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ORIGINAL ARTICLE

Comparing Teachers and Medical Students as Trainers of Cardiopulmonary Resuscitation (CPR) among Secondary School Students

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ABSTRAK

Resusitasi kardiopulmonari (CPR) yang dilakukan di tempat kejadian terhadap mangsa serangan jantung telah menunjukkan peningkatan peluang mangsa untuk pulih. Walau bagaimanapun, kadar CPR ini masih rendah di seluruh dunia disebabkan oleh kekurangan pengetahuan dan kemahiran dalam melakukan CPR di kalangan orang awam. Melatih masyarakat dengan kaedah CPR adalah salah satu cara untuk meningkatkan kadar bantuan CPR di tempat kejadian. Kajian ini adalah untuk membandingkan keberkesanan dalam pemerolehan dan pengekalan pengetahuan dan kemahiran CPR di kalangan pelajar sekolah menengah di Lembah Klang yang dilatih oleh guru sekolah dan pelajar perubatan. Kami telah memilih lima orang guru sekolah dan lima orang pelajar perubatan sebagai pengajar. Mereka telah dilatih dalam beberapa sesi oleh pengajar yang diperakui oleh American Heart Association (AHA) dengan menggunakan modul pengajaran CPR bantuan video. Empat puluh empat pelajar sekolah menengah ini dibahagikan kepada dua kumpulan, kumpulan guru, dan kumpulan pelajar perubatan. Kami membandingkan pengetahuan dan psikomotor kedua-dua kumpulan ini pada tiga peringkat; sebelum, selepas dan pada tiga bulan selepas latihan CPR. Keputusan selepas latihan menunjukkan pengetahuan dan kemahiran psikomotor pelajar dalam kumpulan guru meningkat setanding dengan kumpulan pelajar perubatan (skor median perbezaan 3 vs 2, $p>0.05$) dan (perbezaan median 5 vs 7, $p<0.05$). Tahap pengetahuan dan kemahiran menurun sedikit selepas 3 bulan tetapi kekal jauh lebih tinggi daripada permulaan untuk kedua-dua kumpulan. Sebagai kesimpulan, guru dapat mengajar CPR kepada pelajar mereka sebaik pelajar

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perubatan. Kajian ini telah membuka peluang untuk melatih CPR kepada orang awam dengan lebih meluas.

Kata kunci: bantuan asas kehidupan, pelajar sekolah, resusitasi kardiopulmonari

ABSTRACT

Bystander rate of cardiopulmonary resuscitation (CPR) is still low worldwide because of inadequate skills and knowledge. Training the public on CPR is one of the methods to increase the bystander CPR rate. This study aimed to compare the efficacy in acquiring and retaining CPR skills and knowledge among secondary school students in Klang Valley trained by school teachers and medical students. We recruited five school teachers and five medical students as trainers. They were trained in several sessions by American Heart Association (AHA)-certified instructors using the video-assisted CPR training module. The recipients were 44 secondary school students divided between the teacher's group and the medical student's group. We compared knowledge and psychomotor skills between these two groups prior, immediately after and at three months after CPR training. Students in the teacher's group showed a higher increase in knowledge comparable to the medical student's group (median score difference 3 vs 2, $p>0.05$) and in psychomotor skill (median score difference 5 vs. 7, $p<0.05$). The level of knowledge and skills decreased after 3 months but remained significantly higher than at baseline for both groups. In conclusion, teachers could provide CPR training to their students as effective and retainable as medical students. This study aims to create an opportunity to teach CPR to the public in a larger scale.

