

# Application of the ACE-Star Evidence-Based Nursing Model Combined with Voice Training in Voice Rehabilitation after Vocal Cord Polyp Surgery

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## Abstract

**Objective:** Vocal cord polyps are common voice disorders, and surgical resection is the main treatment method. However, postoperative voice rehabilitation is crucial to the quality of life of patients. This study analyzed the application effect of the ACE-Star evidence-based nursing model combined with voice training in voice rehabilitation after vocal cord polyp surgery. **Methods:** A total of 94 patients who underwent vocal cord polyp surgery in our hospital from January 2024 to December 2024 were selected and divided into a control group and an observation group according to the random number table method, with 47 patients in each group. The control group received routine nursing care, and the observation group received the ACE-Star evidence-based nursing model + voice training on the basis of the control group. The Voice Handicap Index (VHI) scores, Grade, Roughness, Breathiness, Asthenia, Strain (GRBAS) scores, complication and disease recurrence rates, and nursing satisfaction were compared between the two groups. **Results:** Before nursing, there was no statistically significant difference in VHI and GRBAS scores between the groups. After nursing, the scores of all dimensions of VHI and GRBAS in the observation group were lower than those in the control group. The complication incidence and disease recurrence rate in the observation group were lower than those in the control group. The total nursing satisfaction in the observation group was higher than that in the control group. **Conclusion:** The ACE-Star evidence-based nursing model combined with voice training has a high effect in voice rehabilitation after vocal cord polyp surgery. It can effectively improve the voice function and hoarseness degree of patients, prevent or reduce the complication and disease recurrence rates, and further improve satisfaction.

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## Keywords

ACE-Star Evidence-Based Nursing Model, Voice Training, Vocal Cord Polyps, Voice

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## 1. Introduction

Vocal cord polyps are relatively common chronic laryngeal diseases. Most vocal cord polyps are characterized by edema, fibrosis, or vascular hyperplasia. There is no significant change in appearance, and they are mostly unilateral, pedunculated or broad-based masses. Vocal cord polyps are mostly caused by long-term abnormal vocalization, usually accompanied by symptoms such as hoarseness and vocal fatigue, which have a great impact on the voice. Currently, the main treatment method for vocal cord lesions is surgical resection of the lesions to restore the normal anatomical structure of the vocal cords. The traditional view is that appropriate voice rest after surgery can effectively promote the repair of oral mucosa and prevent the formation of vocal cord scars [1]. However, clinical studies show that the voice of some patients does not recover well after surgery. Or, due to factors such as continued over-use of the voice or exposure to irritants after surgery, the recurrence rate of polyps is relatively high [2]. Therefore, it is very necessary to provide effective nursing interventions after surgery. Conventional nursing gradually fails to meet the increasing clinical needs. Early professional voice training after surgery can improve the patient's vocalization habits, gradually restore the postoperative voice to a normal state, and achieve the purpose of preventing recurrence. However, the current voice training still lacks a standardized method and should be further improved [3]. As a new type of nursing method, ACE-Star evidence-based nursing plays an important role in problem-setting, evidence-seeking, transmission and evaluation, practice integration, and effect evaluation, and has now been widely used in clinical nursing [4]. Applying ACE-Star evidence-based nursing to voice rehabilitation after vocal cord polyp surgery is highly feasible. That is, through scientific methods and personalized rehabilitation programs, the patient's voice function and quality of life can be significantly improved. Based on this, this study specifically analyzed the application effect of the ACE-Star evidence-based nursing model combined with voice training in voice rehabilitation after vocal cord polyp surgery.

## 2. Materials and Methods

### 2.1. General Data

A total of 94 patients who underwent vocal cord polyp surgery in our hospital from January 2024 to December 2024 were selected and divided into a control group and an observation group according to the random number table method, with 47 patients in each group.

Control group: There were 26 males and 21 females, aged 24 - 65 years, with an

average age of  $(46.59 \pm 4.85)$  years; the disease duration was 1 - 5 years, with an average of  $(3.15 \pm 0.95)$  years.

Observation group: There were 25 males and 22 females, aged 26 - 64 years, with an average age of  $(46.45 \pm 4.77)$  years; the disease duration was 1 - 4 years, with an average of  $(3.07 \pm 0.89)$  years. There was no statistically significant difference in the data between the two groups. The study was approved by the Ethics Committee.

