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Effectiveness of Basic Life Support Short Course Training Among Thai Vocational College Students

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Abstract

The purpose of this quasi-experimental research was to compare test scores among Thai vocational college students regarding their basic life support knowledge and cardiopulmonary resuscitation (CPR) skills before and after receiving short course training. Purposive sampling was used to select 30 students with no prior training in basic life support (BLS). The BLS short course training was based on the guidelines of CPR 2020 by the American Heart Association. The content validity index of the questionnaire used was 1.0, the reliability testing of knowledge questionnaire was .84, and the skill checklist was .70. The mean post-test score for BLS knowledge obtained after an informative lecture was higher than that obtained pre-test. Similarly, the mean post-test CPR skills score obtained after training was higher than that received in the pre-test; the score differences were statistically significant ($p < .001$). The results indicated that short course training can be used to improve students' understanding of BLS guidelines and effectively perform cardiac compressions. Such short course training should be implemented and established as a feature in the curricula of Thai vocational college education institutes throughout the country.

Keywords: *Basic life support, cardiopulmonary resuscitation, course training*

Introduction

Non-Communicable diseases (NCDs) are the leading global cause of death. In 2020, NCDs deaths represented over 43 million (73%) of the 60 million deaths recorded (WHO, 2020). Coronary artery disease or ischemic heart disease (IHD) is the major cause of health loss among NCDs (Roth et al., 2017). Out-of-hospital cardiac arrest (OHCA) is another condition that needs to be mentioned. It is defined as loss of mechanical activity, confirmed by the absence of signs of circulation that occurs outside of a hospital setting (Krishna et al., 2017; McCarthy et al., 2018). According to a report by the Ministry of Public Health in Thailand (2019), IHD ranked fourth, with fatality rates amounting to 39.7 deaths/100,000 people. In 2019, the prevalence rate among males who were over 15 years was 1,396.40 /100,000 people, and the incidence rate was 160.28/100,000 people (Ministry of Public Health, 2019). The most common cause of OHCA across the Asia-Pacific region (2009–2012) was a presumed cardiac etiology (61.4%). The initial arrest rhythm was non-shockable in 48.2% of cases, 61.8 % of arrests occurred at home, 21.5% of arrests were in public places, CPR assistance was given by bystanders in only 15.8% of instances, and those surviving to admission was 27.7% (Ong et al., 2015). The study of Vattanavanit et al. (2020) showed that OHCA in southern Thailand occurred in 54% of cases, witnessed cardiac arrest was 88.4%, and 45.0% of cardiac arrest cases were attributed to cardiac causes. The most common cause of arrest was acute myocardial infarction (67.8%) and the initial rhythm was unable to be shocked (74%). Bystander CPR was administered to 34.8% of clients.

Several reports have shown that witnessed arrests coming from cardiac causes with a non-shockable rhythm could potentially be helped by a bystander. Bystanders can save the life of an individual experiencing arrest by carrying out initiation of high-quality CPR until medical personnel reach the scene (American Academy of CPR & First Aid, Inc., 2019). Every minute that CPR is delayed, a victim's chance of survival decreases by 10%. This means that immediate CPR from someone nearby can lead to a higher chance of survival (American Heart Association, 2020). Early high-quality CPR and the use of an automated external defibrillator (AED) increase survival dramatically in those

experiencing OHCA (Hasselqvist-Ax et al., 2015). Similarly, the study of Limesuriyakan (2018) showed that there was a higher rate of returning spontaneous circulation (ROSC) in patients who received early CPR and AED shock (71.4%). On the other hand, bystander CPR along with the application of an AED was observed at a low incidence of 0.8% (Sirikul et al., 2022).

