

Research Article

Application of the ADDIE Combined with Nursing-Mini-CEX Model in Undergraduate Nursing Education for Nephrology

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Abstract

Background: At present, clinical practice teaching in nursing is confronted with challenges such as inaccurate goal positioning, lack of systematic design and effective evaluation system. As a systematic instructional design framework, the ADDIE model, when combined with the nurse-mini-CEX which has the function of teaching assessment, can optimize the teaching process and enhance the clinical practice ability and comprehensive quality of trainee nurses. **Objective:** To explore and analyze the effect of ADDIE combined Nursing-Mini-CEX teaching model in the clinical teaching of undergraduate nursing students in the department of nephrology. **Methods:** Fifty-eight undergraduate Nursing interns in the Department of Nephrology from December 2023 to November 2024 were selected into the study and divided into control group and observation group, 29 in each group according to random number table method. The control group was taught by traditional teaching methods, and the observation group was taught by ADDIE combined nursing -Mini-CEX teaching mode. The results and teaching satisfaction of two groups of undergraduate nursing interns were evaluated. **Results:** The theoretical knowledge, clinical practice test scores and teaching satisfaction of the observation group were better than those of the control group ($P < 0.05$). **Conclusion:** The application of ADDIE combined Nursing-Mini-CEX teaching mode in the practice teaching of renal department nursing undergraduates can improve the theoretical knowledge and clinical practice assessment scores, and thus enhance the teaching satisfaction, which is worthy of promotion.

Keywords

Nursing Undergraduate Intern, ADDIE Teaching Mode, Nursing-Mini-CEX, Satisfaction

1. Introduction

As an independent primary discipline, nursing science is undergoing continuous optimization of its academic structure through nursing education reforms. Undergraduate nursing students represent China's future primary nursing workforce and serve as the backbone driving the sustained development of nursing science [1]. The shift in modern medical paradigms has heightened public health awareness and increased demand for healthcare services [2]. As a highly specialized

and practice-oriented discipline within internal medicine, nephrology places significant demands on clinical nursing students' comprehensive practical skills. Traditional teaching methods struggle to achieve optimal outcomes, making the adoption of scientific and efficient instructional approaches crucial for enhancing both student competence and teaching quality in nephrology nursing. How to cultivate and evaluate undergraduate nursing students' comprehensive practical

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abilities in clinical nursing has become a key focus in nursing education. The ADDIE model, proposed by renowned American educationalist Robert [3] in 1975, consists of five stages: Analysis, Design, Development (Development), Implementation, and Evaluation. It involves designing and developing programs based on student training needs, conducting timely assessments at each stage of the teaching process to avoid one-sidedness and blindness. This model is both flexible and adaptable while ensuring training quality [4, 5]. It is currently one of the most mature and widely applied instructional design models [6], offering superior practicality, reliability, and integrity to facilitate effective training [7, 8]. The Nursing-Mini-CEX (Nursing Mini-Clinical Experience Evaluation) is an extension of the Mini-CEX that integrates nursing-specific elements. It assesses the attitudes, knowledge, and skills of student nurses, aiming to enhance practical skills and professional competence. This approach actively guides healthcare workers to adapt to clinical work in the shortest possible time [9]. By establishing realistic clinical scenario models, it encourages trainees to exercise initiative, shifting from passive instruction to active learning, thereby enhancing their comprehensive practical abilities [10]. Therefore, our department applies the combined ADDIE and Nursing-Mini-CEX teaching model in undergraduate nursing clinical education to improve clinical teaching quality and students' comprehensive practical competencies.