Inclusion criteria:

- 1) Aged 18 - 65 years old.
- 2) Diagnosed with unilateral vocal cord polyps through admission examination and received surgical treatment.
- 3) Complete clinical data, etc.
- 4) The patient was informed about this study and voluntarily signed the agreement.

Exclusion criteria:

- 1) Complicated with severe organ damage such as liver and kidney and malignant diseases.
- 2) History of previous laryngeal or vocal cord surgery.
- 3) Contraindications to surgery or severe drug allergies.
- 4) Associated with other vocal cord diseases, such as vocal cord nodules.
- 5) Abnormal cognitive function, mental diseases, communication disorders.
- 6) History of alcohol or drug dependence.
- 7) Poor compliance.

## 2.2. Methods

The control group received routine nursing care, that is, explaining relevant precautions to patients, patiently answering questions from patients and their families; keeping silent appropriately within 24 hours after surgery and advising patients to develop good living habits; strengthening the observation of the patient's condition and symptoms after surgery. If any abnormal situation occurred, the doctor was informed immediately, and the patient was treated specifically together with the doctor; strictly following the doctor's advice on medication; and advising patients to come to the hospital for regular re-examinations after discharge.

The observation group received the ACE-Star evidence-based nursing model + voice training on the basis of the above. The specific methods were as follows:

(1) Establish a professional nursing team: An ACE-Star evidence-based nursing team was established, led by the head nurse and composed of attending physicians, professional nurses, etc. The head nurse organized all members to learn ACE-Star knowledge and required all members to master it proficiently.

(2) Problem establishment: The rehabilitation after vocal cord polyp surgery is closely related to the quality of peri-operative nursing. By investigating previous cases of vocal cord polyps, factors affecting the patient's nursing cooperation degree, knowledge mastery degree, rehabilitation training effect, and the occurrence of

complications and recurrence were explored. For example, “1) Due to pain at the lesion site and postoperative rehabilitation, etc., patients have unstable emotions and cannot perform rehabilitation such as voice training well. How to improve this situation? 2) Due to the different educational levels of patients, some patients have a low understanding of the disease, thus reducing their self-care ability. How to improve this situation? 3) Due to rehabilitation plans such as voice training and pain, patients have fear and anxiety about rehabilitation, resulting in an unsatisfactory training effect for some patients. How to improve this situation? 4) Complications caused by poor diet, home self-management, etc. hinder the patient’s rehabilitation process, and if nurses cannot follow up in a timely manner, how to improve this situation?” etc. Subsequently, the evidence-based nursing content was determined according to the PICO model: P represents patients, I represents comprehensive peri-operative nursing, C represents routine peri-operative nursing, and O represents the result, that is, to promote the rehabilitation of the patient’s postoperative voice function and thus improve the quality of life.

(3) Evidence synthesis: According to the problems of this study, corresponding Chinese and English search keywords were designed: “vocal cord polyps”, “peri-operative period”, “voice function”, “voice training”, etc. The original literature was statistically analyzed and evaluated through websites such as CNKI and Wanfang Knowledge Service Platform. Finally, about 10 pieces of literature were retained.

(4) Translation and evaluation: According to the literature quality evaluation and evidence level assessment, and based on the patient’s needs and the clinical experience of nurses, the comprehensive postoperative nursing plan was revised and implemented, with the head nurse monitoring the whole process.

(5) Specific implementation:

1) Voice training: Started in the second week after surgery.

a) Relaxation training: Sit, relax the neck, shoulders, and back, and massage appropriately to relax the laryngeal and neck muscles; listen to soothing music and consciously control the muscles. Initially, it was carried out for 5 minutes each time, 3 - 5 times a day; if the tolerance effect was good, it could be increased to 15 minutes each time, 3 - 5 times a day after 3 days.

b) Respiratory training: Ensure that the whole body muscles are relaxed. When breathing, inhale through the nose first and then exhale slowly and evenly through the mouth. Initially, it was carried out for 5 minutes. If the tolerance effect was good, it could be increased to 15 minutes each time, 3 - 5 times a day after 3 days.

c) Phonation training: Bubble phonation method: Relax the oral and laryngeal muscles, then inhale air through the nose. During the training process, ensure that a weak and stable air flow impacts the vocal cords to produce a sound like a bubble bursting; Sigh phonation method: Guide the patient to feel the sigh sound when yawning and let them experience the feeling of air entering the larynx through the mouth; Practice phonation method: Guide the patient to pronounce in a low voice, such as “a”, “o”, “e”, etc., and each syllable is maintained for 3 seconds (a, b, and c

are the contents of the **Appendix**). Each of the above three phonation training methods was carried out for 5 minutes each time, 3 - 5 times a day. In-hospital voice training was guided and trained by professional nursing staff, and out-of-hospital follow-up and supervision were carried out through WeChat and other means.