Keywords: basic life support, cardiopulmonary resuscitation, school children

INTRODUCTION

Cardiopulmonary resuscitation (CPR) performed by bystanders are still lacking among the public throughout the world (Anderson et al. 2014). A study showed that interns also lacked knowledge and skills to perform CPR (Saiboon et al. 2007). Bystander CPR could significantly improve the chance of survival of out of hospital cardiac arrest victims (Geri et al. 2017). Bystander CPR increases the survival rate from seven to eleven percent with the initiation of CPR on-site (McNally et al. 2011). Training the public on cardiopulmonary resuscitation is one of the methods to increase bystander CPR rate. In many developed countries, this strategy can be achieved by imparting CPR teaching in a school curriculum. In the United States, half of their university students learned CPR and Automated External Defibrillation (AED) (Bogle et al. 2013). Eighty-nine percent of secondary school students

in Norway attend CPR training (Kanstad et al. 2011).

However, in Malaysia, we have a limitation to provide CPR training to our school students, as we have a limited number of basic life support (BLS) certified instructors. Thus, training school teachers to be part of CPR instructors could reduce this gap (Iserbyt et al. 2011). Indeed, it is one of the most promising strategies for the general public to learn CPR (Lockey & Georgiou 2013). The study showed that school teachers can teach CPR effectively to their students (Toner et al. 2007). As shown by the previous study, physical education teachers can teach CPR as good as a registered nurse to the secondary school students (Cuijpers et al. 2016). In addition, Connolly et al. (2007) reported that medical students and school teachers could train many children with minimal duration and cost.

To date, we know little regarding the efficiency of delivering CPR training to the school students in Malaysia by trained teachers. Therefore, this study was to compare the effectiveness of CPR training provided by teachers and medical students among school students in Cheras, Malaysia.

MATERIALS AND METHODS

This study was a prospective, single-blind, randomised controlled trial comparing school teachers and medical students in teaching adult CPR module among form four secondary school students in Sekolah Menengah Sains Selangor, a boarding school located in the capital city of Kuala Lumpur, Malaysia. The study was conducted over a 12-month period between June 2014 and June 2015. The Universiti Kebangsaan Malaysia's Research and Ethics Committee approved this study.

Development of the Teaching Module

A panel of experts in Emergency Department, Universiti Kebangsaan Malaysia Medical Centre (UKMMC) prepared the video assisted CPR training module. The module was designed based on the AHA Compression-Only CPR. This module consisted of an instructional video and hands-on exercise on CPR.

Assessor and Facilitator Preparation

One day training of trainers (TOT) session was done for the facilitators and the assessors to calibrate and standardize the teaching and marking process. They were trained and tested in CPR for several rounds and were briefed regarding the study process and psychomotor skill assessment during the session by the AHA-certified instructors using this module. However, with many cycles of training, we did not carry out statistical assessment of inter-rater reliability for practical reason. The recruited facilitators comprised of five teachers from Sekolah Menengah Sains Selangor and five medical students from Cyberjaya University College of Medical Sciences.

Participant Recruitment

A total of 44 form four secondary

school students were recruited in this study. Those who did not give consent, unable to perform steps of CPR, exchange program students and those who were not present during both intervention and retention, were excluded from the study.

Selected students were randomised into parallel groups which were the teacher's group and the medical student's group. The sample size was calculated via Open Epi software.

Research Design

Each student was randomly allocated into two groups and was given a number that was used throughout the data collection. Group 1 was the intervention group and was trained by the teachers. Group 2 was the control group and was trained by the medical students. In both groups, the students were further divided into numerous subgroups, resulting in a trainer- student ratio of 1:6, manikin-student ratio of 1:4. Both groups underwent a pre-test that assessed their knowledge, willingness to perform CPR and psychomotor skills using self-administered questionnaires and practical test. Immediately after the pre-test, both groups attended a half-day course at their school. During the course, the trainees were given a 20-minute lecture and 1-hour practical session.

Questionnaires were divided into three sections; Section A was to record the demographic data, Section B focusing on the knowledge of CPR, Section C using a 5-point Likert scale, the willingness of the students to perform CPR on various victims was gauged. Likert scale was treated as semi-qualitative parameter and was not subjected to statistical test. Trainees' competency was assessed using a psychomotor checklist.

