



Pre-anesthetic clinic internship: new teaching method of pre-anesthesia evaluation for undergraduates

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Background: This study aimed to observe the effect of internship in a pre-anesthetic clinic on the teaching quality of pre-anesthesia evaluation for undergraduates.

Methods: A total of 120 undergraduates from July 2017 to July 2018 in the anesthesia department of our hospital were randomly divided into two groups: pre-anesthetic clinic internship teaching group (n = 60) and traditional teaching group (n = 60). The knowledge in the pre-anesthesia evaluation teaching chapters was evaluated between the two groups of undergraduates.

Results: There were no significant differences in the demographic information between the two groups. The scores in the case analysis and theoretical knowledge test in the pre-anesthetic clinic internship teaching group were significantly higher than those in the traditional teaching group. In addition, the students' satisfaction with the curriculum design was significantly higher in the pre-anesthetic clinic internship teaching group than in the traditional teaching group.

Conclusion: Pre-anesthetic clinic internships can improve the quality of pre-anesthesia assessment teaching for undergraduates.

Keywords: Preanesthetic Clinic; Preanesthetic Evaluation; Undergraduate.



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INTRODUCTION

Anesthesiology belongs to the second-level clinical discipline. Undergraduates have fewer practice teaching hours, but with the course content increasingly professional. The teaching content includes pre-anesthesia evaluation, anesthesia methods, anesthesia management, and postoperative analgesia. Pre-anesthesia assessment is a comprehensive assessment of patients before anesthesia to determine whether they can withstand the challenge of anesthesia and related risk assessment. It is the basis for selecting anesthesia methods, formulating anesthesia

plans, and optimizing anesthesia risk management and postoperative analgesia. A detailed pre-anesthesia assessment can minimize the risks associated with anesthesia surgery [1].

In pre-anesthesia evaluation, many interdisciplinary fields are involved, including cardiology, pulmonology, gastroenterology, nephrology, neurology, and pediatrics [2]. It is a great challenge for interns to master complex content in a short time. Outpatient anesthesia clinics are a new type of outpatient clinics that have become increasingly popular in recent years. The main tasks of outpatient anesthesia clinics are to obtain patients' health information via various methods, select necessary

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preoperative auxiliary examinations, rationally adjust the treatment plan, determine the necessary consultation of related disciplines, formulate the relevant treatment plan around the surgical period of anesthesia, and make patients understand anesthesia work and risks [3].

To date, no report has indicated anesthesia clinics as part of undergraduate internship teaching plans. This study aimed to innovatively introduce anesthesia clinic internships into undergraduate anesthesia internship teaching, evaluate the effect and importance of anesthesia clinic internships on clinical practice, and provide a new alternative method to improve clinical practice.

METHODS

1. General information

A total of 120 undergraduates (fifth grade) from July 2017 to July 2018 in the anesthesia department of our hospital were randomly divided into two groups: pre-anesthetic clinic internship teaching group ($n = 60$) and traditional teaching group ($n = 60$). The data of all 120 students were entered into the EXCEL form according to the order of the student ID number. Each ID generated a random number between 1000 and 9999. Thereafter, all the students were arranged again according to the generated random number from small to large to obtain a new order. In the new order, the students were assigned to the pre-anesthetic clinic internship teaching group with an odd number or to the traditional teaching group with an even number. The randomized grouping was then completed. There were 33 women and 27 men in the pre-anesthetic clinic internship teaching group, with an average age of 21.52 ± 0.57 (range, 20 to 25) years. Meanwhile, there were 32 women and 28 men in the traditional teaching group, with an average age of 22.13 ± 0.86 (range, 20 to 26) years. There were no significant differences in age or sex between the two groups. This research received ethical approval (2021-208) from the Biomedical Ethics Committee of Xi'an Jiaotong University. The need for consent was waived according

to our university regulations. It is a teaching reform program that was confirmed by our university.

2. Methods

All interns in the pre-anesthetic clinic internship teaching group received PowerPoint presentations in the first 2-h class during the 6-h study of the course of pre-anesthesia evaluation. Video teaching of pre-anesthesia evaluation was conducted in the second 2-h class. Thereafter, the workflow of the anesthesia clinic and pre-anesthesia clinic evaluation sheet were provided to each student as after-class homework to familiarize themselves with the process and content of pre-anesthesia evaluation. In the last 2-h class, the students were arranged to practice in the pre-anesthetic clinic, while learning how to evaluate patients before surgery, preparing preoperative examinations, arranging consultation in related disciplines, and making detailed preoperative evaluation by synthesizing the results of various examinations and consultations.

