Progress in Medical Education
ISSN: 3007-0007

Zentime

Teaching Innovation https://doi.org/10.61189/141225jwthfp

Optimization of lesson preparation and teaching methods for basic anesthesiology from a competency-based perspective

Yijie Tao[1], Jiaojiao Feng[1], Geng Sun[1], Kaiwei Jia[2]

Departments of [1]Physiology for Anesthesiology, School of Anesthesiology, [2]Tropical Diseases, Faculty of Naval Medicine, Naval Medical University, Shanghai 200433, China.

Corresponding author: Kaiwei Jia.

Acknowledgement: This work was supported by the 2024 Annual Teaching Achievement Cultivation and Development Project of Naval Medical University (JPY2024B18).

Declaration of conflict of interest: None.

Received May 26, 2025; Accepted July 28, 2025; Published October 31, 2025

Highlights

- A comprehensive anesthesiologist competency model is established, including clinical skills, crisis management, communication, and research innovation.
- The course design introduces an innovative "theory-virtual-practice" training approach, utilizing high-fidelity simulators and virtual reality to bridge the gap between knowledge and application.
- The article emphasizes the integration of political education and humanitarian care into teaching, aiming to cultivate anesthesiologists who are both technically skilled and compassionate.

Abstract

Basic anesthesiology is a core course in anesthesiology education, and it is crucial to improve its teaching effectiveness. This proposal focuses on optimizing the lesson preparation and teaching methods for basic anesthesiology based on competency. A comprehensive anesthesiologist competency model is established, covering clinical knowledge, crisis management, doctor-patient communication, and research innovation. The course objectives and content are restructured to integrate core knowledge with competency elements. In terms of lesson preparation, a layered teaching design is adopted, incorporating real case libraries and ideological and political elements. The teaching approach adopts a blended teaching mode, utilizing diverse methods. Additionally, the teaching evaluation system is also reformed based on Miller's Pyramid. This optimized model aims to enhance students' clinical thinking, operational skills, and professional qualities, while reducing the job adaptation period.

Keywords: Basic anesthesiology, competency model, teaching methods

Introduction

Basic anesthesiology is a fundamental course in anesthesiology education, encompassing pre-anesthesia assessment, drug application, and operational skills, and it bridges theoretical knowledge and clinical competence. The course not only explores the theory of perioperative safety management but also emphasizes the standardized training of practical skills. Through case discussions and operational drills, it helps students build a preliminary clinical thinking framework, laying a solid foundation for specialization and multidisciplinary collaboration. Thus, its role in anesthesiology education is indispensable.

Traditional teaching methods, which primarily rely on textbooks and classroom lectures, have evident shortcomings [1]. Students tend to rote-memorize information for exams, without developing the ability to apply it effectively in clinical scenarios. Furthermore, conventional assessment mainly focuses on theoretical

Address correspondence to: Kaiwei Jia, Department of Tropical Diseases, Faculty of Naval Medicine, Naval Medical University, 800 Xiangyin Road, Shanghai 200433, China. Tel: +86-15721570382; E-mail: kwjia1994@126.com.

