

Research progress on the application of Kirkpatrick model in continuing nursing education

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Abstract: This study reviews the brief introduction, content and application status, problems and suggestions of Kirkpatrick model in the field of continuing nursing education, in order to provide theoretical basis and practical reference for the follow-up research and clinical application.

Keywords: Kirkpatrick model; Continuing nursing education; Review

In recent years, with the improvement of people's living standards and health awareness, the people's demand for nursing services has increased significantly. In the face of increasingly complex and diversified nursing environment and service needs, it is of great^[1] significance to strengthen the training of nursing personnel to improve the quality of nursing, ensure the safety of patients, and promote the high-quality development of hospitals. Continuing nursing education (CME) is a lifelong education^[2] based on learning new theories, knowledge, techniques and methods following standardized professional training after graduation, including training for new nurses, standardized training for nurses and training for specialist nurses. The quality of the training is directly related to the effect of nursing personnel training. As an important basis for measuring the quality of training, the evaluation system can directly reflect the completion of training objectives^[3]. As a comprehensive, systematic and scientific effect evaluation model, the Kirkpatrick model is widely used in the field of education. The application of Kirkwall model in training effect evaluation can deeply understand the transformation degree of trainees' knowledge, find out the possible problems in the training, and put forward solutions, so that the training content can be applied^[4] in practical work. At present, the application of the Kirkpatrick model in the field of nursing in China is still in its infancy, but it has initially shown effect in continuing nursing education training. This paper reviews the concept and connotation of the Kirkuk model and its application in the field of continuing nursing education, and puts forward the existing problems and prospects, so as to provide a reference for improving the evaluation system of nursing staff training effect and improving the quality of teaching.

1 Overview of the Kirkpatrick model

1.1 A brief introduction to the Kirkroyal Model

Kirkpatrick's Model, also known as the four-level training evaluation model, was proposed by the famous scholar Kirkpatrick in 1959. It is one of the most widely^[5] used training effectiveness evaluation tools in the world. This model evaluates the effectiveness of training from four levels: reaction layer, learning layer, behavior layer and outcome layer.^[6] Based on the uniqueness of Medical Education, Best Evidence Medical Education (BEME) further subdivides the learning layer of the Kirkwinian model into attitude and knowledge and skills, and the outcome layer into organizational practice and patient benefit.^[7] Based on the behavioral theory, the hierarchy of the Kirkpatrick model is divided from the superficial to the deep, from the concept to the behavior, from the improvement of personal quality and ability to the improvement of the evaluation of organizational performance, step by step, which makes a systematic, comprehensive and scientific evaluation of the training effect^{[8][9]}, and has strong convincing. It emphasizes that the evaluation results of the last round^[10] of training are the cornerstone and starting point for the improvement of the training effect of the next round. Therefore, using the model to evaluate the training effect can find out the problems in time, so as to improve the training program and improve the training effect.

1.2 Evaluation content of the Kirkroy Model

① Reaction layer: It mainly focuses on the reflection and satisfaction degree of trainees to the training, covering the evaluation of curriculum setting, training methods, teaching resources allocation, teaching staff and organizational management, etc. Relevant data are usually collected by questionnaire or interview after the training.^{[11][12]} The evaluation of this level can quickly collect the overall feelings of the trainees on the training, obtain a large number of suggestions for improvement, and provide reference for adjusting the training content and teaching methods.^[13]

② Learning level: it mainly evaluates the degree of mastery of knowledge and skills and the change of learning attitude of the students. Generally, the best^[14] evaluation effect is carried out during or immediately after the training. The evaluation method mainly adopts a combination of theoretical examination, operational skills assessment, case analysis, scenario simulation and other methods to comprehensively investigate the mastery of knowledge before and after the training, measure the effectiveness of the training, and help the trainers identify and strengthen the weak links^[2,7] in the training.

③ Behavior layer: it mainly investigated the students' application of the knowledge they had learned, and evaluated whether they applied the knowledge, skills and attitudes learned in the training to clinical practice. Self-evaluation, peer evaluation, observation and interview methods were often used to evaluate

the changes^[15,16] in the students' behavior before and after the training. In this level, sufficient time should be set aside to promote the change of trainees' behavior during the evaluation, and the evaluation is generally carried out 3 to 6 months after the end of the training.^[17] The evaluation of behavior level can reflect the influence of training on practical work, and is the most important indicator to judge the effect of training.