In the traditional teaching group, all interns received PowerPoint presentations in the first 4-h class during the 6-h study of the course of pre-anesthesia evaluation. Thereafter, video teaching of pre-anesthesia evaluation was conducted in the second 2-h class. Therein, they learned how to evaluate patients before anesthesia, prepare preoperative examinations, arrange consultation of related subjects, and make detailed preoperative evaluations by synthesizing the results of various examinations and consultations.

All interns participated in the examination after 6 h of the clinical practice teaching pre-anesthesia assessment course. The examination included a case analysis (Appendix 1) and an assessment of theoretical knowledge (Appendix 2). After the examination, the scores in the two examinations of all interns were counted. A questionnaire (Appendix 3) was used to follow up the feedback of the two groups on the satisfaction with the curriculum design, and the results were analyzed and compared.

Table 1. Sex and age composition of the two groups of students

Group	P	C
Sex (female/male)	33 : 27	32 : 28
Age (years)	21.5 ± 2.6	22.1 ± 2.9

P, pre-anesthetic clinic internship teaching group; C, traditional teaching group.

3. Statistical analysis

All measurement data were expressed as means ± standard deviations. The scores in the theoretical knowledge test and case analysis of the two groups were analyzed using the t-test. Counting data were analyzed using the chi-square test. All statistical analyses were performed using SPSS® version 16.0 (SPSS Inc., Chicago, IL, USA). Statistical significance was set at P-values of < 0.05.

RESULTS

The female-to-male sex ratio of the students was 33 : 27 in the pre-anesthetic clinic internship teaching group and 32 : 28 in the traditional teaching group. The average age of the students in the pre-anesthetic clinic internship teaching group was 21.5 ± 2.6 years, and that of the students in the traditional teaching group was 22.1 ± 2.9 years. There were no significant differences in age or sex between the two groups. The results are shown in Table 1.

The scores in the theoretical knowledge test were 43.39 ± 6.39 in the pre-anesthetic clinic internship teaching group and 35.17 ± 4.56 in the traditional teaching group. The scores of the pre-anesthetic clinic internship teaching group were significantly higher than those of the traditional teaching group ($P < 0.05$). Meanwhile, the scores in the case analysis were 45.16 ± 7.78 in the pre-anesthetic clinic internship teaching group and 30.57 ± 8.27 in the traditional teaching group. The scores of the pre-anesthetic clinic internship teaching group were significantly higher than those of the traditional teaching group ($P < 0.05$). The results are shown in Fig. 1.

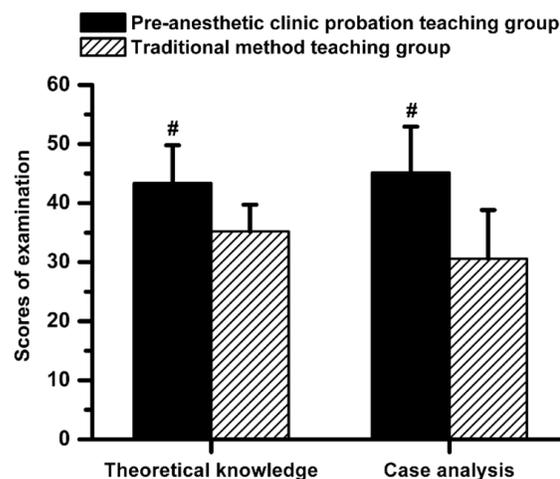


Fig. 1. The scores in the theoretical knowledge test and case analysis of the two groups of students are shown. The scores in the theoretical knowledge test of the pre-anesthetic clinic internship teaching group were significantly higher than those of the traditional teaching group. Meanwhile, the scores in the case analysis of the pre-anesthetic clinic internship teaching group were significantly higher than those of the traditional teaching group. # $P < 0.05$ compared to the traditional teaching group.

Table 2. Differences in the teaching effect between the two groups

Group	P	C
Learning interest	51 (85)	28 (47)
Learning activity	56 (93)	27 (45)
Ability to combine theory with practice	50 (83)	24 (40)
Core knowledge acquirement	57 (95)	37 (62)

The data are presented as n (%). P, pre-anesthetic clinic internship teaching group; C, traditional teaching group.

