

Construction and Practice of an Industry-Education Integration Curriculum System for Vocational Rehabilitation Therapy Technology Based on the ERAS Concept — Evaluation of Clinical Internship Teaching Effectiveness

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Abstract: *Accelerated Recovery After Surgery (ERAS) refers to a multidisciplinary collaborative approach centered around the perioperative period. While some hospitals in China have already implemented ERAS, it has not yet been introduced into the teaching or internship programs of higher vocational rehabilitation therapy technology majors. Currently, vocational rehabilitation programs face limited progress in industry-education collaboration, with few jointly developed courses by schools and enterprises, and insufficiently diverse evaluation methods for internships. From the perspective of industry-education integration, this paper introduces the ERAS concept into clinical internships for the rehabilitation therapy technology major, transforming issues based on the logic of “clinical pathway competency-based curriculum content.” Leveraging collaborations with top-tier tertiary hospitals, the curriculum is designed accordingly. The involved topics gather extensive literature resources based on practical needs, employing tools such as the Delphi method, action research, and quasi-experiments to analyze teaching practices, aiming to establish an evaluation model for vocational internships. According to the research conclusion, if the content described in ERAS is applied to courses or internships that combine industry and education, it can effectively fill the knowledge gap related to perioperative and interdisciplinary collaboration, make internship evaluation more effective, and cultivate talents that are more in line with job requirements, which has practical significance for vocational rehabilitation education.*

Keywords: ERAS philosophy, Vocational rehabilitation therapy technology, Integration of industry and education, Curriculum system, Clinical internship, Teaching evaluation.

1. Introduction

Enhanced Recovery After Surgery (ERAS) is a model developed in the 1990s, which designs perioperative measures based on evidence-based medicine and uses multidisciplinary cooperation to alleviate surgical stress, thereby reducing hospitalization time and postoperative problems. At present, some tertiary hospitals in China have introduced ERAS clinical programs, but a survey on the implementation of ERAS in domestic hospitals shows that the actual intervention rate of rehabilitation therapists is only 41.7%, and there is still a gap in the allocation of rehabilitation professionals.

According to the “Teaching Standards for Vocational Rehabilitation Therapy Technology” issued by the Ministry of Education in 2022, the current standards do not include ERAS as a teaching content. At present, most of the school enterprise cooperation in rehabilitation majors in vocational colleges only hang the brand of internship bases, and the proportion of jointly developing courses is less than 20%. The teaching of traditional rehabilitation techniques accounts for a significant proportion in both learning stages, with less consideration given to perioperative rehabilitation. The assessment of internships is mainly based on test papers or qualitative judgments made by teachers, and there is limited data on patient rehabilitation outcomes used. Sometimes, the trained talents may not be well aligned with real clinical needs.

Starting from practical problems and considering the

requirements of technical skills training in higher vocational education, this article regards ERAS as the guiding ideology for curriculum design and clinical internships, and proposes a comprehensive evaluation method that considers theory, operation, thinking, and rehabilitation results to improve the current situation of talent cultivation in rehabilitation therapy majors, enhance their practical effectiveness and teaching quality.

2. Teaching Status of Rehabilitation Therapy Technology Major in Higher Vocational Education under ERAS Concept

2.1 Current Status of Related Research Abroad

The clinical guideline system under ERAS in foreign countries is a relatively mature type. Evidence shows that adopting ERAS in European and American hospitals can reduce hospitalization time by 30%~50%. However, specialized ERAS training for rehabilitation therapists is not yet complete. Rehabilitation education in the United States focuses on job skills, while Germany's dual system and Australia's TAFE Institute have conducted extensive experiments combining medical education. However, the relevant teaching of ERAS is currently mostly scattered in surgical nursing courses, and there is still a lack of a complete curriculum arrangement for rehabilitation therapy majors. The current concept of industry education cooperation generally only extends to the use of practical training equipment,

without unifying the design of theory, teaching, and practice.

2.2 Current Teaching Difficulties in China

At present, there are still many practical difficulties in teaching rehabilitation majors in higher vocational education in China. The teaching philosophy itself has not been updated in a timely manner, and the rehabilitation methods used in the classroom are generally the classic types of Bobath or Brunnstrom. The overall design of ERAS pre rehabilitation and related preoperative and postoperative treatment, as well as interdisciplinary cooperation, has not been carried out, and some students are not very clear about the practical application of ERAS.

The second issue is the insufficient depth involved in the integration of industry and education. According to the survey, currently 85% of rehabilitation majors in China only provide internship arrangements or general equipment training for cooperation with enterprises, and do not make extensive use of clinical experts to design courses. There are few examples related to cases and diagnosis and treatment processes, and teaching materials are difficult to correspond to the latest clinical knowledge in a timely manner, resulting in lagging teaching content.

