

Impact of CELIK CPR Training on Knowledge, Attitude and Self-Confidence among Pre-service Teachers

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ABSTRAK

Latihan resusitasi kardiopulmonari (CPR) dalam kalangan guru telah diamalkan di serata dunia dan guru seharusnya dilatih secara berkesan. Namun begitu latihan sedemikian masih tidak ditekankan kepada guru-guru di Malaysia. Kajian ini dijalankan dengan bertujuan untuk menguji keberkesanan implementasi buku panduan CELIK CPR terhadap tahap pengetahuan, sikap dan keyakinan diri dalam melakukan CPR dalam kalangan pelajar jurusan pendidikan di Malaysia. Dengan menggunakan reka bentuk kuasi-eksperimen, kajian ini dijalankan dengan melibatkan seramai 20 orang pelajar pendidikan daripada Jabatan Pendidikan Jasmani dan Kesihatan, Fakulti Pendidikan, Universiti Teknologi MARA. Ujian berbentuk aneka jawapan dan borang soal selidik digunakan untuk mengukur tahap pengetahuan, sikap dan keyakinan diri pelajar. Pengukuran dilakukan sebelum (minggu ke-2) dan selepas (minggu ke-14) latihan CPR. Dapatan kajian menunjukkan seramai 5 orang pelajar berjaya mencapai skor lulus $\chi^2(1, N = 20) = 5.71; p < 0.05$, dengan skor pengetahuan pasca 5.40, 95% CI (-7.16, -3.64) lebih tinggi secara signifikan berbanding skor pra $t(19) = -6.421; p < .001$, beserta saiz kesan yang besar, $d = 1.76$. Namun begitu, tiada perbezaan yang signifikan bagi skor sikap, $t(19) = -0.765; p > 0.05$ dan keyakinan diri $t(19) = 0.00; p > 0.05$. Secara kesimpulan, pelajar pendidikan mempunyai tahap pengetahuan yang terhad, serta sikap dan keyakinan diri yang rendah terhadap CPR. Justeru, pendedahan awal terhadap CPR adalah amat penting terhadap pengajar pendidikan sebagai

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persediaan dalam meningkatkan pengetahuan, sikap dan keyakinan diri yang berpotensi dalam meningkatkan pengetahuan pelajar di sekolah dan orang awam terhadap CPR.

Kata kunci: keyakinan diri, pelajar pendidikan, pengetahuan, resusitasi kardiopulmonari, sikap

ABSTRACT

Cardiopulmonary resuscitation (CPR) training among school teachers are well known and teachers should be trained well. Meanwhile, Malaysia has yet to galvanise our educators to move towards CPR training. This study aimed to investigate the efficacy of implementing the CELIK CPR handbook of CPR training to enhance the knowledge, attitude and self-confidence in performing CPR among pre-service teachers in Malaysia. A quasi-experimental study was implemented involving 20 pre-service teachers from the Department of Physical & Health, Faculty of Education, Universiti Teknologi MARA. Multiple-choice questions and questionnaires to assess the knowledge, attitude and self-confidence of the respondents were used before (week-2) and after (week-14) CPR training. A total of 5 (25%) pre-service teachers successfully achieved the passing scores of $\chi^2(1, N = 20) = 5.71$; $p < 0.05$ with post-knowledge scores, 5.40, 95% CI (-7.16, -3.64), which was significantly higher compared to the pre-scores, $t(19) = -6.421$; $p < 0.001$, with large effect size, $d = 1.76$. However, there were non-statistically significant differences for attitude, $t(19) = -0.765$; $p > 0.05$ and self-confidence, $t(19) = 0.00$; $p > 0.05$. Pre-service teachers had limited knowledge, low self-confidence and attitude about CPR. Early training is crucial as pre-service teachers constitute an important potential for CPR training dissemination among school children and the public.

