



# Application of Nursing Intervention Based on the Information-motivation-behavioral Model in Rehabilitation after Vocal Cord Polypectomy

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## Abstract

**Background:** Vocal cord polyps are common benign lesions that cause voice disorders, particularly hoarseness, which can interfere with daily communication.

**Objectives:** The present study aimed to determine the effect of applying a nursing intervention based on the information-motivation-behavioral (IMB) model on rehabilitation after vocal cord polypectomy.

**Methods:** A total of 76 patients who underwent vocal cord polyp resection in Wuhu Second People's Hospital between January 2019 and September 2021 were selected by convenience sampling as the study participants. A random number table was used to assign the patients to two groups, an intervention group and a control group (n=38 in each group). Patients in the control group were given routine postoperative nursing, whereas those in the intervention group received an IMB-based nursing intervention based on that of the control group. The data collected regarding self-care ability, vocal cord recovery, and voice disorder severity of the two groups after surgery were compared in January and February.

**Results:** The Exercise of Self-Care Agency scale scores of the intervention group were higher than those of the control group both one and two months after surgery, and the difference was statistically significant ( $97.1 \pm 26.1$  vs.  $84.6 \pm 19.8$ ,  $103.3 \pm 28.4$  vs.  $85.6 \pm 20.0$ ,  $P < 0.05$ ), indicating the superior self-care ability of the intervention group. The Voice Handicap Index scores of the intervention group were lower than those of the control group both one and two months after the surgery, and the difference was statistically significant ( $35.8 \pm 9.2$  vs.  $39.8 \pm 13.9$ ,  $24.6 \pm 6.2$  vs.  $29.7 \pm 7.3$ ,  $P < 0.05$ ), indicating that voice disorder severity was lower in the intervention group than in the control group. Moreover, the effective rates (recovery and improvement) of the intervention group were higher than those of the control group one and two months after the surgery.

**Conclusion:** As evidenced by the obtained results, nursing intervention based on the IMB model for patients who undergo vocal cord polyp resection can effectively improve self-care ability, reduce the severity of voice disorders, and promote the recovery of vocal cords.

**Keywords:** Exercise of self-care agency scale, Information-motivation-behavioural model, Knowledge-attitude-practice, Postoperative rehabilitation, Self-care ability, Vocal cord polypectomy, Voice disorder, Voice handicap index

## 1. Background

Vocal cord polyps are common benign lesions that cause voice disorders, particularly hoarseness, which can interfere with daily communication (1). Although the exact pathogenesis of vocal cord polyps remains unclear, excessive and erroneous vocalizations are recognized as major risk factors (2). A large prospective study conducted by Won et al. (2) in South Korea revealed that 1.31% of respondents had vocal summaries which demonstrated a certain relationship with subjective perception, educational level, and age. At present, the primary treatment for vocal cord polyps is surgical treatment, with a recurrence rate of approximately 3.9%-8.6% (3,4). In China, the rehabilitation of patients after vocal cord polypectomy is generally completed independently under the guidance of specialist nursing staff. Nonetheless, due to non-compliance with medical orders, psychological factors, and lack of self-care knowledge, patients often experience poor postoperative voice recovery outcomes. Therefore, nursing intervention beyond guidance is essential to promote postoperative rehabilitation in patients with

vocal cord polyps.

Nowadays, there is no fully satisfactory method for voice rehabilitation training after vocal cord polyp surgery. The information-motivation-behavioral (IMB) model is a widely used health education strategy that emphasizes three core factors related to healthy behavior: accurate information, personal and social motivation, and behavioral skills (5). Behavioral interventions based on the IMB model have been shown to be applicable and effective in the health management of patients with chronic diseases (6). Nonetheless, there are no reports on the application of this theory to voice rehabilitation training after vocal cord polyp surgery.

## 2. Objectives

In light of the aforementioned issues, the present study aimed to explore the effect of applying a nursing intervention based on the IMB model on rehabilitation after vocal cord polypectomy in relation to self-care ability, voice disorder severity, and vocal cord recovery to provide a scientific

theoretical basis for the clinical promotion of the IMB model in the field of otolaryngology.

