in Group B compared to Group A (P <0.05). See Table 4.

Table 4: Comparison of the occurrence of mouth-opening difficulty between the two groups [n (%)]

group	Example number	I level	II level	III level	IV level	Total occurrence
A group	48	17(35.42)	6(12.50)	4(8.33)	0(0.00)	27(56.25)
B group	48	12(25.00)	3(6.25)	2(4.17)	0(0.00)	17(35.42)
$\chi 2$	-	-	-	-	-	four point one nine six
P	-	-	-	-	-	point zero four one

Oral Pain Comparison Between the Two Groups

Compared with week 1 of intervention, oral pain scores increased in both groups during the 3 to 9 weeks of intervention, lower in group B (P <0.05). See Table 5.

Table 5: Comparison of oral pain between the two groups (, points)

group	Example number	Week 1	Week 3	Week 6	Week 9
A group	48	0.68±0.08	2.54±0.13#	3.98±0.18#△	6.86±0.37#△▲
B group	48	0.71±0.08	2.10±0.12#	3.02±0.11#△	5.01±0.21#△▲
t	-	one point eight three seven	seventeen point two three one	thirty one point five two nine	thirty point one two seven
P	-	point zero six nine	<0.001	<0.001	<0.001

After the i ntervention	A group	48	10.32±0.45*	8.54±0.63*	6.43±0.82*
	B group	48	6.18±0.36*	5.89±0.47*	4.07±0.73*
-	t	-	forty nine point seven seven two	twenty three point three five eight	fourteen point eight nine three
-	P	-	<0.001	<0.001	<0.001

Note: # P <0.05; P <0.05 compared with week 3; and ▲ P <0.05 compared with week 6.

Comparison of Nursing Satisfaction Between the Two Groups

After the intervention, group B was better satisfied compared to group A (P <0.05). See Table 6.

Table 6: Comparison of nursing satisfaction between the two groups [n (%)]

group	Example number	Very satisfied	satisfied	discontent	Nursing satisfaction
A group	48	24(50.00)	13(27.08)	11(22.92)	37(77.08)
B group	48	27(56.25)	19(39.58)	2(4.17)	46(95.83)
χ2	-	-	-	-	seven point two zero seven
P	-	-	-	-	point zero zero seven

Discussion

Nasopharyngeal cancer is one of the most common head and neck tumors in China. Due to its special anatomical site and high radiosensitivity, radiotherapy is the best main choice for nasopharyngeal cancer, [13-15]. Radiotherapy, however, will produce many side effects, one of the most common is the oral mucosa, its main symptoms is the oral mucosa redness, ulcers, pain, and discomfort, and even affect the normal diet, its incidence of more than 40%, patients often difficult to endure, the quality of life and radiotherapy success have a great impact on [16-18]. The disadvantage of routine care is that patients only start symptomatic care after receiving radiotherapy, without initiative, foresight and pertinence.

In the course of treatment, patients may have a negative mentality, targeted nursing intervention for patients, the causal analysis based predictive nursing intervention can well guide patients, let patients to enhance their treatment confidence, thus improving the clinical matching and treatment confidence [19-21]. The predictive nursing intervention based on causal analysis is also to strengthen patients 'oral nursing, improve patients' diet, and use early rehabilitation nursing to ensure that patients return to normal life as soon as possible, which can not only maximize the control of clinical complications, but also enable patients to obtain better prognosis [22]. Vision nursing intervention based on the patient's point of view, comprehensive clinical treatment work to the patient, and appropriate nursing intervention to the patient, let patients to realize, oral mucositis is an indispensable complication of radiotherapy, and improve the patient's safety awareness, enable it to actively cooperate with clinical nursing staff in the prevention work [23-25]. The results of this study show that than group A, group B oral mucosa grade grade, grade of patients, cancer fatigue, anxiety, depression, sleep quality score is lower, for grade I, grade patients' proportion are higher, further confirmed that the causal analysis based on predictive nursing intervention can effectively reduce nasopharyngeal cancer radiotherapy patients psychological state and cancer fatigue, improve the health of oral mucosa, improve the quality of sleep.

