

Application of an MMHEM-Based Postoperative Transitional Care Program in Patients After Laryngeal Cancer Surgery

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Abstract: *Objective:* To observe the application effect of a postoperative transitional care program based on the Multisensory Multilevel Health Education Model (MMHEM) in patients after laryngeal cancer surgery. *Methods:* A total of 110 patients who underwent laryngeal cancer surgery in our hospital between January 2023 and December 2025 were selected. They were randomly divided into a control group and an observation group by the envelope method, with 55 patients in each group. The control group received a conventional nursing program, while the observation group received an MMHEM-based postoperative transitional care program in addition to the conventional program. Self-care ability (Exercise of Self-Care Agency Scale), swallowing function (M.D. Anderson Dysphagia Inventory, MDADI), and psychological status (Self-Rating Depression Scale and Self-Rating Anxiety Scale) were compared between the two groups. The incidence of home-based adverse events was followed up for 2 months. *Results:* At baseline, there were no statistically significant differences in the indicators between the two groups. After intervention, the total score and all dimension scores of the Exercise of Self-Care Agency Scale in the observation group were higher than those in the control group ($P < 0.05$). The MDADI score in the observation group was higher than that in the control group, while the Self-Rating Depression Scale and Self-Rating Anxiety Scale scores were lower than those in the control group ($P < 0.05$). The total incidence of home-based adverse events in the observation group was lower than that in the control group ($P < 0.05$). *Conclusion:* The MMHEM-based postoperative transitional care program can effectively improve self-care ability and quality of life, relieve negative emotions, and reduce the incidence of home-based adverse events in patients after laryngeal cancer surgery, with positive significance for promoting postoperative rehabilitation.

Keywords: Postoperative laryngeal cancer; Multisensory Multilevel Health Education Model; Transitional care; Postoperative rehabilitation

Online publication: October 20, 2026

1. Introduction

Laryngeal cancer is a relatively common malignant tumor in otorhinolaryngology–head and neck surgery, and surgical resection remains one of the preferred treatments for laryngeal cancer ^[1]. The postoperative transitional period after laryngeal cancer surgery refers to the stage from hospitalization to home-based rehabilitation. This is a period with a high incidence of complications and profound psychological changes. However, conventional care mostly focuses on airway management and incision care during hospitalization, with insufficient continuity of care after discharge. After discharge, lacking professional guidance, patients are inadequately prepared to cope with delayed complications such as granuloma formation and swallowing aspiration ^[2]. In addition, negative emotions such as anxiety and depression are highly prevalent in patients after laryngeal cancer surgery, mainly related to social avoidance caused by the inability to communicate verbally after discharge ^[3]. Conventional care lacks individualized psychological intervention mechanisms and is difficult to help patients rebuild social confidence. Moreover, traditional health education mostly uses oral instruction or written manuals; however, because patients with laryngeal cancer are voiceless after surgery, their communication channels are already limited, and the absorption rate of one-way written education is extremely low. In response to the limitations of conventional care, the Multisensory Multilevel Health Education Model (MMHEM) emphasizes breaking through the limitations of traditional single-text or oral education. It integrates art, culture, and science in the development of health education resources. Through coordinated stimulation of multiple sensory channels, it enhances audience participation, acceptance, and information retention, and is suitable for populations with low health literacy or limited resources. This provides a new approach for improving health education and transitional management in patients after laryngeal cancer surgery ^[4-5]. At present, systematic evidence for the application of MMHEM in postoperative transitional care after laryngeal cancer surgery is still lacking. Therefore, this study aimed to construct an MMHEM-based postoperative transitional care program and apply it to patients after laryngeal cancer surgery, exploring its impact on postoperative rehabilitation.