2. Materials and Methods

2.1. General Information

Fifty-eight undergraduate nursing students enrolled in the Nephrology Department of Deyang People's Hospital from December 2023 to November 2024 were selected as research subjects. They were randomly divided into a control group and an observation group, each comprising 29 participants. Throughout the study, a blinding method was employed for the interventionist, data collector, and data analyst, ensuring separation among these roles to guarantee trial validity and data reliability. Control Group: Male/Female: 2/27; Age: 20–22 years, mean (20.41 ± 1.18) years. Observation Group: Male/Female: 3/26; Age: 20–23 years, mean (21.23 ± 2.06) years. No statistically significant differences existed between groups in age or gender ($p > 0.05$), rendering them comparable.

Inclusion Criteria: 1) Currently in the clinical internship phase of the fourth academic year; 2) Completed all theoretical and practical training courses; 3) Possess a smartphone and demonstrate proficiency in internet usage; 4) Not participating in other teaching research projects during the internship period; 5) Voluntarily agree to participate in this study and understand its purpose and significance. Exclusion Criteria: Individuals who discontinued the internship for any reason during the study period.

2.2. Method

Both groups of nursing students underwent one month of clinical training in the nephrology department.

2.2.1. Control Group Protocol

Upon entering the department, trainees attended a single centralized lecture delivered by the same instructor, comprising theoretical explanation and practical demonstration. Theoretical instruction was delivered face-to-face using PowerPoint presentations. Training occurred twice weekly over four weeks, totaling eight sessions. Specific times were Tuesdays and Thursdays from 4:30 PM to 5:30 PM in the study room. Observation and scenario simulation served as primary learning methods throughout. A departmental exit assessment covering theory and skills was conducted before internship completion, emphasizing specialty-specific competencies.

2.2.2. Observation Group Protocol

Traditional teaching supplemented with the combined ADDIE and Nursing-Mini-CEX instructional methods. (1) Formation of Departmental Teaching Team: Coordinated and supervised by the Nephrology Department Head Nurse, comprising 6 instructors responsible for theoretical knowledge and clinical practice training. The teaching faculty includes one Associate Chief Nurse and five Senior Nurses, all possessing extensive clinical teaching experience. Team members undergo standardized training covering the purpose and significance of the ADDIE combined with Nursing-Mini-CEX approach, setting teaching objectives, and developing simulation teaching cases. (2) Training Practices: 1) Analysis Phase: As the primary component of the entire training process, the analysis phase serves as the foundation for all training activities [11]. Therefore, the first step in training undergraduate nursing students in nephrology involves conducting a learning needs survey to determine training content and methods. We employed a Questionnaire Star survey across eight dimensions: specialized knowledge and clinical case practice, nurse-patient communication, humanistic care, infection control and occupational protection, research capabilities, laws and regulations, and training methods. Specialized knowledge and clinical case practice ranked as the students' top priority, followed by infection control and nurse-patient communication in second and third place. Regarding training methods, students preferred a blended online-offline approach to overcome limitations of teaching time and location, facilitating learning during fragmented periods. The high demand for specialized knowledge and clinical case practice stems from the fact that clinical internships mark a transitional phase for nursing students, shifting from academic learners to practicing nurses. This period involves applying theoretical knowledge to clinical settings and lays the foundation for becoming qualified healthcare providers. Consequently, students place greater

