

# Preliminary application of formative evaluation in pediatric ultrasound clinical teaching

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**Abstract:** Objective: To explore the effectiveness of formative evaluation in pediatric ultrasound clinical teaching. Methods: A total of 30 medical undergraduates who were enrolled in the ultrasound clinical practice in the Children's Hospital of Chongqing Medical University in 2023 were selected as the research objects and randomly divided into study group and control group, with 15 students in each group. The teaching evaluation method used by the study group was formative evaluation, while the control group was terminal evaluation. After the teaching, the final assessment results (theoretical results and technical results) of the two groups of students were compared and analyzed, and the students in the study group also gave feedback on the formative evaluation system. Results: By comparing the scores of the two groups, it was found that the scores of the study group were significantly higher than those of the control group, and the difference was statistically significant ( $P < 0.05$ ); 80% of the students believed that the application of formative assessment in pediatric ultrasound clinical teaching was helpful to the increase of their clinical thinking. 85% of the students believed that the application of the evaluation system in the clinical teaching of pediatric ultrasound had a certain promoting significance to improve their doctor-patient communication ability; 90% of the students believed that the application of formative evaluation in pediatric ultrasound clinical teaching could effectively improve their own skill operation ability; 80% of the students believed that the application of the teaching evaluation system could stimulate their interest in learning to a certain extent. Conclusion: The application of formative evaluation in pediatric ultrasound clinical teaching can effectively improve students' self-study ability, innovation ability and problem-solving ability, and can greatly improve the quality of pediatric ultrasound clinical teaching.

**Key words:** Formative evaluation; Pediatrics; Ultrasonic clinical teaching

Pediatric ultrasound is a basic subject that medical students must learn, which is highly professional and theoretical, and the pace of related clinical work is fast. Carrying out clinical teaching of pediatric ultrasound can help students apply the theoretical knowledge to practice better, and teaching evaluation is indispensable in this process. The traditional clinical teaching of pediatric ultrasound mostly adopts the terminal evaluation, but this evaluation method can not feedback the problems existing in the actual teaching process. Although formative evaluation started late in China's education system, its application has been widely recognized by virtue of its advantages such as timely feedback and short cycle. This study selected 30 medical undergraduates in our hospital for ultrasound clinical practice in 2023 as research objects to explore the effectiveness of the application of formative assessment in pediatric ultrasound clinical teaching, as reported below.

## I. Materials and methods

### 1. General information

Thirty medical undergraduates who had clinical practice in the Department of Ultrasound in Children's Hospital Affiliated to Chongqing Medical University in 2020 were selected as research objects and randomly divided into study group and control group, with 15 students in each group. There were 8 males and 7 females in the study group and 8 males and 7 females in the experimental control group, with no statistical significance ( $\chi^2 = 0.100$ ,  $P > 0.05$ ). The average score of the students in the control group was  $(85.40 \pm 5.82)$  points, and that of the students in the study group was  $(84.84 \pm 6.11)$  points, with no statistical significance ( $t = 0.286$ ,  $P > 0.05$ ). The average score of the students in the control group was  $(81.22 \pm 6.57)$ , and the average score of the students in the study group was  $(82.36 \pm 5.82)$ , with no statistical significance ( $t = -0.581$ ,  $P > 0.05$ ).

**Inclusion criteria:** Students who had been in pediatric ultrasound clinical practice for  $\geq 1$  month and volunteered to participate in this study were included.

**Exclusion criteria:** Students who did not agree to participate in the clinical practice of pediatric ultrasound for more than 1 month or who withdrew from the study were excluded.

### 2. Methods

The control group adopted the final assessment, which mainly included the assessment of students' theoretical knowledge (60%) and operational skills (40%). The study group adopted the formative evaluation, which included the rotation assessment of students according to the uniform standards required by pediatric interns, including the mini clinical evaluation exercise. Mini-CEX, direct observation of procedural skills (DOPS), Multiple evaluation feedback, daily management assessment, objective structured clinical examination (OSCE) and other assessment programs.

(1) mini clinical evaluation exercise (MINI-CEX) : The hospital conducted unified training for teachers and medical students, let them understand the implementation rules, prepared the evaluation scale for pediatric ultrasound clinical teaching, and unified the scoring standard. This study adopted a nine-point evaluation standard, namely:  $< 3$  points (failing),  $4 \sim 6$  points (passing),  $7 \sim 9$  points (good). The

assessment personnel for the students were doctors above the level of pediatric attending physicians, which mainly included the assessment of the students' doctor-patient communication and consultation. At the end of the assessment, the evaluation teacher evaluates and gives feedback on the results of the students, and then issues questionnaires to the evaluation teachers and medical students to understand their satisfaction with the examination, which can be specifically divided into three criteria: very satisfied, basically satisfied, dissatisfied, and on this basis, the corresponding improvement suggestions or suggestions are put forward.

(2) direct observation of procedural skills (DOPS) : The evaluation scale of this method is mainly used to evaluate students' ability of operation and application of clinical ultrasound technology, such as examining students' preparation before operation and communication with patients, ultrasonic clinical practice operation, communication skills with patients throughout the whole process, etc. Each content is evaluated by a nine-point system, and the assessment teacher scores the process performance of the students, and gives the evaluation feedback and corresponding improvement suggestions to the students.

(3) Multiple evaluation feedback: This method mainly evaluates students' professional quality and interpersonal communication ability. The pediatric teaching supervisor issues questionnaires to understand the evaluation of students' professional quality and clinical interpersonal communication, teamwork and other abilities by different groups such as nurses, classmates, parents and superior physicians, and the related work is summarized by the pediatric teaching supervisor.

