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ORIGINAL

The effect of education with case-based scenario simulation on interns' proficiency in cardiopulmonary resuscitation

El efecto de la educación con simulación basada en casos sobre la competencia de los internos en resucitación cardiopulmonar

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ABSTRACT

Introduction: this research examines the impact of case-based scenario simulation instruction on intern physicians' proficiency in cardiopulmonary resuscitation (CPR).
Objectives: to compare the effectiveness of conventional teaching methods versus case-based scenario simulation techniques on the CPR skills of intern doctors.
Method: the study involved 62 intern doctors at The First Affiliated Hospital of Guangxi University of Chinese Medicine, divided into two groups of 31: control and observation. The instruction period lasted three months, with the control group receiving conventional teaching and the observation group using case-based scenario simulations. Post-instruction, the groups were assessed on course content, the impact of training, and satisfaction levels.
Results: the observation group showed significantly better performance in theoretical knowledge, scenario simulation, and practical exams compared to the control group. The passing rates for chest compression, electric defibrillation exams, total mastery of theoretical knowledge, and overall practical competence were all higher in the observation group. Additionally, the overall satisfaction rate and evaluation of the teaching effect were significantly greater in the observation group.
Conclusions: case-based scenario simulation teaching positively influences the CPR skills of intern doctors and is an effective method to improve teaching outcomes and trainee satisfaction.

Keywords: Cardiopulmonary Resuscitation; Education; Internship and Residency; Clinical Competence; Teaching Methods.

RESUMEN

Introducción: esta investigación examina el impacto de la instrucción con simulación basada en casos sobre la competencia de los médicos internos en resucitación cardiopulmonar (RCP).
Objetivos: comparar la efectividad de los métodos de enseñanza convencionales versus las técnicas de simulación basadas en casos en las habilidades de RCP de los médicos internos.
Método: el estudio involucró a 62 médicos internos en el Hospital Afiliado Primero de la Universidad de Medicina China de Guangxi, divididos en dos grupos de 31: control y observación. El período de instrucción

duró tres meses, con el grupo de control recibiendo enseñanza convencional y el grupo de observación utilizando simulaciones basadas en casos. Después de la instrucción, se evaluó a los grupos en contenido del curso, el impacto del entrenamiento y los niveles de satisfacción.
Resultados: el grupo de observación mostró un desempeño significativamente mejor en conocimientos teóricos, simulación de escenarios y exámenes prácticos en comparación con el grupo de control. Las tasas de aprobación en los exámenes de compresión torácica, desfibrilación eléctrica, dominio total de conocimientos teóricos y competencia práctica general fueron mayores en el grupo de observación. Además, la tasa de satisfacción general y la evaluación del efecto de la enseñanza fueron significativamente mayores en el grupo de observación.
Conclusiones: la enseñanza con simulación basada en casos influye positivamente en las habilidades de RCP de los médicos internos y es un método eficaz para mejorar los resultados de la enseñanza y la satisfacción de los aprendices.

Palabras clave: Reanimación Cardiopulmonar; Educación; Prácticas y Residencia; Competencia Clínica; Métodos de Enseñanza.

INTRODUCTION

A common acute symptom, cardiac arrest calls for prompt, efficient cardiopulmonary resuscitation in addition to the creation of an artificial airway to improve the patient's prognosis by raising the resuscitation success rate and lowering the risk of complications.[1] One of the often used artificial breathing techniques for emergency airway management is the laryngeal mask. Its benefits include being easy to use, simple to learn, and not requiring any specialised equipment. However, it is essential to instruct aspiring physicians on the pertinent information because incorrect operation may result in issues including insufficient breathing and airway damage.[2]

The demands of contemporary medical clinics cannot be addressed by traditional teaching techniques, which are frequently too boring and mostly rely on indoctrination education, which makes it difficult to foster trainees' comprehension of theoretical information and mastery of practical operation.[3] On the other hand, case-based scenario simulation instruction enhances students' comprehension and practical skills by constructing particular scenarios and allowing students to act out the parts in them in a creative and vivid manner, thereby improving their overall ability.[4,5] It is yet unknown, nevertheless, how case-based scenario simulation instruction affects trainee physicians' learning of laryngeal mask airway setup and cardiopulmonary resuscitation. The scientific problem motivating this research is the observed inadequacy in the proficiency of medical trainees in performing CPR and correctly setting up an LMA using traditional teaching methods. These conventional methods often fail to provide the hands-on experience and critical thinking skills necessary for effective emergency response. This inadequacy can result in lower success rates in resuscitation efforts and higher incidences of complications, which ultimately affect patient survival and recovery rates. By addressing this problem, the study aims to improve the practical skills and theoretical understanding of medical trainees, thereby enhancing patient care outcomes.