emphasis on mastering clinical knowledge and its application to typical clinical cases. 2) Design Phase: This phase refines training objectives based on the analysis phase. Accordingly, the training team discusses and determines teaching objectives, content, methods, and assessment criteria according to nursing students' needs. Teaching methods include: - Task-driven approach: Assigning pre-class learning tasks to encourage proactive exploration and stimulate interest. - Lecture method: Delivering specialized theoretical knowledge to facilitate learning and mastery of nephrology expertise. - Scenario-based teaching: Guiding students in independent holistic nursing practice, evaluated using the Nursing-Mini-CEX scale to provide timely feedback and corrections for issues identified during practice. 3) Development Phase: As the core stage of the ADDIE instructional model, this phase emphasizes student-centered learning and learning needs orientation. Potential challenges and solutions encountered during nephrology rotations are integrated into the training curriculum. For platform development, our department leveraged WeChat groups—the most frequently used software among students—to establish a nephrology rotation training platform. Group administrators promptly distribute learning materials to facilitate pre-study, knowledge reinforcement, and learning feedback. In addition to traditional specialty theory PowerPoint presentations, teaching content now includes scenario simulations on hospital infection control and video-based patient-nurse communication training. For evaluation, alongside classroom assessments, we added a department exit symposium where students provide feedback on the overall nephrology training experience before completing their rotation. During this phase, communication and feedback with students should be strengthened to adjust training content and formats as needed, ensuring training effectiveness. 4) Implementation Phase: This phase encompasses three stages—practical analysis, design, and development. Therefore, it requires reasonable scheduling and thorough preparation. First, pre-class preparations must be completed: including instructor assignments, creation and review of teaching materials, and preparation of teaching venues. The clinical teaching coordinator should distribute training materials in advance via WeChat groups, allowing nursing students to complete self-study within the designated timeframe. Second, manage the teaching process: Instructors may employ methods such as knowledge competitions, experiential learning, and scenario simulations to deliver content, utilizing Yu Classroom for in-class quizzes.

Post-class, lecture videos should be uploaded to the WeChat group to address make-up training needs and facilitate student review. 5) Evaluation Phase: Evaluation permeates the entire teaching model [12]. A two-way assessment approach is adopted: instructors gauge trainees' mastery through in-class quizzes, departmental exams, and seminars, while trainees evaluate instructors' courseware, teaching methods, content, classroom atmosphere, and overall satisfaction via Questionnaire Star surveys. Typical department cases are selected for comprehensive nursing student assessment using the Nursing-Mini-CEX scale. Finally, the nephrology department head organizes a student symposium to thoroughly understand trainees' learning experiences and insights. Suggestions raised by students are addressed to enhance the quality of nephrology internship instruction.

2.2.3. Observation Indicators

(1) Theoretical Knowledge Assessment: Developed by the Nephrology Teaching and Training Team based on curriculum content, featuring standardized theoretical knowledge assessment criteria and a maximum score of 100 points.

(2) Practical Assessment: Evaluated using our department's self-developed practical assessment scoring rubric, with a maximum score of 100 points. Higher scores indicate better performance.

(3) Teaching Satisfaction.

Utilize the undergraduate nursing teaching satisfaction survey questionnaire developed by our hospital. Conducted via Wenjuan xing, it assesses teaching plans, content, methods, classroom atmosphere, and teaching competence. The total questionnaire score is 100 points, with each section worth 20 points. A score ≥ 80 indicates satisfaction, 60–79 indicates relatively satisfied, and < 60 indicates dissatisfaction. $(\text{Satisfied} + \text{Relatively Satisfied}) \div \text{Total Participants} \times 100\% = \text{Teaching Satisfaction Rate}$.

2.2.4. Statistical Methods

Data analysis was performed using SPSS 25.0 statistical software. Count data were described using frequencies and analyzed with chi-square tests or Fisher's exact probability test. Continuous data were described as mean $\pm$ standard deviation and analyzed with t-tests. The significance level was set at $\alpha=0.05$ (two-tailed), with $P<0.05$ indicating statistically significant differences.

3. Results

3.1. Comparison of Theoretical Knowledge and Clinical Practice Assessment Scores Between Two Groups of Students ($P < 0.05$) (See Table 1)

Table 1. Comparison of Theoretical Knowledge and Clinical Practice Assessment Scores Between Two Groups of Students.

Group	Theoretical Knowledge	Clinical Practice
Observation Group (n=29)	88.52 $\pm$ 6.38	86.24 $\pm$ 7.17
Control Group (n=29)	84.48 $\pm$ 7.29	80.36 $\pm$ 6.92
t	2.246	3.178
P	0.029	0.002

3.2. Comparison of Teaching Satisfaction Between the Two Groups of Students

The observation group demonstrated higher teaching satisfaction than the control group ($P < 0.05$). See Table 2.

