

# Effect of the China-America Union Pre-Hospital Emergency Care Training Program on the emergency knowledge and skills of Chinese paramedics

Jianfeng Tu, MD, Wenwei Cai, MD, Meiqi Zhang, MD, Xianghong Yang, MD, Huan Chen, MD, Shengang Zhou, MD, Xuning Chen, MD, Yiming Zhao, MD, Junping Guo, MD, Yue Yang, MPA.

## ABSTRACT

**الأهداف:** تقييم الاتحاد الأمريكي الصيني لبرنامج الرعاية الطبية في الطوارئ قبل الدخول إلى المستشفى وذلك على مستوى معرفة ومهارات المسعفين الصينيين بأسس الرعاية الطارئة.

**الطريقة:** أُجريت هذه الدراسة في مقاطعة زيجيانغ، الصين وذلك خلال الفترة من يونيو إلى ديسمبر 2011م. شملت الدراسة مجموعة الدراسة المكونة من 113 متدرب، ومجموعة الشاهد المكونة من 85 متدرب تلقوا جميعاً تدريباً في أصول ونظرية الرعاية الطبية في الطوارئ قبل الدخول إلى المستشفى. لقد خضع المشاركون في الدراسة إلى اختبارات قبل وبعد التدريب وذلك من أجل تقييم مستوى مهاراتهم ومعرفتهم. ولقد كان المحتوى التدريبي متشابهاً في المجموعتين غير أن فريق التدريب في المجموعتين، وطرق التدريس، والمواد كانت مختلفة. وقمنا بعد ذلك باختبار معرفة المتدربين بأسس الرعاية الطارئة، بالإضافة إلى مهاراتهم. وقام المتدربين في كلتي المجموعتين بإكمال استبيان حول فعالية هذا التدريب. واستخدمنا اختبار تي من أجل قياس الفروق بين المجموعتين.

**النتائج:** لقد كانت العلامات التي حصل عليها المتدربين في كلتي المجموعتين بعد التدريب أعلى من تلك التي حصلوا عليها قبل التدريب ( $p < 0.001$ ). وكانت قيمة الفروق في علامات الاختبارات بعد التدريب أعلى بصورة واضحة من الناحية الإحصائية لدى مجموعة الدراسة من مجموعة الشاهد وذلك فيما يخص التحكم بالتنظف، ورعاية الجروح والكسور، والنقل ( $p < 0.001$ ، وإدخال الأنابيب التنفسي ( $p < 0.001$ ، ولم يكن هنالك اختلاف بين المجموعتين فيما يخص المعرفة بأسس الرعاية الطارئة، والإنعاش القلبي الرئوي، وعلاج عدم انتظام إيقاع القلب ( $p < 0.001$ ). وأشارت نتائج الاستبيان إلى أن 95.6% من المتدربين في مجموعة الدراسة قد أشادوا بفعالية الاتحاد الأمريكي الصيني في برنامج الرعاية الطبية الطارئة.

**خاتمة:** أظهرت هذه الدراسة بأن استخدام المعايير الأمريكية في برنامج الرعاية الطبية في الطوارئ قبل الدخول إلى المستشفى يمكن أن يساعد في تحسين مهارات المسعفين الصينيين وذلك فيما يخص التحكم بالتنظف، ورعاية الجروح والكسور، والنقل، وإدخال الأنابيب التنفسي. ونحن ندعم تطبيق مثل الاتحاد التدريبي في كافة المناطق وتوحيد مثل هذه البرامج في مختلف أنحاء الصين.

**Objectives:** To evaluate the effect of the China-America Union Pre-Hospital Emergency Care Training Program (PHEC) on the emergency medical knowledge and skills of Chinese paramedics.

**Methods:** This study was conducted at the Emergency Command Center of Zhejiang Province, Zhejiang

Provincial People's Hospital, Hangzhou, China from June to December 2011. The experimental group of 113 trainees, and the control group of 85 trainees received training in pre-hospital emergency care (PHEC) theory and practice. They were given pre- and post- tests to evaluate their knowledge and skill levels. The training content was the same and the teaching methods, materials and training team in the 2 groups were different. All trainees were tested for emergency knowledge and skills, before and immediately following the training, and also a survey was conducted regarding the effectiveness of the training. T-test was used to measure the difference between the 2 groups.

