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The Paybacks of Using Online Multimedia in Training for Resident Doctors

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Abstract

This paper analyses the use of multimedia technology in training orthopaedic residents and assesses how such aids can improve residents' ability to master treatments in orthopaedic surgery. To this end, a total of 120 resident trainees who had recently graduated from clinical medicine were recruited for this study, and were classified into two groups. Based on which, the new teaching model using multimedia aids was studied and compared with traditional teaching model (mainly with oral presentation). . The results show that resident trainees with the new teaching model could be more active in thinking ability and interest, and have improved learning outcomes, compared with those with traditional teaching models. Meanwhile, the former trainees showed reduced passive, thereby their understating of key points was strengthened. Overall, the use of multimedia images improved the quality of teaching, transformed the teacher-centred clinical teaching model, and increased trainees' level of satisfaction with the teaching methods. Therefore, this paper concludes that the use of multimedia images can significantly improve the quality of clinical teaching for resident trainees and should be widely promoted.

Keywords: teaching methods, clinical setting, medical training, multimedia teaching, orthopaedic residents

1. Introduction

In the traditional model of teaching and learning in a clinical setting, trainees' participation in clinical work and learning follows a fixed and monotonous pattern, which lacks innovation and renders trainees passive learners who do not think critically. Clinical teaching in the field of orthopaedics entails multidisciplinary knowledge and complex concepts from radiology, anatomy, mechanics, material science, and other disciplines (Teng H., 2021). Traditionally, teachers only give didactic lectures to explain key points, which often leaves trainees confused and unable to apply theories in practice (Zhou H., 2021). Multimedia materials such as images and films can help fill these gaps in traditional teaching.

With the rapid development of modern medicine, clinical teaching has been updated in terms of practical skills and theories, as well as through more advanced teaching equipment. Furthermore, since new teaching technologies, such as computed-based multimedia equipments are becoming increasingly common in clinical settings, and the traditional lecture model of teaching is in decline, the importance of computers, multimedia projectors, and teaching software is becoming

more evident. The internet-based education, blended and virtual learning strategies have replaced traditional teaching styles especially during past 2 years that have been adversely affected by the COVID-19 pandemic. Therefore, the quality of clinical teaching now largely depends on the application of multimedia teaching. Multimedia teaching is a method that builds on traditional teaching and further applies images and films to clinical teaching using computers, photography, and photo editing techniques. This method is particularly applicable to clinical medicine, as it involves the anatomy and tissue structure of multiple organs, which is relatively difficult for trainees to comprehend. Since many concepts and principles are also very abstract, it is often difficult for teachers to give accurate verbal descriptions in linguistic terms. By using a computer or multimedia projector, teachers can directly show trainees images of different surgical approaches, regional anatomy, characteristics of tissue injury, methods of revision surgery, and revision results, so that trainees can keep up with a variety of new treatment techniques and treatment methods.

During morning handover meetings, trainees traditionally demonstrate their knowledge through oral presentations. However, supplementing this through multimedia training aids (i.e., through presentations that include photos) can familiarize trainees with the real clinical context, while also giving them a chance to further exercise their oral expression skills. This presentation-style handover may be an effective way to enhance trainees' oratory skills, while also complementing new methods of teaching using visual and realistic images.

2. Materials and Methods

2.1 Method

We recorded the information of trainees enrolled in the standardised training program for resident doctors at the Department of Traumatology and Orthopaedics, Affiliated Hospital of Youjiang Medical University for Nationalities, from October 2019 to December 2021. A total of 120 resident trainees who had recently graduated from clinical medicine and were in the process of completing a 3-month clinical practice were included. For the purpose of this study, the sample was randomly divided into two equal groups (60 participants were assigned to each group), namely the clinical multimedia images group (A) and the clinical practice group (B). A new teaching model that used multimedia aids to supplement surgical images was adopted for Group A, whereas Group B followed traditional teaching methods. A three part test (including a written medical examination, a clinical case practice, and medical skills practice) was then conducted to assess the two groups' performance and outcomes. Based on their results, trainees were divided into three categories: excellent, good and poor.

2.2 Instruments and Software

Trainees in Group A used Microsoft Office PowerPoint (PPT) to give presentations in their morning handover meetings.

2.3 Method of Teaching

Group A (Experimental group): In daily surgical cases, a resident trainee from the standardised training program that participated in the surgery was responsible for taking photos to record radiological data of the injury site, the surgical incision, the level of the incision, the characteristics of fractures, the implant placed after reduction, and the fluoroscopy of the intraoperative C-arm after reduction. Then, the resident doctor prepared PPT slides depicting these processes. At the handover meeting the next morning, the resident trainee that participated in the surgery gave an oral presentation describing the key features and difficult points of each step. Following this, three senior doctors gave their comments and feedback on the presentation and surgical case.

Group B (control group): The traditional teaching model was applied in Group B, such that the teacher made a teaching plan according to the existing syllabus and requirements of clinical practice. Trainees accompanied the teacher on daily visits of the ward; although they sometimes participated in the surgery, they did not take photos to record the process. During the surgical process, the teacher instead gave oral instructions and the trainees learned by listening. During the handover meeting the next morning, trainees gave oral accounts of the surgery. Following this, three senior doctors gave their comments.