In addition, this study found that compared with group A, group B total incidence of mouth difficulty, oral pain score is lower, the nursing satisfaction is higher, further suggests that the causal analysis based predictive nursing intervention can effectively reduce the incidence of nasopharyngeal cancer radiotherapy patients with mouth difficulty, relieve oral pain, and also can improve the nursing satisfaction of patients. The reasons may be, Causal analysis-based predictive care intervention can be delivered by comparison with clinically typical cases, To analyze the causes of oral pain and its complications, Enhance caregivers' awareness of the harmfulness of complications after radiation therapy of nasopharyngeal carcinoma, To help relieve patients' oral pain conditions, on this basis, Should think positively about its possible impact, And to adopt active and effective interventions, To improve the overall quality of nurses; besides, Predictive nursing interventions based on causality, Help for nurses to assess the controllability of the intervention, Reduce high-risk, inefficient intervention behaviors, Improve the effectiveness and satisfaction of nursing work.

Conclusion

In conclusion, based on the causal analysis of predictive nursing intervention can effectively reduce nasopharyngeal cancer radiotherapy patients and cancer fatigue, reduce the incidence of patients mouth difficult, improve patients with oral mucosa health, improve the quality of sleep, relieve patients with oral pain, and also can improve the patient's nursing satisfaction. However, this study is limited by the small number of cases included, and the short follow-up time, so the wide applicability of the research results may be affected. Therefore, in order to improve the reliability of the research results, the clinical research design needs to be improved.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Credit Author Statement

Conceptualization: Qin Xiujuan played a leading role in the conceptualization of this study. She identified the research gap in the field of nasopharyngeal carcinoma radiotherapy nursing, proposed the idea of applying causal analysis - based predictive nursing interventions, and designed the overall research framework. Liu Shunhua also contributed to the initial concept discussion, providing additional perspectives from a clinical practice - based understanding.

Methodology: Both Qin Xiujuan and Liu Shunhua were involved in developing the research methodology. They determined the use of a randomized controlled trial design, carefully selected the inclusion and exclusion criteria for patient recruitment, and formulated the detailed intervention and measurement methods. Qin Xiujuan, with her professional knowledge and experience, was mainly responsible for the scientific validity of the methodology, while Liu Shunhua participated in the practical aspects of method implementation planning.

Data Curation: The research team, under the supervision of Qin Xiujuan and with the active participation of Liu Shunhua, was responsible for data curation. They collected data from 96 patients, ensuring the accuracy and completeness of patient information, intervention records, and outcome measurements. Liu Shunhua was actively engaged in the day - to - day data collection process, while Qin Xiujuan oversaw the quality control of the data.

Formal Analysis: The data analysis was carried out by the research team using SPSS 26.0 software. Although not explicitly stated, it can be inferred that Qin Xiujuan, as the corresponding author with in - depth knowledge of research methods, guided the analysis process. Liu Shunhua may have also participated in the data analysis, helping to input data, check for errors, and understand the preliminary analysis results.

Investigation: Liu Shunhua and other members of the research team were directly involved in the investigation. They implemented the routine care in Group A and the causal analysis - based predictive nursing intervention in Group B, closely observing patients' conditions during the radiotherapy period. Qin Xiujuan supervised the investigation process to ensure that the interventions were carried out as planned and the data collection was accurate.

Writing: Original Draft Preparation: The research team jointly prepared the original draft of the manuscript. Liu Shunhua likely contributed to the initial writing of the methods, results, and parts of the discussion sections based on the data collected and observed during the study. Qin Xiujuan provided overall guidance on the content structure, ensuring that the manuscript adhered to academic norms and effectively conveyed the research findings.

Writing: Review and Editing: Qin Xiujuan was primarily responsible for the review and editing of the manuscript. She carefully reviewed the entire manuscript, checking for scientific accuracy, logical consistency, and readability. Liu Shunhua also participated in the review process, providing feedback based on her understanding of the research from a practical perspective.

Project Administration: Qin Xiujuan served as the project administrator. She coordinated all aspects of the research project, including patient recruitment, research team communication, and resource allocation. Her administrative efforts ensured the smooth progress of the study from its initiation to the completion of data collection and analysis.

Funding Acquisition: Liu Shunhua was responsible for obtaining the funding for this study from the self - funded research project of the Health Commission of Guangxi Zhuang Autonomous Region (Project No.: Z20211037). Her efforts in securing funding enabled the research to be carried out, covering costs related to patient care, data collection tools, and statistical analysis software.

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