The primary objective of this research is to evaluate the impact of case-based scenario simulation instruction on the proficiency of medical trainees in performing CPR and setting up an LMA. Specifically, the study aims to determine whether CBSS can enhance the practical skills, theoretical knowledge, and teamwork abilities of medical trainees compared to traditional teaching methods.

METHOD

In the present study, 60 intern doctors from the income of The First Affiliated Hospital of Guangxi University of Chinese Medicine, January 2020 to January 2022, were chosen for the research. They were divided into two groups, the observation group (30) and the control group (30), using the random number table approach. Twelve females and eighteen males, ages 19 to 23, with a mean age of (21,73±0,41) years, made up the control group. Within the observation group, there were 15 males and 15 girls, ages ranging from 19 to 22 years old with a mean age of (21,49±0,39). When age and gender were examined between the two groups, general statistics did not show statistically significant differences ($P > 0,05$). Dongtai People's Hospital's Medical Ethics Committee examined and authorised the study.

The interns who fulfilled the requirements for inclusion were those who completed the state-mandated general full-time undergraduate internship, were over the age of 18, were in their first internship, had normal vision and hearing, could communicate effectively, received complete information about the study and granted permission to take part. Those with a history of criminal, disciplinary, or irregular behaviour, those with unhealthy habits like drunkenness or smoking, and those with contagious disorders were among the exclusion

criteria.

The control group received instruction using a traditional method. The primary topics covered were the causes of cardiac arrest, how to identify cardiac arrhythmia, how to perform cardiopulmonary resuscitation using a laryngeal mask to establish an airway, and other related topics. The 2005 guidelines for cardiopulmonary resuscitation were also covered. Instructors created slides and gathered instructional videos that were pertinent to the material. They then gave lectures, describing the material on the slides and showing the videos, and giving the students instructions to carry out the practical procedure on the CPR manikin. During clinical practice, the instructor chooses suitable patients (physically well, between the ages of 18 and 60, with normal or sound organ function and a body mass index between 18 and 24 kg/m2) to perform CPR and establish a laryngeal mask airway, which includes placing endotracheal tubes directly through laryngoscopic means and using disposable laryngeal masks. When the training came to a close, the teacher helped the participants when they came across cardiac arrest instances.

The observation group used a case-based scenario simulation teaching methodology. Heart arrest cases served as the focal focus of the instructional material, and the instructor organised pertinent scenario exercises with quick drills and important themes. The participants were then divided into small groups of five to six people each, and they took on the roles of nurses, doctors, and family members of the patients. When the exercise started, the "nurse" noticed that the SimMan simulator's patient had become unconscious. She then determined whether or not cardiac arrest had happened and began CPR. Concurrently, the "doctor" gave the "nurse" instructions on how to perform open IV access, cardiac monitoring, and other tasks, and he gave other trainees instructions on how to perform resuscitation. Two trainees were in charge of airway care and chest compressions, while one trainee was in charge of administering drugs intravenously. In the role-play, the "doctor" was expected to provide professional and understandable explanations in response to questions from the "patient's family" regarding the patient's condition. After that, an airway was established using a laryngeal mask using the same technique as CPR. Throughout the exercise, the "doctor" keeps an eye on the patient's eyelash reflex, where to place their head to smell, how to operate the laryngeal mask to create an airway, and how to use related tools. The instructor will step in if the pupil tries to put on the disposable mask several times without success.

Following instruction, statistics on the two groups' performance on the theoretical, practical, and scenario simulation exams, as well as their combined score of 100 points, are presented. Additionally, statistics on the two groups' performance on the basic respirator, placement of the laryngeal mask, chest compressions, and electric defibrillation are evaluated based on the given scenario.

A questionnaire was created to evaluate the two trainee groups' performance in terms of improving their practical abilities and grasp of theoretical knowledge at the conclusion of the instruction. A score of 80 or higher indicated that the trainees were proficient or improved; a score between 60 and 79 indicated that the trainees were essentially proficient or improved; and a score below 60 indicated that the trainees were neither proficient nor improved. The total score was 100. The ratio of cases with a high level of proficiency or improvement and cases with a low level of proficiency or improvement to the total number of cases will be used to calculate the total mastery rate or total improvement rate. The results will be presented as a percentage.

