

The application of critical pathway management to resident doctor's standardized training in pediatrics

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Abstract. – OBJECTIVE: To further guide the standardized training work of the resident doctor and apply critical pathway management to resident doctor's standardized training.

MATERIALS AND METHODS: The traditional training contents were adjusted. The main research content of evaluating the results of standardized training was designed, and the research method was adopted by the standardized training of the resident doctor.

RESULTS: The resident doctors of the group with the new teaching method demonstrated a high participation rate. Because of the constraint of the standardized training, trainers would pay more attention to their training.

CONCLUSIONS: The clinical pathway polishes up the ability of resident doctors, further guiding the standardized training work of a resident doctor.

Key Words:

Clinical path, Standardized training, Resident doctor.

Introduction

The critical pathway is a method that aims at improving the medical quality, enhancing the efficiency of work and decreasing the medical payments through the standardization of diagnosis and treatment process. The critical pathway has advantages such as fine management practices, standardization, and programming. It can be applied to the training of post-medication treatment, standardized training of resident doctor and served as the joining point for hospital and clinical management, and continuous education. The standardized training of resident doctors is the continuous medical education for medical graduates and postgraduates in a clinical training base, which is designed to master the clinical specialist basic knowledge, theory, and skill. The implementation of standardized training of the re-

sident doctor is an important measure to cultivate therapists and improve the performance of clinical medication¹. At present, in some developed countries like US, UK, and Australia and, some regions like Hong Kong, China, and Taiwan, China, comparatively mature systems have already established in the standardized training of the resident doctor². In China, standardized training of the resident doctor began in the 1920s in accordance with the American methodology. The critical pathway is an effective way to standardize the clinical work and scientific diagnosis. During the formulation of the clinical pathway, it conforms to the idea of evidence-based medicine and summarizes the clinical experience, which is the collective product of medical specialists in clinical practices. The implementation of the clinical pathway is not easy, as many difficulties and problems may present themselves. For example, some problems may occur in the mastery and application of admittance, variation, and discharge. Therefore, to master these standards and solve the problems accurately and timely is the key to improving the problem-solving ability. The American Annuals of Internal Medicine in 1995 reported that the combination of a clinical pathway to other pedagogical methods made by Harvard Medical School and others could significantly improve the interns' clinical ability of operation and strengthen the cost-effective awareness in diagnosis. They brought the clinical pathway into their teaching plans, discussed on the controversial parts and combined clinical teaching organically. The report declared that the teaching methods of the clinical pathway could significantly improve the interns' clinically operative ability³. Some people in China have also tried clinical practice teaching based on the clinical pathway and have made some achievements⁴. Our hospital introduced clinical pathway into the standardized training of the resident doctor in pediatrics and

made some beneficial attempts. The details are as follows.

Materials and Methods

The Implementing Measures of Standardized Training of Resident Doctor in Clinical Pathway

Firstly, the traditional training contents were adjusted: Apart from the traditional training method based on the training manual printed by Ministry of Health for standardized training of a resident doctor, the clinical pathway ideas were added. The major ones were: (1) Each disease on the training manual for resident doctors needed a clinical pathway form. The form was mainly involved with the criterion of diagnosis, the choice of the treatment plan, the examination of laboratory and auxiliary inspection, the choice of drugs and dosage, and the main diagnostic procedure. Resident doctors were required to learn the theory and practice systematically according to the procedures. In the training process, 110 diseases in 12 pediatric majors in our hospital, newborns, digestion, critical care medicine, cardiovascular, kidney, infection, blood and tumor, nerves, internal secretion, genetic rheumatism, child care, had a clinical pathway form. (2) To formulate the clinical pathway flow chart for round section training of the resident doctor: Resident doctor's admittance to a new major→the identification of clinical teacher→the clinical teacher's strict accomplishment of tasks according to the clinical pathway form→the exam of theory, practice and course completion. Under the requirements of the training manual for resident doctors in pediatrics, formulated clinical disease pathway and PDCA circulation principle, the clinical teacher took the real circumstances and objectives of training of the resident doctor to formulate the clinical pathway form (Table I).