Out of hospital resuscitation is an initiated sequence in critical situations known as the “Chain of Survival” (American Heart Association, 2017). The Association guidelines are revised and updated every five years. In the year 2020, the Association changed the chain of survival from five to six links, encompassing "early access, rapid CPR, quick defibrillation, effective advanced care, post-cardiac arrest care, and recovery." The Association placed increased emphasis on lay rescuers as crucial initiators of CPR. Historically, the proportion of adults who received CPR initiated by a layperson was less than 40%, and even fewer individuals (approximately 12%) had an AED applied before the arrival of emergency medical services. The potential harm to the patient is minimal when CPR is initiated in the absence of cardiac arrest. Bystanders should feel confident to commence CPR even if uncertain about the victim's breathing status or cardiac arrest occurrence (American Heart Association, 2020). With the outbreak of the Corona virus (COVID-2019), the American Heart Association and the European Resuscitation Council recommended that for cases of unconfirmed COVID-19, bystanders should consider placing a mask or cloth over the person’s mouth and nose prior to performing chest compressions to reduce the risk of airborne spread of the virus during chest compressions. In a confirmed case of COVID-19, with no personal protective equipment available or where only droplet-precaution protective equipment is provided, an operator should use defibrillation only when limited personnel are present (American Heart Association, 2020; Edelson et al., 2020; European Resuscitation Council, 2020). In confirmed cases in the absence of COVID-19, those intervening should implement all components of high-quality CPR including chest compressions of adequate rate and depth, full chest recoil between compressions, minimizing interruptions in chest compressions, and avoiding excessive ventilation (American Heart Association, 2020; European Resuscitation Council, 2020).

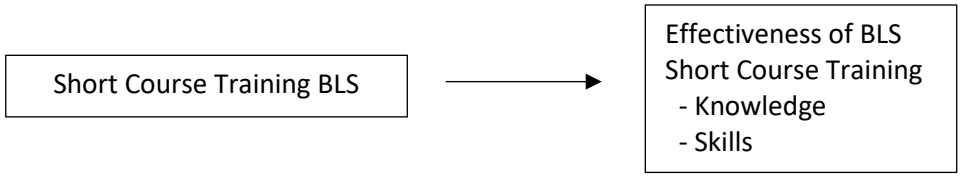
High quality CPR from non-healthcare professionals (bystanders) significantly improves the chances of survival of OHCA victims (Geri et al., 2017; Hasselqvist-Ax et al., 2015; Limesuriyakan, 2018; Panchal et al., 2019). When high-quality bystander CPR is conducted, the rates of prehospital ROSC (41.6% vs. 22.5%), total ROSC (47.7% vs. 29.0%), survival at discharge (30.2% vs. 10.1%), and neurologically favorable discharge (25.5% vs. 5.7%) are all higher (Park et al., 2020). Moreover, bystander administered CPR has demonstrated a statistically significant twofold increase in the likelihood of 30-day survival among clients (Sirikul et al., 2022).

High-quality CPR is associated with young age bystander participation (Park et al., 2020). However, despite this association, the general public worldwide still lacks proficiency in CPR skills, as reported by Anderson et al. (2014). To address this issue, one method to enhance bystander CPR rates among the public is through BLS short course training. In Thailand, a significant target group for such training is comprised of vocational college students, who predominantly belong to the young age group. This group has considerable potential to act as high-quality bystanders for administering CPR interventions. In the study conducted by Tippayanate et al. (2017), they investigated the effectiveness of two training methods, namely, brief video training and traditional training. The results revealed a significant increase in knowledge levels for both groups, but it was noted that over 60% of the video group could not demonstrate sufficient CPR skills competency. This indicated that for vocational college students, a comprehensive approach that includes hands-on CPR practice is crucial alongside video training. The educational content for BLS training of bystanders encompasses theoretical knowledge about OHCA, practical CPR skills training, and instruction on using an AED. Implementing BLS short course training has the potential to empower younger bystanders with effective CPR skills, thereby contributing to improved survival rates for patients experiencing out-of-hospital cardiac arrest.

Research Conceptual Framework

A BLS short course training was used that was based on the chain of survival outlined by the American Heart Association (2020) and Gagne's (1992) nine events of instruction. The chain of survival recommended by the Association consists of six steps, namely, early recognition of symptoms and activation of Emergency Medical Services, bystander CPR, early defibrillation, advanced Emergency Medical Services, post-cardiac arrest care, and recovery (American Heart Association, 2020). Gagne's nine-step model is based on the behaviorist approach to learning. In the current study, learners were trained through learning experiences by applying Gagne's nine events of instruction (Gagne et al., 1992) in a BLS short course training program (Figure 1).

Figure 1 *Conceptual Framework Adopted*



Research Objective

To determine the effectiveness of BLS short course training in Thai vocational college students.