Following the instruction, a questionnaire was created using the pertinent information found in the literature [6]. Its purpose was to evaluate the trainees' level of interest in the mode of instruction as well as their performance in terms of learning outcomes, classroom environment, professional knowledge, clinical practice standards, humanistic care, doctor-patient communication abilities, and teamwork.

In order to ascertain the degree of satisfaction that the two participant groups had with the teaching model, we created the Teaching Satisfaction Questionnaire [7] at the conclusion of the teaching session. The questionnaire has a total score of 100; participants are considered to be fully satisfied if their score is 80 or higher, somewhat satisfied if their score is 60–79, and not satisfied if their score is less than 60. The ratio of completely and satisfactorily happy trainees to all trainees will be used to compute the overall satisfaction rate, which will be reported as a percentage.

A statistical application called SPSS 21.0 was used to analyse the data. Using n (%), the count data were expressed the t test of independent means was used to compare the means of the observation and control groups and the X2 Test was used to determine the statistical association between the variables. A statistically significant result was defined as $P < 0,05$.

RESULTS

Comparison of the assessments from the two groups

With the exception of the theory, practical, and scenario simulation exam scores, the observation group outperformed the control group in every category after the programme concluded. Additionally, the observation group performed better on the chest compression and electric defibrillation tests than the control group did, and the difference was statistically significant ($P < 0,05$). Refer to tables 1, 2.

Table 1. Contrasts the observation group's and the control group's evaluation results (score, *x + S)*

Group	Number	Tests Grade	Practical examination	Scenario simulation exam scores
Control group	30	79,72±7,5	65,56±7,55	64,58±6,25
Observe group	30	85,65±8,52	79,54±7,90	79,58±8,65
t value	-	2,812	6,265	7,748
P value	-	0,006	0,0001	0,0001

Table 2. Comparison of the observation group's and the control group's passing percentages on the abilities test [Name (%)]

Group	Number	Simple respirator	Laryngeal mask insertion	External chest compression	Electric defibrillation
Control group	30	26(80,22)	25(78,56)	23(70,21)	20(65,75)
Observe group	30	28(93,65)	26(82,88)	28(95,26)	29(90,23)
t value	-	-	0,423	5,475	4,786
P value	-	0,224	0,526	0,023	0,058

Comparison of the two participant groups' assessments of the course material

Following training, the observation group outperformed the control group in terms of total practical competence improvement rate and overall theoretical knowledge mastery rate. According to Table 3, there was a statistically significant difference (P < 0,05).

Table 3. Comparative Analysis of the Course Content by the Observation and Control Groups [Name (%)]

Group	Number	Theoretical knowledge mastery level				Practice			
Control group	30	12(40,29)	10(32,65)	9(24,65)	24(40,65)	12(40,26)	7(24,65)	10(32,25)	20(65,56)
Observe group	30	17(57,05)	12(34,56)	3(6,5)	28(92,56)	19(56,58)	11(33,25)	4(9,85)	27(90,30)
x2 value	-	-	-	-	4,285	-	-	-	4,458
P value	-	-	-	-	0,035	-	-	-	0,025

Comparison of the two groups' participant assessments on the efficiency of the instruction

After instruction, the observation group's members outperformed the control group in terms of their general learning outcomes and level of interest in the teaching methodology, active classroom atmosphere, improved observation and resilience, improved level of professional knowledge, improved degree of standardisation of clinical operation, greater cooperation skills, better communication between doctors and patients, and improved humanistic care. Following statistical analysis, the specific data are displayed in table 4.

Table 4. A Comparison of the Teaching Effectiveness Evaluations from the Observation and Control Groups [Name (%)]

Group	Number	Interested in teaching modes	Good learning outcomes	Active classroom atmosphere	Can improve observation and adaptability	Can enhance professional knowledge
Control group	30	20(65,23)	21(64,25)	20(66,58)	19(65,23)	24(74,65)
Observe group	30	26(88,25)	27(89,54)	25(98,65)	26(90,32)	28(92,65)
x2 value	-	4,301	5,902	6,625	4,351	4,256
P value	-	0,021	0,042	0,026	0,012	0,025

Comparing the two groups' levels of teacher satisfaction

Table 5 demonstrates that following the lecture, overall satisfaction was rated higher by the observation group than by the control group, and the difference was statistically significant (P < 0,05).