The questionnaire results indicated that 85% and only 47% of the students in the pre-anesthetic clinic internship teaching group and traditional teaching group showed interest in learning, respectively. Among the pre-anesthetic clinic internship teaching group and traditional teaching group, 93% and only 45% of the students were willing to participate actively in the study of anesthesia assessment, respectively; 83% and only 40% believed that they could combine theoretical knowledge with clinical practice, respectively; and 95% and only 62% admitted that they could master the core knowledge of pre-anesthesia evaluation, respectively. All the results of the pre-anesthetic clinic internship teaching group were significantly higher than those of the traditional teaching group ($P < 0.05$). The results are presented in Table 2.

DISCUSSION

Pre-anesthesia assessment is used to evaluate whether patients could afford the risk of surgery and anesthesia before surgery. It is the basis of anesthesia method selection, anesthesia planning, anesthesia risk management, and postoperative analgesia optimization. Detailed pre-anesthesia assessments can minimize the risks associated with anesthesia and surgery [4].

Clinically, not all patients are suitable for anesthesia, and it is common for patients to die owing to improper anesthesia treatment each year [5]. For elderly patients, especially those with cardiovascular, cerebrovascular, and respiratory diseases, pre-anesthesia assessment is necessary, as it not only improves the safety of anesthesia but also optimizes the process and shortens the duration of hospitalization [6]. Therefore, pre-anesthetic clinic internships could better allow undergraduate students to learn how to evaluate patients before surgery and anesthesia.

Pre-anesthetic clinics are a new type of outpatient clinics that have become increasingly popular in recent years. In addition to routine anesthesia evaluation for endoscopic diagnosis and contraception, pre-anesthetic clinics are mainly aimed at evaluating patients categorized under ASA levels 1 to 2 and patients whose conditions require elective surgery levels 1 to 2, including healthy young patients, patients needing hernia repair, patients with breast mass and thyroid nodules, and patients undergoing gynecological surgery or small head and neck surgery [7]. However, there are no reports on the usefulness of pre-anesthetic clinics for student education. Thus, our study compared the effects between traditional and pre-anesthetic clinic internships on undergraduate students' education. The pre-anesthetic clinic internship teaching group was able to obtain patients' health information via various methods, select the necessary preoperative auxiliary examinations, rationally adjust the treatment plan, determine the necessary consultation of related disciplines, formulate

the anesthesia-related treatment plan during the surgical period, and make the patients understand the work and risk of anesthesia through communication in the pre-anesthetic clinic [8,9]; this improved the students' ability to make more appropriate decisions on patient evaluation. In addition, the pre-anesthetic clinic internship group was able to prescribe necessary preoperative examinations and consultations conducted in the pre-anesthetic clinic to effectively avoid delays or cancelations of surgery. This not only shortened the hospitalization period and saved medical expenses but also saved medical resources for hospitals and yielded a win-win situation between hospitals and patients [2, 10]; this also enhanced their interest and activity in learning and practicing. Moreover, the pre-anesthetic clinic internship group was able to understand the patients' condition and the difficulty of anesthesia treatment to not only make more appropriate decisions and better preparations before surgery but also maximize patient safety [11]. Our research innovatively introduced pre-anesthetic clinic internships into undergraduate clinical practice teaching. The results showed that compared with the traditional teaching method, the pre-anesthetic clinic internship teaching method can stimulate students' interest in learning, improve their enthusiasm for learning, increase their knowledge mastery rate and degree of understanding, and enable them to have a deeper understanding of the relationship between theoretical knowledge and clinical practice. Compared with abstract traditional teaching methods, the pre-anesthetic clinic internship teaching method can enable students to apply the knowledge learned in the classroom to clinical practice better. Students can learn to obtain patients' medical history and clinical data from attending physicians or chief physicians by talking with the patients in a pre-anesthetic clinic internship and grasp the anesthesia interview conversation to establish clinical logical thinking.

Compared with the traditional teaching method, the pre-anesthetic clinic internship teaching method can improve students' learning interest and enthusiasm better.

Many students will have more questions on professional knowledge after the pre-anesthetic clinic internship and choose to review their basic theoretical knowledge after class. We also observed that in the final examination after the internship, the students in the pre-anesthetic clinic internship teaching group scored higher in the case analysis and theoretical knowledge test than did those in the traditional teaching group. This shows that the introduction of pre-anesthetic clinic internships into undergraduate anesthesia internship teaching can improve students' understanding and mastery of pre-anesthesia assessment.

In summary, pre-anesthetic clinic internships can improve students' interest and enthusiasm in learning and enhance their knowledge and understanding. Therefore, it is of significance to promote the introduction of pre-anesthetic clinic internships into undergraduate anesthesia internship teaching.

