

Knowledge of and willingness to perform Hands-Only cardiopulmonary resuscitation among college students in Malaysia

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Abstract

Worldwide, millions of people die of sudden cardiac arrest every year. This is partly due to limited and sometimes ineffective bystander cardiopulmonary resuscitation (CPR). The need for mouth-to-mouth contact, fear of causing harm, litigation, and the complexity of delivering CPR are the main deterrents. In view of this, the basic life support algorithm has been simplified and lay rescuers are encouraged to perform Hands-Only CPR.

The objective of this study is to assess knowledge on and willingness to perform Hands-Only CPR among Malaysian college students and to determine the relationship between the two.

In an online self-administered survey, college students responded to a questionnaire on demographics, exposure to CPR, knowledge on Hands-Only CPR, and their willingness to perform Hands-Only CPR in 5 different scenarios (family members or relatives, strangers, trauma victims, children, and elderly people).

Data for 393 participants were analyzed. For knowledge, the mean score was 8.6 ± 3.2 and the median score was 9. In the sample, 27% of the respondents did not attend any CPR training before, citing that they were unsure where to attend the course. The knowledge score among those who attended CPR training ($M=3.6$, $S=2.9$) was significantly higher compared to those who did not ($M=6.7$, $S=3.0$). Out of the 393 participants, 67.7%, 55%, 37.4%, 45%, and 49.1% were willing to perform Hands-Only CPR on family members or relatives, strangers, trauma victims, children, and elderly people, respectively. There were significant associations ($P < .001$) between knowledge and willing to perform Hands-Only CPR on family members or relatives ($OR=1.32$, 95% CI 1.43, 1.43), strangers ($OR=1.31$, 95% CI 1.21, 1.42), trauma victims ($OR=1.21$, 95% CI 1.12, 1.31), children ($OR=1.28$, 95% CI 1.19, 1.39), and elderly people ($OR=1.36$ 95% CI 1.25, 1.48).

Based on this study, knowledge on Hands-Only CPR among local college students is not encouraging. Not many know where to attend such courses. There was significant association between knowledge and willingness to perform Hands-Only CPR.

Abbreviations: AHA= American Heart Association, BLS = basic life support, CPR = cardiopulmonary resuscitation, EMS = emergency medical service.

Keywords: Hands-Only CPR, knowledge, willingness

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1. Introduction

Out-of-hospital cardiac arrest is a medical condition in which the heart stops functioning, which can be due to many factors such as heart disease, drowning, trauma, and drug overdose. Out-of-hospital cardiac arrest is a major public health concern with millions of people dying of sudden cardiac arrest every year, despite important advances in prevention. This worrying healthcare problem is often associated with poor survival rates of 7.6% and has not improved over a 30-year period.^[1] Recent studies have shown that out-of-hospital cardiac arrest patients, when given cardiopulmonary resuscitation (CPR: a medical procedure involving repeated compression of a patient's chest, performed in an attempt to restore the blood circulation and breathing of a person who has suffered cardiac arrest) before the arrival of emergency medical service (EMS), were associated with a 30-day survival rate, that was more than double compared to patients with no CPR prior to EMS arrival.^[2] Many adults in cardiac arrest can survive with intact neurologic function if the bystanders provide immediate CPR. However, it is only performed in less than 30% of cases.^[3] As such, increasing public knowledge and understanding of the practical applications of CPR is an essential strategy to increase CPR success for cardiac arrest cases.

The incidence of out-of-hospital cardiac arrest is one of the leading causes of death and disability in many countries, including Malaysia. Based on a study by Nurumal and Karim,^[4] the survival rate of out-of-hospital cardiac arrest at Kuala Lumpur Medical Emergency Coordinator Centre in Malaysia was 22.5% of 213 cases, in 2011. This shows an alarmingly high prevalence of out-of-hospital cardiac arrest in Malaysia.