**Results:** The post-test scores for both groups in knowledge and skills were higher than that of the pre-test ( $p < 0.001$ ). The value of difference between the post-test scores of each group in bleeding control, wound care, fracture care and stabilization, and transportation (BWFT) ( $p < 0.001$ ), and intubation ( $p < 0.001$ ) was significantly higher in the experimental group except emergency knowledge, cardiopulmonary resuscitation and arrhythmia treatment ( $p < 0.001$ ). In the survey, 95.6% of the trainees in the experimental group considered the Union Training Program a more effective way to help paramedics learn emergency medical knowledge and skills.

**Conclusion:** The use of the American standard of PHEC can improve the emergency skills of Chinese paramedics, especially in the areas of BWFT and intubation, and support its use province-wide in an effort to standardize the PHEC medical procedure in China.

*Saudi Med J 2013; Vol. 34 (2): 177-180*

*From the Department of Emergency, Zhejiang Provincial People's Hospital, The Emergency Command Center of Zhejiang Province, Hangzhou, China.*

*Received 15th October 2012. Accepted 9th December 2012.*

*Address correspondence and reprint request to: Dr. Yue Yang, Student's Office, Zhejiang Medical College, Hangzhou 310053, China. Tel. +86 (137) 77838779. E-mail: yangyuerr@163.com*

The non-standardization and lack of uniform training in pre-hospital emergency care (PHEC) for paramedics hinders the development of the Emergency Medical Services (EMS) in China.<sup>1</sup> At present, the universal problem in the Pre-Hospital Emergency Care field in China is the unevenness of the knowledge and skills of paramedics, especially that they do not employ a standardized PHEC process well in the field treatment. However, the management of PHEC departments continues to explore how to optimize training to improve its quality. As the premier management unit of all the pre-hospital emergency departments in Zhejiang Province, the command center of emergency in Zhejiang province at Zhejiang Provincial People's Hospital (ZPPH) sought to avail ourselves of the standardized practice and knowledge already in use by the Emergency Department of College of Medicine at SUNY Upstate Medical University (UMU), New York, USA. Our collaboration began in 2008 with the joint preparation of training materials, the selection of teaching methodology, and the design of the training. The inaugural China-America Union PHEC Training Program is open to every licensed paramedic in Zhejiang Province, and was launched in April of 2008. We designed a customized training program for Chinese paramedics, and focused on the standardization of PHEC in China, and expect that the paramedics could intensify their knowledge and skills, and carry out the standard PHEC. The aim of this study was to evaluate the effect of the China-America Union PHEC Training Program on the emergency knowledge and skills of Chinese paramedics.

**Methods.** This study was designed as a prospective and experimental study and was conducted at the Department of Emergency Medicine, ZPPH, Hangzhou, China from June to December 2011. The ethics committee of ZPPH approved this study, and all trainees provided written informed consent. Two data sets were used in this study, one set was collected from the Union Training Program (113 trainees; the "experimental group"); the other was generated by an earlier, non-union PHEC training program conducted by the Municipal Emergency Center of Zhejiang Province (85 trainees; the "control group"). The inclusion criteria for the trainees in both groups were the paramedics, and the emergency physicians were excluded. No statistical differences in gender, age, education, length of service, or professional title existed between the 2 groups, and the demographic data of the 2 groups were comparable.

For the experimental group, 4 emergency doctors from UMU, and 2 emergency doctors from ZPPH comprised the training team. The teachers in the control group were 6 experienced paramedics from the Municipal Emergency Center of Zhejiang Province. Teachers from both groups received teacher training on delivering the PHEC content prior to their respective courses. The same content was used with both groups including: patient assessment at the emergency site; emergency care for trauma patients; lifting and transportation skills; airway management; pre-hospital emergency care for non-trauma patients; emergency care of injuries caused by environmental factors; and treatment of allergies.

The training material used in the experimental group was a "Pre-Hospital Emergency Care Training Manual," especially prepared by doctors from the UMU, focusing on the standardization of the rescue process. The material contains different score sheets for various types of emergency care, such as airway management, hemorrhagic shock management, and automated external defibrillation. "Emergency Medicine," the text used by undergraduate medical students (published by Chinese People's Health Press and edited by Shen-Hong) was used in the control group. Training materials for both groups included: cardiopulmonary resuscitation (CPR) models; defibrillators; plywood; spine boards; stretchers; tourniquets; and bandages. Both groups received a total training time of 48 hours, and the ratio of training time between knowledge and skills (1:2) was the same for both groups. The training methods in the experimental group included: theoretical knowledge education; videos; the situation approach; a simulation exercise; and followed by examination of knowledge and skills. The same methods were used in the control group with the exception of the situation approach.