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Xiao-Peng Mei: Conceptualization, Funding acquisition, Writing - original draft

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Appendix 1. Case analysis

Case analysis

Basic information: A 75-year-old man diagnosed with "left femoral head necrosis" planned to undergo "left total hip replacement" under general anesthesia.

Medical history: The patient had a history of hypertension for 10 years and has been taking antihypertensive drugs (details unknown). "Myocardial insufficiency" was diagnosed 5 years ago with local hospital treatment (details not available).

Before induction, the following vital signs were recorded: blood pressure of 155/106 mmHg, pulse rate of 70 beats/min, and respiratory rate of 22 times/min. The breath sounds in both lungs were slightly thick. ECG showed a change in the T wave. The routine blood and biochemical examination findings were normal. Antihypertensive drugs were taken in the hospital but were not taken again a week ago, as treatment has been finished.

1. What are the main pathophysiological changes in patients with hypertension? 5 points
2. How should patients with hypertension be evaluated before surgery? 5 points
3. How should these patients be prepared for surgery? 5 points
4. What should be paid more attention to in the induction and maintenance of anesthesia in these patients? 15 points
5. What are the common causes of hypertensive crises during anesthesia? How can we deal with a hypertensive crisis? 20 points

Appendix 2. Theoretical knowledge test

Theoretical knowledge test

Single-choice questions (2 point for each question, 20 points in total)

1. What is the main purpose of double lumen endobronchial intubation? ()
 - A. Better control of breathing
 - B. Isolation of the airway of the healthy lung and diseased lung
 - C. High ventilation efficiency
 - D. Clear surgical vision
 - E. Prevention of pulmonary atrophy and hypoxemia
2. Which anesthetic may increase the CBF, CPP, CMRO₂, and ICP? ()
 - A. Thiopental sodium
 - B. Ketamine
 - C. Propofol
 - D. Etomidate
3. What clinical methods can reduce ICP? ()
 - A. Liquid limits
 - B. Over ventilation
 - C. Local hypothermia
 - D. Corticosteroid
 - E. All of the above
4. In relation to axillary brachial plexus block, which of these is incorrect? ()
 - A. Needle oscillates with the axillary artery beating
 - B. Breakthrough in the armpit sheath
 - C. Overflow of injection
 - D. Fusiform diffusion after injection
 - E. Acupuncture with a solid bone feeling
5. Which is not an advantage of axillary brachial plexus block? ()
 - A. Does not cause pneumothorax
 - B. Blocks the phrenic nerve
 - C. Does not enter the spinal canal by mistake
 - D. Position is shallow and easy to block
 - E. Induces complete radial nerve block
6. In relation to cervical plexus block, which of these is incorrect? ()
 - A. The deep cervical plexus and superficial cervical plexus belong to the sensory nerve plexus.
 - B. The C2-4 nerve constitutes the cervical plexus.
 - C. The bone mark of cervical plexus block is the C4 transverse process.
 - D. Thyroid surgery should block both superficial and deep cervical plexuses at the same time.
 - E. Superior laryngeal nerve block is the most likely to occur in cervical plexus block.
7. Where is the spinal cord of adults terminated at? ()
 - A. Lower thoracic 12 vertebrae
 - B. Lumbar 1 lower vertebrae
 - C. Lumbar 2 lower vertebrae
 - D. Lumbar 3 lower spine
 - E. Lumbar 4 lower spine

8. What is the main factor that decreases blood pressure after spinal canal block? ()
 - A. Muscle paralysis
 - B. Adrenal block
 - C. Sympathetic nerve block
 - D. Parasympathetic nerve block
 - E. Central sympathetic medium release reduction
9. What is the main reason for slowing of the heart rate in spinal canal block level up to T4? ()
 - A. Blocking of the cardiac sympathetic nerve
 - B. Blood pressure drop
 - C. Right atrial pressure drop
10. To prevent poisoning from local anesthetic, which of these is incorrect? ()
 - A. Administering no more than the maximum dose
 - B. Using the lowest effective concentration
 - C. Avoiding intravenous injection
 - D. Adding adrenaline into the local anesthetic

Multiple-choice questions (3 points for each question, 30 points in total)