An immediate post-test assessment was carried out after the training sessions for both groups. Three months later, both groups were reassessed for retention on all two components.

Data Analysis

Data were analysed using Statistical Package for Social Science (SPSS) version 21. Demographic data was shown in descriptive form. Student's t-test was used to compare the scores of knowledge and psychomotor skills between these two groups at baseline, immediately post intervention and retention at 3 months

RESULTS

A total of 44 form four secondary school students were assigned to be taught by either the teachers or medical students. All questionnaires from 44 students were returned at pre-training (baseline), immediate post-training, and three months post-training. For baseline assessment, both groups answered only 3 out of 9 questions pertaining to the knowledge of CPR correctly (Figure 1). For baseline psychomotor skill assessment, 60% of the students could perform only 2 out of 9 steps correctly (Figure 2). After the training, there were no significant differences in the median score difference of changes for both groups (Figure 3). For retention, no significant difference was

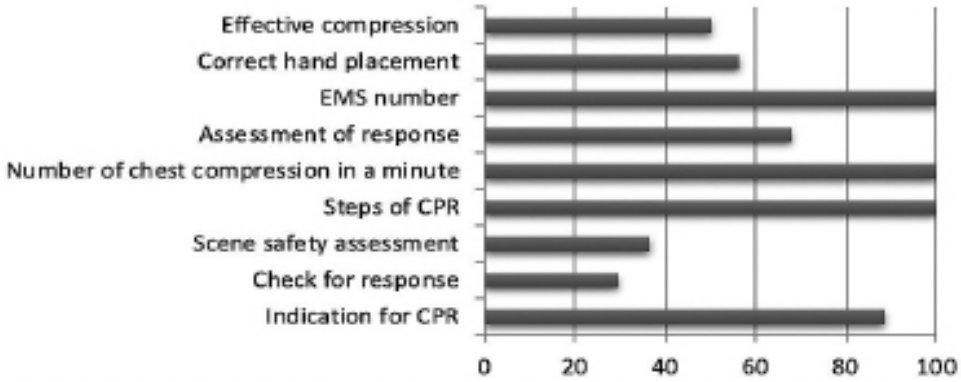

Figure 1: Percentage of students from both groups that answered individual questions at baseline. All participants answered only 3 out of 9 questions regarding the CPR steps correctly

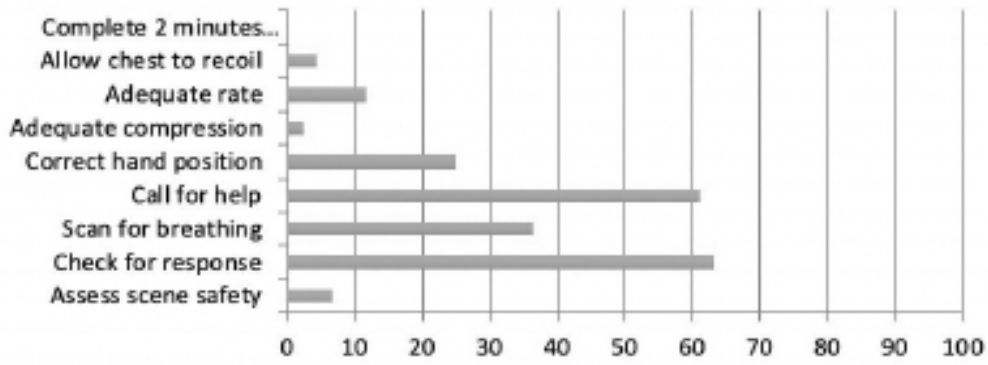

Figure 2: Percentage of students from both groups performed on CPR steps at baseline. Only 60% of the students could perform 2 out of 9 psychomotor skills correctly