④ Result layer: It mainly evaluates the benefits brought by the training program for the trainees and their organizations. It mainly evaluates the effects of the training on the career development of nurses, the quality of patient care and health outcomes by means of questionnaire, observation and index measurement. It is often measured by indicators such as nurse turnover rate, patient satisfaction, incidence of adverse events and incidence of nurse-patient disputes. The specific evaluation indicators should be combined^[8,15,18] with the training objectives. Because the time of improvement in outcomes lags the time of behavioral change, assessments^[17] are generally conducted after 6 months of training. The outcome level evaluation is difficult to implement, but it can test the contribution of training programs to the achievement of organizational goals, and then determine the direction and focus of future training.

2. Application of Kirkpatrick model

2.1 Construction of training quality evaluation system

The construction of evaluation index system is the premise of scientific evaluation. The construction of continuing nursing education training evaluation system based on Kirkpatrick model can provide solid theoretical support for hospital personnel training and management, and make the training work more planned and targeted^[19]. In recent years, based on the Kirkpatrick model as the theoretical framework, combined with Delphi expert consultation method, many domestic scholars have constructed a training effect evaluation system covering continuing nursing education, standardized training of nurses, specialized nurse training and other continuing education forms, so as to comprehensively, systematically and scientifically evaluate the training quality from different levels. Hao Yanqing et al. constructed^[20] a continuing nursing education effect evaluation index system in line with China's national conditions, which included 11 secondary indexes such as training needs, practical skills, and organizational benefits, and could comprehensively evaluate the short-term and long-term effects of continuing education. However, this study mainly focused on the form of continuing education in other hospitals, and did not include all forms of continuing education. However, its universality needs to be further improved. Shang Xingchen et al. constructed a standardized training quality index system for nurses covering^[8] 15 second-level indicators such as professional literacy, organizational construction, and nursing quality, which can provide a basis for effectively improving the quality of standardized training for newly recruited nurses. Xie Yijia et al. innova-

tively combined the post competency of specialized^[21] nurses with the Kirkwall model to construct the training evaluation index system for specialized nurses. The evaluation system extends from the surface evaluation of specialist nurses' subjective feelings and assessment results of training to the deep evaluation of clinical work behavior, practical innovation ability and self-worth, which effectively promotes the development of specialist nurses' training work. Considering that the construction of training evaluation system is affected by many factors such as training content and training objectives, other scholars have also built corresponding specialized nurse training evaluation index system for intravenous therapy, geriatric nursing, traditional Chinese medicine nursing, operating room nursing, orthopedic and traumatology nursing and other specialized fields,^[11,22–25] so as to make the training evaluation work of nursing staff more scientific and refined. The application of Kirkwall model has been extended to the training of continuing nursing education teachers. Zhang Yuhong et al. 's quality evaluation system for hospice care teacher training provides a scientific basis for teacher training, assessment and management. Compared with domestic research, there are relatively few foreign studies on the construction of evaluation system. At present, although China's related research has made significant progress, most of the research is stalled in the index construction stage, and there is a lack of follow-up in-depth research to determine the practicability and operability of the evaluation system. In the future, it is necessary to further clarify the specific measurement methods of each three-level index to carry out empirical research, so as to realize the continuous optimization and improvement of the training effect evaluation system.

2.2 Verify the effectiveness of the training program

Effectiveness evaluation is a key means to test the effectiveness and quality of training. As a long-term and comprehensive evaluation tool, the Kirkwin-based model can assist training organizers to clarify the effectiveness and feasibility of training programs. Many scholars have carried out in-depth evaluations of the newly established training programs with the help of the Kirkkirkham model. Zhu Xinqing et^[19] al. conducted a systematic evaluation of the implementation effect of the "three-level, two-way and six-loop" continuing education training system for nurses by using questionnaire survey, test method, situational exercise, case practice and others' evaluation under the guidance of the Kirkwall model. The results showed that the training model could improve the participation and satisfaction of nurses in training, the pass rate of assessment, the ability of post and the satisfaction of patients. Meanwhile, it can reduce the incidence of adverse events. Huang Xueyan et^[26] al. comprehensively evaluated the implementation effect of the TCM nursing training program and confirmed that nurses had a high satisfaction with the program. After training, it could promote the TCM nursing behavior of nurses and improve patient satisfaction, and the personal benefit of nurses was good. Fan et^[27] al. evaluated the effect of venous