The exam on the course completion must refer the *fascicule clinical practice guidelines for pediatrics, internal medicine* and *Zhu Futang practical pediatrics* on which the clinical pathway set was based.

To establish a regularized vocational study record, three-level ward round and the discussion of cases.

The content of practical skills exam was based on the clinical pathway and added to the exam on course completion. They questioned the skills of medical history, the physical examination, the

first writing of daily progress note, admittance, variation, and discharge based on the clinical pathway set.

Secondly, the main research content of evaluating the results of standardized training of the resident doctor by means of the clinical pathway are: 1) The completion of designated topic, including the opening time, frequency and the attendance of trainee. 2) The influence of resident doctor theory and exam on skills. 3) The basic circumstances of a clinical round of resident doctor (the round time, department and the management of bed). 4) The training of clinical skills of the resident doctor, mainly including skill operation, the teaching of superior doctors, the teaching rounds and discussion of cases.

Thirdly, the research method adopted by the standardized training of the resident doctor: The clinicians who graduated on July 2008 and July 2009 and were distributed to our hospital were graduates and postgraduates, respectively, among which forty clinicians of the earlier period received traditional training, forty-two clinicians of the later period received standardized training of the resident doctor by way of clinical path. 1) To conduct an interview and discussion on the focus themes, we held two forums for director of the department and clinical teachers, with 12 relevant experts participating and discussing on the big picture of the standardized training of resident doctor and the process management. 2) We conducted an interview for resident doctors in each group to understand their views on the training method, with two groups and twenty-eight resident doctors participating. 3) We had a personal in-depth interview to have a conversation with the director responsible for the teaching, clinical teachers and administrative staff about teaching plans, and the management of the department and training system. 4) We had questionnaire surveys. 150 resident doctors participated with 148 copies responded and retrieved, and the response rate was 98.7%. The content of the questionnaire included the necessity of the series lectures, the effect of teaching content, the effectiveness and necessity of rounds and checks.

Statistical Analysis

SPSS 13.0 software (SPSS Inc., Chicago, IL, USA) was adopted. The Chi-square test was applied for the comparison of count data, and *t*-test for the comparison of measurement data. $p < 0.05$ suggested that the difference had statistically significant.

Table I. The clinical path form of the training of resident doctor in pediatrics.

| Time | The important learning content and guidance |
|---|---|
| Preparations for beginning the internship | 1) To have a basic understanding of the department; 2) to learn the rules and regulations of the department and the core rules of the hospital 3) to receive the education of medical safety and medical norms; 4) to introduce the basic circumstances of clinical path teachers; 5) to distribute the clinical teachers, one teacher to one intern; 6) to teach how to write a specialized case |
| The first month | 1) to study 1/3 of all the disease in specialty; 2) one vocational study per week, the concentration is on these diseases that are unlikely in clinics; 3) one ward round per week, elaborating on 2-3 critical disease; 4) to discuss one case per week, elaborating on 2-3 important disease; 5) to explain the clinical pharmacy; 6) the demonstrative teaching of specialist skills should account for 1/3; 7) disease combined clinical theory accounts for 1/3, emphasizing the mechanism of clinics; 8) diagnosis and diagnostic skills. |
| The second month | The procedures are same as the first month, including seven aspects. |
| The third month | The procedures are same as the first month, including seven aspects. |
| The exam on course completion | 1) to evaluate the case writing 2) to check the diagnostic skills and physical examination 3) theory test: 4) operation test. |

Results

We compared and analyzed the results of the two groups with different training methods.

The Comparison of the Results of the two Groups

Findings showed that only 56% of resident doctors held that someone was responsible for teaching during the rotation with traditional training method, while 95% with the new training method. Compared the four training methods in the two groups, we found that the resident doctors of the group with the new teaching method demonstrated a high participation rate ($t = 3.42$, $p < 0.05$) (Table II).