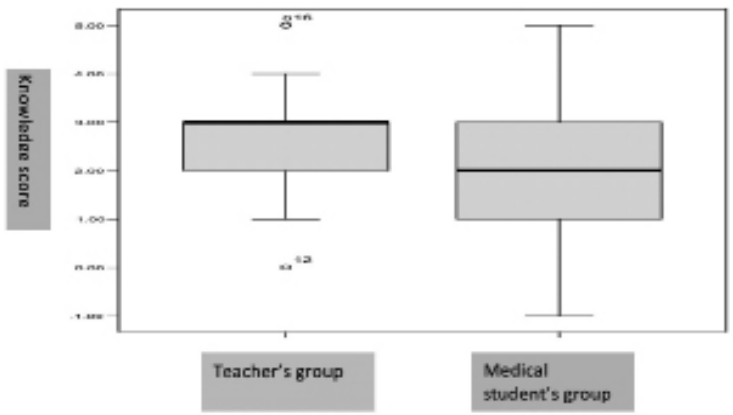

Figure 3: The difference of changes of CPR knowledge at baseline and at immediate post training between teacher's group and medical student's group. There were no significant differences in the median score for both groups

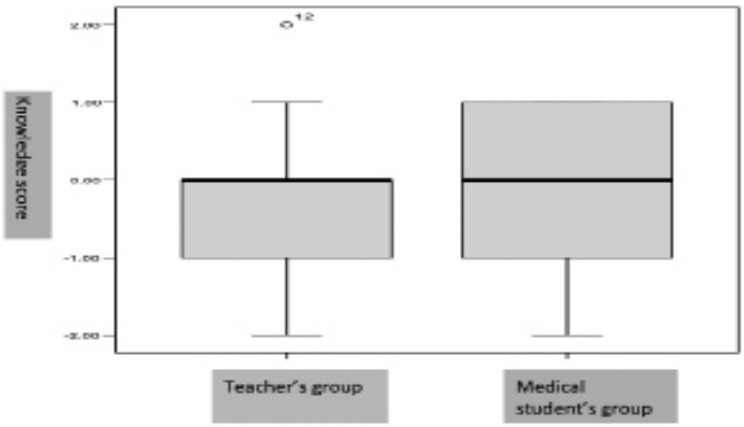

Figure 4: The difference of changes of CPR knowledge at immediate post training and at 3 months between the teacher's group and medical student's group. No significant differences were noticed during the retention period.

noticed across the groups in changes in CPR knowledge at immediate and three months post-training (Figure 4). There was a significant difference in psychomotor skills score at baseline and immediate post-training in both groups ($p<0.05$) as shown in Table 1. Teacher's group scored 5 (IQR 2), and medical student's group scored 7 (IQR 3). However, there were no significant differences for knowledge retention between the two groups.

DISCUSSION

Cardiopulmonary resuscitation training for school students is a possible way to increase the frequency of bystanders performing CPR (Lorem et al. 2008). However, despite the recommendation by AHA to incorporate CPR training into the school curriculum (Cave et al. 2011) most nations have not implemented this measure yet. Many studies have proved that pre-trained medical students can teach CPR well to school students because they are educated, motivated and enthusiastic in carrying out the task (Toner et al. 2007; Lester et al. 1994). However, by having a teacher as a trainer, they can spread CPR skills in the community on a larger scale (Toner et al. 2007; Lester et al. 1994). According to Miro et al. (2006), trained teachers are willing to teach CPR to their school students. It has been proven by many studies that teachers can teach CPR to their students effectively (Cuijpers et al. 2016; Lester et al. 1996).

We received positive feedback from teachers and school students about this

Table 1: The difference of changes of psychomotor skills at baseline and immediate post training. There was a significant difference post training for both groups.