Keywords: attitude, cardiopulmonary resuscitation, knowledge, self-confidence, pre-service teacher

INTRODUCTION

Cardiovascular diseases (CVD), such as myocardial infarction and stroke, have claimed the lives of an estimated 17.5 million individuals annually, making them the most common cause of death worldwide (Field et al. 2010). A typical medical emergency, such as cardiac

arrest, occurred in all age categories, accounting for 70% of the high-risk fatality occurrences in non-hospital settings (Dwood et al. 2014; Rajeswaran et al. 2018). Cardiopulmonary resuscitation (CPR), which entails compressions of the chest and artificial ventilation, is meant to restore the heart function by maintaining the flow

of blood supply to all essential organs including the brain. As the second link in the survival chain, CPR should be taught and applied globally, as it significantly improves a victim's rate of survival when correctly provided by skilled individuals before the intervention of professional medical personnel (Hazinski et al. 2010; Nolan et al. 2010).

CPR instruction is now available to secondary school pupils, who are urged to learn (Reder & Quan 2003). In several countries, these abilities are now taught as an alternative component of both the curriculum in primary and secondary schools (Onyeaso & Onyeaso 2018; Ghayeb et al. 2017). The American Academy of Paediatrics and the American Heart Association (AHA) emphasised that the syllabus for Basic Life Support (BLS) should be included as part of the curriculum at school, which is based on the criteria of the International Liaison Committee on Resuscitation (ILCOR) (Jain et al. 2016; Onyeaso & Onyeaso 2018).

According to recent research, in any medical emergency, school teachers are supposed to be primarily involved in providing efficient CPR on pupils. Teachers should gain the necessary information and abilities to conduct effective resuscitation. They are frequently the first to recognise the occurrence of cardiac arrest in a student on the scene (Zinckernagel et al. 2017). AHA and the American Academy of Paediatrics developed a guideline emphasising the importance of school instructors acquiring emergency response methods when dealing

with events that are life-threatening (Olympia et al. 2005). Hence, increasing awareness among school teachers will improve their pupils' understanding, which they can then disseminate to their families, producing a ripple effect to the community and raising awareness. This will eventually benefit the one who has been trained to perform CPR during a crisis (Jain et al. 2016; Onyeaso & Onyeaso 2018).

There are about 10,000 schools in Malaysia, with about 5 million pupils in enrolment, and nearly half a million teachers employed, from pre-school to high school levels (MOE 2019). CPR training in schools has been taught over the years by persons from a variety of professions, including physicians, firefighters, medical students, and paramedics (Tanaka et al. 2011). Although school teachers are recommended to lead CPR instruction, just 20% of schools do so (Tanaka et al. 2011). Moreover, 50% of teachers declined to be responsible in teaching CPR due to a perception that they lacked knowledge, confidence and teaching skills on CPR (Mpotos et al. 2013; Tanaka et al. 2011).

The benefits of introducing CPR training at a young age are mirrored in the good outcomes of resuscitation, such as greater confidence, willingness to help others, an inner incentive to help individuals who are in need and increase situational empathy during medical emergencies (Bernama 2019; Jain et al. 2016; Onyeaso & Onyeaso 2018; Zinckernagel et al. 2017). Correct measures, such as public awareness or education, encourage behaviour change that is relevant to public health

(Tanaka et al. 2011). Theoretically, behavioural change therapies are the most successful (Plant & Taylor 2013). According to the Intention-focused model of bystander CPR, early exposure to CPR training is likely to impact self-confidence and attitude towards assisting others in performing CPR should a medical emergency present itself (Panchal et al. 2015).

Panchal et al. (2015) proposed improvements with the intention to lead to behavioural improvements in better CPR outcomes. Moreover, changes in intention can be produced by a variety of factors, including early exposure to CPR training. We anticipate that successful CPR knowledge acquisition during initial CPR training will nurture and impact their attitudes toward helping others, as well as boost self-confidence in performing CPR during medical crises. Furthermore, the effectiveness and success of CPR training programs are influenced by the facilitator's skills, teaching experience, expertise, teaching instruments and tactics.

Over the years, many modules have been developed following the standard resuscitation guidelines for the application towards the non-medical community (Awang et al. 2016; Isa et al. 2019; KKM 2019). Nevertheless, the handbook for teachers' training on CPR teaching in a Malaysian school settings remains sparse. Therefore, the study aimed to investigate the efficacy of implementing a training protocol for CPR (CELIK CPR Handbook of CPR Training) on knowledge, attitudes and self-confidence of individuals in performing CPR among the pre-service

teachers in Malaysia.