Trainees in both groups took the knowledge and skills examination before and immediately following the training. The knowledge examination consisted of single-choice and multiple-choice questions. After the knowledge examination, trainees randomly selected one subject for the skills examination from 4 topics, such as bleeding control, wound care, fracture care and stabilization, and transportation (BWFT) were included as a unified skill set, intubation, CPR, or arrhythmia treatment. The highest score for each of the knowledge and skills exams was 100. Trainees in the experimental group were asked to complete a post-training assessment survey. We did not carry out a survey for the control group as we considered that the survey was a little subjective and less comparable. The aim of the survey is understanding the trainees view for the new training program.

**Table 1** - Itemized difference of pre- and post-training scores in the experimental group and control group ( $\bar{X}\pm s$ ).

Training item	Experimental group				Control group			
	N	Pre-training	Post-training	t-value	N	Pre-training	Post-training	t-value
Knowledge	113	46.01 ± 4.20	89.36 ± 5.22	-71.35	85	42.68 ± 4.14	84.15 ± 5.37	-54.61
BWFT	28	61.43 ± 3.68	93.16 ± 3.46	-40.43	21	60.14 ± 4.30	88.52 ± 3.74	-23.826
Intubation	28	26.21 ± 2.90	92.86 ± 3.81	-66.60	21	24.3 ± 2.85	88.88 ± 5.30	-45.213
CPR	28	72.77 ± 2.10	88.38 ± 3.57	-19.19	21	75.36 ± 2.22	88.19 ± 2.31	-18.362
Arrhythmia treatment	29	47.95 ± 2.30	87.90 ± 3.18	-51.18	22	46.11 ± 3.12	87.91 ± 4.49	-45.825

All  $p < 0.001$ . BWFT - bleeding control, wound care, fracture care and stabilization, and transportation

**Table 2** - Comparison of the post-training value of difference of scores between the 2 groups ( $\bar{X}\pm s$ ).

Training item	Control group	Experimental group	t-value	P-value
Knowledge	41.46 ± 7.00	43.35 ± 6.46	1.94	0.054
BWFT	28.38 ± 5.46	31.73 ± 4.15	2.35	0.024
Intubation	12.83 ± 3.20	15.61 ± 4.30	2.48	0.017
CPR	64.57 ± 6.54	66.64 ± 5.29	1.22	0.227
Arrhythmia treatment	41.80 ± 4.28	40.09 ± 4.21	-1.41	0.164

BWFT - bleeding control, wound care, fracture care and stabilization, and transportation, CPR - cardiopulmonary resuscitation

All the data was expressed as  $\bar{X}\pm s$ . Before the test, the Levene's test of homogeneity was conducted in both groups. Using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) version 18, t-test was used to measure the difference between pre- and post-training scores within each group. The value of difference after training between the 2 groups for each examination subject was also compared by the t-test. A  $p < 0.05$  was considered statistically significant.

**Results.** No statistical differences in gender, age, education, length of service or professional title existed between the 2 groups. The demographic data of the 2 groups were comparable. The difference between pre- and post-training scores of knowledge and skills in both groups was significant ( $p < 0.05$ , Table 1). The value of difference of scores in the BWFT and intubation in the experimental group was also significant ( $p < 0.05$ , Table 2). The differences in knowledge, CPR, and arrhythmia treatment were not significant ( $p > 0.05$ , Table 2).

One hundred and seven surveys out of 113 qualified for analysis in the experimental group. Ninety-five point six percent of the trainees considered China-America Union PHEC training program effective overall. Only zero point eight percent considered the training in the actual rescue procedures useless. Ninety-nine point two percent considered the training in the actual rescue procedures effective. Ninety-two point three percent of trainees thought that the comprehensive teaching

methods including the situation approach would stimulate future trainees' interest in learning. Only 0.9% of trainees did not believe that teaching by foreign teachers brought the material to life and made it easier to learn. Approximately one quarter trainees thought the training content was too simple. Fifteen point five percent of trainees thought the language barrier reduced the effectiveness of the training.