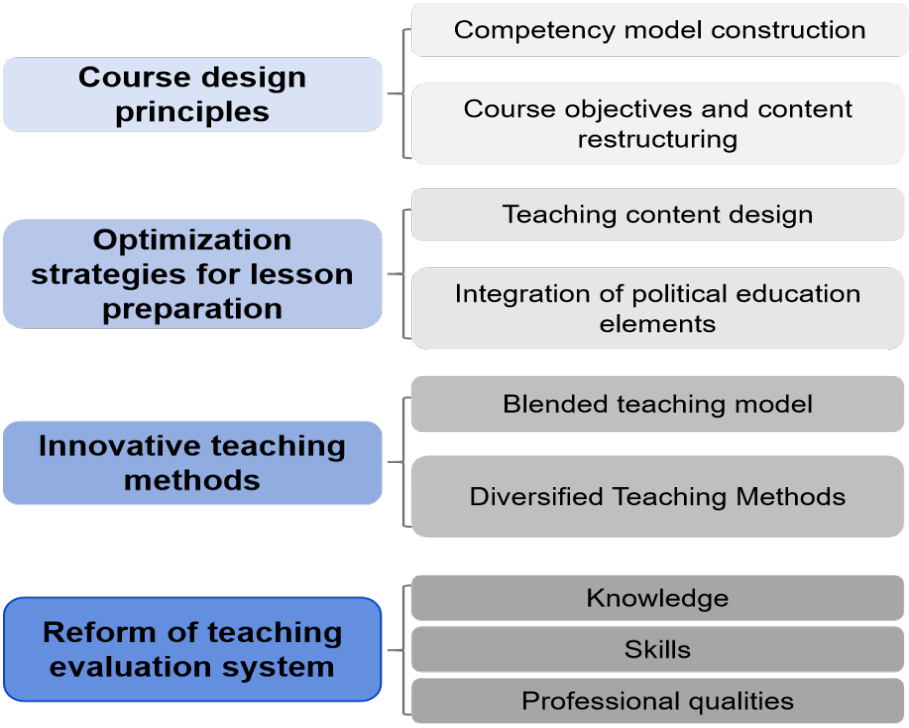

Figure 1. Model construction diagram for improving teaching quality based on competence.

achievements, overlooking clinical procedures, emergency response, and doctor-patient communication. This leads to a disconnection between theory and practice, to weak clinical thinking and to inadequate development of professional qualities [2, 3]. Therefore, it's crucial to transform anesthesiology education from "knowledge infusion" to "competency-based cultivation." In this study, we present a theoretical design proposal for the lesson preparation and teaching methods in basic anesthesiology (**Figure 1**).

Course design principles

Competency model construction

The competency model refers to the integration of diverse competence elements required by an individual in a specific role to perform particular tasks and achieve goals in a given work environment [4]. For anesthesiologists, the competency model should focus on core professional abilities, using a multi-dimensional capability matrix to support clinical practice and drive teaching reform. This model prioritizes clinical operational skills, covering standardized operations like endotracheal intubation and intrathecal anesthesia, with an emphasis on precision and safety. Crisis management ability is the key focus of the competency model. Rapid identification and team collaboration in dealing with intraoperative emergencies are essential, which can be strengthened by simulation training. Additionally, doctor-patient communication ability serves as a bond, with scenario-based training designed for pre-anesthesia risk assessment and postoperative pain management communication, thereby enhancing patients trust and compliance. Research and innovation ability extends this model, promoting evidence-based medical thinking and clinical research design, such as perioperative big data analysis, to foster advancements in anesthetic techniques and the development of individualized medicine [5].

Through this hierarchical design, the competency model not only provides a quantitative foundation for setting course objectives but also serves as a dynamic navigation system for anesthesiologists' lifelong career development.

Course objectives and content restructuring

In competency-based course restructuring, the key factor is the deep integration of core knowledge and capabilities. The course follows the core content of the "Anesthesiology Teaching Syllabus" as the theoretical framework, while incorporating four critical competency dimensions: clinical operational standards, crisis management logic, ethical decision-making, and technological innovation awareness.

For clinical operational standards and crisis management logic, the course integrates simulated emergency scenarios, using high-fidelity simulators to replicate critical situations such

as anaphylactic shock and difficult airways. These scenarios require students to engage in teamwork and perform operations under time pressure. Additionally, an "anesthesia ethical decision-making" module is innovatively included in this model [3]. Real cases, such as dealing with religious conflicts during intraoperative blood transfusion, help train students to balance medical principles with patients' values. In terms of technological innovation awareness, a three-dimensional visualization model of airway anatomy is introduced, allowing students to understand the significance of new technologies in procedures like fiberoptic bronchoscopy-guided intubation. Moreover, they accumulate muscle memory and form standardized operational cognition, along with emergency response intuition, before entering the real operating room [6].

This tiered "theory-virtual-practice" training model not only narrows the gap between knowledge and application but also accelerates the transformation of students from "passive learners" to "active decision-makers."

Optimization strategies for lesson preparation

Teaching content design

Tiered teaching

Tiered teaching is guided by the principle of "individualized teaching and targeted breakthrough" to enhance learning effectiveness through differential teaching designs [7]. For the basic theoretical parts in basic anesthesiology, a Small Private Online Course platform is used to build modular micro-lesson resources [8]. This allows students to independently complete pre-class study and knowledge map construction. For more challenging content, the team-based learning model is employed, integrating a three-stage task chain of "pre-class learning, in-class role debate, post-class reflection report" [9]. For instance, in the topic of "anesthesia risk assessment for elderly patients," students take on the roles of anesthesiologists, surgeons, and patients' family members. Using real patient data, students from different roles engage in multi-perspective discussions to form evidence-based decision-making. This tiered design of "basic online learning and difficult-point collaboration" ensures efficient knowledge delivery and promotes the transfer and application of higher-order thinking skills through team interaction.