MATERIALS AND METHODS

Research Design

Quantitative research was employed using a quasi-experimental design involving undergraduate Year 2 pre-service teachers from the Physical and Health Education Department, Faculty of Education, Universiti Teknologi MARA (UiTM). The study used a pre test (week-2), followed by intervention on the same week and a post-intervention test (week-14) before the end of the semester to determine whether there were significant changes in the level of knowledge, attitude, and self-confidence in performing CPR to help others in medical emergencies.

Setting & Sample

This study was conducted for 13 weeks, which began from September to December 2020 in the Faculty of Education, UiTM. The samples were recruited from the Department of Physical and Health Education, using non-probability convenience sampling among 20 pre-service teachers. The inclusion criteria include second-year undergraduate students from the department and without any physical disabilities. The exclusion criteria included students from different programs and students who attended any additional first aid, emergency science courses or experienced any medical emergencies, which required the utilisation of resuscitation skills within the study period's intervention.

The Ethical Institutional Committee provided approval for this study [UiTM/200-FP(PT.3/3)]. Course details were described, following the protocol to the pre-service teachers before the interventions. Consent was acquired before the study's commencement, with a 100% response rate was obtained in terms of participation.

Data Collection Procedures

The CPR knowledge, attitude and self-confidence were assessed twice from September 2020 before the intervention involving CPR teaching and training, and 13 weeks later, following the intervention (December 2020) as recommended (Price et al. 2017; Thiese 2014).

Research Instruments

CELIK CPR Handbook

For this study, a facilitator was assigned to conduct the intervention covering the standard theory and practice for CPR teaching and learning using the specifically designed learning material called '*CELIK* CPR A handbook for the school teacher.' The content of this school teachers' training handbook is part of the combination of materials derived from the American Red Cross and the AHA. An additional round of reviews was conducted in Malaysia through the selected experts from various fields to ensure its reliability (Fariduddin et al. 2020a). Furthermore, this handbook provides links and instructions on how to execute the teaching of CPR from the educators'

perspective, which includes lecture materials, online videos, step-by-step guidance on how to execute the practical training and a pre-designed case scenario in a school setting to aid with the simulation activities together with the debriefing notes for novice to execute debriefing session following simulation activity.

CPR Knowledge Assessment

CPR knowledge was obtained in a 20-item multiple choice question (MCQ) assessment. The questions were constructed based on the AHA's guidelines for BLS Resuscitation (for adults, children, and infants) and previously verified by selected subject-matter experts for face validity, construction, criteria, content validity and assessed for reliability (Fariduddin et al. 2018; Fariduddin et al. 2019; Fariduddin et al. 2020b). This study adopted a passing grade of 84 percent (16 out of 20) for the MCQ, commensurate with the official AHA criteria. For each correct response, one mark was awarded, while there was no penalty for incorrect responses. For post-test evaluation, a different set of questions with identical content was utilised to minimise independent learning from repeated testing.

Attitude & Self-Confidence Assessment

Attitude and Self-Confidence were assessed using an ordinal scale, which consisted of 19 items in total, using a questionnaire. The attitude construct consisted of 13 items, whereas the self-confidence construct consisted of

6 items. The items were adapted from the original questionnaire by Pivac and colleagues (2020). The agreement level was assessed based on a 5-point Likert scale, which ranged from 1-strongly disagree to 5-strongly agree. The content and face validity were established, with internal consistency reliability of Cronbach's = 0.81.

Assessment Sequence

Before the intervention, initial demographic data (age, gender, highest education level attained, history of being trained with CPR, and experience in implementing CPR) were collected, followed by the pre-CPR knowledge, attitude and Self-Confidence assessment using Google Forms. Next, the intervention session was conducted by a single researcher for 6 hours, separated into two sessions. The first section included a CPR lecture using the CELIK CPR Handbook to deliver CPR practice theory and skill steps, concentrating primarily on effective chest compression, opening, and maintaining airways, rescue breathing, and recovery position for adults, children, and infants, along with multiple video presentations to help deliver lectures, followed by a virtual online simulation course to allow the students to experience demonstration virtually. All the sessions were conducted using a webinar platform. In the next sessions, all students attended the skill lab session for 3 hours, conducted in the faculty. The same researcher demonstrated each practical task using the Quality-CPR (QCPR) mannequin