The Comparison of the Teaching Methods of two Groups

We chose three provincial level key clinical specialties (neonatology, emergency, and neurolo-

gy and one municipal level key clinical specialty (respirology), and found that the teaching rounds and vocational studies in the group with the traditional teaching method were conducted two or three times a month, while three or four times in the group with new training method. Hence, we concluded that due to the constraint of the standardized training, teachers should pay more attention to their training (Table III).

The Statistical Analysis of four Findings from the two Groups

We mainly compared and analyzed the resident doctors' marks in the theory and skill test, their distribution to different departments, and their relationship with patients. Our findings were as follows: 1) Resident doctors of the two groups participated in the theory test on standardized training for the resident doctors organized by Department of Health of Jiangsu province in 2011 and 2012 respectively. The passing rate of

Table II. Comparison of participation rate in two groups.

| Group | Professional training (%) | Case discussion (%) | Teaching rounds (%) | Active consultation with senior doctors (%) |
|--|---------------------------|---------------------|---------------------|---|
| Group with traditional training method | 63.3 | 71.5 | 75.1 | 83.2 |
| Group with new training method | 71.5 | 87.3 | 88.5 | 96.5 |

Table III. Distribution of teaching frequency of senior doctors in two groups.

| Training method | Specialty | ≤Once a month | | Twice a month | | Three times a month | | ≥Four times a month | | Total |
|-----------------------------|-------------|---------------|------|---------------|-------|---------------------|-------|---------------------|-------|--------|
| | | Number | % | Number | % | Number | % | Number | % | number |
| Traditional training method | Neonatology | 2 | 6.67 | 10 | 33.33 | 12 | 40.00 | 6 | 20.00 | 30 |
| | Emergency | 1 | 3.33 | 11 | 36.67 | 12 | 40.00 | 6 | 20.00 | 30 |
| | Neurology | 1 | 3.33 | 12 | 40.00 | 13 | 40.43 | 4 | 13.34 | 30 |
| | Respiration | 1 | 3.33 | 13 | 40.43 | 12 | 40.00 | 4 | 13.34 | 30 |
| New training method | Neonatology | 1 | 2.78 | 3 | 8.33 | 8 | 22.22 | 24 | 66.67 | 36 |
| | Emergency | 0 | 0.00 | 3 | 8.33 | 7 | 19.45 | 26 | 72.22 | 36 |
| | Neurology | 0 | 0.00 | 4 | 11.11 | 8 | 22.22 | 24 | 66.67 | 36 |
| | Respiration | 0 | 0.00 | 2 | 5.55 | 7 | 19.45 | 27 | 75.00 | 36 |

Table IV. Comparison of total score of case collection and physical examination ($\bar{x}\pm s$).

| Group | Professional training (%) | Case discussion (%) | Teaching rounds (%) | Active consultation with senior doctors (%) |
|--|---------------------------|---------------------|---------------------|---|
| Group with traditional training method | 63.3 | 71.5 | 75.1 | 83.2 |
| Group with new training method | 71.5 | 87.3 | 88.5 | 96.5 |

the group with traditional training method was 70%, and that of the group with new training method was 94.1% (χ^2 -value=5.39, $p<0.05$). 2) Resident doctors of the two groups participated in the skill test organized by the Department of Health of Jiangsu in 2011 and 2012 respectively. The test centered upon the case collection and physical examination (as shown in Table IV), case record (as shown in Table V), and recognition of videos, electrocardiograms and blood smears (as shown in Table VI). 3) After the first stage of standardized training for the resident doctors, the group with new training method demonstrated a high success rate in the two-way selection for specialty ($\chi^2=10.10$, $p<0.05$). 4) The group with new training method showed a significant decrease in the resident doctors receiving complaints from the patients and their families during the three-year training period ($\chi^2=6.98$, $p<0.05$).