Case library construction

The principles guiding case library construction are authenticity, multi-dimensionality, and dynamism. First, typical cases are selected in collaboration with the anesthesiology department of the teaching hospital. In strict adherence to ethical standards, case data is divided into modules of pre-anesthesia assessment, plan design, intraoperative monitoring, and postoperative follow-up, with decision-making evidence provided at critical points [10]. During the pre-class stage, students access case-related information on the Small Private Online Course platform and independently complete risk assessment forms and preliminary plan design. In class, groups present different plans using the team-based learning model. Teachers can then guide students to reflect on decision-making blind spots by comparing them with actual clinical outcomes. In addition, the case library uses a "tree-like index" structure to categorize disease types and is regularly updated with newly-emerged cases to ensure that the teaching content evolves alongside the latest advancements in clinical practice.

Integration of political education elements

Integration of the concept of "medical humanism"

"Medical humanism" emphasizes the ethical mission of anesthesiologists as "guardians of life" and enhances awareness of humanitarian care through the integration of theory and cases [11]. For example, the "Baby Not Cry" public welfare project, initiated by the Second Affiliated Hospital of Wenzhou Medical University, used toys and stories to alleviate children's fear of anesthesia. This approach transforms children from crying and resisting to actively cooperating, not only reducing anesthesia-related risks but also creating warm memories. This practice highlights that the responsibility of anesthesiologists lies not only in precise drug administration and vital sign regulation but also in providing humanized care to dispel patients' fear. Thus, integrating the concept of "medical humanism" promotes the value-based evolution of anesthesiology from "safety and pain-free" to "warm and healing".

Discussion of ethical issue

Incorporating ethical discussions into the teaching of basic anesthesiology encourages students to think critically. During the teaching process, the four ethical principles: autonomy, non-maleficence, beneficence, and justice, should be introduced, with reference to real medical dispute cases. For example, when

discussing anesthesia risks, it is important to consider patients' cognitive differences and cultural backgrounds, exploring how to communicate risks in an understandable way. In intraoperative emergency scenarios, the conflict between patient autonomy and the principle of beneficence should be thoroughly analyzed. These ethical discussions cultivate students' patient-centered decision-making thinking.

Innovative teaching methods

Blended teaching model

Blended teaching model integrates online precise empowerment and offline situation internalization to enhance the quality and efficiency of teaching [12]. The Small Private Online Course platform is used to build an online resource system, delivering basic theories through fragmented micro-lessons. The offline teaching model relies on high-fidelity medical simulation centers and a tiered practice task chain, ranging from standardized skill training to multi-role crisis simulations. The Objective Structured Clinical Examination assessment is used to evaluate skill integration [13, 14]. This blended teaching model truly fosters an integrated innovation of "teaching-learning-evaluation".

Diversified teaching methods

Diversified teaching methods are a new ecosystem for anesthesiology education, driven by problem-based learning and case-based learning to foster clinical thinking and promote team collaboration [15-17]. In the problem-based learning model, open-ended tasks are centered around complex clinical issues. In this model, students independently search for guidelines, analyze risks, and make decisions through group debates. Case-based learning is based on a real-case library and maps abstract theories to concrete scenarios through the three-step method of "medical history analysis, treatment review, and expert commentary". Additionally, multi-role simulation training is introduced to train students' professional, empathy, and communication skills [18]. Therefore, these diversified teaching methods work synergistically to enhance the professional competence of anesthesia students.

Reform of teaching evaluation system

Multi-dimensional evaluation indicators

The assessment of basic anesthesiology adopts a "knowledge-skills-professional qualities" three-dimensional evaluation system, which comprehensively reflects the requirements of professional competencies. This system is designed in accordance with Miller's Pyramid, ensuring a hierarchical and comprehensive evaluation of students' abilities [19]. Knowledge mastery (50%) includes theoretical examinations, covering core theories (30%) ("Knows") and case analysis reports (20%) ("Knows how"). Skill performance (30%) centers on objective and quantifiable indicators, including simulation-based operation scores and Objective Structured Clinical Examination ("Shows how") [20, 21]. Professional qualities (20%) evaluate teamwork and proactive response through peer reviews, communication clarity and empathetic expression through patient satisfaction surveys, and ethical decision-making through assessments of real-world cases ("Does").

This system overcomes the limitations of traditional examination approach. It introduces a dual-track operation of process-oriented evaluation and summative assessment, transforming from single-knowledge testing to a comprehensive job-competency profile. This provides a scientific framework for cultivating anesthesiologists who are technically proficient and compassionate.

