The method and effect evaluation of BLS training for college students of polytechnic

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Abstract: Objective: To compare the effect of Basic Life Support (BLS) training on cardiopulmonary resuscitation (CPR) between students majoring in medical & nursing specialties and other specialties in polytechnic colleges. This paper analyzes the necessity and feasibility of on-the-spot cardiopulmonary resuscitation training for polytechnic college students and discusses the effective ways of BLS training. **Methods:** using stratified sampling method, 20 students of second grade were randomly selected from rehabilitation treatment technology major and medical laboratory technology major of Binzhou Polytechnic, and 20 students were chosen from three specialties which were randomly selected from other 32 non-medica&nursing specialties. Conduct questionnaire survey and take a test of the BLS knowledge (Test A) before the training, take another test to the BLS knowledge (Test B) and assess the BLS skills after the training .The scores of each group were analyzed statistically. **Results:** There was no significant difference in the scores (Test A) between each group ($P > 0.05$) , but there was a significant difference in pass rate between group A and group C、D、E ($P < 0.05$) before the training , as well as between group B and group C、D、E. There was no significant difference in the scores (Test B) after training ($P > 0.05$) . There was a significant difference between the scores and pass rates of Test A and Test B in each group ($P < 0.001$). There was no significant difference in BLS skill assessment results and pass rates between each group ($P > 0. 05$). **Conclusion:** there is a general lack of BLS knowledge and skills in polytechnic college students, but formal and strict training can significantly improve the BLS knowledge and skills of polytechnic college students. It is an effective way to improve the public's ability to save and rescue each other by relying on college teachers who were experienced medical education to carry out BLS training for college students.

Basic life support (BLS), also known as on-the-spot resuscitation or initial recovery, is the first aid measure taken immediately after the discovery of cardiac arrest (CA), which determine the success rate of resuscitation. The results show that if the BLSs are intiated within 4 minutes after CA, the success rate of rescue can reach 43%～53%. The survival probability of patients can be reduced by about 10 percent for every 1 minute delay, and the survival rate of patients over 10 minutes is extremely low[1]. Polytechnic college students have strong learning ability, if they master the skilled resuscitation technology through BLS training, they can deal with CA accidents calmly after entering the work station and gain valuable "golden time" for patients. We randomly selected 100 sophomores majoring in 5 specialties in Binzhou polytechnic to carry out BLS training, for the sake of evaluating the master degree to the BLS knowledge and skills students majoring in medical & nursing specialties and other specialties in polytechnic colleges. To judge the feasibility of popularizing BLS knowledge and skills training among college students.

1. Objects and methods

1.1 Objects

In October 2017, a stratified sampling method was used to select 20 sophomores randomly and respectively from Rehabilitation technology major (group A, 7 boys, 13 girls) and Medical inspection technology major (group B, 5 boys, 15 girls) in Binzhou polytechnic. Air crew technology major (group C, 2 boys, 18 girls), electrical automation major (group D, 12 boys, 8 girls) and navigation technology major (group E) were randomly selected from the remaining 32 non-medical majors. There are 20 students in each of the three groups. The students in Group A and B have studied the basic courses such as Anthropotomy and Physiology, but haven't studied the clinical courses such as Emergency Medicine. The students in group C,group D and group E haven't studied the basic courses or the clinical courses.

1.2 Methods

1.2.1 Questionnaire

A self-designed "cardiopulmonary resuscitation questionnaire" was used to conduct the survey .The questionnaire is divided into two volumes: A (pre-training) and B (after training). The questionnaire consists of four parts: 1. Personal general data .2.BLS related basic knowledge and training demand analysis. 3. BLS training attitude questionnaire. 4. BLS knowledge questionnaire. The first three parts are identical in Volume A and Volume B. Eight emergency rescue training teachers at or above the provincial level constructed a test database for cardiopulmonary resuscitation knowledge. Two sets of examination papers were chosen randomly as the part 4 of the Volume A and Volume B, including 40 single-choice questions, 10 judgment questions with One point per question & 50 points in total.($\geq$ 30, passing). The questionnaire was determined by three statisticians to be accurate and reliable, and its internal consistency reliability coefficient was 0.8320.

1.2.2 Conducting the questionnaire survey

Before the training, the researchers sent out the questionnaires (Volume A) to the research subjects who answered it in 45 minutes (Test A). 100 questionnaires were distributed and 100 copies were recovered in the research, the response rate is 100%. After all the training tasks were completed, the researchers sent out questionnaires (Volume B) to the research subjects, and they were answered in 45 minutes too. Just as Volume A,100 questionnaires were distributed and 100 copies were recovered in the research, the response rate is 100%.