(Laerdal Little Family Pack, Shah Alam, Selangor, Malaysia) for approximately 20 minutes. The selected students were invited to practice the task while feedback was given as they performed the task accordingly. Lastly, all students were divided into smaller groups, with four participants per mannequin to allow individual exposure to each mannequin's practical task that was integrated with a short case scenario involving cardiac arrest. Students were given several minutes for each case scenario and were required to rotate in order to complete each scenario while being observed by the researcher. The session ended with a debriefing on matters related to the practical task performed by students during the scenario session. At week 14, all students were assessed again for their post-CPR knowledge, attitude and self-confidence assessment using a different set.

QCPR Mannequin

The QCPR Laerdal Little Family Pack provided feedback to students on CPR technical skills performance in real-time. Five mannequins were used in this study. The Laerdal "Little Anne", "Little Junior", and "Little Baby" mannequins collected chest compression and artificial ventilation for the technical skills training. Each mannequin's microcontroller and optical compression sensor were linked with the instructor's gadget via Bluetooth, which allowed visualisation of real-time CPR performances. All data were gathered, used and discussed by instructors through the debriefing

session.

Data Analysis

SPSS (IBM Corp., Armonk, NY, USA) was used to perform statistical analyses (Version 26). We used descriptive statistics to assess, organise, tabulate, and statistically analyse the demographic data. Descriptive statistics were also employed to analyse the data on outcome measures for CPR knowledge, attitudes, and self-confidence. The variations incurred in the proportion of right answers on the test of knowledge before and after CPR training were analysed using a chi-square test of contingencies. A paired-samples t-test for comparing two samples was employed to determine whether there were significant differences in the participants’ knowledge, attitude and self-confidence pre- and post-CPR instruction.

RESULTS

Out of the 20 MCQs and the

questionnaires disseminated to Malaysian pre-service teachers (100%), all 20 were returned, with a 100% response rate. Out of the study participants, 8 (40%) were males and 12 (60%) were females. There were two age categories, 19-21 (M = 1.63) and 22-24 (M = 1.50). The pre-service teachers’ educational levels were 6 (30%) with STPM/Matriculation while 14 (70%) with Diploma holders. As for knowledge and experience-wise, only 5 (25%) of the pre-service teachers had completed their CPR training while the majority, 75% (15), had not (Table 1).

We employed the Pearson’s chi-square test of contingencies to evaluate the differences in correct and incorrect scores of each question related to CPR knowledge pre- and post-CPR training ($p=0.05$ was considered as significant). The chi-square test was statistically significant only in the sub-topic of airway management following the training. The progress was in breathing assessment $\chi^2(1, N = 20) = 4.44; p<0.05$, opening airways for suspected spinal injury $\chi^2(1, N = 20) = 5.01; p<0.05$, reposition of airway for

Table 1: The pre-service teachers’ demographic characteristics

Demographics		N (%)
Sex	Male	8 (40)
	Female	12 (60)
Level of Education	STPM/Matriculation	6 (30)
	Diploma	14 (70)
Nationality	Malaysian	20 (100)
Previous CPR Training	Yes	5 (25)
	No	15 (75)
		Mean
		S.D
Age-Group	19-21	1.63
	22-24	1.50