2) Psychological intervention: Guide patients with vocal cord polyps to comprehensively cultivate their interests, give appropriate comfort and encouragement, and teach patients psychological self-adjustment methods. Develop personalized and scientific rehabilitation plans according to the actual situation of patients. Explain successful cases to patients so that they can face their conditions with a positive attitude.

3) Life intervention: Remind patients to pay attention to personal hygiene, strengthen physical exercise, monitor their heart rate, blood pressure, etc., strengthen oral hygiene care, and guide them to rinse their mouths with normal saline. For patients with alcohol and tobacco addiction, inform them of the significance of quitting smoking and drinking, and strengthen the monitoring and intervention of quitting smoking and drinking. It is recommended that patients avoid eating irritating, dry and hard foods after surgery, strengthen exercise, and at the same time pay attention to getting more rest. If there is throat bleeding, it needs to be treated in a timely manner. After discharge, patients should try to avoid going to public places with a large flow of people and prevent coughing and colds.

(6) Effect evaluation and quality control: The head nurse supervised the nursing quality throughout the process and adjusted measures in a timely manner according to the problems that occurred. Both groups were intervened for 3 months, and the patients were followed up for 1 year after surgery.

### 2.3. Observation Indicators

(1) Compare the Voice Handicap Index (VHI) scores of the two groups: The scale includes three aspects: physical, emotional, and functional. Each aspect contains 10 items, and each item is scored from 0 to 4 points. The higher the score, the more severe the voice disorder. The evaluation was carried out before surgery and 3 months after surgery.

(2) Compare the Grade, Roughness, Breathiness, Asthenia, Strain (GRBAS) scores of the two groups: The scale includes three items: total hoarseness, roughness, and breathiness. Each item is scored from 0 to 3 points. The higher the score, the more severe the hoarseness. The evaluation was carried out before surgery and 3 months after surgery.

(3) Compare the complication and disease recurrence rates of the two groups: Complications include anterior commissure adhesion, glottic insufficiency, vocal cord scar healing, cricoarytenoid joint dislocation, etc. The recurrence criteria are: persistent hoarseness with progressive aggravation; uncomfortable sticky phlegm in the throat, often making throat-clearing movements, or occasional cough with a small amount of clear and thin phlegm; and inspection shows gray-white edematous neoplasms on the edge of the vocal cords.

(4) Compare the nursing satisfaction of the two groups: Follow-up was conducted 3 months after surgery. A self-made hospital questionnaire was used for the survey, with a total score of 100 points. There are three dimensions: dissatisfied (<60 points), relatively satisfied (60 - 80 points), and satisfied (>80 points). The total satisfaction rate = (number of relatively satisfied + number of satisfied)/number of cases in each group  $\times$  100%.

## 2.4. Statistical Analysis

SPSS 25.0 software was used as the processing system for this study. Mean  $\pm$  standard deviation and percentage [n, (%)] are the simplified representations of measurement data (meeting the normal distribution) and count data respectively. The *t*-value and *P*-value are the calibration test methods for the above two types of data. A *P*-value < 0.05 indicates that the difference is statistically significant.

## 3. Results

### 3.1. Comparison of VHI between the Two Groups

Before nursing, there was no statistically significant difference in VHI scores between the groups. After nursing, the scores of each dimension in the observation group were lower than those in the control group, and the scores of both groups were lower than those before nursing. See **Table 1** for details.