Numerous studies have shown that both the layperson and even health care providers show reluctance to perform out-of-hospital CPR due to the need for mouth-to-mouth contact. This could be due to fear of harming the patient, fear of litigation, the complexity of rescue breaths, and the unwillingness to have physical contact.^[5-7] Additionally, their reluctance could be due to their insufficient knowledge, skills, or confidence.^[8] In 2010, the American Heart Association (AHA) published new guidelines for CPR and emergency cardiovascular care to emphasize the importance of chest compressions and early defibrillation.^[9] Seeing as many responders may be unwilling to perform mouth-to-mouth resuscitation, the latest guidelines recommend that the sequence be changed from Airway-Breathing-Circulation (A-B-C) to circulation-Airway-Breathing (C-A-B), in which resuscitation begins with chest compressions before the lay responder opens the airway to give mouth-to-mouth breaths.^[10] Consequently, the basic life support (BLS) algorithm was simplified to Hands-Only CPR (a method of CPR without mouth-to-mouth breaths). It is recommended for use by people who see a teen or adult suddenly collapse in an "out-of-hospital" setting in order to encourage more bystanders to take appropriate steps during an event of a cardiac arrest.^[11]

Despite being around for several years, awareness on Hands-Only CPR is still relatively low. Based on a recent study conducted in Australia in 2017, 68% of the respondents had undergone some form of CPR training and only half of those surveyed have heard of hands-only CPR. However, when compared to standard CPR, a larger percentage of respondents were willing to deliver hands-only CPR for strangers (67% vs 86%).^[12]

Lately, there has been an influx of number of studies investigating CPR knowledge, attitude, skills and training of college and university students, and their participation in CPR or BLS in many countries.^[13,14] The findings suggest that students were familiar with the importance of CPR training and regardless

of their low level of knowledge, they were willing to participate.^[14] It was concluded that the students' willingness, knowledge, and self-efficacy improved after training.^[15] Although not mandatory, several countries have implemented CPR training in school with some participants as young as 12 years of age.^[16] Thus, promoting and providing CPR training to the youth is highly recommended.^[17]

However, given the abovementioned literature, most of the data obtained on this topic were from studies conducted in countries other than Malaysia, with little information or investigations done in the local context. The present study was undertaken to identify current knowledge and willingness to perform Hands-Only CPR among Malaysian college students. The target population in this study was tertiary education students attending private and public colleges in Malaysia. The findings of this study would provide information for future planning and training.

2. Materials and methods

2.1. Study population

The population in this study was tertiary education students in Malaysia. In Malaysia, a student requires either A-levels and the equivalent or O-levels and the equivalent to enrol in a degree level and pre-university level programs. Presently, the estimated number of college students in Malaysia is 1,250,000.^[18] For a population size as big as this, based on Krejcie and Morgan^[19] sample-size table, the sample size targeted for this study was 400. In our capacity, it was not possible to do a random sampling. Data collection was done online using a questionnaire designed in Google Forms.

2.2. Instrument

The questions in the questionnaire were adapted from previous studies and modified to suit our local population. The content of the questionnaire was validated by an expert in the field of emergency medicine. There were 5 sections in the questionnaire:

1. A: Participant's Information Sheet and Consent Form,
2. B: Demographics,
3. C: Exposure to CPR,
4. D: Knowledge of Hands-Only CPR and
5. E: Willingness to Perform Hands-Only CPR.

The participant's information sheet contained the introduction and purpose of the study. Consent forms were provided to ensure participation was voluntary and to assure confidentiality of information provided (see Table, Supplemental Digital Content (Appendix, <http://links.lww.com/MD/D512>), which shows the questions asked in sections B, C, D, and E).

Demographic characteristics asked included age, gender, and ethnicity. Additional questions were asked on the respondents' highest completed education level and their current institution. Also, respondents were asked whether they or their first-degree family members had any history of heart disease.

In the section on Exposure to CPR, the respondents were asked questions such as "Have you done CPR on another person before?" and "Have you attended CPR training before?". Those who had attended CPR training sessions were asked to state where, when, and what type of course they have attended. Those who had not attended CPR training sessions before were asked for the reason(s) for not attending one.