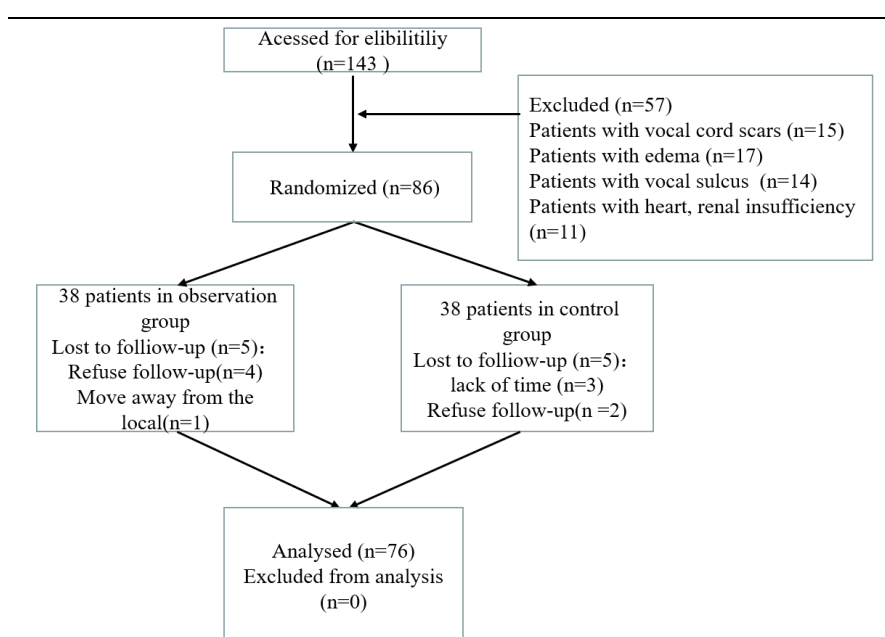
### 3. Methods

#### 3.1. Study design and participants

This prospective research used a convenient sampling method to select patients who underwent vocal cord polyp resection in the Department of Otolaryngology and Neck Surgery of Second People's Hospital of Wuhu between January 2019 and September 2021. The inclusion criteria were as follows: (1) age  $\geq 18$  years, (2) vocal cord polyp diagnosed using electronic laryngoscopy and a consistent postoperative pathological diagnosis, (3) an ability to understand and adhere to verbal and written instructions and demonstrate skilled use of WeChat and network equipment. On the other hand,

the exclusion criteria entailed (1) the presence of vocal cord scars, edema, sulcus vocalis, and other vocal cord lesions, (2) a history of mental illness or cognitive impairment, (3) heart conditions, renal insufficiency, and other diseases.

After convenient sampling and screening, 76 patients were included in the final study. The participants were assigned to two groups (an intervention group and a control group) using a random number table. This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Wuhu Second People's Hospital. Written informed consent was obtained from all participants in this study. See [Figure 1](#) for the study flow chart.



**Figure 1.** Study flow-chart

#### 3.2. Intervention measures

##### 3.2.1. Control group

Routine nursing methods, including basic specialized nursing, health education, as well as psychological and rehabilitation guidance, were used for the control group. Prior to surgery, patients were educated by professional medical staff on the inducement and pathogenesis of vocal cord polyps in simple language. Nurses provided the patients with basic postoperative care, administered medication according to the doctor's instructions, and monitored vital signs. Patients were urged to follow medical orders. After vocal cord resection, the patients rested for one week, after which they were allowed to talk at a normal volume (frequent shouting was prohibited). The primary intervention methods were oral guidance and the distribution of health brochures. One and two months after the surgery, follow-up

visits were held in the hospital to evaluate the condition of the patients.

##### 3.2.2. Intervention group

The intervention group was given postoperative rehabilitation nursing using the IMB model but based on the intervention of the control group. The intervention group's team of professionals was composed of one attending physician, two specialist nurses, and one rehabilitation therapist. The intervention group participated in the IMB nursing training and in the study after examination. The intervention measures using the IMB model were as follows.

Information intervention: Patients in the intervention group had their medical information collected during hospitalization. Each patient's age, gender, medical history, and other personal information were comprehensively evaluated to anticipate potential problems after surgery and

prepare for targeted responses. Before the operation, the intervention group's team of professionals performed one-on-one interviews with the participants to understand their psychological status. After vocal cord polypectomy, they conducted voice training and pronunciation training with the patients, emphasizing postoperative precautions. During hospitalization, the intervention group's nursing staff communicated with the patients once a day in the morning for 20-30 min. After discharge, a WeChat group was created to communicate with the patients in real-time, and the patients were given continuous and sufficient information support. Information about voice rehabilitation was regularly shared, and the patients were encouraged to actively participate in discussions.