2. Materials and methods

2.1. General information

A total of 110 patients who underwent laryngeal cancer surgery in our hospital between January 2023 and December 2025 were selected. They were randomly divided into a control group and an observation group by the envelope method, with 55 patients in each group. In the control group, there were 45 men and 10 women; age range 45–76 years, mean (58.97 ± 6.44) years; surgical procedures: total laryngectomy in 30 cases and subtotal laryngectomy in 25 cases; education level: junior middle school or below in 17 cases, senior high school in 27 cases, and college or above in 11 cases. In the observation group, there were 46 men and 9 women; age range 46–73 years, mean (57.91 ± 5.51) years; surgical procedures: total laryngectomy in 32 cases and subtotal laryngectomy in 23 cases; education level: junior middle school or below in 18 cases, senior high school in 25 cases, and college or above in 12 cases. Comparison of basic data between the two groups showed $P > 0.05$. Patients and their family members were informed of this study and signed informed consent. This study was approved by the hospital ethics committee.

2.1.1. Inclusion criteria

(1) Patients met the surgical indications for laryngeal cancer in the Expert Consensus on Surgical and

Comprehensive Treatment of Laryngeal Cancer ^[6] and were pathologically diagnosed with laryngeal cancer;

- (2) Patients were conscious after surgery and able to cooperate with questionnaire surveys and follow-up;
- (3) Expected survival ≥ 6 months.

2.1.2. Exclusion criteria

- (1) Patients with other malignant tumors or distant metastasis;
- (2) Patients with severe cardiac, hepatic, or renal dysfunction or coagulation disorders;
- (3) Patients with a history of mental illness or cognitive impairment who could not cooperate with the study;
- (4) Patients with severe postoperative complications requiring prolonged hospitalization.

2.2. Methods

The control group received conventional postoperative nursing for laryngeal cancer: airway humidification, incision and cannula maintenance, oral care, pain and nutrition management, and swallowing and voice training; at discharge, oral and written guidance was provided, patients and family members were taught cannula insertion and removal, disinfection, cannula instillation, and simple disinfection and isolation techniques, and follow-up arrangements were explained; after discharge, the primary nurse conducted telephone follow-up according to departmental regulations, answered questions, and reminded patients to return for review.

The observation group received an MMHEM-based transitional care program in addition to conventional care:

- (1) Visual intervention: illustrated health readers were prepared for patients, covering stoma cleaning and cannula management, dietary matching, and functional exercise; concise operation reminder cards were posted at the bedside; a rehabilitation progress display area was arranged in the corridor; postoperative recovery videos were shown continuously; and centralized learning was organized using projected courseware and animations; discharge materials included a checkable daily rehabilitation list.
- (2) Auditory intervention: a designated primary nurse provided continuous education from before surgery to after surgery; during ward rounds, audio devices were used to remind patients about humidification, drinking water, and other key points; relatives were asked to read positive messages aloud every day; patients were allowed and encouraged to record their rehabilitation experiences; an audio corner was set up to play rehabilitation experiences of fellow patients; after discharge, voice messages were used for remote tracking and guidance.
- (3) Tactile intervention: the swallowing process was demonstrated at the bedside, and patients were asked to imitate it in front of a mirror; neck and shoulder functional exercises were arranged according to tolerance, with daily activities completed step by step; patients were involved in the stoma care process; during inspiratory training, patients held an air bag to increase proprioceptive input; foods requiring chewing were provided for practice; touchable three-dimensional picture books were used to aid cognition; auxiliary tools such as swallowing training sticks and oral motor devices were distributed to enhance operational participation.
- (4) Patients were guided to inhale peppermint solution or neroli essential oil to relieve discomfort and activate the olfactory pathway; bland and easily accepted foods were provided; patients were encouraged

to choose previously favored tastes to evoke taste memory and eating pleasure; scent patches or olfactory training cards were used for olfactory stimulation; foods with different temperatures and textures were used to stimulate the tongue surface and enhance taste discrimination.

- (5) Psychological status screening was completed simultaneously when the patient sat up for the first time after surgery, providing a reference for subsequent psychological support; peer mutual aid exchanges were carried out; a mood expression box was placed for patients to write or draw to vent emotions; the nurse in charge left an encouraging sentence on the bedside card every day; patients were guided to make wish cards and write down rehabilitation goals and feelings; diaphragmatic breathing and progressive muscle relaxation were trained; and targeted psychological counseling plans were designed jointly with the psychology department for high-risk patients.
- (6) Continued follow-up: at discharge, a home care kit was distributed, containing illustrated materials, video courses, and rehabilitation equipment; a patient peer group chat was established, and texts, images, audio, and short videos were sent according to plan; weekly video follow-ups were arranged, with relatives invited to participate; a task checklist was developed, and personalized reminders were pushed according to recovery progress; full-time nurses provided individualized coaching; regular online consultation and mini rehabilitation classes were carried out to enhance patients' sense of active participation.