Table 2: CPR knowledge of pre-service teachers' before and after CPR training

Items		Pre-Assessment (P1)		Post Assessment (P2)		Chi-Square (p-value)
		n	%	n	%	
The correct sequence for basic life support is	Correct	5	25	10	50	2.667 (0.102)
	Incorrect	15	75	10	50	
When assessing the victim for breathing, you should	Correct	0	0	4	20	4.444 (0.037)*
	Incorrect	20	100	16	80	
For any victim, the correct compression rate is	Correct	8	40	13	65	2.506 (0.113)
	Incorrect	12	60	7	35	
The recommended compression depth for an adult is	Correct	9	45	12	60	0.902 (0.0342)
	Incorrect	11	55	8	40	
If performing rescue breathing, you should	Correct	6	30	7	35	0.114 (0.736)
	Incorrect	14	70	13	65	
When assessing the victim, you should feel for a pulse for	Correct	7	35	8	40	0.107 (0.744)
	Incorrect	13	65	12	60	
The correct sequence in the adult chain of survival is	Correct	9	45	9	45	0.000 (1.000)
	Incorrect	11	55	11	55	
If you are alone and come upon a person who may need CPR, the FIRST thing you should do is	Correct	10	50	10	50	0.000 (1.000)
	Incorrect	10	50	10	50	
Assessing the victim includes all the following EXCEPT	Correct	4	20	2	10	0.784 (0.376)
	Incorrect	16	80	18	90	
You are alone and find an unconscious victim on the ground who may need CPR. The scene is safe. You assess the victim and determine he is not breathing and will not awaken. You should	Correct	3	15	0	0	3.243 (0.072)
	Incorrect	17	85	20	100	
What is the compression to breathing ratio in two-person CPR for an adult?	Correct	7	35	11	55	1.616 (0.204)
	Incorrect	13	65	9	45	
An infant becomes unresponsive and stops breathing. A strong pulse is still present. How many rescue breaths should be given until help arrives or the infant starts breathing on its own	Correct	4	20	5	25	0.143 (0.705)
	Incorrect	16	80	15	75	
Where should you palpate for a pulse on an unconscious adult during CPR?	Correct	10	50	11	55	0.100 (0.752)
	Incorrect	10	50	9	45	

Items		Pre-Assessment (P1)		Post Assessment (P2)		Chi-Square (p-value)
		n	%	n	%	
To protect your safety while providing CPR, you should	Correct	5	25	4	20	2.667 (0.102)
	Incorrect	15	75	16	80	
The recommended compression depth for an infant is	Correct	10	50	12	60	4.444 (0.037)*
	Incorrect	10	50	8	40	
Where should you place your hand to provide chest compressions to an adult?	Correct	5	25	7	35	2.506 (0.113)
	Incorrect	15	75	13	65	
How do you open an unresponsive victim's airway?	Correct	16	80	18	90	0.902 (0.342)
	Incorrect	4	20	2	10	
How do you open an unresponsive victim's airway with a suspected spinal injury?	Correct	8	40	15	75	0.114 (0.736)
	Incorrect	12	60	5	25	
You attempt to deliver a breath through a mask, but it does not go in. What is the next step?	Correct	6	30	13	65	0.107 (0.744)
	Incorrect	14	70	7	35	
How often should rescuers switch roles when performing two-rescuer CPR?	Correct	3	15	11	55	0.000 (1.000)
	Incorrect	17	85	9	45	
Passing Scores	Pass	0	0	5	25	5.714 (0.047)*
	Fail	20	100	15	75	

*significant at p<0.05

unsuccessful rescue breathing $\chi^2(1, N = 20) = 4.91; p < 0.05$, and role switching for two-rescuer CPR $\chi^2(1, N = 20) = 7.03; p < 0.05$. The passing scores increased significantly, with 5(25%) pre-service teachers successfully achieving the passing scores as per the AHA guidelines $\chi^2(1, N = 20) = 5.71; p < .05$

(Table 2). In addition, the preliminary assumption testing showed that both CPR knowledge pre- ($M = 6.75; SD = 2.44$) and post-training ($M = 12.15; SD = 3.67$) were normally distributed, where on average, the post score was 5.40, 95% CI (-7.16, -3.64), which was significantly higher compared to the

Table 3: Dependent t-test of pre & post differences of CPR knowledge scores

Variable			Paired Differences			t	df	Sig
	Mean	S. D	Mean Difference	Lower	Upper			
CPR Knowledge	Pre (6.75)	2.44	- 5.400	-7.160	-3.640	-6.421	19	0.000
	Post (12.15)	3.67						

Table 4: Attitude and self-confidence before and after CPR training among pre-service teachers