1.2.3 Training content

The training content refers to the following textbooks: *The teaching course of rescue teachers (ii) cardiopulmonary resuscitation and trauma rescue* by the Red Cross society of China(RCSC) , *Surgery (8th edition)* by the People's Medical Publishing House, and *2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. It mainly includes the details such as the basic knowledge of CPR, Emergency Medical Service System(EMSS) and the Survival Chain, the indications and processes of BLS, the using of automatic extracorporeal defibrillator(AED) and so on. While training, we incorporate the updates for laypersons of *2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*[2]: 1.When laypersons find that a patient was not conscious and breathing, they should start EMSS and initiate BLS immediately in the order of C (Circulation)- A (Airway) -B (Breathing); (2)The frequency of closed cardiac massage is 100 ~ 120 per minute; (3)The depth of closed cardiac massage is 5 ~ 6 cm. (4) C/A   is 30: 2 either for single or double. The contents of the training are simple, popular, practical and easy to understand.

1.2.4 Training methods and process

Eight emergency rescue teachers from the China Red Cross Association were selected to form a

professional training team. All of them were bachelor's degree or above in clinical medicine or nursing major in medical colleges and universities. Since 2010, they have been responsible for the emergency rescue training work of the city's Red Cross Society. They are rich in teaching experience, their BLS skills are standard and proficiency. The training adopted the methods of theory teaching, skill demonstration, group skill training, theory examination and skill examination. The process is as follows.

First, after the subjects completed the questionnaire (Volume A), a teacher taught the theoretical knowledge of BLS to 100 students using the PPT made by RCSC in 2 hours, with the aid of Multimedia Teaching Means.

Second, according to the ratio of teachers to students at 1:5, BLS training is carried out for each group in turn (the training sequence is drawn by lots). The teacher explains and demonstrates the skills two hours firstly, then the teacher guides the student to train four hours using the training aid of Resusci Anne (made by Laerdal Medical, half body). Teachers are asked to explain 45 minutes, demonstrate twice (5 cycles / time), the students are asked to practice 4 hours (5 cycles / time).

Third, the volunteers of each group were asked to answer the questionnaire (Volume B) using a close-book exam while finished the training (Test B), 100 questionnaires were distributed and 100 copies were recycled, the response rate is 100%.

Forth, the Scoring Standards to assess the BLS skills were designed according to the *2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care*. Ten other emergency rescue teachers who didn't take part in the research team were employed to carry out BLS skills assessment randomly, with two examiners per group. All students of each group were assessed in random order. The two examiners scored separately and then averaged the scores as each student's final score. The passing line is 80 points.

1.2.5 Data statistics and analysis

The scores of Test A, Test B and the BLS skill assessment were input into the *Excel Spreadsheet* for preliminary statistics, and the statistical analysis was carried out by *SPSS 16.0*. The scores were tested by *T test* and the passing rate were tested by chi-square test. $P < 0.05$ indicates that the difference is statistically significant.

2. Results

2.1 Statistical results of BLS knowledge test scores

The scores of knowledge Test A were ranged from 13points to 35 points, the pass rate was 13%. The scores of knowledge Test B were ranged from 24points to 48 points, the pass rate was 95%. A comparison was made between each groups. Firstly, there was no significant difference among the five groups in Test A ($P > 0.05$).   The passing rates of group A and group B were compared with the other three groups respectively, the difference was statistically significant ($P < 0.05$). secondly, there was no significant difference among the five groups in Test B ($P > 0.05$). Thirdly, compare the scores of Test A, Test B and the pass rates among each groups, there were significant differences ($P < 0.001$).The results are shown in table 1, figure 1.

Table 1: Scores of BLS knowledge test of students majoring in different specialties

$(\overline{x} \pm s$，n=100)

Group	Number of examples	Pre-training (Test A) Score	Pre-training (Test A) Pass rate(%)	Post-training (Test B) Score	Post-training (Test B) Pass rate(%)	X^2price
A	20	24.95±6.36	30	40.45±5.86#	100#	21.538
B	20	24.18±6.01	30	41.04±5.98#	100#	21.538
C	20	22.72±3.95	0*	38.75±6.89#	85#	29.565
D	20	22.95±3.48	5*	39.37±6.72#	95#	32.400
E	20	22.10±3.44	0*	39.41±6.11#	95#	36.190

Note: * Test A, compared with group A, group B respectively, $P < 0.05$
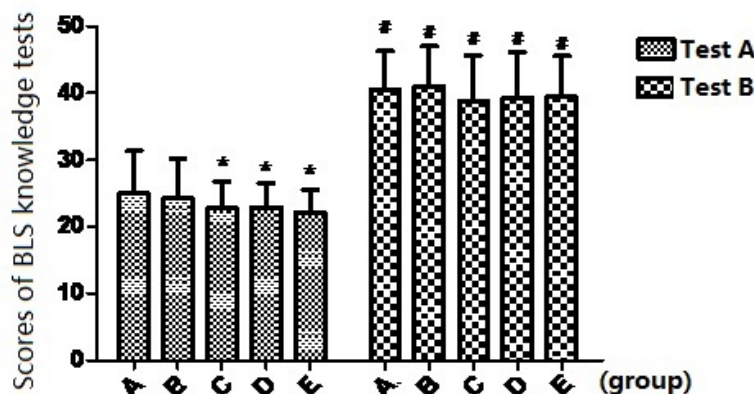   # compared with the scores of Test A, $P < 0.001$.