**Motivation intervention:** The intervention group's team of professionals often communicated with the family members of the patients to inform them about basic nursing knowledge after vocal cord polypectomy. In addition to past pathology, the team educated the family members and patients on the importance of continuous voice training and asked the family members to give their full support. The team maintained contact with the patient's family members and remained informed of the participants' rehabilitation and psychological status to ensure they continued their postoperative voice rehabilitation training.

**Behavioural intervention:** Voice rehabilitation training was conducted one week after the operation as follows. 1) Voice rehabilitation health education was given. The medical staff explained the purpose, importance, and precautions of postoperative voice training to the patients and their families. 2) Patients were trained in muscle relaxation. The specialist nurses guided patients to lie comfortably in the supine position with a relaxed body. They asked the patients to inhale gradually until they felt the air sink to the chest floor. The patients maintained a state of natural relaxation as they slowly exhaled from the mouth. 3) Patients were trained in abdominal breathing. The nurses instructed the patients to relax their limbs, stand with their feet about shoulder-width apart, and naturally droop their arms. They were told to inhale deeply through the nose and breathe slowly through the mouth. At the same time, patients were educated on inspiratory bloating and breathing. The patients also received balloon training. For this, their hands were placed on both sides of the abdomen, and continuous and stable expiratory balloons enabled the abdomen to contract smoothly. 4) Pronunciation training was given. The patients were instructed to relax their mouth, throat muscles, and jaw, breathe through the nasal cavity, lift the upper lip slightly, and emit a weak bubble sound through the throat. 5) Resonance training was implemented. The patients were instructed to open their lips, exhale, and practice nasal resonance by

saying simple words and sentences. Patients were instructed to perform voice rehabilitation training exercises for approximately 30 minutes, 2-4 times daily. Each training session was recorded on the voice rehabilitation training table, including time spent and any problems encountered.

### 3.3. Results evaluation index

The self-care ability and dysphonia severity of patients in both groups were assessed one day before the surgery, as well as one and two months postoperatively. In addition, vocal cord repair was assessed one and two months postoperatively in both groups.

### 3.4. Self-care ability

The Exercise of Self-Care Agency (ESCA) scale developed by Keainey et al (7) was used to evaluate the patients before and after polypectomy. The scale measures a total of 43 items spanning four categories: self-concept, self-care responsibility, health knowledge level, and self-care skills. Each item is scored from 0-4, according to the subject's response, on a 5-point Likert-type scale. The minimum and maximum total scores are 0 and 172, respectively. A higher score demonstrates a stronger self-care ability.

### 3.5. Severity of voice disorders

The Voice Handicap Index (VHI) compiled by Jacobson et al. was used to evaluate the patients before and after vocal cord polypectomy (8). The scale consists of a total of 30 items in three categories: emotion, function, and physiology. The scale has five levels ranging from 0-4, and the highest possible score is 40. A higher score signifies the greater severity of voice disorder.

### 3.6. Vocal cord restoration

The recovery level after polypectomy was determined by examining the vocal cords using an electronic laryngoscope. The three possible levels are recovery (smooth vocal mucosa, normal vocal mucosa waves, no new organisms, good vocal cord closure, and normal vocalization), improvement (slight congestion of vocal mucosa, smooth vocal mucosa, normal or weakened vocal mucosal waves, no obvious new organisms, good vocal cord closure and significant improvement regarding hoarseness), and invalidity (failure to significantly reduce polyps, visible new organisms appearing, vocal mucosal waves disappearing or weakening, and a lack of improvement regarding hoarseness).

### 3.7. Statistical analysis

Statistical software SPSS (version 22) was used for data management and analysis. Continuous quantitative variables were expressed as mean  $\pm$  standard deviation ( $\bar{x} \pm S$ ) and repeatedly measured data were analyzed by repeated measurement

analysis of variance (ANOVA). Quantitative variables were expressed in the form of frequency and constituent ratio (%), and the rank-sum test was used for statistical analysis. Except for special instructions,  $P < 0.05$  indicated that the difference was statistically significant.

