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Original article

Effects of basic life support training program on knowledge, perceived self-efficacy and basic life support performance in village health volunteers

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Background: Bystander cardiopulmonary resuscitation (CPR) is crucial for rescuing out-of-hospital cardiac arrest (OHCA) victims. Therefore, basic life support (BLS) training is necessary to effectively save lives of OHCA patients. In rural Thailand, village health volunteers are usually the first responders to perform CPR and activate emergency medical service system on the patients. Unfortunately, BLS knowledge and performance after training program as well as the retention of those elements over time has not been studied in this population.
Objective: The primary objective of this quasi-experimental research was to investigate the effects of BLS training program on knowledge, perceived self-efficacy and BLS performance in village health volunteers.
Methods: Data were collected from 30 subjects using the BLS knowledge, perceived BLS self-efficacy questionnaires and BLS performance evaluation form before training, immediately after training and three months after training. The mean scores of the components were compared among various periods of assessment.
Results: Mean BLS knowledge and perceived BLS self-efficacy scores significantly increased immediately after training, compared with those of pre-training period but declined at 3 months after training. BLS performance scores at 3 months post-training period was significantly higher than that of the immediate post-training period.
Conclusions: BLS knowledge and perceived BLS self-efficacy was enhanced after training but they faded away over time. However, BLS performance was still boosted during 3 months after training.

Keywords: Basic life support, knowledge, perceived self-efficacy, basic life support performance, village health volunteers.

Sudden cardiac arrest is one of the global health concerns. In Thailand, only one-third of out of hospital cardiac arrest (OHCA) victims received assistance from the emergency medical team.[1] Important factors that improve their chance of survival include public knowledge and skills in performing basic life support (BLS) promptly on the patients suffering from OHCA.

Village health volunteers are the first responders who provide BLS on OHCA victims in rural Thai communities. Therefore, BLS knowledge and skill training on the volunteers are crucial in rescuing the patients in our country.[2]

At present, there is no definite guideline on BLS training for village health volunteers, as well as retention of the knowledge and skills. Only few studies on evaluation of BLS performance of this population were conducted. Previous studies revealed that knowledge, perceived self-efficacy and skills of BLS in medical personnel tended to decline over time.[3-8]

The primary aim of this study was to compare pre-training, immediate and 3-month post-training scores in knowledge, perceived self-efficacy and skills of BLS in the village health volunteers. The findings of this study may help organize and schedule the BLS training programs to ensure the long-term retention of their knowledge and skills.

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Materials and methods

This was a quasi-experimental study conducted from August to November, 2018. Subjects aged 20 to 60 years old were recruited from the village health volunteers of Nhong Sam Wang Hospital 1, Nhong Sue District, Pathumthani Province, Thailand.

Participant recruitment and sample size calculation

Eligible subjects were recruited based on inclusion criteria as follows: 1) did not have any habitat migration in the next three months; 2) did not have any chronic illnesses that may affect physical exertion e.g. bone and joint diseases, heart diseases, or respiratory infections; and 3) did not have physical disability of the extremities.

The subjects were excluded if they had undergone BLS training within the past six months.

As for sample size calculation, the effect size of the knowledge variable was 0.85 and the effect size of the perceived self-efficacy variable was 0.75 based on a study.[8] In our study, the type one error and power of the test were set at 0.05 and 0.80, respectively. Sample size was determined based on the Table of a one-group before-after design with the medium effect size of 0.35 and three repeated measurements.[9]

Program intervention

The BLS training program was a one-day program. Three certified trainers trained the subjects with the teaching contents as follows: 1) 5-minute video on BLS knowledge; 2) 30-minute power point slide lecture about BLS steps and procedures; and 3) live demonstration of BLS including the automated external defibrillator (AED) use. As for BLS practice, the subjects were divided into three groups (10 subjects per group). Each group was conducted by a trainer to enhance the coverage of supervision. The training program in this study was exercised according to the 2015 American Heart Association (AHA) guideline. Ten weeks after completion of the course, the investigators distributed BLS and AED instruction manuals to all participants for self-refreshment.