Discussion

Firstly, training quality was improved significantly with standardized training for the resident doctors guided by a clinical pathway. We conducted the standardized training in accordance with the requirements of the clinical pathway. In the beginning, resident doctors learned how to formulate forms of clinical pathways for pediatric diseases. As for theoretical learning, they grasped key points in learning by integrating the clinical basis and diseases to avoid the boredom of theoretical learning. The new training method, characterized by the combination of the perceptual and rational knowledge of clinical practice, highlights the key points in clinical practice, and sticks to the guideline of the disease and differential diagnosis and treatment. Instead of a knowledge-infusion approach, teachers adopt an inspiring method to increase the learning efficiency. The evaluation of the results of

Table V. Score of case record ($\bar{x}\pm s$).

| Group | n | Score | t-value | p-value |
|--|----|------------|---------|---------|
| Group with new training method | 30 | 91.83±3.60 | 0.02 | >0.05 |
| Group with traditional training method | 36 | 91.82±4.16 | | |

PS: t-value was calculated with SPSS 13.0 statistical software, and differences had no statistical significance. (t-value=0.02, p-value > 0.05).

Table VI. Recognition of videos, electrocardiograms and blood smears ($\bar{x}\pm s$).

| Group | n | Score | t-value | p-value |
|--|----|-------------|---------|---------|
| Group with new training method | 30 | 83.58±9.43 | 4.81 | <0.01 |
| Group with traditional training method | 36 | 68.00±14.20 | | |

PS: *t*-value was calculated with SPSS 13.0 statistical software, and differences had no statistical significance. (*t*-value=0.02, *p*-value > 0.05).

standardized training for resident doctors fully demonstrates the effectiveness and practicality of the new training method.

A clinical pathway is the best-standardized pathway formulated by a host of specialists for a particular disease. On this basis, diagnosis quality and safety will be ensured, and the discrepancies in skills of the medical staff will be eliminated. Differences in results come from variances in the treatment processes and methods, offering a standardized paradigm for training. Fostering professional ability and learning medical theories in a planned and scientific way helps build a harmonious relationship between the resident doctors and their teachers, and enhance the connection between the resident doctors, their teachers, and subject leaders.

Secondly, training quality will be improved because of the standardized and systematic training method for the resident doctors guided by a clinical pathway through integration between management and standardized training. The clinical pathway is an efficient and standardized disease management pattern, indicating the team spirit and concept of a procedure. In the new health care system, it plays a critical role in improving medical quality and curbing soaring medical costs. Formulating clinical pathway is to find the best way for clinical treatment. Forms of clinical pathway start from evidence-based medicine, and reference books for disease treatment are of referential value for resident doctors. Based on the standardized training for resident doctors guided by clinical pathway, they will learn clinical skills effectively and make their thinking pattern about clinical practice more active, thus raising the quality of their medical service. As a result, a more harmonious relationship between the doctors and patients will be established.

Thirdly, the clinical pathway will regulate teachers' behaviors and clinical skills, improve their comprehensive quality and sense of responsibility, and foster their ideas of lifelong learning. The teaching of clinical pathway requires that doctors

stick to the guideline of diagnosis, differential diagnosis, and treatment. With the correct clinical thinking method, it reinforces doctors' perceptual and rational knowledge of the clinical treatment. Besides, it helps doctors organically connect basic theories like pathophysiology and neurobiology with clinical practice to comprehensively and systematically master medical knowledge⁵. The teaching method of clinical pathway integrates perceptual and rational knowledge, which greatly improves doctors' ability to comprehensively analyze and solve problems⁶.

Lastly, the relationship between resident doctors and patients will become more harmonious with the management of standardized training for resident doctors guided by the clinical pathway. The clinical pathway can not only regulate their medical behaviors, but also break through the situation where doctors completely monopolize care information, which does alleviate the trust crisis between doctors and patients⁷. Due to the new training method, there is a significant reduction in resident doctors receiving complaints from the patients' parents.

Conclusions

The standardized training for resident doctors aims to cultivate their ability to find, analyze and solve clinical problems, and help them master clinical and operational skills. The management of clinical pathway meets the requirements for resident doctors, which is a training method worth trying.

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Conflict of interest

The authors declare no conflicts of interest.

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