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Effectiveness of production-oriented approach and plan-do-check-action cycle for clinical teaching of gynecological oncology

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Abstract

This study explored the effectiveness of combining the production-oriented approach (POA) with the Plan-Do-Check-Action (PDCA) cycle in clinical teaching of gynaecologic oncology. A total of 60 rotating physicians, undergoing standardized training in First Affiliated Hospital of Bengbu Medical University between January 2023 and March 2024, were randomly divided into an experimental group (n=30) and a control group (n=30). The control group followed traditional teaching methods, while the experimental group received teaching based on the POA and PDCA cycle. Comparison of pre- and post-teaching scores revealed that the experimental group had significantly higher scores in theoretical examinations, practical operations, and case analysis (P<0.05). Additionally, the experimental group demonstrated greater enthusiasm for learning and stronger autonomous learning abilities (P<0.05). Furthermore, teaching satisfaction was notably higher in the experimental group (P<0.05). These findings suggest that integrating POA with the PDCA cycle can significantly enhance the quality of clinical teaching, improve learning outcomes, and increase satisfaction among gynaecologic oncology physicians *(Afr J Reprod Health 2025; 29 [5]: 158-165).*

Keywords: gynaecologic oncology; physician; plan; production; teaching

Résumé

Cette étude a exploré l'efficacité de la combinaison de l'approche orientée vers la production (AOP) et du cycle Planifier-Faire-Vérifier-Agir (PDCA) dans l'enseignement clinique en oncologie gynécologique. Au total, 60 médecins en stage, suivant une formation standardisée au Premier Hôpital Affilié de l'Université de Médecine de Bengbu entre janvier 2023 et mars 2024, ont été répartis aléatoirement en un groupe expérimental (n = 30) et un groupe témoin (n = 30). Le groupe témoin a suivi des méthodes d'enseignement traditionnelles, tandis que le groupe expérimental a bénéficié d'un enseignement basé sur les cycles AOP et PDCA. La comparaison des scores avant et après l'enseignement a révélé que le groupe expérimental obtenait des scores significativement plus élevés aux examens théoriques, aux opérations pratiques et à l'analyse de cas (p < 0,05). De plus, le groupe expérimental a fait preuve d'un plus grand enthousiasme pour l'apprentissage et de meilleures capacités d'apprentissage autonome (p < 0,05). De plus, la satisfaction à l'égard de l'enseignement était nettement plus élevée dans le groupe expérimental (p < 0,05). Ces résultats suggèrent que l'intégration du POA au cycle PDCA peut améliorer significativement la qualité de l'enseignement clinique, les résultats d'apprentissage et la satisfaction des médecins en gynécologie oncologique. *(Afr J Reprod Health 2025; 29 [5]: 158-165).*

Mots-clés: gynécologie oncologique ; médecin ; plan ; production ; enseignement

Introduction

As an extremely common and frequent disease in the female reproductive system, gynaecologic tumors pose a serious threat to the physical and mental health of women and greatly affect their quality of life[1]. In recent years, the clinical treatment methods of gynaecologic tumors have been constantly updated and increasingly diversified, manifested as the refinement of surgical techniques, continuous optimization of chemotherapy protocols, gradual emergence of targeted therapy, and active exploration of immunotherapy[2]. These cutting-edge treatments place higher demands on the professional quality of nursing staff while increasing more hope for patients. At present, the traditional mode of gynaecologic oncology teaching has problems such as a single method and insufficient attention to practical teaching[3].

In contrast, production-oriented approach (POA) is output-oriented, clarifies learning goals,

and stimulates learning motivation[4]. POA emphasizes that teaching should be oriented to students' learning output, and that students should learn language knowledge and skills in the process of completing output tasks, thereby improving their language application ability and comprehensive quality[5]. Plan-Do-Check-Action (PDCA) cycle management constructs a constantly optimized architecture for the teaching process, which contributes to continuous improvement of teaching quality through continuous planning, implementation, inspection and improvement of measures[6]. Through continuous optimization and improvement, PDCA cycle can improve students' practical operation ability in surgical operation skill training. It is important for students' career development to make comprehensive use of knowledge when analyzing cases, to make accurate decisions in the face of complex clinical situations, and to improve their ability of autonomy and cooperation in solving problems. For POA plus PDCA cycle, student-centered plans and objectives are developed in line with learning characteristics to improve teaching quality and satisfaction, and create a good learning atmosphere[7].