thromboembolism (VTE) prevention ability training for nurses in the medical alliance, and found that the training program effectively improved the nurses' VTE prevention knowledge level and prevention ability, and enhanced the compliance and standardization of patients' self-prevention. Wang Chuan Xia et al. evaluated the effect of the training system for^[24] specialized geriatric nurses, and the results showed that the training effectively improved the clinical nursing ability of nurses. However, this study only evaluated the two levels of the Kirkuk model, and lacked the evaluation of the behavior layer and the outcome layer. Therefore, future research should pay attention to the complete application of the Kirkuk model to the whole process of training. The study^[28] by Marzieh et al. confirmed that the training program of auxiliary and alternative communication between nurses and patients with intubation significantly improved the success rate of communication between nurses and patients with intubation, and improved the satisfaction and difficulty of communication. Noh et al. evaluated the multi-mode simulation disaster education training program based on ADDIE^[29] model and found that the program could effectively improve the disaster response ability of nurses, with high satisfaction of nurses and significant learning effects. Cheryl et al. applied the Kirkwall model to evaluate the effectiveness of the hematopoietic stem^[30] cell transplantation coordination ability training program. The results showed that the nurses were highly satisfied with the program, and the nurses' transplantation-related knowledge, health education ability and transplantation coordination ability were significantly improved after training. However, these two studies did not evaluate the outcome level indicators due to the low frequency of disasters and transplantation events. In summary, there have been mature experiences in the application of Kirkpatrick model in the evaluation of training outcomes. However, most of the current studies use the single-group before and after measurement method, which may lead to Hawthorne effect and affect the authenticity of the evaluation results. Some studies did not fully apply the four evaluation levels of the Kirkpatrick model, which reduced the systematicity of the evaluation. It is recommended to set up a control group in future studies to enhance the persuasive power of the research results, extend the research time, and evaluate the long-term impact of the training effect, so as to improve the reliability of the research results.

2.3 Optimize the nursing training system

As a "post hoc" evaluation model, the evaluation results of Kirkpatrick model are of great significance for optimizing the follow-up training program and promoting the continuous improvement of training quality. Researchers have used the KirkBritish model in different training scenarios to carry out practical exploration. Yu Lina et^[31] al. introduced Kirkman evaluation model into needle-stick injury protection training, carried out course satisfaction survey, theoretical and operational assessment and daily work evaluation before and after each training, and continuously revised the training program according to the evaluation

results and problem feedback. The results showed that: The results showed that the observation group was significantly better than the control group in training satisfaction, theoretical and operational assessment results, needle stick injuries behavior attitude and ability, the number of needle stick injuries and the correct treatment rate and so on. Chen Yi et^[15] al. applied the Kirkwall model to the training of new nurses' professional image and behavioral norms. Before the training, the training needs were investigated and the training content was adjusted. After the training, the shortcomings of the training were analyzed and the training methods and means were dynamically adjusted through theoretical examination, behavioral norms examination, self-behavior evaluation and satisfaction evaluation. After the training, the theoretical and practical assessment scores of the observation group were higher than those of the control group, and the self-evaluation of the observation group was better than that before the training. However, there are some limitations in this study, which do not compare the self-evaluation of the observation group and the control group, and lack of objective evaluation indicators. Zheng Mozhen et^[32] al implemented the Kirkwin-based management training system for nursing staff in the disinfection supply room. By analyzing the learning effect and behavior change, targeted re-training measures were implemented to ensure the training effect. The study showed that the training system could improve the quality of care, the qualified rate of supply in the disinfection supply room, the core competence of nurses, self-initiative and training satisfaction. Song Lei et^[33] al. took 59 newly recruited nurses as the research object and divided them into three groups to complete the training of newly recruited nurses in the ICU in turn. According to the evaluation results of the Kirkham model, the training program of each group was revised, that is, the training content of the next group was adjusted according to the evaluation results of the previous group. The satisfaction of training, test scores, nursing behavior and the implementation rate of semi-recumbent position in the second and third groups of new nurses were better than those in the first group. However, these two studies did not set up a blank control group, and the interpretation of the results may be biased, which needs to be further demonstrated in follow-up studies. It can be seen that the training system based on the Kirkkirkian model is beneficial to comprehensively control the training process, improve the training methods and improve the quality of training. However, compared with the evaluation index system construction and the study of verifying the effect of training programs, there are relatively few related researches on the optimization of training system based on the Kirkkirkian model, and further exploration in this aspect can be strengthened in the future.