Items	Pre-Training (N = 20)		Post Training (N= 20)		Dependent t-test (p-value)
	Mean	S. D	Mean	S.D	
Attitude					
If someone fell in front of me, I would help them	4.10	0.641	4.25	0.716	-0.679 (0.505)
If my friend lost consciousness, I would help them	4.45	0.605	4.65	0.587	-1.00 (0.330)
I am willing to help others because I would also expect help when in need	4.35	0.671	4.45	0.826	-0.418 (0.681)
I help because I can recognise a person who is not showing signs of life	3.75	0.716	3.85	0.745	-0.418 (0.681)
I like to help others when they are in need	4.20	0.696	4.50	0.607	-1.453 (0.163)
I notice when my friends need help	4.05	0.759	4.20	0.607	-0.590 (0.562)
If someone fell in front of me, I would call for help immediately	4.35	0.745	4.40	0.883	-0.213 (0.834)
If I noticed a group of people only observing a victim not showing signs of life, I would start providing help immediately	4.05	0.686	4.10	0.788	-0.237 (0.815)
I am aware that by helping a victim not showing signs of life, I can save their life	3.85	0.671	4.10	0.641	-1.157 (0.262)
When friends ask for my help, I do not hesitate and help them right away	3.95	0.605	4.00	0.858	-0.213 (0.834)
I feel for friends who are very ill or were struck by misfortune	3.95	0.887	4.15	0.671	-1.073 (0.297)
I think one of the best things is being able to help others	4.40	0.598	4.55	0.510	-0.825 (0.419)
Helping others gives me satisfaction	4.30	0.571	4.45	0.686	-0.679 (0.505)
Self-Confidence					
When I notice that someone needs help, I ask myself how I can help them	4.45	0.686	4.55	0.605	-0.490 (0.629)
If someone fell in front of me and showed no signs of life, I would start CPR	3.20	1.056	3.35	1.348	-0.389 (0.702)
If I noticed a victim who was not moving or showing signs of life, I would begin CPR immediately because I am not afraid of injuring them	2.70	1.218	2.90	1.210	-0.535 (0.599)
If I noticed a victim who was not moving or showing signs of life, I would begin CPR immediately because I believe in myself	3.10	1.071	3.20	1.056	-0.335 (0.741)
I would dare to provide CPR before receiving training	4.40	0.598	4.75	0.444	-2.66 (0.015)*
I would dare to provide CPR after receiving training	3.85	0.489	3.85	1.182	0.000 (1.00)

*significant at p<0.05

Table 5: Dependent t-test of pre & post differences of attitude scores

Variable	Paired Differences							
			Confidence Interval			t	df	Sig
	Mean	S. D	Mean Difference	Lower	Upper			
Attitude Scores	Pre (49.98)	5.70	- 1.361	-5.088	2.365	-0.765	19	0.454
	Post (51.34)	5.33						
Self-Confidence Scores	Pre (18.94)	2.88	- 0.000	-2.013	2.013	0.000	19	1.00
	Post (18.94)	3.16						

pre scores, $t(19) = -6.421$; $p < 0.001$, and large effect size, $d = 1.76$ (Table 3).

Paired samples t -test was employed to compare the mean scores of items under attitude and self-confidence before and after receiving CPR training. For all items, we visually inspected the histograms and normality was assumed. The means for items under the attitude showed an improvement before and after receiving the training, ranging from 3.75 (pre) to 4.65 (post), although no significant improvements were noted ($p > 0.05$). Under self-confidence, all items improved before and after the training, ranging from 2.70 to 4.75, except for the last item, which evaluated the willingness to provide CPR after receiving the training with no differences in the mean scores of 3.85 ($p > 0.05$). However, the pre-service teachers were willing to provide CPR before receiving CPR training with a significant difference in the mean score from 4.40 (pre) to 4.75 (post) ($p < 0.05$) (Table 4). These two items showed that the willingness to provide CPR was higher before receiving CPR training rather than after receiving the training. On average, the participants score was 1.361; 95% CI (-5.08, 2.36), which was higher in the pre ($M = 49.98$; $SD = 5.70$) than the post attitude ($M =$

51.34; $SD = 5.33$) and no statistically significant differences were found, $t(19) = -0.765$; $p > 0.05$. As for self-confidence, there was no mean difference 95% CI [-2.01, 2.01], from pre- to post-training ($M = 18.94$; $SD = 2.88, 3.16$) and no statistically significant differences were found, $t(19) = 0.00$; $p > 0.05$ (Table 5).