Fig. 1 Scores of BLS knowledge tests of different groups

2.2 The assessment of the students' BLS skills

After training, the BLS skill operation score of 100 students were ranged from 24points to 48 points, the average score was 89.83, and the pass rate was 98.00%. There was no significant difference in BLS skill score and pass rate among five groups (P > 0. 05). The results are shown in table 2.

Table. 2 .The assessment of BLS skill operation of students majoring in different specialties

($\overline{x} \pm s$，n=100)

group	Number of examples	Skill operation score	pass rate(%)
A	20	90.15±5.31	20(100)
B	20	91.06±5.57	20(100)
C	20	88.75±5.08	19(95)
D	20	89.79±5.61	20(100)
E	20	89.42±4.82	19(95)

3. Discussion

3.1 Polytechnic college students are lack of BLS knowledge and skills generally

The survey showed that all of the 100 subjects thought that college students should learn BLS knowledge and skills, but no students had received formal BLS training, and 22 students had learned BLS knowledge by means of television or internet before training. This shows that the college students generally lack BLS knowledge and skills, which can basically reflect the cognitive level of the basic first aid knowledge and skills of Chinese college students. As the future and hope of a country, college students mastering the skills of CPR before stepping into their jobs, and becoming a qualified "first witness" is of great significance to improve the rescue success rate and lower the mortality rate of patients suffered from CA.

3.2 Formal and rigorous training can significantly improve college students' BLS knowledge and skills

Polytechnic college students have strong learning ability and are good at acquiring knowledge and skills by means of modern information technology. Freshmen and sophomores have relatively light learning tasks and are more willing to learn knowledge and skills outside their major. Willing to learn first aid knowledge to improve their own quality [3]. In this study, the pass rate of the overall theoretical knowledge of higher polytechnic college students reached 95%, and the pass rate of skill operation reached 98%. There was no significant difference between the medical & nursing majors and non-medical students after training, indicating that after the strict training college students can master BLS knowledge &skills and have the ability of self - rescue and mutual aid.

The training takes the way of centralized training to refer to the training process of the Red Cross

ambulance. First, PPT explains BLS related theoretical knowledge, the selection of the content is sufficient and the time of teaching is 2 hours. The number of students should be controlled within 50 to 100 people to ensure the training effect. In order to prevent the deviation from happening, the research took one teachers to focus on the knowledge teaching and the teachers will explain the technical details and operation points in detail to each group in a hour. The teacher demonstrated BLS two times (5 cycles / time) strictly according to the scoring standards, including environmental assessment, CA judgment, starting the EMSS system, chest compression, open airway, mouth to mouth manual breathing and so on, the time is a hour. Finally, the teacher instructs the students to carry out single resuscitation training observed by the other four students in turn, each student operated 5 times and the total class time is 4 hours. The teacher-student ratio of skill training in this study is 1: 5, so the teachers can control the training process and have time and energy to guide each student, the students had enough time to train the skills using the Recovery Anne. The research directed students to students train BLS skills with Recovery Anne, which has been proved to be a successful experience and guide in BLS training in the United States for more than 30 years [4]. Recovery Anne connected with the computer, voice prompts and light displays can assess the position, frequency, and range of presses is correct or not, which can help the teachers and other students give guidance and correction in time when the operation is wrong. While one student train with Recovery Anne , the remaining students observe the operation, all the students can make great progress. The final pass rate of the final skill assessment is the 98 percent. The research shows that the sophomores of different majors can master the BLS skill after standard and strict training, the difference is not significant.

3.3 Relying on Medical Education Teachers in Colleges and Universities to carry out BLS training for College students is an effective way to enhance the ability of self - rescue and mutual aid

Carrying out the BLS training of college students will creat a powerful demand for professional emergency rescue teachers. Presently, domestic emergency rescue teachers consists mainly of doctors and nurses of emergency departments in public hospitals, which make it difficult to carry out systematic and large-scale public BLS training. School education is the best and most fundamental way to popularize the knowledge of BLS and improve the quality of residents. It is difficult for doctors and nurses of emergency departments in public hospitals to meet the needs of the BLS training of all the students of a college [5]. Twenty medical education teachers graduated from medical or nursing universities of our college obtained the certificate of emergency rescue teachers through training organized by RCSC, they had been serving as emergency rescue workers of the city Red Cross for many years. The teachers undertaken many projects of the municipal, provincial and national levels, accumulated rich experience in emergency rescue training, So, the teachers has the ability and conditions to carry out BLS training for college students. In 2015, these teachers undertook the Red Cross Life Health and Safety Education Project. The model of Red Cross BLS training based on colleges and universities was highly recognized by the leaders of RCSC, Binzhou polytechnic exchanged experiences at the project summing up meeting. It is an effective way to improve the ability of public self-rescue and mutual rescue by developing BLS training for college students relying on teachers and resource advantages.

Acknowledgement

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