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Analysis of the application effect of step teaching method in upper gastrointestinal endoscopy teaching in children

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Abstract: *To investigate and analyse the real effectiveness of using the stepped teaching method in teaching upper gastrointestinal endoscopy in children, the data of students who participated in paediatric gastrointestinal endoscopy training in our hospital between May 2022 and May 2023 were compiled and screened by retrospective analysis. 46 students were identified and divided into a control group of 23 students/group and an experimental group by machine grouping. The teaching methods were then collated and the relevant survey data were compiled to compare the teaching outcomes of the two groups under the differences in teaching methods.The experimental group had higher assessment scores and satisfaction with teaching than the control group ($p<0.05$). The introduction and application of the stepped teaching method in the teaching of upper gastrointestinal endoscopy in children can improve the practical operation level of students, reduce operational errors and improve learning performance.*

Keywords: *Stepwise teaching method; children; upper gastrointestinal endoscopy; teaching; effectiveness of application*

Gastrointestinal endoscopy has become a universal and widely used examination in gastroenterology due to its advantages of minimal trauma, clear vision, high safety and accurate results [1]. However, the young age of children and the fact that their digestive system is not yet fully developed can make endoscopy more difficult to perform, and inadvertent errors can occur and lead to unnecessary disputes [2]. Therefore, it is vital to receive relevant education and training during the learning phase, which is a core element to improve their practice. However, the traditional approach to clinical teaching is to instil a great deal of theoretical knowledge into the student, which is beneficial to knowledge acquisition but not to practice [3]. Therefore, there is a need to optimise and innovate teaching methods for upper gastrointestinal endoscopy in children, so that they can improve their theoretical and practical skills simultaneously. The stepwise teaching method has been used in many clinical teaching activities, which is to divide the teaching content into specific stages and carry out teaching activities based on the learning ability and knowledge mastery of the trainees, so that they can understand and master the important and difficult points in the shortest possible time and effectively exercise their practical skills. Therefore, this paper will focus on the effectiveness of the ladder teaching method in upper gastrointestinal endoscopy in children, as reported below.

1. General information and methods

1.1 General information

Before the formal investigation study, information on the doctors and postgraduates who participated in the clinical teaching activities of upper gastrointestinal endoscopy in the pediatric gastroenterology department of our hospital from May 2022 to May 2023 was screened, and then a total of 46 observation targets were identified for inclusion, which were divided into control and experimental groups by random grouping, with the number of group members being 23/group. In the control group, there were 12/11 male and female interns, aged 23-38 years, with a mean age of (31.45±8.13) years; in the experimental group, there were 13/10 male and female interns, aged 24-37 years, with a mean age of (30.72±7.86) years. The two groups showed no difference ($P > 0.05$) when the basic data information was compared.

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1.2 Methods

1.2.1 Control group

The teaching method used in this group was conventional teaching. (1) Theoretical teaching: the teacher explained to the interns in detail the principles of gastroscopy, operation methods, condition assessment and other knowledge around the teaching objectives and syllabus of upper gastrointestinal endoscopy in children, and encouraged the interns to ask questions and answer them after the lecture was completed; (2) Practical teaching: the interns were organized to observe the operation and explained by the teacher at the same time, and the students were guided to use their spare time to try to simulate practice.