Research Hypotheses

1. BLS training will increase participants' theoretical knowledge compared to pre-training levels.
2. BLS training will enhance participants' skills compared to their baseline levels.

Expected Outcomes and Benefits

The BLS short course training will help students provide more effective CPR when they encounter a cardiac arrest patient and improve the survival rate in out-of-hospital cardiac arrest patients. The results will support introducing a BLS course into the curriculum.

Operational Definitions Adopted

1. "Knowledge of BLS" involves an understanding of the American Heart Association's BLS guidelines that has been obtained after training.
2. "CPR skill" is the ability to perform effective cardiac compressions after training.
3. "Vocational college student" represents a student who has learnt special skills in school to prepare for work in a particular field such as computers, carpentry, automotive services, etc.

Research Design and Methodology

Design

A quasi-experimental research approach was taken involving one group using a pre-test/post-test design approach to study the effectiveness of a BLS short course training program.

Population and Sample

1. The population consisted of 125 students who were studying in Year 1 at Muak Lek Technical College in the first semester of the 2022 academic year.

2. Sampling involved the selection of 30 students who were studying in Year 1 at Muak Lek Technical College in the first semester of 2022.

Purposive sampling was used involving the following inclusive criteria: (a) studying in a vocational college Year 1 with a willingness to participate, (b) aged 18 and over, and (c) having no prior short course training in BLS 2020.

Also the following exclusion criteria were utilized: (a) anyone with an underlying disease or congenital disease such as: asthma, heart disease, etc., and (b) an individual who had undergone a short course training in BLS 2020.

Research Instruments

A questionnaire was used to assess the knowledge of BLS knowledge so that pre-test and post-test data could be compared. The questionnaire developed by Wongsasung et al. (2018), which was adapted from the guidelines of the American Heart Association, was utilized. Four choices were available. In addition, a practical checklist was used to assess both pre-test and post-test CPR skills. The checklist was developed from the guidelines provided by the Association.

Both instruments were tested for validity and reliability. The test for validity was based on the content validity index (CVI) according to the rating provided by three experts (two emergency department physicians and one emergency department nurse). The total value that experts gave to each item divided by the number of experts was 1.0.

The instruments were tested for reliability by conducting a pilot study among 30 Thai vocational Year 1 students. The KR-20 by Kuder and Richardson was used to assess the knowledge of BLS. The Kuder-Richardson Formula 20 (KR-20) of the knowledge questionnaire returned a value of .84, and the skills checklist value was .70.

The final element utilized was a basic life support training program that was developed specifically. It consisted of several parts.

1. A PowerPoint presentation on BLS was delivered, based on the American Heart Association guidelines. The presentation included a video from the Association.
2. Handouts were distributed to the participants; they containing essential BLS knowledge and appropriate CPR steps.
3. The researchers conducted a comprehensive demonstration of the entire BLS procedure (1 hour), providing clear explanations at each step.
4. A question and answer session followed the demonstration to address any queries or uncertainties from the participants.
5. Participants engaged in hands-on practice of CPR skills (1 hour) to reinforce their learning.
6. The researchers provided feedback and guidance to the participants. Subsequently, the participants had another opportunity to practice their CPR skills.
7. The researchers assessed the participants' performance during the CPR skill practice session to evaluate their proficiency and understanding.

The PowerPoint BLS was also validated by three experts (two emergency department physicians and one emergency department nurse). The CVI obtained for the content was 1.0.

Protecting the Rights of Participants

Research ethics approval was obtained from the Institutional Review Board of Asia-Pacific International University (RRDC 2020-206 /AIU.RO.014/2020, November 25, 2020). The rights of the participants in the study were protected throughout the study. The processes used were as follows:

1. Before data collection, the researchers asked for permission from the administration of Muaklek Technical College and met with the target group.
2. The rights for informed consent were explained, such as the research objectives, process of the experiment, expected outcomes, risks, benefits, characteristics of participants, and reasons for inviting the students to participate in the study. Participants were given the right to refuse to participate in this research or withdraw at any time with no effect on their scores in any of their subjects.
3. The researchers gave prospective participants information sheets about the study, thus enabling them to have a complete understanding of it before requesting their signatures for permission.
4. The results were reported as an overview of the data so that individuals could not be identified. At the end of the study, personal data were destroyed.