**Table 1.** Comparison of VHI between the two groups (points,  $\bar{x} \pm s$ ).

Group	No.	Physiology		Emotion		Functionality	
		PRN	PIO	PRN	PIO	PRN	PIO
OBG	47	22.46 $\pm$ 3.15	10.26 $\pm$ 1.75*	19.76 $\pm$ 2.95	8.95 $\pm$ 1.64*	20.12 $\pm$ 2.87	10.56 $\pm$ 2.77*
CG	47	22.58 $\pm$ 3.07	14.96 $\pm$ 1.96*	19.49 $\pm$ 3.04	12.45 $\pm$ 1.78*	20.20 $\pm$ 2.76	14.91 $\pm$ 3.03*
<i>t</i>	-	0.187	12.263	0.437	9.914	0.138	7.264
<i>P</i>	-	0.852	0.001	0.663	0.001	0.891	0.001

Note: Compared with the situation before nursing in this group, \**P* < 0.05.

### 3.2. Comparison of GRBAS between the Two Groups

Before nursing, there was no statistically significant difference in GRBAS scores between the groups. After nursing, the scores of each dimension in the observation group were lower than those in the control group, and the scores of both groups were lower compared with those before nursing. See **Table 2** for details.

**Table 2.** Comparison of GRBAS between the two groups (points,  $\bar{x} \pm s$ ).

Group	No.	Total hoarseness		Roughness		Breathiness	
		PRN	PIO	PRN	PIO	PRN	PIO
OBG	47	1.46 $\pm$ 0.43	0.34 $\pm$ 0.15*	1.32 $\pm$ 0.26	0.28 $\pm$ 0.07*	1.56 $\pm$ 0.58	0.30 $\pm$ 0.09*
CG	47	1.36 $\pm$ 0.50	0.89 $\pm$ 0.28*	1.39 $\pm$ 0.35	0.71 $\pm$ 0.23*	1.58 $\pm$ 0.47	0.81 $\pm$ 0.22*
<i>t</i>	-	1.040	11.870	1.101	12.262	0.184	14.709
<i>P</i>	-	0.301	0.001	0.274	0.001	0.855	0.001

Note: Compared with the situation before nursing in this group, \**P* < 0.05.

### 3.3. Comparison of the Incidence of Complications and Disease Recurrence Rate between the Two Groups

The incidence of complications and disease recurrence rate in the observation group were lower than those in the control group ( $P < 0.05$ ). See **Table 3** for details.

**Table 3.** Comparison of the incidence of complications and disease recurrence rate between the two groups [n, (%)].

Group	No.	Anterior commissure adhesion	Incomplete glottal closure	Vocal cord scar healing	Cricoarytenoid joint dislocation	Total incidence of complications	Disease recurrence rate
OBG	47	2 (4.26)	1 (2.13)	0 (0)	0 (0)	3 (6.38)	0 (0)
CG	47	4 (8.51)	3 (6.38)	2 (4.26)	1 (2.13)	10 (21.28)	4 (8.51)
$\chi^2$	-	-	-	-	-	4.374	4.178
$P$	-	-	-	-	-	0.036	0.041

### 3.4. Comparison of Nursing Satisfaction between the Two Groups

The overall satisfaction rate of the observation group was higher than that of the control group ( $P < 0.05$ ). See **Table 4** for details.

**Table 4.** Comparison of nursing satisfaction between the two groups [n, (%)].

Group	No.	Satisfied	Somewhat satisfied	Somewhat dissatisfied	Overall satisfaction
OBG	47	27 (57.45)	19 (40.43)	1 (2.13)	46 (97.87)
CG	47	14 (29.79)	26 (55.32)	7 (14.89)	40 (85.11)
$\chi^2$	-	-	-	-	4.919
$P$	-	-	-	-	0.027

## 4. Discussion

Vocal cord polyps are a common laryngeal disease. They are mostly caused by excessive or improper use of the voice, resulting in mechanical stress. They usually occur on the surface of the vocal cords and can lead to phonation dysfunction, seriously affecting people's normal lives. In current clinical practice, vocal cord polyps are mainly treated surgically with drug adjuvant therapy. However, there is a high recurrence rate after surgery, and some patients have poor rehabilitation outcomes. Providing scientific nursing interventions is of great significance for improving the prognosis.