2.3. Outcome measures

- (1) Self-care ability: assessed using the Exercise of Self-Care Agency Scale, which has 4 dimensions and 43 items. Each item is scored on a 5-point Likert scale, with a total score of 0–172; higher scores indicate stronger self-care ability.
- (2) Swallowing function: assessed using the M.D. Anderson Dysphagia Inventory (MDADI), which contains 30 items; higher scores indicate better swallowing function.
- (3) Psychological status: assessed using the Self-Rating Depression Scale and Self-Rating Anxiety Scale; higher scores indicate more severe anxiety and depression.
- (4) Incidence of home-based adverse events: patients were followed up for 2 months, and the occurrence of home-based adverse events was recorded in both groups, including skin infection at the tracheostomy site, airway obstruction, unplanned extubation, and pulmonary infection.

2.4. Statistical methods

SPSS 25.0 software was used. Normally distributed continuous data were expressed as mean $\pm$ standard deviation (SD), and independent-samples *t*-tests were used for between-group comparisons. Categorical data were expressed as relative numbers, and the χ^2 test was used for between-group comparisons. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of self-care ability between the two groups

The Exercise of Self-Care Agency Scale score in the observation group was higher than that in the control group ($P < 0.05$). See **Table 1**.

Table 1. Comparison of self-care ability between the two groups (mean $\pm$ SD, scores)

Group	n	Before intervention	After intervention
Observation group	55	91.85 $\pm$ 8.67	125.60 $\pm$ 10.46
Control group	55	93.71 $\pm$ 8.04	114.09 $\pm$ 12.20
<i>t</i>		1.163	-5.310
<i>P</i>		0.247	<0.001

3.2. Comparison of swallowing function and psychological status between the two groups

The MDADI score in the observation group was higher than that in the control group, while the Self-Rating Depression Scale and Self-Rating Anxiety Scale scores were lower than those in the control group ($P < 0.05$). See **Table 2**.

Table 2. Comparison of swallowing function and psychological status between the two groups (mean $\pm$ SD, scores)

Group	n	MDADI		SDS		SAS	
		Before	After	Before	After	Before	After
Observation group	55	47.67 $\pm$ 5.30	71.47 $\pm$ 8.93	49.36 $\pm$ 6.00	42.53 $\pm$ 3.66	51.11 $\pm$ 6.60	41.07 $\pm$ 4.84
Control group	55	47.05 $\pm$ 4.90	62.53 $\pm$ 6.01	50.15 $\pm$ 5.68	44.73 $\pm$ 4.44	52.02 $\pm$ 5.12	45.87 $\pm$ 3.56
<i>t</i>		-0.636	-6.161	0.702	2.838	0.807	5.927
<i>P</i>		0.526	<0.001	0.484	<0.05	0.421	<0.001

3.3. Comparison of the incidence of home-based adverse events between the two groups

No patients were lost to follow-up during the follow-up period of this study. The total incidence of home-based adverse events in the observation group was lower than that in the control group ($P < 0.05$). See **Table 3**.

Table 3. Comparison of the incidence of home-based adverse events between the two groups [n (%)]

Group	n	Skin infection at tracheostomy site	Airway obstruction	Unplanned extubation	Pulmonary infection	Total incidence
Observation group	55	2 (3.63)	1 (1.82)	1 (1.82)	2 (3.63)	6 (10.9)
Control group	55	4 (7.27)	2 (3.63)	2 (3.63)	3 (5.55)	11 (20.0)
χ^2						4.681
<i>P</i>						0.031