Data Collection

The students undertook the pre-test and post-test of theoretical knowledge and were tested for their skills in CPR for 1 hour.

Data Analysis

Analysis of the general data was accomplished using descriptive statistics. A paired *t*-test was used to compare the student's theoretical knowledge and skills in BLS.

Results

The total number of vocational college students in the study was 30. Most were males (76.7%) with ages ranging from 18 to 25 years with a mean age of 18.9. Among these, 83.3% did not have experience with the emergency medical phone number 1669, 73.3% did not have first-hand experience in CPR, and 96.7% did not have experience with AED as shown in Table 1.

Table 1 *Demographic and Characteristics Information of Research Respondents* (*N* = 30)

Demographic Information	Number	Percentage
Gender		
Male	23	76.7
Female	7	23.3
Age (Years)		
18	14	20
19	12	40
20	1	3.3
21	2	6.7
25	1	3.3
	M = 18.9, *SD* = 1.4	
Experience with Emergency Medical Call No. 1669		
Yes	5	16.7
No	25	83.3
Experience with CPR		
Yes	8	26.7
No	22	73.3
Experience using AED		
Yes	1	3.3
No	29	96.7

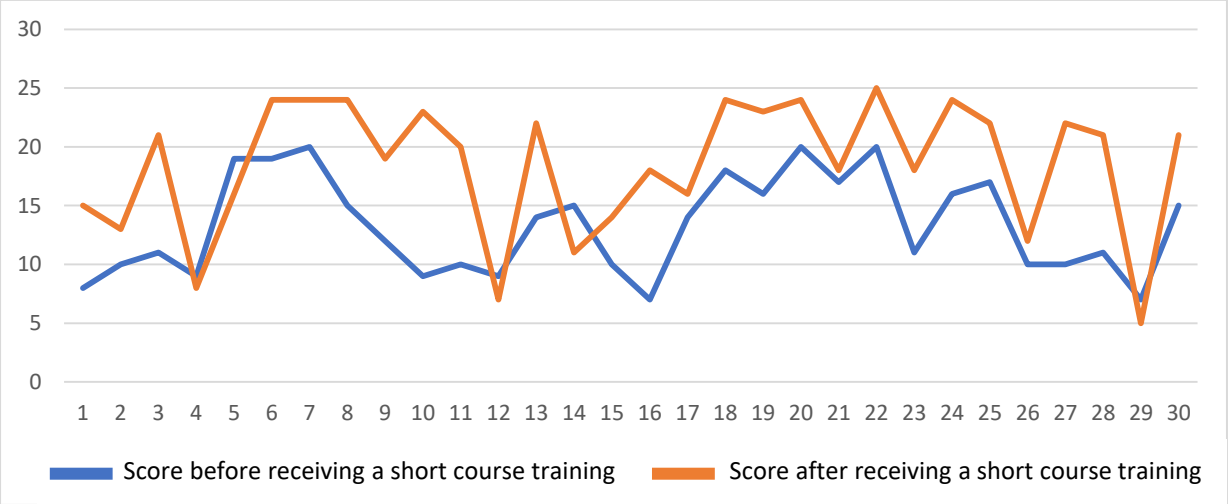
The pre-test score of knowledge prior to the BLS lecture was 13.30. After the lecture, the post-test mean was 18.47. A few participants (Nos. 4, 12, and 29) showed a post-test score lower than in the pre-test. The mean of pre-test CPR skill was 3.57. After the demonstration, the students achieved a higher post-test score (mean = 10.57), as shown in Table 2.

Table 2 *Comparison of BLS Knowledge and CPR Skill Score Before and After Receiving a Short Course Training* (*N* = 30)

Subjects	BLS Knowledge Score (Total 25 Points)		Skill of BLS Score (Total 13 Points)	
	Pre-Test	Post-Test	Pre-Test	Post-Test
No.1	10	15	3	10
No.2	12	13	5	12
No. 3	10	21	5	10
No.4	11	8	3	11
No.5	5	16	1	5
No.6	12	24	6	12
No.7	11	24	4	11