	Teacher's group Median (IQR)	Medical student's group Median (IQR)	Difference	p-value
Score	5 (2)	7 (3)	-4.696	0.000

Table 2: Percentage of students from both groups that answered individual questions at baseline, immediate post training and at 3 months. For breathing assessment, less than 60 percent of students were able to answer correctly

Topic question	Baseline N= 44		Immediate post training N= 44		3 months N=44	
	Correct (%)	Incorrect (%)	Correct (%)	Incorrect (%)	Correct (%)	Incorrect (%)
1. Indication	88.6	11.4	100	0	97.7	2.3
2. Before calling	29.5	70.5	59.1	40.9	56.8	43.2
3. First step	36.4	63.6	97.7	2.3	95.5	4.5
4. Correct steps	100	0	100	0	97.7	2.3
5. Chest compression	100	0	100	0	95.5	4.5
6. Why tap shoulder	68.2	31.8	100	0	100	0
7. EMS number	100	0	100	0	97.7	2.3
8. Hand placement	56.8	43.2	100	0	97.7	2.3
9. Effective compression	50	50	100	0	97.7	2.3

program. They find the teaching and training enjoyable, easy to understand and give them the confidence to practice CPR. We designed the training module used in this study for school students. The process of learning CPR was simplified using the animated video, video demonstration, and video-assisted skill training. Basic science and physiology of CPR were not included, as this can bore the audience with extra unnecessary information.

Our findings showed that most students at baseline unable to perform most of the CPR technique including breathing assessment, scene safety, assess responsiveness, hand placement and effective chest compression (Figure 2). For the knowledge assessment at baseline, both groups answered only 3 out of 9 questions pertaining to the knowledge of CPR correctly (Figure 1). These questions are regarding emergency telephone number, rates of compression, and CPR steps. These findings show that most students did not have the basic knowledge and skills of CPR and based on their baseline characteristic, all the students attended no CPR course prior to this study.

During the immediate post-training, most of the students answered the majority of the questions correctly (Table 2). This was similar to the previous studies that show students could gain knowledge significantly post intervention (Connolly et al. 2007; Lubrano et al. 2005) except for the question regarding breathing assessment. We observed that, for this particular question, only less than 60% of the students could answer it correctly despite the training (Table 2). This was the part that the students were facing the problem to understand, and the improvements will be made to the teaching module for future training. It was brought to our attention that the animated video session was more effective compared to other teaching

materials used in this CPR training.

Resuscitation is a complex psychomotor skill. As we can see from this study, most students at baseline could not perform CPR skills effectively. However, after the intervention, both groups improved significantly (Table 1). Besides that, the students also able to retain them at three months later. Training-intervention should be age appropriate. Age and physical factors play a role in better knowledge and skills performance. Thus, we employed 16 years-old in this current study. In general, older children (high school group) perform better in the assessment of knowledge compared to their younger counterparts (Soar et al. 2010). To practice high-quality CPR requires an adequate rate and depth of chest compression. Older children can achieve this as many studies have shown significant correlations between weight, height, and Body Mass Index (BMI) in-depth of chest compression (Naqvi et al. 2011; Fleischhackl et al. 2009).

Based on the findings presented in this paper, school teachers could train their students' CPR effectively. Teaching experience and students-teacher familiarity certainly add more advantages to this. Hence, school teachers could assist medical professionals in disseminating CPR knowledge to school students. Engaging healthcare workers in training school students is challenging because of many trainers needed, cost and scheduling difficulties. The Malaysian education system requires the students to take part in certain uniformed societies such as Boy Scouts, Red Crescent Society, St John Ambulance society, and Girl Guides as part of their co-curricular activities, where CPR training can be taught easily. Thus, incorporation of the CPR module into the Malaysian curriculum will ensure that the students have wider access to learn the life-saving technique.

CONCLUSION

School teachers trained secondary school students CPR as effectively as medical students. The features of animated video, video demonstration, and video-assisted skill training in this module allow the teachers to train their students effectively. School teachers can train students CPR as this will reduce the shortage of CPR instructors in secondary schools. Furthermore, it has been elucidated that this can result in similar efficacy with less time and cost involved.

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