(4) Daily management assessment: mainly on student attendance, medical record writing, patient visit records, ward rounds and other aspects of the investigation and evaluation.

(5) objective structured clinical examination (OSCE) The interview is mainly organized and carried out by the teaching director and the physicians above the attending level in the ward. The structured case interview is conducted for the students, focusing on the students' mastery and application of professional knowledge.

### 3. Observation indicators and evaluation criteria

(1) The examination results of students in the two groups: Through the comparative analysis of the examination results of students in the study group and the control group, the results are taken as an important reference index to measure the difference in teaching between formative evaluation and final evaluation. After the end of the internship, the students in the two groups were uniformly assessed, including theoretical knowledge and operational skills, and the content and form of the assessment were carried out according to the unified theoretical examination outline and clinical practical examination specifications.

(2) Teaching feedback of students in the research group on formative evaluation: Questionnaire survey was adopted to compile teaching feedback form based on formative evaluation to investigate students' feedback on professional quality, professional knowledge, clinical ability and satisfaction with teaching management, including 6 aspects: Patient care, professional knowledge, professional quality, clinical practice, interpersonal communication skills, and the ability to practice medicine within the system.

### 4. Statistical methods

SPSS 20.0 statistical software was used for data processing, the mean ( $\bar{x}$ )  $\pm$  standard deviation (s) (i.e.  $\pm s$ ) was used to represent the measurement data, and T-test was used for inter-group comparison and paired T-test for intra-group comparison.  $\bar{x}$   $\bar{x}$  Using [n (%)] to represent the counting data, the test method used was the test,  $P < 0.05$ , the difference was statistically significant.  $\chi^2$

## II. Results

### 1. Comparison of the scores of the two groups of students

The theoretical test scores of the study group and the control group were (88.00 $\pm$ 7.41) and (87.50 $\pm$ 6.91) respectively, the difference was not statistically significant ( $P > 0.05$ ). The test scores of the students in the study group were (82.65 $\pm$ 4.60) points, and the test scores of the students in the control group were (79.80 $\pm$ 5.19) points, which was significantly lower than the scores of the students in the study group, and the difference was statistically significant ( $P < 0.05$ ). For details, see Table 1.

**Table 1 Comparison of annual assessment results between the two groups of students (points,  $\pm s$ )**

group	n	Theoretical test score	Skill test scores
Study Group	20	88.00 $\pm$ 7.41	82.65 $\pm$ 4.60
Control group	20	87.50 $\pm$ 6.91	79.80 $\pm$ 5.19
t value		0.402	3.724
P value		0.692	0.001

### 2. Teaching feedback of students in the study group on formative assessment

This study conducted a questionnaire survey on 15 students in the research group. A total of 15 questionnaires were sent out, and 15 valid questionnaires were recovered.

The results showed that 80% of the students believed that the application of formative assessment in pediatric ultrasound clinical teaching was helpful to their own clinical thinking. 85% of the students believed that the application of the evaluation system in the clinical teaching of pediatric ultrasound had a certain significance in improving their doctor-patient communication ability; 90% of the students

believed that the application of formative evaluation in pediatric ultrasound clinical teaching could effectively improve their own skill operation ability; 80% of the students believed that the application of the teaching evaluation system could stimulate their interest in learning to a certain extent. See Table 2 for details.

**Table 2 Teaching feedback of study group students on formative evaluation [n (%)]**

Feedback content	是	no	General
Enhanced clinical thinking	16 (80.00)	1 (5.00)	3 (15.00)
Improve doctor-patient communication	17 (85.00)	1 (5.00)	2 (10.00)
Improve skill operation ability	18 (90.00)	1 (5.00)	1 (5.00)
Arouse interest in learning	16 (80.00)	0	4 (20.00)

### III. Discussion

Formative evaluation, as a new teaching evaluation system, can take into account the individual differences among different students. This study carried out a unified examination on the two groups of students after the end of clinical practice, and the result found that there was no statistical significance between the two groups of students in the theoretical part of the examination results ( $P > 0.05$ ), which may be because the theoretical examination content of the two groups of students was not much different, and it was closely related to memory and recitation. After comparing the scores of students' skills, it was found that the scores of students in the study group were higher than those in the experimental control group, and the difference was statistically significant ( $P < 0.05$ ). This may be because the assessment of operational skills is related to clinical teaching practice, and what is examined is students' clinical comprehensive ability. And the application of formative assessment is helpful to the improvement of students' clinical comprehensive ability. Some relevant studies also indicated that student assessment based on formative assessment can significantly improve students' practical operation ability, which is consistent with the results of this study.

In the application of formative assessment in teaching, the most important thing is "feedback -- improvement -- evaluation -- feedback". The application of formative evaluation in pediatric ultrasound clinical teaching can help teachers to find the problems existing in students' learning in time, and then improve the teaching process on this basis, and then re-evaluate and constantly revise, so as to gradually realize the optimization and perfection of the teaching program.

In short, formative evaluation is a new teaching mode of pediatric ultrasound clinical teaching at present. It focuses on the investigation and evaluation of students' learning process and emphasizes the timely application of evaluation results, which can effectively enable students to obtain a phased sense of achievement in learning and enhance their learning motivation. It is worthy of promotion and application in the teaching of other clinical specialties in pediatrics.

### Reference literature:

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