**Discussion.** Pre-hospital emergency care is one of the most important links in the Emergency Medicine Service (EMS) System. The quality and efficacy of PHEC are directly dependent upon the mastery of emergency knowledge and skills by paramedics.<sup>2</sup> Enhancing and standardizing the training of paramedics in emergency knowledge and skills is critical. Data from the study showed that the knowledge and skills of paramedics improved with 2 different training programs. However, the value of difference of the post-training scores showed that BWFT and intubation were significantly higher in the experimental group. This effect could be explained by several factors: the inclusion of the situation approach,<sup>3,4</sup> the different methods employed by the foreign teachers, the difference in educational level between the 2 groups' teachers, the higher participation rate of trainees in the Union class, and the specially prepared training material that highlighted the standardization of the PHEC process. On the other hand, the differences of scores in knowledge, CPR, and arrhythmia treatment between the 2 groups were not

significant. This could be explained by the fact that paramedics with solid medical knowledge in China are usually educated in medical colleges (3-5 years of coursework and training), and that CPR training in China is standardized according to CPR guidelines published by the American Heart Association.<sup>5</sup> Analysis of the results of the post-assessment survey of the Union Training Program revealed that most trainees considered the Union Training Program effective and easy to understand, partly due to the high level of interaction between teachers and trainees. They also felt that the teaching methodology was useful in terms of motivation and learning the material. However, 15.5% of the trainees reported that the language barrier negatively impacted the effectiveness of the training, which suggests that increasing the accuracy and rate of translation is important, especially in skills training courses, in strengthening the communication between teachers and trainees. In addition, of note is that 20.1% of trainees thought the content of the Union Training Program was too simple. The reason for this may be due to the higher educational level of Chinese paramedics as compared to their American counterparts. Some chapters in the program, based on American standards, were simply too basic for Chinese paramedics.<sup>6,7</sup> Therefore, to be even more effective, the training program would need to be modified for use in the Chinese context; this is the next step in our research. From the point of view of standardization, however, 99.2% of the trainees considered the emergency process training effective, which indicates to us that in terms of standardizing the PHEC procedure, this training was appropriate for Chinese paramedics. At present, the universal problem in the PHEC field in China is that the paramedics grasp the knowledge and skills well, but do not employ a standardized PHEC process, the fact of which translates into low rescue success rates.<sup>8</sup>

The criteria of test for emergency skills was followed by different teachers in the 2 groups and may have influenced the scores to some degree, which was a limitation of the study.

In conclusion, the Union Training Program, focusing on the standardization of the PHEC process, could improve the acquisition of BWFT and intubation by paramedics in the Zhejiang Province of China. The problems revealed by the study suggest some solutions: that the program content is modified to account for the stronger medical base of Chinese paramedics, and that the accuracy and rate of English-to-Chinese translation are improved. In accordance with these results, we will modify the China-America Union PHEC Training Program in future research, especially evaluating these single factors including teaching method, teaching materials and teachers. All efforts will be conducted to standardize the PHEC medical procedure in Zhejiang Province of China.

## References

1. Zhang ZQ, Chen WB, Chen WY, Guo YC, Fu Y, Yang ZF, et al. [The epidemiological characteristic of 97,823 cases of pre-hospital medical care in Guangzhou city] *Zhongguo Wei Zhong Bing Ji Jiu Yi Xue* 2011; 23: 99-103. Chinese
2. Arreola-Risa C, Mock C, Herrera-Escamilla AJ, Contreras I, Vargas J. Cost-effectiveness and benefit of alternatives to improve training for prehospital trauma care in Mexico. *Prehosp Disaster Med* 2004; 19: 318-325.
3. Lammers RL, Byrwa MJ, Fales WD, Hale RA. Simulation-based assessment of paramedic pediatric resuscitation skills. *Prehosp Emerg Care* 2009; 13: 345-356.
4. Saravia G, Judice R. Training at the national level. The National EMS Academy offers a variety of simulation scenarios. *JEMS* 2010; 35: 18-19.
5. Wang XP, Martin SM, Li YL, Chen J, Zhang YM. [Effect of emergency care simulator combined with problem-based learning in teaching of cardiopulmonary resuscitation] *Zhonghua Yi Xue Za Zhi* 2008; 88: 1651-1653. Chinese.
6. Cason D, Robinson K. EMS Education Agenda: changes that will affect you. *JEMS* 2011; 36: 66-67, 69-71.
7. Cooper S. Contemporary UK paramedical training and education. How do we train? How should we educate? *Emerg Med J* 2005; 22: 375-379.
8. Kaspruk LI. [The training of paramedical personnel of primary medical sanitary care system in Orenburgskaya oblast]. *Probl Sotsialnoi Gig Zdravookhraneniiai Istor Med* 2010; 6: 31-34. Russian