1.2.2 Experimental group

The teaching method used in this group is the stepped teaching method. (1) Stage 1: In this stage, the focus is on the anatomical structure of the upper gastrointestinal tract of children, including its location, vascular distribution, function and various pathological manifestations. At the same time, students will be able to observe the classification of instruments, methods of operation and procedures of upper gastrointestinal endoscopy in children through the use of photographic displays in conjunction with lectures. After the completion of this stage, an examination on theoretical knowledge will be organised, based on a percentage system. In the first half of the stage, the teacher should select the most representative and typical examination case video in the department, and refine the video content into multiple steps, cut it into multiple short micro-lesson videos, and explain to students in detail all aspects and details of upper gastrointestinal endoscopy in children by pausing and zooming in during teaching. At the same time, after the teaching activities were completed, videos were transmitted in the form of WeChat groups and QQ groups to guide students to watch the videos repeatedly during the rest of the class to consolidate and remember the knowledge. In the second half of the lesson, the trainer will demonstrate the various aspects of upper gastrointestinal endoscopy in children, and will ensure that all students can observe the procedure at close quarters through a mini-lesson. During this time, the teacher should provide a breakdown of the procedure, highlighting the various precautions to be taken during the procedure. (3) Phase 3: During this phase, students are given the opportunity to carry out a practical exercise, i.e. they perform the upper gastrointestinal endoscopy in children on their own, with the teacher observing and guiding them, pointing out any errors and helping them to correct them. In addition, during this stage, the teacher can divide the students into groups, and guide the members of each group to supervise and guide each other, record the problems that occur in each member's practice, and use the time after class to discuss the problems and propose corresponding rectification plans, so as to check the gaps and make up for the shortcomings, so that all trainees can be proficient in This is to ensure that all trainees have a good grasp of operational knowledge and to improve their learning outcomes. The total duration of this phase is 30d.

1.3 Observation indicators

(1) Assessment performance. Record the theoretical scores and practical scores (including successful insertion of gastroscopy into the child's esophagus, successful insertion of gastroscopy into the child's pyloric area, successful insertion of gastroscopy into the child's descending duodenum, successful turning of the gastroscope in the child's organism, and diagnosis of the condition) for both groups, with scores of 0-100 for each subject, of which, the practical scores are 0-20 for each item, and the higher the total score obtained indicates the better the student's learning situation. (2) Satisfaction with teaching. Students in both groups were given a self-made "Satisfaction with teaching methods" questionnaire, which included motivating learning, enriching teaching contents, reducing learning difficulties, expanding knowledge horizons, facilitating understanding of important and difficult points, improving theoretical and practical skills, improving problem analysis and solving skills, strengthening the sense of responsibility, improving job adaptability and Cultivate clinical thinking. Each item was scored from 0 to 10, and the higher the total score obtained, the higher the students' satisfaction with teaching.

1.4 Statistical methods

The data of the survey study were processed using SPSS23.0 statistical software; the measurement data were expressed using (±s) and tested by t-test; statistical differences were expressed using ($P<0.05$).

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2. Results

2.1 Comparison of assessment scores between the two groups

The total assessment score of the experimental group was 186.33±61.46 (points) and that of the control group was 138.19±41.00 (points), and the performance of the experimental group was significantly higher than that of the control group (P<0.05), as shown in Table 1.

Table 1: Comparison of the assessment results between the two training groups ($\bar{X}$±s)

Projects	Control group(n=23)	Experimental group(n=23)	t-value	P-value
Theoretical knowledge	73.26±14.35	92.75±18.75	3.959	0.000
Successful insertion of gastroscope into the oesophagus of a child	13.12±5.31	18.34±8.96	2.404	0.021
Successful insertion of the gastroscope into the pyloric region in children	11.56±4.76	18.13±8.58	3.211	0.003
Successful insertion of the gastroscope into the descending duodenum in a child	12.48±4.97	19.02±7.63	3.444	0.001
Successful reversal of the gastroscope in the child's organism	13.32±5.48	18.85±8.56	2.609	0.012
Diagnostic status of the condition	14.45±6.13	19.24±8.98	2.113	0.040
Total score	138.19±41.00	186.33±61.46	3.125	0.003

2.2 Comparison of the teaching satisfaction of the two groups of training participants

The total rating of teaching satisfaction in the experimental group was 83.67±41.05 (points), compared with 42.58±21.99 (points) in the control group, and the teaching satisfaction in the experimental group was significantly higher than that in the control group (P<0.05), as shown in Table 2.