DISCUSSION

We investigated the efficacy of CPR training using the CELIK CPR handbook for school teachers towards improving the pre-service teachers' knowledge, attitude, and self-confidence. The study found that the knowledge of CPR theory among the participants improved after the training and the number of pre-service teachers who successfully passed the assessment as per the AHA guidelines increased compared to before training. The training provided, which included lectures and practical training, clearly increased their knowledge level but could not increase their attitudes and self-confidence towards performing CPR following the training. Despite the significant improvement in the number of pre-service teachers who passed the test, the number was still low. Only a single area of improvement was noted,

which was airway management.

The results of this study showed that our study participants (i.e. pre-service teachers) had low knowledge regarding CPR theory, as reflected in their responses to the various questions shown in Table 2. The result was consistent with a study conducted by Patsaki and colleagues (2012). The number of incorrect answers was associated with no previous training in CPR. Among our pre-service teachers, only five had exposure to previous CPR training, while this was the first time for the rest. The result supported the study finding in other countries such as Saudi Arabia and the United Kingdom, whereby, little knowledge and skills among pre-service teachers were due to the limited exposure from any form of CPR training in their life; which explained the high number of incorrect responses (Alharbi et al. 2016; Al Enizi et al. 2016; Lockey et al. 2016).

As the reassessment of respondents' knowledge was conducted on week-14, which was three months apart from the pre-assessment, the low passing rate as reflected among the students indicates that the respondents failed to retain their knowledge following the intervention program. Research has shown that the knowledge and skills of healthcare workers decreased three months post-training (Bukiran et al. 2014; Ouseph et al. 2015). In this study, respondents who were considered laypeople would have higher rates of decline in knowledge than healthcare workers, indicating a much faster decline rate. A similar study conducted among pre-service teachers revealed

that there is a low rate of retention in knowledge after two months of CPR training (Fariduddin & Jaafar 2021).

Despite the low passing rate on the respondents' knowledge following the intervention, a significant improvement was noted on the knowledge scores which was consistent with several studies, suggesting that a half-day CPR program integrated with lectures, presentations, and part-task training is sufficient to provide adequate theoretical knowledge (Onyeaso 2016; Onyeaso & Onyeaso 2017). The intervention in this study was conducted for 6 hours with a break between the two sessions, where the first session covered the most crucial parts. The delivery method was useful, followed by the second session, which involved applying theory to practical training. Studies have consistently shown that CPR training programs that provide psychomotor skills sessions result in an adequate proficiency level (Monsieurs et al. 2004; Teague & Riley 2006). These skills are essential components of the CPR training program.

In addition, this study also introduced an advanced mannequin that is available in the market, which is coupled with feedback devices to improve skills training such as QCPR. Over the years, studies involving resuscitation training in the non-medical community yielded major barriers such as inadequate funding to support the latest learning materials (Hoyme & Atkins 2017; Malta Hansen et al. 2017; Salciccioli et al. 2017; Salvatierra et al. 2017). Hence, the latest learning materials involving the

use of QCPR as part of the feedback devices in practical skills training will directly assist with the improvement of resuscitation skills. The quality of CPR performance improves during training using QCPR in the classroom (Tanaka et al. 2019). This was also supported by studies by Onyeaso & Onyeaso (2017) and Navarro et al. (2018), whereby the feedback devices such as QCPR that comes with an audio-visual approach and feedback gave the best outcome for skills training and overall CPR training program.

Our research compared the attitudes towards helping others and self-confidence, pre- and post-CPR training. Following the training intervention, there was no significant improvement in their attitudes and self-confidence. The increase in CPR knowledge was usually associated with a greater willingness. Subsequently, this increased their confidence and attitude in helping others during medical emergencies (Naqvi et al. 2011). The lack of change in attitude after emergency-related training was documented in a previous study (Lamis et al. 2017). This may be because attitude is a multifaceted phenomenon, which requires interventions that affect behaviours, feelings, and cognitions (Pisani et al. 2011). However, most health education interventions only target the cognitive or knowledge component (Osteen et al. 2014).