## 4. Results

### 4.1. General information of the patients

In the intervention group, there were 21 men and 17 women. The mean age was  $39.8 \pm 2.3$  years, and the course of the disease was 2-9 ( $3.2 \pm 3.4$ ) months. In the control group, there were 19 men and 19 women. The mean age was  $40.1 \pm 1.9$  years, and the course of the disease was 3-10 ( $4.00 \pm 1.9$ ) months. The two groups had no significant difference in the basic characteristics ( $P > 0.05$ ).

### 4.2. Comparison of self-care ability

The repeated variance analysis results of the self-care ability comparison between the two groups illustrated that the ESCA scores of the intervention group were higher than those of the control group both one and two months after the surgery, and the

difference was statistically significant ( $97.1 \pm 26.1$  vs.  $84.6 \pm 19.8$ ,  $103.3 \pm 28.4$  vs.  $85.6 \pm 20.0$ ,  $P < 0.05$ ). In addition, there was a relationship between time and group, with each group's ESCA scores changing at different time points, and the increase in the ESCA scores was more significant in the intervention group ( $P < 0.05$ ) (Table 1).

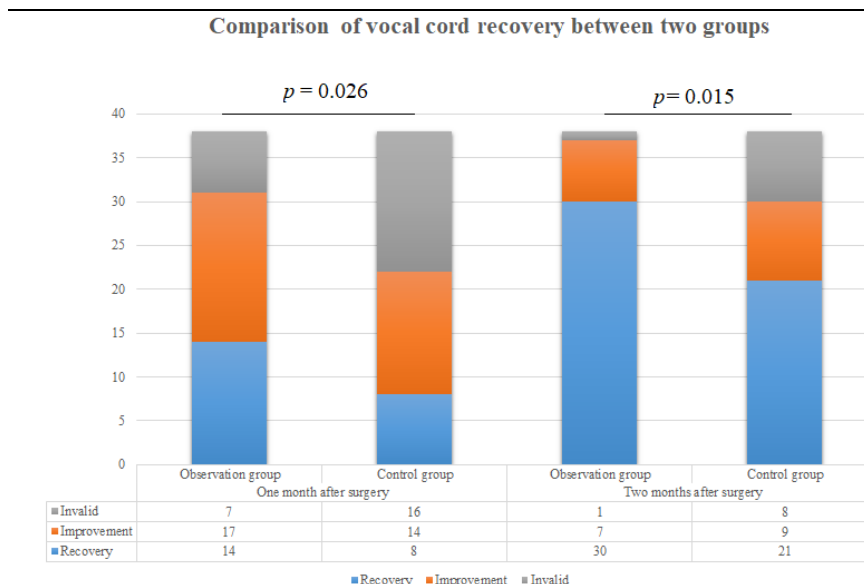
### 4.3. Comparison of voice disorder severity

The results of repeated variance analysis for the comparison of voice disorder severity between the two groups demonstrated that the VHI scores of the intervention group were lower than those of the control group both one and two months after the surgery, and the difference was statistically significant ( $35.8 \pm 9.2$  vs.  $39.8 \pm 13.9$ ,  $24.6 \pm 6.2$  vs.  $29.7 \pm 7.3$ ,  $P < 0.05$ ). There was a relationship between time and group, and the change trend of the severity at different time points was different ( $P < 0.05$ ) (Table 1).

**Table 1.** Comparison of self-care ability and voice disorder severity between the two groups of patients

	Group	N	1 day before surgery	One month after surgery	Two months after surgery	Time effect	Group effect	Interaction effect
Self-care ability	Intervention group	38	$83.1 \pm 18.8$	$97.1 \pm 26.1$	$103.3 \pm 28.4$	$P = 0.015$	$P = 0.014$	$P = 0.007$
	control group	38	$82.9 \pm 19.2$	$84.6 \pm 19.8$	$85.6 \pm 20.0$			
Voice disorder severity	Intervention group	38	$43.2 \pm 15.2$	$35.8 \pm 9.2$	$24.6 \pm 6.2$	$P = 0.021$	$P = 0.031$	$P = 0.017$
	Control group	38	$42.6 \pm 17.1$	$39.8 \pm 13.9$	$29.7 \pm 7.3$			