In the section on Knowledge on Hands-Only CPR, the respondents were tested on their knowledge in CPR. This section

included questions such as “Can Hands-Only CPR be performed outside a hospital setting?”, “Where is the right location to perform chest compression?”, and “What is the correct sequence to perform CPR? (according to AHA guidelines 2015).” In total, this section had 8 questions (1 question had 6 sub-questions within). For each question, a score of 1 was given for the correct answer, whereas the incorrect answer or “not sure” response was given a score of 0. The scores for the 13 questions were added and the total, ranging from 0 to 13, was considered as a measure of the knowledge score on Hands-Only CPR.

The section on “Willingness to Perform Hands-Only CPR” contained 5 different scenario-based questions. For example, “In an emergency situation, would you perform Hands-Only CPR on ‘X’?”, where “X” referred to a stranger, a victim of trauma (person who suffered from physical injury), a child, an elderly person, or a family member/relative. In each scenario, the respondents were given the option of answering “Yes” or a few options of “No” that included their reason for reluctance. Some examples were “No, because of poor knowledge/technique” or “No, because I am afraid of disease transmission.”

2.3. Data collection

A pilot study was conducted by distributing 30 hardcopies of the questionnaire to local college students. Based on the feedback from the pilot study, the questionnaire was revised and improvised. After making necessary changes, a second pilot study was conducted online using Google Forms among 44 respondents. The finalized questionnaire in Google Forms was administered to college students in Malaysia via social media platforms. Social media platforms used were mainly Facebook, WhatsApp, and Instagram.

2.4. Statistical analysis

The data were analyzed using IBM SPSS (version 20.0, IBM Corp., New York, NY). Qualitative variables were described as frequencies and percentages, whereas quantitative variables were described as means and standard deviations. The independent sample *t* tests was used to determine the association between attendance of CRP training and knowledge on Hands-Only CPR. Logistic regression analyses were used to test the associations between knowledge on Hands-Only CPR and willingness to perform Hands-Only CPR. For all tests, the significance level (*P* value) was set at .05.

2.5. Ethical approval

This study was approved by University of Malaya Research Ethics.

3. Results

In this study, a total 445 responses were received. Out of this, 393 respondents met the inclusion criteria. The demographic characteristics of the respondents are summarized in the Table 1.

3.1. Exposure to CPR training

Out of the 393 respondents, 286 (73.0%) have attended CPR training before, of which 249 (87.1%) have attended a CPR training within the last 5 years (Table 2). The most common (68.9%) type of CPR course attended was chest compression and

Table 1
Demographic characteristics of the respondents.

Variables	Frequency (n)	Percentage (%)
Highest education certificate achieved		
SPM/O levels or the equivalent	353	89.8
A level/matriculation/STPM/foundation	40	10.2
Age		
20 and below	92	23.4
More than 20	301	76.6
Gender		
Male	142	36.1
Female	251	63.9
Ethnicity		
Malay	157	39.9
Chinese	63	16.0
Indian	81	20.6
Others	92	23.4

SPM = Sijil Pelajaran Malaysia, STPM = Sijil Tinggi Pelajaran Malaysia.

mouth-to-mouth resuscitation. Among those who have not attended CPR training, 78 (72.9%) stated that they were not sure where to attend a CPR training. One third of the respondents indicated that they have performed some form of CPR before.

3.2. Knowledge of Hands-Only CPR

Assessment of Knowledge of Hands-Only CPR for the individual questions is provided in Table 3 (correct responses in bold). The correct responses were added and the possible range for each respondent was between 0 and 13. The overall mean knowledge score was rather low (7.9 ± 3.0). The distribution of the score was fairly symmetrical. The mean knowledge score among those who have attended CPR training before (8.6 ± 2.8) was statistically significantly higher compared to those who have not (6.1 ± 2.9) (Table 4). Among those who have attended CPR training before, the mean knowledge score among those who have attended the training within the last 5 years (8.8 ± 2.7) was statistically significantly higher compared to those who have attended CPR training more than 5 years ago (6.9 ± 2.8) However, there was no

Table 2
History of CPR training.