In view of this, this study explored the application value of POA plus PDCA cycle for the clinical teaching of gynaecologic oncology, aiming to provide new ways and methods for training high-quality professionals, to raise the quality of life of patients, and to facilitate their rehabilitation.

Methods

Participants

Rotating physicians (n=60) receiving standardized training in First Affiliated Hospital of Bengbu Medical University (two wards) from January 2023 to March 2024 were selected and grouped by cluster randomization. Then the physicians of each ward were assigned into an experimental group and a control group by random allocation (n=30). In the experimental group, the physicians had a mean age of 30.8 ± 2.1 years, compared to 31.2 ± 2.3 years in the control group. The gender distribution was nearly identical, with 18 males and 12 females in the experimental group versus 17 males and 13 females in the control group. Additionally, the years of experience were similar, averaging 3.5 ± 1.2 years in the experimental group and 3.7 ± 1.1 years in the control group. Regarding the highest degree obtained, the experimental group consisted of 15 physicians with a bachelor's degree, 10 with a master's degree, and 5 with a doctoral degree, while the control group had 16 with a bachelor's degree, 9 with a master's degree, and 5 with a doctoral degree. The socio-demographic characteristics of the two groups were comparable (P>0.05).

Teaching methods

Control group: Traditional teaching method was adopted, including classroom theory teaching, case analysis and discussion, and clinical practice teaching.

Experimental group: POA plus PDCA cycle was given. Design of POA: (1) Driving: The teachers clearly defined output goals, such as completing a gynaecological tumor case analysis report or academic report. They presented real clinical communication scenarios, such as patient case presentations and consultation videos, to elicit driving questions and stimulate students' desire to learn. (2) Promotion: The teachers explained the driving questions, covering gynaecological tumor knowledge and related skills. They provided rich learning materials for guiding students to learn independently, and organized group discussions and cooperative learning to promote knowledge exchange and teamwork. Besides, they arranged practical activities, such as physical examinations and participation in consultations. (3) Evaluation: This step included immediate evaluation, which observed students' performance and gave feedback in the teaching process; periodic evaluation, which understood the learning progress through quizzes and group reports; and final evaluation, which comprehensively evaluated the output results and employed a combination of multiple methods to ensure fairness and objectivity.

Procedures of PDCA cycle teaching: (1) Plan: The teaching situation and students' needs were analyzed, detailed teaching plans were formulated, the teaching objectives, contents, methods, progress and evaluation methods were clarified, and the tasks and responsible persons of each link of PDCA cycle were determined. (2) Do: Teaching activities

were carried out according to the teaching plan. Multimedia, case analysis and other means were used in the theoretical teaching. In clinical practice teaching, students could participate in ward rounds, surgical observation, medical record writing, thereby cultivating their good clinical thinking ability and solid practical operation skills. (3) Check: Regular assessment and evaluation were performed. The students' learning results were detected by theoretical examination, practical operation examination, case analysis examination, learning attitude observation and independent learning ability evaluation. (4) Act: Based on the evaluation results, the root cause of the problem was analyzed deeply, and then improvement measures were formulated and implemented. Special intensive counseling was provided to gradually fill the hole of students' knowledge, the teaching methods and strategies were adjusted, and the improvement measures were incorporated into the next round of PDCA cycle.