The current mode of internship teaching is relatively fixed, generally focusing only on single rehabilitation skills as the training focus, without providing interdisciplinary practical opportunities. Therefore, the management, judgment, or communication of perioperative patients cannot be well cultivated.

The evaluation system for internships is not yet sound, and the assessments used are mostly based on internal exams or subjective opinions of instructors. They only focus on individual students and lack analysis of whether the teaching content is suitable for the position. Patient rehabilitation is not included in the scope of assessment, and the three parties (hospital, school, and patient) do not participate in the evaluation together.

2.3 Industry Teaching Development Trends

The current rehabilitation medicine teaching has begun to develop towards interdisciplinary direction, and the teaching content is being standardized according to clinical guidelines. VR, artificial intelligence, and wearable devices can all be used for practical training. Several medical institutions have included ERAS as an elective course and conducted comprehensive evaluations of teaching, not only based on whether the technical movements are correct, but also by analyzing the length of hospital stay, adverse reactions, and functional improvements in clinical outcomes. Based on this, practical suggestions or key considerations for curriculum reform have been proposed.

3. Construction of an Integrated Curriculum System for Industry Education under the ERAS Concept

3.1 Overall Research Approach

Based on the feedback from clinical positions on talent shortcomings, this study starts with practical research, completes theoretical analysis, and conducts teaching pilot programs. Then, according to the feedback from the pilot programs, the plan is continuously adjusted and improved. Firstly, conduct a job competency survey and use the Delphi method to invite experts from various fields in universities and hospitals to conduct multiple rounds of consultations. Use gap analysis to identify the corresponding job competency gaps in ERAS; Build a course development framework based on CDIO and TPACK theories to achieve the integration of technology, teaching, and course content; Conduct teaching pilot experiments using non equivalent control group pre-test and post test accuracy experiments; Establish a PDCA cycle improvement mechanism, update course content every semester, and continuously optimize teaching modes.

3.2 Main Research Methods

1) Literature analysis method: Summarize the clinical guidelines, policies, and rehabilitation education literature described by ERAS as the basis for theoretical analysis.

2) Delphi method: Taking into account experts in rehabilitation education in universities and clinical personnel involved in orthopedics, rehabilitation, and anesthesia departments in tertiary hospitals, multiple aspects of curriculum, internships, and assessments are discussed.

3) Action research method: Select cooperative hospitals' rehabilitation departments and orthopedics departments to establish teaching pilot programs, implement cyclic plans, collect frontline feedback, revise teaching content, and improve the ERAS internship teaching path.

4) Statistical analysis method: Using SPSS software, compare the theoretical and practical scores of the experimental group and the control group students, as well as the corresponding patient rehabilitation outcome data.

3.3 Core Content of Curriculum System Construction

1) The teaching content of the integration of industry and education course is designed according to the concept of "clinical pathway job competency course content", and is jointly searched for teaching resources by school teachers and hospital clinical experts to ensure that the proportion of clinical experts used is not less than 30%. The teaching module lists the pre rehabilitation before ERAS surgery, intraoperative cooperation, immediate postoperative rehabilitation (or recovery), and various treatments related to pain, nutrition, and complications, as well as interdisciplinary team collaboration. Not only in the form of regular classroom teaching, but also using actual ERAS cases from cooperative hospitals as teaching materials, analyzing the cases, and combining scenarios, discussions, and MDT multidisciplinary simulations to carry out teaching.

2) The pilot program for clinical internship teaching is designed based on the orthopedic and rehabilitation departments of a cooperative tertiary hospital, and is divided into an experimental group and a control group. The control group used known traditional teaching methods; The

experimental group should follow the ERAS approach to conduct a combined industry education internship, with school teachers and on duty therapists in hospitals guiding students' learning simultaneously. Include students in the ERAS ward round system and multi departmental case analysis, allowing them to make complete judgments on preoperative and postoperative rehabilitation, design plans, and pay special attention to cultivating their abilities in doctor-patient communication, teamwork, and handling practical problems.

3) The evaluation of the effectiveness of multidimensional internship teaching should be based on the model described in CIPP, and indicators should be designed according to three categories: students, teaching, and patients, based on the facts of rehabilitation internship. The assessment of students should include their mastery of ERAS knowledge, proficiency in operation, clinical judgment, and cooperation with others; The teaching part should consider whether the content taught is practical, whether the teaching methods are reasonable, the satisfaction of teachers and students, and the implementation of the dual teacher system; There are various rehabilitation outcomes in terms of patient satisfaction, Barthel index changes, postoperative adverse reactions, and length of hospital stay. Collect information through questionnaires, skill tests, or desensitization case analysis, compare the two groups, and conduct practical verification of the reform.

