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Effectiveness of Surgical Risk Rehearsal Teaching in the Training of Junior Physicians in Head and Neck Surgery

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Abstract: *Objective:* To investigate the application effect of surgical risk rehearsal teaching in the training of junior physicians in head and neck surgery. *Methods:* A total of 42 junior physicians who rotated through the Department of Head and Neck Surgery at a hospital between April 2024 and May 2026 were selected as study subjects. They were divided into an observation group (21 physicians) and a control group (21 physicians) using a random number table method. The observation group received surgical risk rehearsal teaching in addition to traditional teaching, while the control group received traditional mentorship teaching. After training, the two groups were compared in terms of surgical risk knowledge examination scores, surgical risk identification and response ability assessment scores, clinical operation ability assessment scores, and teaching satisfaction. *Results*: There were no statistically significant differences in baseline data between the two groups ($P>0.05$). After training, the surgical risk knowledge examination scores and surgical risk identification and response ability scores in the observation group were higher than those in the control group (all $P<0.001$). The scores for preoperative assessment, intraoperative cooperation, postoperative management, and overall performance, as well as the total score, were higher in the observation group than in the control group (all $P<0.001$). The total teaching satisfaction rate in the observation group was higher than that in the control group ($P<0.05$). *Conclusion*: Surgical risk rehearsal teaching can effectively improve the risk awareness, risk identification and response ability, and clinical operation ability of junior physicians in head and neck surgery, and enhance teaching satisfaction. It is worthy of promotion and application in the training of head and neck surgeons.
Keywords: Surgical risk rehearsal; Head and neck surgery; Junior physicians; Physician training; Scenario simulation

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1. Introduction

Head and neck surgery involves anatomical structures such as the thyroid, larynx, cervical lymph nodes, and major cervical vessels, and is adjacent to important tissues including the recurrent laryngeal nerve,

vagus nerve, and carotid artery, resulting in relatively high surgical risk [1]. Thyroidectomy may damage the recurrent laryngeal nerve and parathyroid glands; cervical lymph node dissection carries the risk of major vessel rupture and bleeding; and laryngeal cancer surgery may be complicated by airway obstruction and postoperative hemorrhage. If these risks are not managed properly, they can cause severe or even irreversible harm to patients [2–3]. Junior physicians are important members of the head and neck surgery team, and their risk awareness and emergency response ability directly affect surgical safety. However, traditional physician training mainly relies on clinical preceptorship and postoperative review. Junior physicians lack opportunities to systematically identify risks, formulate contingency plans, and rehearse emergency management before real surgery, and they often respond inadequately to intraoperative emergencies. In addition, the number of head and neck surgical cases is limited, and operative opportunities are concentrated among senior physicians. As a result, the process by which junior physicians develop risk response ability through natural accumulation is often slow, and targeted teaching methods are urgently needed for intervention. Surgical risk rehearsal teaching is a simulation-based teaching method. Through systematic review of the risks of typical surgical procedures before operation, formulation of response protocols, and scenario simulation rehearsal of intraoperative emergencies, it helps physicians improve risk response ability in a safe and repeatable environment [4]. Simulation training has been widely used in fields such as laparoscopy and microsurgery and has been proven to shorten the learning curve, improve operational proficiency, and ensure patient safety [5]. This study selected 42 junior physicians in head and neck surgery and evaluated the application effect of surgical risk rehearsal teaching in head and neck surgery training through comparative teaching practice.

2. Materials and methods

2.1. General information

A total of 42 junior physicians who rotated through the Department of Head and Neck Surgery at a hospital between April 2024 and May 2026 were selected as study subjects. Inclusion criteria: (1) resident physicians or junior attending physicians; (2) no previous experience as the independent primary surgeon in major head and neck surgery; (3) voluntary participation in this study and signed informed consent. Exclusion criteria: (1) those who withdrew midway or could not complete all assessments; (2) those who missed more than 20% of the total course hours due to leave or other reasons; (3) those who had previously received systematic surgical risk simulation training. The 42 physicians were divided into an observation group (21 physicians) and a control group (21 physicians) using a random number table method.