Conclusion

This proposed model reconstructs the basic anesthesiology teaching system from a competency-based perspective. Through the innovative model comprising tiered teaching, blended practice, and multi-dimensional evaluation, it systematically addresses the shortcomings of traditional teaching. Moreover, the in-depth integration of curriculum-based political education and humanitarian care adds warmth to anesthesiology education.

Author contributions: Yijie Tao drafted the main manuscript. Kaiwei Jia provided overall guidance, revised and edited the manuscript. Jiaojiao Feng and Geng Sun contributed to model construction. All authors read and approved the final manuscript.

References

[1] Guo H, Li AM, Wang J, et al. Integration of Theory and Practice: A Teaching Model for Anesthesia Undergraduate Interns. Xinjiang Med 2025;55(04):523-526.

[2] Zhu C, Yao WL, Gui LL. MDT - Based Teaching Exploration in Thoracic Surgery Anesthesia Residency Training. Chin Contin Med Educ 2020;12(16):21-23.

[3] Xuan Y, Zhang L, Zheng H. Video-Simulation-Based Ethics Teaching in Anesthesiology. J Xinjiang Med Univ 2015;38(11):1455-1459.
[4] Lu MM, Zhu BH. Competency Evaluation Model for Clinical Teaching Faculty in Resident Standardized Training. Zhejiang Med Educ 2025;24(02):93-99.
[5] Sun BZ, Li JG, Wang QM. China's Clinical Physician Competency Model and Application. Beijing (China). People's Medical Publishing House, 2015. p. 310-320.
[6] Zhao J, Xu X, Jiang H, et al. The effectiveness of virtual reality-based technology on anatomy teaching: a meta-analysis of randomized controlled studies. BMC Med Educ 2020;20(1):127.
[7] Qiu HR, Wang Y, Tao X, et al. Tiered Training for Non - Anesthesiologists' Anesthesia Department Rotation. Contin Med Educ 2018;32(01):2-4.
[8] Xu BH, Huang WZ, Xie SB, et al. SPOC - Based Flipped Classroom with PBL in Traditional Chinese Pediatric Teaching. Chin Contin Med Educ 2025;17(08):78-82.
[9] Nawabi S, Javed MQ, Bilal R. Problem-based Learning and Team-based Learning as a Novel Package Approach. J Coll Physicians Surg Pak 2021;31(6):710-715.
[10] Yan W, Wang Y, Zhang H, et al. Case Library Use in Anesthesiology Graduate Clinical Teaching. China Higher Med Educ 2022;(07):144-145.
[11] Chen L, Zhang J, Zhu Y, et al. Exploration and practice of humanistic education for medical students based on volunteerism. Med Educ Online 2023;28(1):2182691.
[12] Wu ZL, Wu QP, Chen QH, et al. Multimodal Teaching for Clinical Anesthesia Internship Quality Improvement. Chin Contin Med Educ 2015;7(24):13-15.
[13] Lu TT, Zhang M, Ma XL. WeChat-Based PBL Teaching with Stage-wise OSCE Assessment in Clinical Teaching. Vocat Educ Health 2025;43(08):58-61.
[14] Gilani S, Pankhania K, Aruketty M, et al. Twelve tips to organise a mock OSCE. Med Teach 2022;44(1):26-31.
[15] Trullàs JC, Blay C, Sarri E, et al. Effectiveness of problem-based learning methodology in undergraduate medical education: a scoping review. BMC Med Educ 2022;22(1):104.
[16] Tan H, Huang E, Deng X, et al. Application of 3D printing technology combined with PBL teaching model in teaching clinical nursing in congenital heart surgery: A case-control study. Medicine 2021;100(20):e25918.
[17] Shen HY, Shi PP, Zhang YY, et al. Case-Based Teaching for Pediatric Interns' Doctor-Patient Communication Skills. J Clin Psychosom Dis 2025;31(03):133-136, 160.
[18] Bevan J, Russell B, Marshall B. A new approach to OSCE preparation-PrOSCEs. BMC Med Educ 2019;19(1):126.
[19] Ten Cate O, Carraccio C, Damodaran A, et al. Entrustment Decision Making: Extending Miller's Pyramid. Acad Med 2021;96(2):199-204.
[20] Liu ZY, Chen M, Yang GC, et al. Scenario-Based Simulation with OSCE in Undergraduate Anesthesiology Education. J Mudanjiang Med Coll 2024;45(06):154-157.
[21] Chan SCC, Choa G, Kelly J, et al. Implementation of virtual OSCE in health professions education: A systematic review. Med Educ 2023;57(9):833-843.