Despite the non-significant change, we noticed an improvement in each item's overall attitude but a stagnation for self-confidence. CPR training helps raise self-confidence in assisting cardiac arrest victims by reducing their

fear of making a mistake (Bohn et al. 2012). However, in our study, these two components scored the lowest. The low self-confidence may be influenced by the possibility of injuring the victim while performing CPR and the lack of self-belief in the ability to perform well. Furthermore, pre-service teachers in a higher education setting may have a low likelihood of encountering emergencies compared to healthcare workers; therefore, there is a lack of practice opportunities that could further boost their self-confidence (Siau et al. 2018).

Similar findings were reported in a study by Mpotos et al. (2013) towards 4237 school teachers in primary to secondary schools. Among all respondents, nearly 60% had received CPR training and successfully passed the knowledge and practical assessment. Despite the existing knowledge and skills acquired through CPR training, more than 60% of the school teachers felt that they could not provide effective CPR to a victim during emergencies, mainly due to the perceived lack of knowledge and skills. Nearly 70% felt that they were incompetent to perform the correct steps in CPR. Subsequently, more than 73% thought that they required additional training to boost their self-confidence, as depicted in our study.

This research provides evidence towards the policymakers from the Malaysia Ministry of Education (MOE) to emphasise the need to introduce CPR training as early as possible, ranging from pre-service teachers across faculties at different universities and subsequently towards all teachers

employed under the MOE. The authors believe the introduction of the CELIK CPR training package, which includes e-learning materials, auditory and visual feedback for CPR skills using Q CPR, could be potentially used for all teachers training since the content of this training emphasises using the latest trends in teaching and learning techniques incorporating the use of Q CPR for high-quality CPR training effectively as healthcare professionals. To ensure the sustainability of the knowledge and skills in providing adequate resuscitation during an emergency, the retention rate between teachers should also be considered as an additional criterion in the design of refresher courses, which can be delivered later in a more appropriate duration. As evidenced in this study, the rate of retention among school teachers is expected to deteriorate within three months, suggesting that intervention, e.g., refresher courses conducted over a period, would help prevent further decline. In the meantime, frequent exposure to refresher courses and recurrent training will help boost the teachers' self-confidence and subsequently change their attitude towards providing CPR during any emergencies without hesitation.

It can be concluded that including training in CPR as part of the teacher training education curriculum is imperative. This is the time to make CPR training compulsory for all teacher training, even to the extent of including it in the school curriculum. This follows the Guidance Documents from The Society of Health & Physical Educators (SHAPE), America, which promotes

best practice in health education, including the certification of qualified health educators who teach health at all levels, as per its core principle.

Several limitations were presented in this study. The increase in sample size per group would have yielded a better presentation of the outcome. Secondly, only one university was involved, thus, the result could not be generalised to all pre-service teachers in Malaysia. Thirdly, we did not include the post-immediate test as part of the post-assessment following the intervention. Integrating the post immediate test, before the post-test at week-14 would have yielded a better outcome in measuring the rate of retention among pre-service teachers. Lastly, the training program has not been tested elsewhere previously, even in other universities in Malaysia. Therefore, no further evaluation of the program's efficacy was done.

CONCLUSION

It was shown that the degree of effectiveness in using the CELIK CPR handbook for CPR training between pre-service teachers following the intervention program was appropriate with significant improvement on the scores of CPR knowledge together with the number of pre-service teachers who passed the test. The low level of attitude and self-confidence perceived by pre-service teachers gives a critical overview, whereby, lack of training and exposure to an actual emergency could be one of the potential factors. This gives the impression in which intervention such as early introduction

towards CPR training followed by subsequent recurrent training over the years would help to develop the attitude and improve the level of confidence in providing effective CPR during an emergency. Finally, the relevant authorities should start implementing CPR teaching as part of the school teachers' curriculum, which will benefit the children and societies for a better tomorrow.

ACKNOWLEDGEMENT

The authors acknowledge and express their gratitude to the Dean and the Head of Department of the respective university for the support and approval and the pre-service teachers from the Physical and Health Education Program for their commitment and interest in completing this project. This work was supported under the Special Research Grant (GPK) 2020, UiTM [600-RMC/GPK 5/3 (270/2020)].

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Received: 07 May 2021

Accepted: 27 Jul 2021