Question	Frequency (n)	Percentage (%)
CPR course attendance		
No	107	27.0
Yes	286	73.0
Most recent CPR training attended		
Within the last 5 yr	249	87.1
More than 5 yr ago	37	12.9
Type of CPR course you attended		
Chest compression and mouth-to-mouth	197	68.9
Hands-Only CPR	31	10.8
Both	58	20.3
Reason for not having attended CPR course		
Lack of interest	40	37.4
No time	15	14.0
Not sure where to attend the course	78	72.9
Cost	14	13.1
Performed CPR before		
Yes	80	20.4
No	313	79.6

CPR = cardiopulmonary resuscitation.

Table 3
Assessment of knowledge on Hands-Only CPR.

Question (bold: correct answer)	Frequency (n)	Percentage (%)
Can Hands-Only CPR be performed outside a hospital setting?		
Yes	315	80.2
No	17	4.3
Not sure	61	15.5
Can bystander Hands-Only CPR be performed without mouth-to-mouth resuscitation?		
Yes	228	58.0
No	38	9.7
Not sure	127	32.3
Can a person perform Hands-Only CPR without certification?		
Yes	208	52.9
No	58	14.8
Not sure	127	32.3
What is the correct sequence to perform CPR? (according to American Heart Association guidelines 2015)		
Circulation > Airway > Breathing	104	26.5
Airway > Breathing > Circulation	233	59.3
Not sure	56	14.2
When should one perform Hands-Only CPR? (scored from 0 to 6 based on correct answers – refer to appendix)		
0	51	13
1	2	0.5
2	-	-
3	11	2.8
4	131	33.3
5	124	31.6
6	74	18.8
Where is the right location (refer to appendix) to perform chest compression?		
A	277	70.5
B	3	0.8
C	72	18.3
D	22	5.6
How fast should one perform chest compression?		
150 compressions per min	26	6.6
100 compressions per min	181	46.1
50 compressions per min	47	12.0
As fast as possible	15	3.8
Not sure	124	31.6
What is the correct depth of compression that should be performed during chest compression?		
Such that the rib cage moves down 1 to 2 cm	89	22.6
Such that the rib cage moves down 5 to 6 cm	169	43.0
Such that the rib cage moves down 6 to 10 cm	2	0.5
As deep as possible	8	2.0
Not sure	125	31.8

CPR = cardiopulmonary resuscitation.

significant difference in mean knowledge scores by the type of CPR training attended. The mean knowledge score among the students pursuing health-related courses (9.1 ± 2.5) was significantly

higher compared to those pursuing non-health-related courses (6.5 ± 3.0).

3.3. Willingness to perform Hands-Only CPR

In this study, the respondents were asked on their willingness to perform Hands-Only CPR in 5 different scenarios: strangers, victims of trauma, children, elderly people, and family members or relatives. Majority (67.7%) of the respondents were willing to perform CPR on their family members or relatives (Table 5). More than half (55%) of the respondents were willing to perform Hands-Only CPR on a stranger, 45% were willing to save a child by doing Hands-Only CPR, and 49.1% were willing to perform it on an elderly person. Only 37.4% were willing to perform Hands-Only CPR on a trauma victim. Poor knowledge on techniques was cited as the main reason for unwillingness to perform Hands-Only CPR in all 5 scenarios. Willingness to perform Hands-Only CPR did not differ between the male and female college students in all 5 scenarios. Willingness to perform

Table 4
Knowledge of Hands-Only CPR by history of CPR training.