Table 2. Comparison of Teaching Satisfaction Between the Two Groups of Students (%).

Group	Satisfied	Fairly Satisfied	Dissatisfied	Satisfaction Rate
Observation Group (n=29)	21	7	1	28 (96.55)
Control Group (n=29)	13	8	8	21 (72.41)
x ²				7.393
P				0.025

4. Discussion

4.1. The Teaching Mode of ADDIE Combined with Nursing-Mini-CEX Has Improved the Clinical Assessment Results

The application of the ADDIE combined with Nursing-Mini-CEX teaching model significantly improved the theoretical and practical assessment scores of undergraduate nursing students during their nephrology clinical rotations. Analysis indicates this improvement primarily stems from the ADDIE model's emphasis on designing instructional training programs based on students' learning needs, thereby stimulating their interest in learning. During the implementation phase, task-driven teaching methods encouraged students to integrate theoretical knowledge with clinical practice. Interns engaged in independent thinking and hands-on practice, effectively mastering textbook content and transforming passive learning into proactive self-training. This

facilitated the conversion of undergraduate educational knowledge. Guo Shufa [13] demonstrated that applying the ADDIE model significantly enhanced student interest and substantially improved final exam scores. The Nursing-Mini-CEX clinical teaching model offers the advantage of real-time feedback. By progressively addressing teaching issues with interns, it heightens their awareness of proactively learning relevant theoretical knowledge [14]. simultaneously, the Nursing-Mini-CEX approach to teaching and assessment for undergraduate interns creates a virtuous cycle of “teaching-practice-evaluation-feedback-improvement-assessment” [15]. Within this cycle, instructors should provide positive reinforcement for students' strengths, allowing them to feel valued and respected during instruction. This fosters confidence and heightens learning motivation. Therefore, integrating the ADDIE model with Nursing-Mini-CEX in undergraduate nursing education within nephrology departments can stimulate student interest and improve both theoretical and clinical practice assessment outcomes.

4.2. The ADDIE Combined Nursing-Mini-CEX Teaching Model Has Improved Teaching Satisfaction

The application of the ADDIE combined with Nursing-Mini-CEX teaching model enhanced undergraduate nursing students' satisfaction during their nephrology clinical rotations (see Table 2). In traditional teaching approaches, students primarily assume the role of passive listeners, making it easy for instructors to overlook their learning needs and interests. Limited interaction with faculty often results in low teaching satisfaction. The ADDIE combined with Nursing-Mini-CEX teaching model is a student-centered training approach. It designs training plans by exploring the learning needs and objectives of student nurses, fully respecting their requirements. During instruction, timely evaluations and continuous tracking of teaching effectiveness are conducted to refine the teaching plan, thereby enhancing students' learning motivation and initiative. Preliminary assessments revealed students preferred blended online-offline training to accommodate location and time constraints. Consequently, we implemented WeChat-based online courses, enabling nursing students to access training conveniently during fragmented time outside work hours, thereby reducing time costs. The integrated ADDIE and Nursing-Mini-CEX teaching model aligns with student learning needs, emphasizes student engagement, and respects learner feedback, thereby enhancing teaching satisfaction among undergraduate nursing interns in nephrology.

5. Conclusion

The application of the ADDIE combined with Nursing-Mini-CEX teaching model in undergraduate clinical training for nephrology nursing students improves theoretical knowledge and clinical practice assessment scores, thereby enhancing teaching satisfaction. This approach warrants wider implementation.

Abbreviations

ADDIE	Analysis, Design, Development, Implementation and Evaluation
Mini-CEX	Mini-Clinical Evaluation Exercise

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Data Availability Statement

The data supporting the findings of this study are available upon request from the corresponding author.

Conflicts of Interest

The authors disclosed no relevant conflicts of interest.

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