4. Discussion

The anatomical changes caused by laryngeal cancer surgery significantly increase the difficulty of postoperative nursing management. On the one hand, after tracheotomy, the humidification function of the upper respiratory tract is lost, leading to increased risks of thick sputum, sputum crust formation, and pulmonary infection. On the other hand, the loss or alteration of vocal function seriously affects patients' social function, leading to decreased self-identity and causing severe anxiety, depression, and social isolation. Negative emotions not only reduce rehabilitation adherence but are also key independent factors affecting quality of life [7-8]. However, conventional care mostly focuses on acute-phase management in the hospital and

lacks systematic and multidimensional integration, making it difficult to address these complex difficulties. MMHEM uses multimedia audiovisual technology to create an immersive learning experience and activate multiple sensory channels. Compared with traditional single-text or oral education, it is more likely to attract attention, consolidate memory, and promote skill acquisition. Moreover, the intervention design targets not only individuals but also extends to interpersonal relationships, thereby forming an all-round support network^[9]. Introducing MMHEM into clinical nursing management, especially for patients with poor adherence, long disease duration, and complex self-management needs, has good clinical application prospects.

The results of this study showed that the total score and all dimension scores of the Exercise of Self-Care Agency Scale in the observation group were higher than those in the control group ($P < 0.05$). Patients after laryngeal cancer surgery face voicelessness and have difficulty learning through verbal feedback, while negative emotions such as anxiety further reduce their willingness to learn and the efficiency of information reception. MMHEM, through multisensory input such as video demonstration (vision), voice guidance or peer demonstration recordings (hearing), and swallowing demonstration (touch), bypasses language communication barriers and directly establishes visual–motor mapping. The results of this study also showed that the quality of life in the observation group was higher than that in the control group. The reason may be that MMHEM uses visual, auditory, tactile, and other sensory inputs, and the integration of consistent multisensory information can improve individual performance, learning, decision-making, and memory, thereby allowing patients to re-establish a sense of control in this process. In addition, by providing rehabilitation experiences of fellow patients, MMHEM offers a “survivor” identity through peer modeling, which helps promote the recovery of patients’ social function and social roles, thereby improving quality of life^[10]. In this study, the Self-Rating Depression Scale and Self-Rating Anxiety Scale scores in the observation group were lower than those in the control group ($P < 0.05$). Patients after laryngeal cancer surgery need to face expressive deprivation caused by voicelessness, leading to increased anxiety and depression. MMHEM uses a coordinated audiovisual–tactile multisensory system to construct alternative communication and relieve patients’ negative emotions. In addition, conventional psychological counseling is difficult to reach the deep fear of “cancer recurrence.” MMHEM introduces the experiences of rehabilitation peers and, through empathic identification and role modeling, reshapes patients’ cognitive appraisal of illness uncertainty and transforms negative emotions into adaptive coping. Furthermore, the total incidence of home-based adverse events in the observation group was lower than that in the control group. Through multisensory practical transformation, MMHEM converts abstract medical orders into intuitive perceptual–motor memory. At the same time, multisensory integration accelerates the process of skills from unfamiliarity to proficiency, directly reducing airway adverse events caused by operational errors. In addition, relying on digital platforms, MMHEM enables patients to receive continued guidance and real-time consultation outside the hospital through WeChat groups, thereby reducing the occurrence of home-based adverse events. However, this study still has the following limitations: as a single-center study, the sample size is limited, and extrapolation of the results should be done cautiously; secondly, the follow-up time of this study was only 2 months, and the impact of MMHEM on long-term rehabilitation outcomes remains unclear. Future multicenter, large-sample, long-term randomized controlled trials are needed to verify the clinical value of this program further.

5. Conclusion

In summary, the MMHEM-based postoperative transitional care program can improve self-care ability, quality of life, and psychological status in patients after laryngeal cancer surgery and reduce the incidence of

home-based adverse events, providing a reference for transitional management after laryngeal cancer surgery.

Funding

Fund Name: Wenzhou Basic Public Welfare Scientific Research Projects, “Development of a Personalized Predictive Model for the Risk of Pharyngeal Fistula in Patients After Laryngeal Cancer Surgery” (Project No.: Y20220852)

Disclosure statement

The authors declare no conflict of interest.

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