2.4 Indicators to Assess Teaching and Learning

Separate examinations were held to assess each group's performance in theories and clinical skills, and a survey was conducted to determine trainees' level of satisfaction. The theoretical assessment was held in the form of a closed-book test that used objective test questions to assess trainees' grasp on basic theories and concepts. The assessment for clinical skills mainly examined trainees' thinking capacities when diagnosing and treating common orthopaedic diseases, covering diagnosis, clinical manifestations, treatment principles, treatment norms, and the management of related complications (Liu Y., et al. 2002). There was also an on-site session where trainees were asked questions. Unified grading criteria were used in the standardised training of resident doctors.

2.5 Statistical method

The SPSS 23.0 software was used to analyse the data. The variable data were represented by (mean ± standard deviation), and a t-test was used for the two independent samples. The attribute data were represented as rates, and the $\chi 2$ test was used to test statistically significant differences at the $p< 0.05$ level.

3. Results

When comparing the level of satisfaction of the two groups of trainees, the level of satisfaction of the experimental group (Group A) was 82%, while the level of satisfaction of the control group (Group B) was 56%.

When comparing the test results, the experimental group outperformed the control group in terms of their performance in the theoretical assessment and the assessment of clinical skills and thinking ability. These differences were statistically significant ($p<0.05$). Therefore, the new teaching model with multimedia technique is more effective than the traditional one, and is more reliable. Due to the above reason, the new teaching model should be encouraged.

4. Discussion

The use of multimedia technology (namely, graphic materials) can enhance clinical teaching, which traditionally relies on verbal instruction. The visual nature and directness of multimedia technology makes it possible to better organize the different kinds of content being taught. Not only can this make it easier for trainees to grasp challenging points, but it can also help teachers avoid the monotony and dullness of verbal narration. Furthermore, multimedia teaching can compensate for a lack of resources, for example, by depicting a wider variety of disease types in teaching.

Multimedia teaching makes it possible for teachers and learners to mutually enhance each other's experience in the clinical setting. In the traditional teaching model, teachers are mainly required to master the content of teaching and enhance trainees' verbal presentation skills. Multimedia teaching reduces the intensity of clinical teachers' work and makes trainees more active agents, thus providing valuable aid to the teachers. At the same time, teachers and trainees are required to sharpen their computer skills, become more familiar with different software, and master techniques such as image processing or designing and rearranging edits (Wu Y., 2021). In the process of image processing and creating PPTs, trainees can also acquire more information and theoretical knowledge.

In the past, in order to meet the expectations of clinical teaching, teachers would add practical cases to theoretical lectures, for example, by including radiological materials and prompting resident trainees to carry out in-depth analyses. The teacher would ask resident trainees to carefully examine the body, read supporting tests, consult the radiological materials, and review disease treatments (Li Y., et al., 2021). This is a rather compact teaching model that does not do justice to the fact that being a resident trainee is a key part of becoming a clinical physician. During this period, clinical skills and thinking ability may be at its weakest, since residents are transitioning from learning concepts in theory to applying them in practice. Therefore, the starting point of teaching should be to streamline this transition, improve the quality of standardised training, and encourage resident trainees in orthopaedic surgery to learn independently (Wang J., 2021). The model proposed herein (in Group A) ensures that trainees make observations and comprehensively conduct analyses from multiple perspectives, while deepening their sensory understanding of the three-dimensional structure of organs and tissues.

Incorporating multimedia surgical images into clinical teaching has been widely appreciated by teachers and trainees, and has effectively enhanced clinical teaching. In particular, it can liven up the overall atmosphere of teaching and learning (Zhang Y., 2020). When explaining key concepts, teachers can help trainees grasp abstract concepts through visual images. When it comes to clinical skills, teachers can also give vivid demonstrations using such images.

However, it requires a lot more time and effort to take photos during the surgery and to make PPT slides (Chi et al., 2020). Due to the low quality of PPT slides, the potential of multimedia teaching may not always be met, which can affect the quality of clinical teaching. Therefore, how to make use of the advantages of multimedia teaching is one of the important issues in current discussions about clinical teaching.

The vast majority of trainees acquire multimedia skills through observation and self-learning. In this regard, the educational management department should provide timely guidance, organize training courses on multimedia skills, and formulate standards for the production of multimedia teaching aids in clinical medicine, while also offering trainees guidance when they have questions (Li Q., et al., 2021). In this way, the effectiveness of multimedia teaching aids can be optimised in the long-term.

With the popularization of multimedia technology and equipment, the application of multimedia teaching in clinical teaching has been rapidly increasing and is being welcomed by the majority of teachers and trainees. The effect and quality of clinical teaching has also greatly improved as a result. However, due to the generally low level of multimedia skills among clinical teachers at present, traditional teaching methods will still need to be used for a considerable period of time, and multimedia teaching cannot completely replace traditional teaching at this current stage. In the future, we should

consider the complementary roles of multimedia teaching and traditional teaching, respect the leading role of clinical teachers in teaching activities, and apply multimedia teaching to various facets of clinical medicine in order to ensure that residents are receiving the highest quality training possible.

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