2.2. Teaching methods

Both groups completed head and neck surgery rotation training under the same teaching team and according to the same training syllabus. The training period was 4 weeks, with 4 class hours per week. The control group received traditional mentorship teaching, mainly including morning rounds, intraoperative observation, and postoperative case discussions. Physicians participated in perioperative management under the guidance of supervising teachers and accumulated experience through clinical practice and postoperative debriefing. The observation group received surgical risk rehearsal teaching in addition to traditional teaching, specifically including: (1) Risk identification training: around typical procedures such as thyroidectomy, cervical lymph node dissection, and laryngeal cancer resection, the relevant anatomical adjacency and main

risks (such as recurrent laryngeal nerve injury, hypoparathyroidism, intraoperative hemorrhage, and airway obstruction) were systematically reviewed, and a standardized risk checklist was established. (2) Protocol formulation: graded response protocols were formulated for each type of risk, clarifying management processes and emergency measures (such as hemostasis, nerve monitoring, and tracheotomy). (3) Scenario rehearsal: risk rehearsal drills were conducted through simulated surgical scenarios, simulating intraoperative emergencies such as hemorrhage, sudden drop in blood pressure, and laryngospasm. Physicians completed emergency decision-making in groups, and supervising teachers provided on-site comments. (4) Debriefing feedback: the management during the rehearsal was compared with real surgical cases in debriefing sessions to reinforce risk cognition.

2.3. Outcome measures

After training, both groups of physicians underwent unified assessment and evaluation. The main indicators included: (1) Surgical risk knowledge examination: a unified closed-book examination, with a full score of 100 points. (2) Surgical risk identification and response ability assessment: standardized cases were used for assessment, with scores in 4 dimensions: risk identification, risk assessment, protocol formulation, and emergency decision-making. Each dimension was scored 25 points, with a total score of 100 points. (3) Clinical operation ability assessment: scores were given in 4 dimensions: preoperative assessment, intraoperative cooperation, postoperative management, and overall performance. Each dimension was scored 25 points, with a total score of 100 points. (4) Teaching satisfaction: a self-designed questionnaire was used to evaluate teaching methods, teaching content, teaching effect, and teaching attitude. It was divided into 4 grades: very satisfied, satisfied, fair, and dissatisfied. The overall satisfaction rate = (number of very satisfied + satisfied cases) / total number × 100%. (5) Independent completion of risk rehearsal assessment: before the end of training, physicians were assessed on whether they could independently and standardly complete one risk rehearsal of a typical procedure under the supervision of a supervising teacher. The number of qualified cases was recorded, and the qualification rate was calculated.

2.4. Statistical methods

SPSS 27.0 statistical software was used for data analysis. Continuous data were expressed as ($\bar{x} \pm s$), with two decimal places retained, and independent-samples t-tests were used for between-group comparisons. Categorical data were expressed as n (%), and the χ^2 test was used for between-group comparisons. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of general information

There were no statistically significant differences in baseline data between the two groups ($P>0.05$), indicating comparability, as shown in **Table 1**.

Table 1. Comparison of general information between the two groups of junior physicians

Item	Observation group (n=21)	Control group (n=21)	t/χ^2	P
Male/female (cases)	10/11	11/10	0.095	0.758
Age (years)	29.46 ± 2.38	29.12 ± 2.57	0.457	0.650

Years of work (years)	3.28 ± 1.15	3.41 ± 1.22	0.381	0.705
Master's degree or above [n (%)]	14 (66.67)	13 (61.90)	0.104	0.747
Pre-enrollment risk knowledge assessment (scores)	71.35 ± 5.42	70.86 ± 5.69	0.286	0.777

3.2. Comparison of surgical risk knowledge examination and risk identification and response ability assessment scores

After training, the surgical risk knowledge examination scores and surgical risk identification and response ability scores in the observation group were higher than those in the control group (all $P<0.001$), as shown in **Table 2**.

Table 2. Comparison of surgical risk knowledge and risk identification and response ability assessment scores between the two groups of junior physicians (scores, $\bar{x} \pm s$)

Indicator	Observation group (n=21)	Control group (n=21)	t	P
Surgical risk knowledge examination	88.62 ± 3.46	79.34 ± 4.85	7.146	<0.001
Risk identification and response ability assessment	87.12 ± 4.36	72.77 ± 6.53	8.365	<0.001

3.3. Comparison of clinical operation ability assessment scores

The scores for preoperative assessment, intraoperative cooperation, postoperative management, and overall performance, as well as the total score, were higher in the observation group than in the control group (all $P<0.001$), as shown in **Table 3**.

Table 3. Comparison of clinical operation ability assessment scores between the two groups of junior physicians (scores, $\bar{x} \pm s$)

Dimension	Observation group (n=21)	Control group (n=21)	t	P
Preoperative assessment	22.05 ± 1.60	19.13 ± 2.20	4.917	<0.001
Intraoperative cooperation	21.74 ± 1.78	18.66 ± 2.34	4.799	<0.001
Postoperative management	21.58 ± 1.66	18.92 ± 2.15	4.505	<0.001
Overall performance	21.36 ± 1.84	18.48 ± 2.31	4.460	<0.001
Total score	86.73 ± 4.52	75.19 ± 6.28	6.828	<0.001

3.4. Comparison of teaching satisfaction

The total teaching satisfaction rate in the observation group was higher than that in the control group ($P<0.05$), as shown in **Table 4**.