Question	Mean, S	P value
CPR course attendance		
No	8.6 ± 2.8	<.001
Yes	6.1 ± 2.9	
Most recent CPR training attended		
Within the last 5 yr	8.8 ± 2.7	<.001
More than 5 yr ago	6.9 ± 2.8	
Type of CPR course you attended		
Chest compression and mouth-to-mouth	8.4 ± 3.0	.214
Hands-Only CPR	8.5 ± 2.3	
Both	9.2 ± 2.5	

CPR = cardiopulmonary resuscitation.

Table 5
Willingness to perform Hands-Only CPR.

No	Factors	Frequency (n)	Percentage (%)
1	In an emergency situation, would you perform Hands-Only CPR on a stranger?		
	Yes	216	55.0
	No, because of poor knowledge/technique	140	35.6
	No, because I am afraid of hurting the victim	19	4.8
	No, because I am afraid of disease transmission	12	3.1
	No, because I am afraid of legal issues	5	1.3
2	In an emergency situation, would you perform Hands-Only CPR on a victim of trauma?		
	Yes	147	37.4
	No, because of poor knowledge/technique	159	40.5
	No, because I am afraid of hurting the victim	63	16.0
	No, because I am afraid of disease transmission	19	4.8
	No, because I am afraid of legal issues	4	1.0
3	In an emergency situation, would you perform Hands-Only CPR on a child?		
	Yes	177	45.0
	No, because of poor knowledge/technique	164	41.7
	No, because I am afraid of hurting the victim	37	9.4
	No, because I am afraid of disease transmission	15	3.8
	No, because I am afraid of legal issues	0	0
4	In an emergency situation, would you perform Hands-Only CPR on an elderly person?		
	Yes	193	49.1
	No, because of poor knowledge/technique	149	37.9
	No, because I am afraid of hurting the victim	38	9.7
	No, because I am afraid of disease transmission	9	2.3
	No, because I am afraid of legal issues	1	0.3
5	In an emergency situation, would you perform Hands-Only CPR on a relative/family member?		
	Yes	266	67.7
	No, because of poor knowledge/technique	107	27.2
	No, because I am afraid of hurting the victim	11	2.8
	No, because I am afraid of disease transmission	5	1.3
	No, because I am afraid of legal issues	4	1.0
	No, because of social/religious reasons	0	0

CPR = cardiopulmonary resuscitation.

Hands-Only CPR in all 5 scenarios was significantly higher among the students pursuing health-related courses compared to those who pursued non-health-related courses.

3.4. Knowledge on Hands-Only CPR and willingness to perform Hands-Only CPR

The association between knowledge on Hands-Only CPR and willingness to perform Hands-Only CPR in the 5 different scenarios was tested using binary logistic regression analyses (Table 6). There were statistically significant associations between knowledge on Hands-Only CPR and willingness to

perform Hands-Only CPR on all 5 scenarios. The higher was the knowledge on Hands-Only CPR, the higher was the odds of willingness to perform Hands-Only CPR in each scenario. Similarly, respondents who have had CPR training were more willing to perform Hands-Only CPR in all 5 scenarios (Table 7).

4. Discussion

This study was conducted among college students in Malaysia to determine their knowledge on Hands-Only CPR and their willingness to perform Hands-Only CPR. In terms of fundamental knowledge, it was found that only 70% of the respondents

Table 6
Knowledge on Hands-Only CPR and willingness to perform Hands-Only CPR.

Scenario	OR (95% CI)	P value
1. Stranger	1.325 (1.222, 1.436)	<.001
2. Trauma victim	1.235 (1.138, 1.339)	<.001
3. Child	1.309 (1.204, 1.422)	<.001
4. Elderly person	1.391 (1.273, 1.520)	<.001
5. Family	1.355 (1.248, 1.471)	<.001

CPR = cardiopulmonary resuscitation, OR = odds ratio.

Table 7
Previous training on CPR and willingness to perform Hands-Only CPR.