4. Implementation Guarantee and Technical Roadmap

4.1 Research Guarantee Conditions

Our medical school has complete hardware conditions for practical training, with multiple professional training rooms and a complete set of rehabilitation training equipment. We have also built more than 40 off campus internship bases to meet the needs of simulated training teaching. Two tertiary integrated traditional Chinese and Western medicine hospitals cooperate to carry out ERAS clinical work on a regular basis, with a mature MDT multidisciplinary team that can provide clinical cases, teaching staff, and desensitized clinical data. The research team is composed of teachers from the school and clinical physicians from the hospital; The funds are used for literature procurement, case library construction, expert consultation, paper publication, and follow-up services to ensure the orderly progress of research.

4.2 Implementation Steps

1) The preliminary work related to the project (1-3 months) should include: developing a plan, implementing the school campus agreement, compiling textbooks and evaluation materials, and holding a kickoff meeting.

2) The so-called project implementation period is (4 to 15 months): theoretical and simulation training should be arranged, clinical internships should be conducted, opinions of teachers, students, and mentors should be investigated, and the teaching plan should be modified accordingly.

3) The so-called project evaluation period is from the 16th to the 20th month: it is necessary to organize evaluation

indicators and conduct statistical surveys on teaching and clinical data.

4) The relevant summary and promotion period (21 to 23 months) should include writing reports, creating teaching manuals and courseware, giving examples, organizing teacher training courses, etc. It is necessary to identify teaching methods that can be replicated and promoted.

The technical route of this research is to design the ERAS teaching mode based on literature research ideas and combine it with teaching practice to statistically analyze the data involved. Based on the results, suggestions are proposed to improve teaching and further refine the teaching mode for promotion.

5. Research Innovations

Firstly, there has been a new breakthrough in teaching philosophy. In the past, internships mainly focused on individual skills as training objectives. Now, we need to apply the ERAS concept to clinical internships in vocational rehabilitation, to have a more comprehensive consideration of perioperative rehabilitation, and encourage interdisciplinary cooperation and joint action.

Secondly, implement the integration of industry and education in practice. Course design, internship guidance, and even outcome evaluation are all jointly completed by the school and hospital, using actual case processes as teaching materials to create a highly collaborative educational relationship between the school and clinical practice.

Thirdly, make appropriate adjustments to the internship evaluation. The subjects involved include the students themselves, the teaching process, and the patient's recovery. Clinical outcomes such as the Barthel index are used to measure internship outcomes, and success or failure is not solely determined by test papers.

Fourth, make internship practice more informative. Adopting MDT's multidisciplinary collaborative scenario training method, the role of rehabilitation therapists in ERAS is clearly explained, supplementing the shortcomings of traditional internships.

6. Practical Challenges and Countermeasures

The practical difficulties related to the joint implementation of educational reform by schools and colleges cannot be ignored. At present, some of the teaching staff used in hospitals have limited knowledge and understanding of ERAS teaching; Starting from clinical practice, there may not be enough room for teaching time; However, tracking patients and collecting relevant information may encounter various obstacles that are difficult to solve in terms of medical ethics or operations.

To address the above issues, corresponding measures can be taken: conducting ERAS special teacher training for school and college teachers to unify teaching cognition; The school and college jointly issued standards for teaching work,

clarified the responsibilities of dual teacher positions, and reasonably allocated teaching tasks; Strictly adhere to medical ethics, complete desensitization of all case information, and collaborate with the hospital information department to extract standardized rehabilitation data to ensure the objectivity and reliability of evaluation data.

7. Conclusion

In recent years, the application of the ERAS model in various hospitals in China has been greatly expanded, and correspondingly, the overall requirements for rehabilitation talents in clinical practice have become more stringent. Vocational rehabilitation education should be reformed in combination with reality to achieve substantial progress in the integration of industry and education. Guided by the ERAS approach, the course and internship content are redesigned in the article, incorporating patient rehabilitation outcomes into multiple evaluation criteria, and considering the methods of school hospital cooperation to promote the formation of a training pattern for technical rehabilitation talents who not only have perioperative concepts but also excel in interdisciplinary cooperation.

The topic under discussion is currently only being piloted in two medical institutions, and the sample size is not broad enough. In the future, we need to expand the sample, organize the relevant teaching content clearly, promote the methods to multiple universities and internship sites, and continue to improve the combination of industry and education in rehabilitation treatment technology under ERAS guidance.

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2) Shaanxi Vocational and Technical Education Society: Research on the integration path of ERAS concept and engineering alternation mode in vocational rehabilitation therapy technology major. Project Approval Number: SGH25Q761, Project leader: Zhu Tian.

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