Table 2: Comparison of teaching satisfaction between the two training groups ($\bar{X}$±s)

Projects	Control group(n=23)	Experimental group(n=23)	t-value	P-value
Motivating learning	4.48±2.35	8.13±4.76	3.298	0.002
Enriching the content	3.15±1.24	8.36±3.85	6.177	0.000
Reducing the difficulty of learning	3.62±1.98	7.93±3.76	4.864	0.000
Broadens the horizons of knowledge	4.33±2.37	8.05±4.12	3.753	0.001
Facilitate the understanding of important points	3.86±1.97	8.21±3.58	5.105	0.000
Improves theory and practice at the same time	4.17±2.85	9.02±4.73	4.212	0.000
Improving problem analysis and solving skills	4.26±2.15	8.73±3.48	5.241	0.000
Reinforce the sense of responsibility	5.34±2.54	9.17±4.78	3.393	0.002
Improve job adaptability	4.25±2.48	8.14±4.53	3.612	0.001
Develop clinical thinking	5.12±2.06	7.93±3.46	3.347	0.002
Total score	42.58±21.99	83.67±41.05	4.232	0.000

3. Discussion

Upper gastrointestinal endoscopy in children is highly technical and specialized, and if the physician has no prior experience or training in endoscopic procedures, this will increase the probability of errors, which will not only increase the pain of the child but also pose a serious risk to his or her own safety [4-5]. Therefore, it is essential that teaching children about upper gastrointestinal endoscopy is carried out. However, due to the complexity and extensive knowledge of gastrointestinal endoscopy, it is difficult to ensure that trainees are proficient in the operation of the procedure by continuing the conventional teaching methods.[6-7] In the face of this phenomenon, it is particularly crucial to actively reform and innovate clinical teaching methods. The full development of the medical education field has given rise to a variety of teaching methods, among which the ladder teaching method has been highly favoured by the industry. This method of teaching is based on the teaching objectives, the teaching content is divided into 3-4 stages to be studied separately, refining all the

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knowledge points, making it easier for students to understand and master, and can achieve an overall improvement in the teaching effect [8]. In the investigation of this paper, a stepped teaching method was used, divided into three main stages. In the first stage, the teacher will explain the basic theoretical knowledge to the students in detail, so as to ensure that they can improve their knowledge and understanding of the anatomical structure of the digestive system in children. In the second stage, the teacher will mainly focus on watching videos and live demonstrations, and can ensure that students have an intuitive understanding of the whole process of upper gastrointestinal endoscopy by pausing the videos and operations at any time and repeating explanations around the key points, so as to help them grasp the details of the examination operations more solidly and firmly, and thus be able to avoid mistakes and errors when they participate in their jobs in the future. [9]In the third stage, the teacher places the student in the main position and guides him/her to carry out the upper gastrointestinal endoscopy on his/her own, and observes beside him/her, pointing out errors and omissions and assisting him/her in correcting them in a timely manner. In this way, students are given more opportunities to practise, so that they can grasp the methods of checking more fully and accurately and practise their skills effectively. It can be said that the teaching of upper gastrointestinal endoscopy in children is carried out in stages, with the characteristic of "step by step", which enables students to gradually improve their clinical professional skills. In this study, it was found that the total score of the experimental group was 186.33±61.46 (points) compared to 138.19±41.00 (points) for the control group, with the experimental group achieving higher scores ($p<0.05$). At the same time, in terms of assessing satisfaction with teaching, the total scores of the experimental and control groups were 83.67±41.05 (points) and 42.58±21.99 (points) respectively, and it was obvious that the experimental group was more satisfied with the teaching method ($p<0.05$). This can fully demonstrate the feasibility and necessity of applying the stepped teaching method.

In conclusion, the use of the stepped teaching method in teaching upper gastrointestinal endoscopy in children can simultaneously improve the theoretical and practical skills of interns, effectively avoiding errors in later work, and is effective and should be actively implemented.

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