Data collection

Questionnaire of BLS knowledge that consists of 25 items with 25 points was used to evaluate the knowledge competency of the subjects in pre-training, immediate and 3-month post-training periods. The passing score was 20 points (80.0%). Perceived self-efficacy is a 15-item test. It presents a set of rating scales ranging from 0 to 10 (0 = no self-confidence at all to perform, 10 = highest level of self-confidence to perform). The scores were then adjusted to 100 points, dividing into five levels as follows: 0 - 20 points represent a very low level of perceived self-efficacy; 21 - 40 points represents a low level of perceived self-efficacy; 41 - 60 points represents a moderate level of perceived self-efficacy; 61 - 80 points represents a high level of perceived self-efficacy; and 81 - 100 points represents a very high level of perceived self-efficacy.

BLS performance was evaluated with a performance checklist with full score of 14 points. Performance of AED operation was also assessed with full score of 6 points. Resusci Anne® manikin (Laerdal Medical, Norway) and standard trainings AEDs were used during all training and performance examinations.

The serial evaluation was executed on an individual subject in pre-training, immediate post-training and at three months after completion of the training.

Statistical analysis

All data were analyzed with the Statistical Package for the Social Sciences (version 21.0, IL, USA). Demographic data and all scores were analyzed by descriptive statistics. One-way repeated measures ANOVA with multiple comparison was employed to compare the differences of the scores in knowledge and perceived self-efficacy among pre-training, immediately after the training and three months after the training. Data were expressed mean standard deviation (SD)

The study has been approved by the Institutional Review Board of Faculty of Medicine, Ramathibodi Hospital, Mahidol University (ID 04-61-10). Written informed consent was required for every subject.

Results

Thirty village health volunteers were recruited in this study. Their mean age was 47.0 ± 8.1 years old and 27 subjects (90.0%) were females. The demographic data of all subjects are shown in Table 1.

Table 1. Demographic data.

Data characteristics	Number	Percentage
Gender		
Male	3	10.0
Female	27	90.0
Age (years)		
30 - 40	7	23.3
41 - 50	12	40.0
51 - 60	11	36.7
Education level		
Primary school	12	40.0
High school	13	43.3
Vocational certificate	3	10.0
Bachelor degree	2	6.7
Duration of being a village health volunteer		
1 - 5 years	12	40.0
6 - 10 years	11	36.7
More than 10 years	7	23.3
Basic life support training experience		
No	6	20.0
More than 6 month – 1 year	15	50.0
1 – 2 years	3	10.0
More than 2 years	6	20.0
Basic life support experience on real patients		
No	15	50.0
Yes	15	50.0

Basic life support knowledge and perceived self-efficacy

After the course, the mean scores of BLS knowledge in pre-training, post-training and 3-month re-testing period are shown in Table 2.

Post-training scores of BLS knowledge and perceived self-efficacy were significantly higher than that of pre-training test while there was a decline of 3-month retesting scores from post-training period in both BLS knowledge and perceived self-efficacy. The comparisons across all testing periods are demonstrated in Table 3.

Retention of BLS knowledge and perceived self-efficacy in BLS

There was a significant decline in the retention of BLS knowledge and perceived self-efficacy as shown in Table 4.

BLS performance

BLS performance was compared between post-training and 3-month re-testing period. There was an improvement in performance of all BLS individual steps as well as the AED use. The percentages of the subjects who performed BLS steps correctly are shown in Table 5.

Table 2. Mean scores of BLS knowledge and perceived self-efficacy (n = 30).

Variables	Pre-training	Immediately post-training	3-month re-testing
BLS knowledge			
Mean score ± SD	11.4 ± 2.8	21.8 ± 2.4	19.0 ± 3.2
Perceived self-efficacy			
Mean score ± SD	38.0 ± 15.6	82.6 ± 14.9	70.0 ± 19.6

BLS = basic life support SD = standard deviation

Table 3. Comparison of BLS knowledge and perceived self-efficacy at pre-training, post-training and 3-month re-testing period (n = 30).