Outcome indicators

Examination results: (1) Theoretical examination: The students were examined for the basic theoretical knowledge of gynaecologic oncology by closed-book examinations, with a full score of 100 points. (2) Practical operation examination: The students were examined for the gynaecologic examination and basic operation skills, and the teacher gave scores on the spot, with a full score of 100 points. (3) Case analysis ability examination: The students were asked to conduct a comprehensive analysis of a given case, covering the introduction of diagnostic basis, analysis of differential diagnosis and formulation of treatment plans. Finally, the evaluation team consisting of teachers gave scores, with a full score of 100 points. a) Attitude to learning (positive, moderate, and negative) was assessed by observing students' classroom performance, learning enthusiasm and participation. b) Autonomous learning ability (strong, moderate, and weak) was assessed according to the students' autonomous learning time, data access and problem-solving ability. c) Teaching satisfaction (very satisfied, satisfied, moderate, and dissatisfied) was detected by a questionnaire survey to understand the students' satisfaction with teaching methods.

Examination papers were anonymized so that teachers did not know the students' group assignments when scoring. Evaluators for the practical and case analysis examinations used standardized criteria and were blinded to group identity. Additionally, assessments of learning attitude, autonomous learning ability, and teaching satisfaction were conducted independently or through anonymous questionnaires to minimize bias.

Statistical analysis

SPSS26.0 software was used for statistical analysis. Measurement data were described by mean ± standard deviation ($\bar{x} \pm s$) and compared by the *t*-test between two groups. Count data were described by percentage (%) and compared by the chi-square (χ^2) test between two groups. $P<0.05$ was considered statistically significant.

Ethical considerations

This study was approved by the ethics committee of our hospital, and written informed consent was obtained from all participants.

Results

Examination scores of physicians

The scores of theoretical examination, practice operation examination and case analysis ability examination were significantly higher in the experimental group than in the control group ($P<0.05$) (Table 1).

Attitude to learning of physicians

In the experimental group, 19, 8 and 3 physicians had positive, moderate and negative attitudes to learning, respectively, which were 11, 10 and 9 cases in the control group. The attitude to learning in the experimental group was superior to that in the control group ($P<0.05$) (Table 2).

Table 1: Examination scores of physicians

Item	Experimental group (n=30)	Control group (n=30)	*t*	P
Theoretical examination	85.2±6.0	72.6±7.1	7.4	0.001
Practical operation examination	88.4±5.4	75.7±6.2	8.5	0.001
Case analysis ability examination	87.4±5.9	75.1±6.3	7.8	0.001

Table 2: Attitude to learning of physicians

Group	n	Positive	Moderate	Negative
Experimental	30	19 (63.3)	8 (26.7)	3 (10.0)
Control	30	11 (36.7)	10 (33.3)	9 (30.0)
χ^2				7.4
P				0.024

Table 3: Autonomous learning ability of physicians

Group	n	Strong	Moderate	Weak
Experimental	30	19 (63.3)	9 (30.0)	2 (6.7)
Control	30	10 (33.3)	12 (40.0)	8 (26.7)
χ^2				6.8
P				0.033

Table 4: Teaching satisfaction of physicians

Group	n	Very satisfied	Satisfied	Moderate	Dissatisfied
Experimental	30	17 (56.7)	12 (40.0)	1 (3.3)	0 (0.0)
Control	30	9 (30.0)	12 (40.0)	6 (20.0)	3 (10.0)
χ^2					8.2
P					0.043

Autonomous learning ability of physicians

In the experimental group, 19, 9 and 2 physicians had strong, moderate and weak autonomous learning abilities, respectively, which were 10, 12 and 8 cases in the control group. The autonomous learning ability in the experimental group was stronger than in the control group ($P<0.05$) (Table 3).

Teaching satisfaction of physicians

In the experimental group, 17, 12 and 1 physicians were very satisfied, satisfied and moderately satisfied with the teaching respectively. In the control group, 9, 12, 6 and 3 physicians were very satisfied, satisfied, moderately satisfied and dissatisfied, respectively. The experimental group had higher teaching satisfaction than the control group ($P<0.05$) (Table 4).

Discussion

In this study, the teaching mode integrating POA plus PDCA cycle was more targeted and systematic and could more effectively integrate the knowledge system and improve learning efficiency, thereby enabling students to more effectively master the theoretical knowledge of gynaecologic oncology.