Scenario	OR (95% CI)	P value
1. Stranger	7.579 (4.491, 12.792)	<.001
2. Trauma victim	4.063 (2.326, 7.095)	<.001
3. Child	5.717 (3.306, 9.888)	<.001
4. Elderly person	8.471 (4.788, 14.985)	<.001
5. Family	5.938 (3.668, 9.611)	<.001

CPR = cardiopulmonary resuscitation, OR = odds ratio.

knew the correct emergency number in Malaysia. The national emergency number had been standardized since the year 2007, whereby Malaysians only need to call the number 999 if there were casualties or medical emergencies. Before this, the EMS in Malaysia did not have a universal access number, resulting in the lack of interagencies communication and at times, overlapping of resources with more resources available at the site of incident than was actually needed.^[4] However, there was previous literature that stated that the effectiveness of the new system is yet to be seen.^[4] The results of our study in terms of the medical emergency number differ from a research undertaken in Queensland, Australia, where 88.3% of those surveyed knew the emergency telephone number.^[20]

In the past decades, the AHA updated the guidelines of CPR and emergency cardiovascular care every 5 years based on scientific evidence and experts' opinions.^[21] The AHA guidelines are the most commonly used teaching materials for CPR training worldwide. The findings in this study showed that college students in Malaysia had an inadequate knowledge on Hands-Only CPR. A similar study conducted among college students in Hong Kong also showed poor knowledge on Hands-Only CPR.^[22] Like in Hong Kong, most of the Malaysian college students were unaware of the changes in the AHA 2010 guidelines. In the guideline, the CPR sequence was updated to C-A-B from A-B-C.^[23] This is because C-A-B is superior to A-B-C with an earlier start of CPR and a shorter time to completion of the first 30:2 resuscitation cycle.^[24] Most respondents (59.3%) in our study answered that the order of CPR is A-B-C and only 26.5% of the respondents answered C-A-B.

Majority (80.2%) of the respondents in this study agreed that CPR can be performed outside hospital. A similar study conducted among nursing students in India showed that only 67% knew that CPR can be performed outside hospital.^[12] The difference in result can be due to multiple factors that include previous CPR training, exposure, and media. Among the respondents in this study, only 58% were aware of Hands-Only CPR. This level of awareness is comparable to a recent study conducted among adults in Victoria, Australia, where only 50% were aware of Hands-Only CPR.^[12] The awareness of Hands-Only CPR is still low and more awareness efforts must be taken.

Only 70.5% of the respondents in this study answered the location of chest compression correctly. However, this level of awareness was much better compared to a study conducted in Tamil Nadu, India, on awareness of BLS among students, doctors, and nurses of medical, dental, homeopathy, and nursing colleges where 74% did not know that the right location of chest compression was the mid chest. This shows that the awareness of BLS is very poor even among students pursuing health-related courses and practicing doctors.^[25]

Studies have shown that people with previous CPR training were more willing to perform Hands-Only CPR. Bobrow et al^[3] showed that the rate of bystander CPR (CPR that is performed by a layperson who is not part of the organized emergency-response system in a community. Such a person is known as a CPR bystander) increased from 19.6% in 2005 to 75.9% after a large public education campaign in Hands-Only CPR. Another prospective trial by Bobrow et al^[26] among 336 adults without prior CPR training found that laypersons exposed to an ultra-brief Hands-Only CPR training video of only 60 seconds were more likely to attempt CPR and demonstrated superior CPR skills than untrained laypersons. This study showed that those

who had CPR training in the last 5 years were more willing to perform Hands-Only CPR, similar to the findings by Hung et al.^[22]

One of the main limitations of this study was that it was confined to college students only. Ideally, it should be opened to the general population to determine the understanding on Hands-Only CPR among the general public. Another limitation is that, as in all questionnaire surveys, how honestly the respondents answered the questions cannot be determined.

In conclusion, knowledge on CPR among local college students is low. Higher knowledge is associated with previous training and those with better knowledge are more willing to perform Hands-Only CPR. Therefore, our recommendation based on this study is that more training should be provided to college students so that in case of emergency, they will be ready to perform what is necessary.

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