	Pair difference				*P* - value
	Mean	SE	95% Confidence interval for difference		
			Lower	Upper	
BLS knowledge					
Pre-test – Post-test	-10.4	0.6	-11.6	-9.2	<0.001
Post-test – Re-test	2.7	0.5	1.6	3.8	<0.001
Pre-test – Re-test	-7.7	0.6	-9.0	-6.4	<0.001
Perceived self-efficacy					
Pre-test – Post-test	-44.6	3.4	-51.6	-37.6	<0.001
Post-test – Re-test	12.6	2.9	6.7	18.6	<0.001
Pre-test – Re-test	-32.0	4.1	-40.3	-23.7	<0.001

BLS = basic life support SE = standard error

Table 4. Repeated measures on the mean scores of BLS knowledge and perceived self - efficacy within subjects differences across time (n = 30).

Source of variations	SS	MS	*P* - value
BLS knowledge			
Within subjects			
Time	1,744.1	872.0	<0.001
Error	303.2	5.2	
Perceived self-efficacy			
Within subjects			
Time	31,710.2	15,855.1	<0.001
Error	10,598.2	182.7	

BLS = basic life support, SS = sum square, MS = mean square

Table 5. Percentages of the subjects who performed BLS steps correctly during post-training and 3-month re-testing period (n = 30).

BLS performance	Post-training n (%)	3-month re-testing n (%)
High Quality CPR		
Correct hand position	28 (93.3)	30 (100.0)
Correct rate of chest compression (100 – 120 compressions / min)	13 (43.3)	16 (53.3)
Correct depth of chest compression (5 - 6 centimeters.)	24 (80.0)	30 (100.0)
Minimized interruption in chest compression for less than 10 seconds	20 (66.7)	30 (100.0)
Correct opening of airways	25 (83.3)	27 (90.0)
Correct mouth-to-mouth ventilation	29 (96.7)	30 (100.0)
Effective ventilation (chest rising with each breath)	25 (83.3)	28 (93.3)
One-second mouth-to-mouth ventilation	26 (86.7)	30 (100.0)
AED		
Correct positioning of the defibrillator pads	28 (93.3)	29 (96.7)
Correct practice while AEDs was analyzing the rhythm	24 (80.0)	30 (100.0)
Correct practice after the electrical shock	27 (90.0)	30 (100.0)

CPR = cardiopulmonary resuscitation, AED = automated external defibrillator

Discussion

Mean scores of BLS knowledge and perceived self-efficacy of post-training period were higher than that of pre-training. These findings were consistent with previous studies. [3, 4, 6, 8, 10] This result could be explained by the fact that the subjects developed better understanding after attending the program and boosted their confidence to perform BLS. [11]

However, there was a significant decline in the knowledge and self-confidence after 3-month period despite the distribution of written instruction of BLS and AED use before re-testing. Interestingly, scores of the performance on BLS and AED use improved on 3-month re-testing. Distributing the written manuals may help the subjects be able to review the BLS steps and AED operational procedure and then enhance their performance during re-testing. There was an evidence that retraining can promote long-term memory and maintain the skill performance.[12] However, it may not assist the subjects in boosting their scientific knowledge or self-confidence.

As a result, successive renewal or refreshment of the BLS course probably improve the subjects' knowledge and level of self-confidence as well as assure of their trainees' accuracy to perform correct steps of BLS and AED use on the trainees. A previous study showed that the experienced BLS providers performed chest compressions more correctly than those who were novices to BLS training.[13]

This study has several limitations. First, it was a small-sized study that recruited the specific population with particular background (village health volunteers in rural Thailand). The findings may not be generalizable to other types of populations at larger scale. Second, half of the participants had gained experience on BLS training before the trial started. Moreover, some subjects had performed BLS on real OHCA victims during post-training and 3-month re-testing period. These exposures might have affected the scores on skill testing. Lastly, the specific training program was used to train the subjects in this study. The results may not be applicable when different program were used.

Conclusions

BLS training program can enhance the knowledge, perceived self-efficacy and skill performance in BLS and AED used. However, retention of the knowledge and self-confidence of the trainees faded over time. Course refreshment and self-review of BLS training and AED use is necessary to help maintain the BLS skill performance among the lay rescuers.

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Conflict of interest

The investigators declared no conflict of interest.

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