Subjects	BLS Knowledge Score (Total 25 Points)		Skill of BLS Score (Total 13 Points)	
	Pre-Test	Post-Test	Pre-Test	Post-Test
No.8	10	24	5	10
No.9	11	19	3	11
No.10	12	23	3	12
No.11	10	20	3	10
No.12	10	7	3	10
No.13	13	22	1	13
No.14	11	11	5	11
No.15	9	14	3	9
No.16	13	18	3	13
No.17	11	16	0	11
No.18	11	24	9	11
No.19	13	23	5	13
No. 20	7	24	4	7
No.21	13	18	3	13
No.22	13	25	3	13
No.23	9	18	1	9
No.24	7	24	2	7
No.25	12	22	6	12
No.26	9	12	3	9
No.27	13	22	7	13
No.28	11	21	4	11
No.29	9	5	1	9
No.30	9	21	3	9
	M = 13.30, *SD* = 4.19	*M* = 18.47, *SD* = 5.64	*M* = 3.57, *SD* = 1.94	*M* = 10.57, *SD* = 2.00

Figure 1 *Comparison of BLS Knowledge Score Before and After Receiving a Short Course Training* (*N* = (30



The results of the paired *t*-test are highlighted in Table 3 .There were highly significant differences in scores in BLS knowledge and CPR skills between the before and after assessments) $p <$ .001.(The results indicate that short course training can be used to train students to help with OHCA.

Table 3 *Comparison of Mean Scores of BLS Knowledge and Skill Before/After Short Course Training* (*N* = 30)

Feature	*M*	*SD*	*t*	*p*
Score of BLS Knowledge				
Pre-Test	13.30	4.19	6.159-	< .001
Post-Test	18.47	5.64		
Score of CPR Skill				
Pre-Test	3.57	1.94	17.088-	< .001
Post-Test	10.57	2.00		

Discussion

The findings showed that most of the students achieved a higher score after the lecture and training. The result showed a statistically significant difference in the mean scores obtained . One plausible explanation could be that the participants in the study lacked familiarity with CPR, as evidenced by their diverse academic backgrounds in Accounting, Computer Science, Engineering, and other fields. Despite this variation in their areas of study, it is noteworthy that most participants demonstrated improved mean scores in BLS knowledge and CPR skills during the post-test, which followed the short training course. These findings were consistent with the studies by Aloush et al. (2019), Takamura et al. (2022), and Thamnamsin et al. (2022). The knowledge test scores of BLS for all age groups significantly improved after BLS training. Consistent with the findings of Pearkao et al. (2021), the BLS training resulted in a statistically significant increase in the mean scores for both BLS knowledge and CPR skill among the participants.

Significantly, three students displayed lower post-test scores compared to their pre-test scores. During the CPR skill practice session, the researchers inquired about the outcomes, and all three students provided a consistent reason: they were overwhelmed with excitement as it was their first exposure to CPR, leading to subsequent forgetfulness of the material. This finding corresponds with the results obtained by Marcus et al. (2022) where first-year medical students similarly experienced heightened excitement during their initial encounter with CPR. Furthermore, in accordance with the study conducted by Ninwatcharamanee et al. (2021), first-year nursing students achieved lower scores compared to their third and fourth-year counterparts who had prior experience with CPR.

These results indicated that the students, through effective educational and practical training, were able to understand how to respond and act appropriately to help a person who has a cardiac arrest. It suggests that the short course training increased the opportunity for students to help people who may have an out-of-hospital cardiac arrest. Zenani et al. (2022) found in their systematic review, conducted from 2010 to 2020, that in most countries around the world, attention has been directed towards training school children in CPR. The most common instruction protocols utilized in training were video simulations, followed by assessments to evaluate participants' knowledge and skills. An important outcome of this study is that researchers should extend this training to Thai vocational college groups. Moreover, the Thai government might be encouraged to integrate and establish a standardized BLS curriculum in schools.

Future Study

Looking into the future, the simulation lab will play an important and influential role in BLS training. This will enable the young people to be trained using different scenario situations and to enable measurement of their skills in management and decision making.

Conclusion

The effectiveness of the BLS training became evident due to its utilization of diverse methods and strategies, resulting in notable enhancements in participants' knowledge and skills. The instructional program, conducted over 4-hours with the vocational college students, facilitated in-depth learning through practical hands-on experience and immediate feedback. As a result, the

program yielded positive outcomes, leading to significant improvements in both knowledge and skill levels.

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