POA is oriented towards learning output and clarifies the goals that students need to achieve in the learning process. In the clinical teaching of gynaecological tumors, by setting specific learning output goals, such as mastering the diagnostic methods, treatment principles, and surgical techniques of gynaecological tumors, the resident physicians can be more clear about their learning direction and improve their learning motivation[8]. For example, by assigning output tasks such as writing gynaecological tumor case analysis reports

and formulating treatment plans, the resident physicians are encouraged to actively learn relevant knowledge and skills of gynaecological tumors, and improve their clinical thinking ability and ability to solve practical problems[9]. In the planning stage of PDCA cycle, teachers formulate systematic, comprehensive, scientific and reasonable teaching plans by comprehensively considering teaching objectives and students' actual conditions, and clarify the key points and difficulties of theoretical knowledge learning, making learning more targeted[10]. In the implementation stage, the theoretical knowledge and practical clinical cases are integrated through various teaching methods such as classroom teaching and case discussion, so that students can consolidate the theory in practice. In the examination stage, the students' theoretical knowledge learning results are timely evaluated, and the teaching strategies should be adjusted promptly to ensure that the students' mastery of theoretical knowledge is continuously improved.

The experimental group had significantly higher scores of practical operation examination, which benefitted from the emphasis of this teaching mode on practical ability training. POA emphasizes practical application in the learning process. Through simulation of clinical situations and case analysis, it enables physicians to learn in practice and improve their practical ability[11]. In this process, students master operational skills through various practical activities and understand how to apply these skills accurately and appropriately in complex and changeable clinical real-world situations. The continuous optimization mechanism of PDCA cycle plays a key role in the cultivation of practical operation ability. The plan and objectives of practical operation training are formulated in the planning stage, and students have sufficient opportunities for practical operation in the implementation stage, during which teachers provide timely guidance[12]. In the examination stage, the strict examination and the evaluation are carried out on the student's operation skills, and targeted improvement is made after the problem is discovered.

According to the scores of case analysis ability examination, the experimental group had advantages in solving practical clinical problems by comprehensive application of knowledge. POA encourages students to exercise their subjective initiative in the learning process, explore and solve problems independently. In the clinical teaching of gynaecological tumors, the autonomous learning ability of resident physicians is cultivated by setting problem situations and guiding students to learn independently[13]. When faced with complex gynaecological tumor cases, students can use the theoretical knowledge and practical experience they have learned to conduct comprehensive and systematic analysis and put forward reasonable diagnosis and treatment recommendations. Each link in the PDCA cycle lays a foundation for subsequent learning and practice. Specifically, the teaching objectives and contents of case analysis are determined in the planning stage, students participate in case analysis practice by means of case discussion and group collaboration in the implementation stage, the evaluation and feedback are carried out on the case analysis process and results in the examination stage, and targeted improvement measures are formulated for the problems found in the handling stage, such as strengthening clinical thinking training and increasing the difficulty and range of case analysis. In this way, the students' case analysis ability can be comprehensively improved[14].

The proportion of students with positive attitude to learning in the experimental group was significantly higher than in the control group, suggesting that POA plus PDCA cycle teaching can effectively stimulate students' intrinsic motivation for learning. A variety of teaching methods are used during POA, such as classroom lectures, case analysis, group discussions, clinical practice and simulation teaching. In the teaching process, the output driving role of POA is fully utilized, and output tasks are assigned to guide the physicians in training to conduct input learning[15]. For example, when explaining the diagnostic methods of gynaecological tumors, a case analysis task is first assigned to let the resident physicians perform diagnostic analysis based on the case data, and then classroom lectures are conducted to explain the principles and applications of the diagnostic methods. This enables the resident physicians to actively learn the relevant knowledge and skills of the diagnostic methods while completing the output tasks, thus improving the learning effect[16]. Besides,

the continuous feedback mechanism of PDCA cycle also contributes to the change of learning attitude. In the practical activities of education and teaching, teachers carry out comprehensive and timely evaluation according to students' learning performance, homework assignments, and classroom participation, which can make students know their actual progress in learning and further enhance initiative in learning. After knowing the direction of improvement, students will study and practice more pertinently[17].