Note: ANOVA tests were used to compare groups



**Figure 2.** Comparison of vocal cord recovery between two groups

### 4.4. Vocal cord restoration

The vocal cord recovery of the two groups was compared using a rank-sum test. One month after surgery, the invalid rate of the intervention group

was 18.4%, and the effective rate (recovery and improvement) was 81.6%. For the control group, the invalid rate was 42.1%, and the effective rate was 57.9%. There was a statistically significant difference

in the recovery of vocal cords one month after vocal cord resection between the intervention and control groups ( $P=0.026$ ). Two months after the surgery, the invalid rate of the intervention group was 2.6%, and the effective rate was 97.4%. The invalid rate of the control group was 11.8%, and the effective rate was 88.2%. There was a significant difference in the recovery of vocal cords between the intervention group and control group two months after vocal cord resection ( $P=0.015$ ) (Figure 2).

## 5. Discussion

Effective postoperative nursing intervention is of great importance for the rehabilitation of vocal cord polyps (9). The present study revealed that IMB model-based nursing intervention can effectively improve patients' self-care ability after vocal polypectomy, reduce the severity of dysphonia, and promote the recovery of vocal cords.

European and American countries advocate the use of voice training to treat voice disorders (10). After vocal cord polypectomy in China, rehabilitation is mainly completed independently by patients under the oral guidance of medical staff. Due to non-compliance with medical advice, psychological factors, and a lack of self-care knowledge, patients often experience poor postoperative vocal recovery outcomes (10-12). This study found that patients' self-care ability, voice disorder severity, and vocal cord recovery significantly improved after the application of the IMB-based intervention. By adopting the IMB model, patients can gain more knowledge about rehabilitation, enhance their confidence, and increase their treatment compliance, resulting in improved outcomes. The IMB model is a type of behavioral change intervention theory. It holds that if we first have an awareness of behavioral change through the promotion of motivation, behavioral motivation will accumulate a certain level of behavioral change (13,14).

Studies demonstrate that nursing interventions based on the IMB model yield remarkable results in the fields of chronic disease management (15-17) and pre-exposure prevention (18). The accurate information obtained by face-to-face interviews and follow-ups can help medical staff monitor patients' condition changes. The issuance of health promotion manuals can increase patients' awareness of voice rehabilitation training after vocal cord polyp surgery. Close communication between medical staff and family members can also affect patients' behavior and awareness. This study focused on the continuous nursing of patients after surgery through online guidance to ensure that patients adhere to scientific voice rehabilitation training for an extended period, which can effectively promote the early recovery of their voices.

Currently, there are various approaches to voice rehabilitation training for patients after vocal cord polyp surgery, both in China and abroad (19). Although each approach has demonstrated positive results for rehabilitation, they also have unique strengths and limitations. In clinical practice, interventions should fully consider individual patient differences, disease severity, and voice training mastery. To address these challenges, we developed an individualized voice rehabilitation training plan based on the IMB nursing intervention model. Our approach effectively improves wound healing and promotes the recovery of vocal cord function while promoting practices that positively affect the voice and enhancing postoperative quality of life. These results are consistent with the study by Lin et al. (20).

The present study has several limitations. Due to human, material, and other objective reasons, only hospital patients were selected to participate in the study. In addition, there was a lack of multicentre data support, and the sample size was small. Furthermore, the follow-ups with patients occurred shortly after polyp surgery, and the participants' long-term and continuous follow-up observations were not performed. Therefore, the conclusions of this study need further support in the form of multicentre, randomized controlled trials with long-term follow-up and large samples.

## 6. Conclusion

Nursing intervention based on the IMB model after vocal cord polypectomy can enhance patients' self-care ability, reduce the severity of speech disorders, and promote the recovery of vocal cords, indicating that this intervention is worthy of clinical promotion.

## Acknowledgments

None.

## Footnotes

**Conflicts of Interest:** The author had no personal, financial, commercial, or academic conflicts of interest separately.

**Ethics approval and consent to participate:** This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of Wuhu Second People's Hospital. Written informed consent was obtained from all participants in this study.

**Consent for publication:** Not applicable.

**Availability of data and materials:** All data generated or analyzed during this study are included in this published article.

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