The results of this study show that: after nursing, the scores of each dimension of VHI and GRBAS in the observation group were lower than those in the control group, indicating that the ACE-Star evidence-based nursing model combined with voice training can effectively improve the patient's voice function and hoarseness degree. The reasons are as follows: In voice training, methods such as relaxation training and respiratory training can relieve the patient's nerve and muscle tension, keeping their body and mind in a balanced state. This has certain effects on the relaxation of vocal cord muscles and the expansion of the airway, laying a solid

foundation for subsequent phonation training [5]. Phonation training can start from aspects such as the bubble phonation method, sigh phonation method, and practice phonation method, enabling patients to learn the correct phonation methods. Besides being highly targeted, easy to operate, and feasible to carry out at home, it can also promote vocal cord vibration, assist patients in training their respiratory muscles and vocal cord muscles, which is conducive to the normal activities and functional recovery of the vocal cords [6]. The ACE-Star evidence-based nursing model is a concept of providing nursing services to patients based on the most advanced scientific evidence. By categorizing and structuring the problems existing in the current nursing model, retrieving the raised questions, collecting empirical data of solvable problems in the field of nursing research, and after testing for practicality and effectiveness, combining it with clinical nursing experience, it can improve the existing nursing measures and further enhance the quality and actual effect of nursing [7]. Combining it with voice training helps ensure the standardization of voice training and, to a certain extent, guarantees the safety of various measures. The study also shows that: the complication incidence and disease recurrence rate in the observation group were lower than those in the control group, and the total nursing satisfaction was higher than that in the control group, indicating that the ACE-Star evidence-based nursing model combined with voice training can prevent or reduce the complication and disease recurrence rates and improve satisfaction. The results of this study are similar to those of Zhang Manli [8] *et al.*, who applied the ACE-Star evidence-based nursing to patients undergoing thyroid surgery, reducing the complication incidence and increasing patient satisfaction. The reasons are as follows: In the clinical nursing activities of patients, the ACE-Star evidence-based nursing applies a programmed ideological system to explore, identify, and solve the existing problems in nursing, thereby enhancing the work enthusiasm of nursing staff and improving the nursing effect and work efficiency. Conducting voice training under this model makes the training more human-oriented and standardized. For example, during phonation, the coordinated movements of the vocal cord muscles gradually improve the coordination of the vocal cords, strengthen the control and stability of the vocal cords. At the same time, when patients learn the correct voice training, it can increase the mobility of the vocal cords, thus reducing excessive friction and damage to the vocal cords and further preventing the re-formation of polyps [9] [10]. In addition, under the guidance of the “patient-centered” nursing concept, the ACE-Star evidence-based nursing continuously improves the nursing plan, providing patients with more comprehensive and standardized nursing services, which helps improve patient comfort and satisfaction [11].

## 5. Conclusion

The ACE-Star evidence-based nursing model combined with voice training has a high effect in voice rehabilitation after vocal cord polyp surgery. It can effectively

improve the patient's voice function and hoarseness degree, prevent or reduce the complication and disease recurrence rates, and further improve satisfaction, thus having a high promotion value. However, this study still has some limitations. For example, the research time is short and the sample size is small, which may lead to a certain degree of bias in the results. In the future, the sample size will be expanded, and a long-term central study will be launched to further confirm the research conclusions.

## Conflicts of Interest

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

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## Appendix

Voice Training Statistical Table

Training methods	Specific methods	Training duration and frequency
Relaxation training	Sit in a seated position, relax the neck, shoulders, and back, and perform appropriate massage to relax the laryngeal and neck muscles. Listen to soothing music and consciously control the muscles.	Initially, it is carried out for 5 minutes each time, 3 - 5 times a day. If the tolerance is good, it can be increased to 15 minutes each time, 3 - 5 times a day after 3 days.
Respiratory training	Ensure that the muscles of the whole body are relaxed. When breathing, inhale through the nose first, and then exhale slowly and evenly through the mouth.	Initially, conduct the training for 5 minutes each time, 3 to 5 times a day. If the tolerance is good, it can be increased to 15 minutes each time, 3 to 5 times a day after 3 days.
Phonation training	<p>1) Bubble phonation method: Relax the muscles in the mouth and larynx, then inhale air through the nose. During the training, make sure to use a weak and steady air flow to impact the vocal cords, producing a sound similar to that of bubbles bursting.</p> <p>2) Sigh phonation method: Guide patients to feel the sigh sound when yawning, enabling them to experience the sensation of air entering the larynx through the mouth.</p> <p>3) Practice phonation method: Guide patients to pronounce softly, such as “a”, “o”, “e”, etc., and hold each syllable for 3 seconds.</p>	5 minutes per session, 3 - 5 times a day