Table 5. Comparing the Level of Teaching Satisfaction in the Two Groups [Name (%)]

Group	Number	Fully satisfied	Satisfied	Dissatisfied	Overall satisfaction
Control group	30	15(44,17)	8(28,56)	7(24,65)	22(75,18)
Observe group	30	16(55,65)	14(38,47)	2(6,58)	28(96,58)
x2 value	-	-	-	-	4,289
P value	-	-	-	-	0,035

DISCUSSION

Cardiopulmonary resuscitation (CPR) is an essential healthcare worker skill that comes in handy for

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emergency respiratory and cardiac arrest situations, as well as other critical and acute illnesses. One of the most important factors in ensuring the effectiveness of CPR throughout the first aid process is the timely and efficient administration of rescue drugs, airway opening, circulation establishment, and extracardiac compression.[8,9,10] Laryngeal mask airway establishment is a crucial technique in the resuscitation of critically ill patients because it acts as a bridge between tracheal intubation and mask ventilation. It can help patients recover their ventilatory function more quickly and connect to a ventilator for ventilation support. There are hazards involved in using the laryngeal mask, nevertheless, as it requires healthcare providers to insert the patient's airway blindly without the aid of inotropes or laryngoscopy. Careful planning and execution are therefore necessary.[11,12,13]

Conventional teaching approaches provide comparatively little opportunity for practice based on skills and primarily emphasise theoretical information. However, a combination of theory and experience is needed for first aid skills like CPR and using a laryngeal mask to establish an airway. Traditional education eventually fails to fulfil clinical needs because trainees frequently believe that the course material is cryptic and challenging to understand, and that mastering the operating skills and procedures is a challenge.[14]

Conventional medical textbooks and theoretical courses typically have dull characteristics, and trainees have a tendency to passively absorb the knowledge imparted by teachers. These factors lead to subpar teaching outcomes, make it difficult to meet trainee assessment standards, and make it difficult to connect with the demands of actual positions.

The study's findings demonstrate that the observation group using case-based simulation teaching had significantly higher theoretical examination, practical examination, and simulation assessment results than the control group. $P < 0,05$ indicates that this difference is statistically significant. The observation group showed considerably greater defibrillation and chest compression pass rates, as well as an overall mastery rate of theoretical knowledge and an overall improvement rate of practical ability, in contrast to the group under authority. $P < 0,05$ indicated that these differences were statistically significant. This suggests that the use of case-based scenario simulation teaching method to teach CPR and laryngeal mask airway establishment to trainee doctors can effectively improve the trainees' examination results and enhance their mastery of theoretical knowledge and skills as well as their practical ability.[15,16,17,18]

Case-based scenario simulation education emphasises the practical application of academic information and gives greater focus to developing trainees' professional qualities. The teaching methodology creates situations according to certain learning contents and goals, and then assigns roles to trainees, who then complete the associated duties and goals. The incorporation of knowledge points into the contextual mode facilitates the trainees' integration of theoretical information with real-world scenarios, hence enhancing their comprehension and assimilation of the material. In order to better apply their theoretical knowledge and practical operational skills to clinical practice, trainees can also benefit from the situational exercises by improving the accuracy and standardisation of their practical operational skills. Thus, the application of case-based scenario simulation as a training approach can enhance trainees' assessment scores and fortify their command of both theoretical knowledge and skills and practical competence.[19]

Teamwork is essential in the practical application of cardiopulmonary resuscitation and laryngeal mask to establish airway, and the evaluation of instructional efficacy must take into account the team's collective skills as well as individual assessment results, knowledge, and skill mastery.

In terms of interest in the teaching mode, learning effectiveness, classroom atmosphere, observation and resilience, level of professional knowledge, standardisation of clinical operation, the study's findings showed that following the instruction, there was a considerable improvement in the capacity for humanistic care, doctor-patient communication, and teamwork. The observation group that received instruction utilising case-based scenario simulation outperformed the control group. Concurrently, there was a statistically significant ($P < 0,05$) increase in the observation group's overall satisfaction rate compared to the control group. This indicates that teaching trainee doctors CPR and laryngeal mask airway establishment through case-based scenario simulation methods can enhance their level of team skills as well as their interest in learning and overall quality. It can also liven up the classroom environment.

The way that students are taught has changed as a result of case-based situational simulation teaching. Students are now able to consider the problem and experience taking on different roles and perspectives. This has stimulated their ability to think independently and improves their problem-solving skills. Learning in various trainee positions facilitates improved communication and patient care, which enhances the team's capacity to work together. It also helps to better comprehend the family members of patients' emotions.

CONCLUSIONS

In summary, case-based scenario simulation can greatly raise trainees' assessment scores and skill levels, enhance the evaluation of the course material and teaching impact, boost satisfaction and foster teamwork, and have a positive teaching effect. It can also teach trainee doctors CPR and laryngeal mask airway establishment.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

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