1. A 40-year-old female patient had no obvious cardiac and pulmonary dysfunction before surgery. Which of these is the correct anesthesia method for hysterectomy? ()
 - A. L2-3 epidural anesthesia
 - B. L3-4, T12-L1 double gap epidural anesthesia
 - C. Combined spinal and epidural anesthesia in the L1-2 gap
 - D. L3-4 spinal anesthesia
 - E. General anesthesia
2. Which of these is the correct description of the baby? ()
 - A. The metabolic rate is higher than that of adults, and alveolar ventilation is approximately twice as high as that of adults.
 - B. The increase in ventilation depends on the acceleration of frequency rather than the tidal volume.
 - C. The heart is weak in contraction and cannot tolerate tachycardia well.
 - D. The control of the volume vessels is poor; the development of the baroreceptor is poor; and the response to low blood volume is poor.
 - E. The blood volume is 80–85 ml/kg, which is greater than that of adults.
3. Which of these is true in patients with chronic constrictive pericarditis?
 - A. The amount of each beat is almost constant but can only increase without increasing the heart rate.
 - B. The arterial oxygen partial pressure is decreased.
 - C. Most of them have autoimmune diseases.
 - D. The infusion volume should be strictly controlled during surgery.
 - E. Cardiac atrophy and contraction decrease.
4. What can thoracolumbar segment epidural anesthesia block? ()
 - A. Motor nerve that dominates the abdominal muscle
 - B. Sympathetic nerve that dominates the viscera of the chest and abdomen
 - C. Parasympathetic nerve that dominates the viscera of the chest and abdomen
 - D. Sensory nerve that dominates the chest and abdomen
 - E. Vagal nerve

5. What should pre-anesthesia evaluation and preparations include? ()
 - A. Fully understand the general health and special condition of the patient
 - B. Make some preparation before surgery according to the general condition of the patient
 - C. Take some measures to prevent complications during surgery
 - D. Assess the patient's tolerance to anesthesia and surgery
 - E. Make a specific anesthesia plan
6. Which arrhythmias need to be corrected before surgery? ()
 - A. Atrial fibrillation and atrial flutter with a rapid ventricular rate
 - B. Frequent ventricular premature contraction
 - C. Occasional atrial premature contraction
 - D. Atrioventricular block above II degrees
 - E. Right bundle-branch block without any symptom
7. Which descriptions are correct for the proper application of muscle relaxants? ()
 - A. Understanding the interaction between anesthetics and muscle relaxants
 - B. Considering the effect of patient age, obesity, or muscle strength on muscle relaxants
 - C. Understanding the function of the liver and kidney
 - D. Mastering the pharmacology and mechanism of different muscle relaxants
 - E. Fitting the surgical requirements
8. In relation to spinal anesthesia, which of these is correct? ()
 - A. Headache is one of the most common complications after lumbar anesthesia.
 - B. The sudden drop in blood pressure and insufficient blood supply to the brain are the causes of nausea and vomiting.
 - C. Sacral block is a special form of spinal anesthesia.
 - D. Bupivacaine and tetracaine are two most commonly used drugs for spinal anesthesia.
 - E. The distance between the upper and lower boundaries of the block plane is related to the dosage and volume of the drug used.
9. Which of these is the correct description of propofol? ()
 - A. Has an obvious inhibitory effect on the cardiovascular system and respiratory system
 - B. Has a strong analgesic effect
 - C. Has an influence on liver and kidney function
 - D. Can cause pain and local phlebitis in the injection site
 - E. Can increase oxygen consumption and intracranial pressure in the brain
10. What preparations should be made for patients with diabetes mellitus? ()
 - A. The blood glucose level should be maintained at approximately 8.3 mmol/L.
 - B. The blood glucose level should be maintained between 6.1 and 7.2 mmol/L.
 - C. It is not necessary to reduce the blood glucose level of emergency patients to the normal level.
 - D. The urine sugar test finding should be negative or weak positive.
 - E. The urine ketone should test negative.

Appendix 3. Questionnaire

Questionnaire

Dear students:

Welcome to participate in the questionnaire activities.

This is not an examination, and it does not count as a result. Please do not worry about this.

You only need to mark "√" in "()" according to your actual situation.

You can only select one answer for each question.

Thank you for your cooperation!

1. Do you like the form of clinical study in anesthesiology?
A. Yes () B. No ()
2. Are you willing to actively participate in the clinical study of the anesthesiology department?
A. Yes () B. No ()
3. Does the clinical study of the anesthesiology department directly help you solve practical clinical problems?
A. Yes () B. No ()
4. Do you think you have mastered the core content of the clinical study of the anesthesiology department?
A. Yes () B. No ()