Table 4. Comparison of teaching satisfaction between the two groups of junior physicians [n (%)]

Item	Observation group (n=21)	Control group (n=21)	χ^2	P
Very satisfied	13 (61.90)	6 (28.57)	—	—
Satisfied	8 (38.10)	9 (42.86)	—	—
Fair	0 (0)	5 (23.81)	—	—
Dissatisfied	0 (0)	1 (4.76)	—	—
Total satisfaction rate	21 (100.00)	15 (71.43)	7.000	0.008

4. Discussion

The results of this study showed that the observation group receiving surgical risk rehearsal teaching had significantly higher surgical risk knowledge examination scores and higher scores in all dimensions and the total score of risk identification and response ability than the control group receiving traditional teaching. The observation group also had significantly better scores in all dimensions and the total score of clinical operation ability, as well as higher teaching satisfaction. This indicates that surgical risk rehearsal teaching can improve the comprehensive abilities of junior physicians in head and neck surgery at multiple levels, including knowledge mastery, risk response, and clinical operation, and is a practical and effective teaching method.

The core value of surgical risk rehearsal teaching lies in moving the cultivation of risk awareness to the preoperative stage [6]. By systematically reviewing the anatomical adjacency and main risks of typical procedures such as thyroidectomy, cervical lymph node dissection, and laryngeal cancer resection, and by formulating standardized risk checklists and graded response protocols, it helps junior physicians establish a systematic framework of risk cognition. This systematic knowledge construction is more efficient than fragmented clinical accumulation, enabling physicians to proactively identify potential risks and be well prepared when facing specific operations. Simulation training has been shown in surgical resident training to shorten the learning curve and improve operational stability. In this study, the improvements in surgical risk knowledge examination and risk identification ability scores in the observation group further confirm the role of rehearsal teaching in risk cognition training [7].

Scenario rehearsal is an important component of surgical risk rehearsal teaching. By rehearsing intraoperative emergencies such as hemorrhage, sudden drop in blood pressure, and laryngospasm in simulated surgical scenarios, physicians can repeatedly practice emergency decision-making in a risk-free environment and gradually form stable and standardized response processes. This experiential learning not only exercises clinical judgment and emergency response ability but also enhances physicians' psychological stability when facing real emergencies [8]. Previous studies have shown that scenario simulation teaching can improve residents' operational skills and comprehensive clinical abilities and improve trainee satisfaction [9]. In this study, the emergency decision-making dimension score in the observation group was significantly higher than that in the control group, indicating that scenario rehearsal effectively improved physicians' emergency management level. The improvement in clinical operation ability through surgical risk rehearsal teaching should also not be overlooked. Enhanced risk identification and protocol formulation abilities enable physicians to conduct more comprehensive and meticulous preoperative assessment, anticipate and proactively avoid risks during intraoperative cooperation, and promptly identify and manage complications during postoperative management, thereby driving overall improvement in clinical operation. In this study, the observation group scored better than the control group in preoperative assessment, intraoperative cooperation, postoperative management, and overall performance, suggesting that risk rehearsal teaching achieved transfer from risk cognition to clinical practice [10]. The teaching satisfaction evaluation results showed that physicians in the observation group had higher recognition of this interactive, participatory, and clinically relevant teaching method, which is conducive to stimulating learning enthusiasm and active reflection.

This study still has certain limitations. First, the sample size was relatively small, and it was a single-center study, so the external validity of the results needs to be verified by multicenter, large-sample studies.

Second, the assessment of risk identification and response ability and clinical operation ability involved some subjectivity, and the objectivity of the evaluation criteria needs to be improved. Third, the observation period was relatively short, and the long-term maintenance of physicians' risk awareness and emergency ability requires long-term follow-up. From the perspective of teaching practice, surgical risk rehearsal teaching can be organically combined with other teaching methods, such as case-based learning, simulated virtual technology, and structured assessment and evaluation, to build a hierarchical and progressive training system covering the full process of preoperative assessment, intraoperative management, and postoperative follow-up, further improving the standardization and homogeneity of training. In the future, on the basis of expanding the sample, more objective structured assessment tools can be introduced, and the application of surgical risk rehearsal teaching at different training stages and for different procedures can be explored to further optimize the training model for head and neck surgeons.

Surgical risk rehearsal teaching can effectively improve the surgical risk knowledge, risk identification and response ability, and clinical operation ability of junior physicians in head and neck surgery, and enhance teaching satisfaction. It is a safe, effective, and worthy-to-promote physician training model. In the training of head and neck surgeons, it is recommended that surgical risk rehearsal teaching be incorporated into the routine training system, and that the combination of risk cognition and practical rehearsal be used to promote the comprehensive improvement of junior physicians' post competency.

Disclosure statement

The authors declare no conflict of interest.

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