The proportion of students with strong autonomous learning ability was significantly higher in the experimental group than in the control group, which was an important achievement of POA plus PDCA cycle teaching. POA focuses on combining learning with practice, and closely links learning with practical application. In the clinical teaching of gynaecological tumors, resident physicians can apply the knowledge they have learned to actual work by participating in clinical practice, case discussions and other activities, thereby improving the pertinence and effectiveness of learning. Meanwhile, POA emphasizes holistic education, focusing not only on the cultivation of students' professional knowledge and skills, but also on the improvement of students' comprehensive qualities, such as communication skills, teamwork skills, professionalism, etc. This is of great significance for the cultivation of gynaecological oncology clinicians with good professional ethics and comprehensive qualities[18]. In the planning stage of PDCA cycle, students participate in the formulation of teaching plans, define their own learning goals and tasks, and enhance their autonomy in learning. In the implementation stage, students complete learning tasks by independent learning and practical operation, while teachers only provide guidance and assistance[19]. In the examination and handling stages, students conduct self-evaluation according to their learning performance and achievements, and further enhance their autonomous learning ability by continuously improving their learning methods and strategies, thereby better adapting to changing learning needs and requirements for future clinical work[20].

This study revealed that the teaching mode integrating POA plus PDCA cycle displayed significant advantages in meeting students' learning needs and expectations. Taking students as the center, POA plus PDCA cycle pays attention to cultivating students' comprehensive ability, and helps students obtain all-round and multi-level achievement and growth in the learning process through diversified teaching methods and practice links. In this way, students can feel their great progress in theoretical knowledge, practical skills, and clinical thinking, so they have a higher teaching satisfaction. In addition, the continuous improvement mechanism of PDCA cycle promotes the continuous optimization of teaching process, and teachers can adjust the teaching content and method promptly based on the feedback of students to better meet the learning needs of students[21]. For example, if students have difficulties in case analysis, teachers can provide more practice and explanation of case analysis in subsequent teaching, realize stratified teaching, and improve the pertinence of teaching, thereby raising student satisfaction. Higher teaching satisfaction is an important sign of the improvement of teaching quality. The teaching mode integrating POA plus PDCA cycle not only improves students' academic performance and ability but also strengthens the teacher-student interaction and communication, creating a good teaching atmosphere. Teachers can more effectively understand students' learning status and needs through observation, homework, test evaluation, and communication with students in the teaching process, while students can also participate more actively in teaching activities[22]. Students' recognition of teaching methods will stimulate their enthusiasm and initiative for learning, and improve learning effects, thereby laying a solid foundation for training excellent clinicians in gynaecologic oncology. In addition, good reputation for teaching will attract more students, and promote the continuous deepening and development of teaching reform[23].

The strengths of this study include the use of randomization, blinded evaluations, and comprehensive outcome measures that assess theoretical knowledge, practical skills, and case analysis ability, together with learning attitudes and satisfaction. Nevertheless, this study has limitations. The single-center design and relatively small sample size may affect the generalizability of the

findings.

In conclusion, the teaching mode integrating POA plus PDCA cycle has achieved remarkable results in clinical teaching of gynaecologic oncology, which improves the performance of physicians in theoretical, practical operation and case analysis ability examinations, correct their learning attitude, enhance their autonomous learning ability and raise their teaching satisfaction. As a student-centered mode, it enhances the quality of teaching with the help of POA and continuous improvement mechanism of PDCA. Therefore, it should be actively popularized to cultivate more professionals. In the future, it can be further explored and perfected in combination with modern technology and ideas to optimize the teaching process and improve the effect, thereby contributing to the development of medical education of gynaecologic oncology

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Declaration of conflicting interests

The authors declare no competing interests.

Authors' contributions

Conceptualization and Study Design:JZ, JBL, MJL;Data Collection:HLL, Y Z, JB L, J L;Data Analysis and Interpretation:JZ, HL L, Y Z, MJ L, J L;Manuscript Drafting and Critical Revision:J Z, HL L, Y Z, JB L, MJ L, J L;Statistical Analysis:Y Z;Revisions for Intellectual Content and Clarity:J Z, HL L, Y Z, JB L, MJ L, J L .

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