3 Problems and suggestions in the application of the Kirkpatrick model in continuing nursing education

3.1 There are many influencing factors of evaluation and it is difficult to implement

The Kirkpatrick model evaluates the training effect from four aspects. The satisfaction of students in the reaction layer is easy to collect, but it is easy to be affected by subjective factors such as students' learning preferences and emotional states, resulting in the lack of objectivity^[34] of the evaluation results. The learning layer can objectively measure the degree of mastery of knowledge and skills by means of theoretical examination, skill assessment or simulation exercise. The evaluation method is relatively simple, but the amount of data generated is huge and difficult to analyze. The evaluation of behavior layer and outcome layer are the difficulties in the application of the Kirkpatrick model. The behavior layer is easily affected^[6,11] by the working environment, organizational atmosphere and other factors, and the outcome layer may be affected^[35] by personnel mobility, training knowledge update iteration, etc., which makes it difficult to directly attribute the evaluation results to the training effect. In the future research, the reaction layer can add the evaluation of the training process by the training organizers or managers to supplement the trainees' reaction^[11]. By setting up a control group, the interference of other variables can be effectively controlled and excluded, so as to evaluate the training effect more accurately. In addition, nursing teaching system can be used to carry out online training and assessment. With the help of cutting-edge technologies such as big data and artificial intelligence, data such as knowledge assessment, clinical behavior and nursing quality of trainees can be efficiently collected and analyzed to improve the efficiency and accuracy of assessment.

3.2 Evaluation results can not play a feedback role in time

Continuous optimization of training methods is a long-term strategy to improve nursing ability. The Kirkwin-model focuses on the evaluation of training results, and its evaluation results can only have an impact on subsequent research, but has little^[36] effect on current training. The CIPP evaluation model is a "process-oriented" training evaluation model, which can evaluate the whole training process dynamically and circulatorily, so as to continuously improve the training program. The combination of the Kirkwin-based model and CIPP model can improve the training effect^[37]. In the background evaluation stage of CIPP, pre-survey of training needs in the "reaction layer" was introduced to verify the necessity of training. In the input assessment stage, the training content and teaching methods were designed based on the objectives of the "learning layer" to ensure that the resource input was consistent with the learning objectives. In the process evaluation stage, the training implementation was tracked and the behavioral changes of the "behavior layer" students were observed, so as

to optimize the training content and promote the transformation of knowledge to behavior. In the outcome assessment stage, the overall effectiveness of the training program was comprehensively evaluated, that is, the impact of the “outcome layer” training on individuals and organizations, so as to form a complete chain of nursing training from demand analysis to outcome assessment, which could spiral modify the training program in the training process and continuously improve the training effect.

4. Summary

As a widely used training quality evaluation tool, the Kirkpatrick model has important value in the field of continuing nursing education. This model can provide strong support for the further improvement of training programs. Through multi-dimensional evaluation of training effects, it can effectively improve nurses' satisfaction with teaching courses, strengthen nurses' mastery of knowledge and skills, and promote the improvement of nursing behavior, and finally realize the improvement of nursing quality and personal value. However, there are some problems in the Kirkwall model in continuing nursing education, such as the lack of clinical verification of the evaluation system, the evaluation process is easy to be interfered by many factors, and the evaluation results are difficult to have an immediate impact on current research. Further measures need to be taken to make up for the deficiencies. In the future research, on the one hand, empirical research should be strengthened to thoroughly verify the effectiveness and reliability of the application of the Kirkuk model in continuing nursing education, and to improve the practicability and operability of the evaluation system. On the other hand, we can try to apply the Kirkman model and CIPP model together to realize the synergy and complementarily of process assessment and endpoint assessment. At the same time, by setting up a blank control group, controlling the interference of other variables, and using information technology, the evaluation index data can be collected efficiently and accurately, so as to provide a more objective and comprehensive decision-making basis for formulating training programs and help the continuous improvement of the quality of continuing nursing education.

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