European Review for Medical and Pharmacological Sciences 2021; 25: 6775-6781

Adapting evaluation method of skills acquisition in basic cardiopulmonary resuscitation among year 5 and year 6 primary school pupils during the COVID-19 lockdown: a pilot study

A. CÁRDENAS-CRUZ[1], G. GÓMEZ-MORENO[2], A. ROMERO-LINARES[1], D.P. CÁRDENAS-CRUZ[3], A. PÉREZ-BAILÓN[4], F.M. PARRILLA-RUIZ[1]

[1]Department of Medicine, School of Medicine, University of Granada, Granada, Spain
[2]Department of Medically Compromised Patients in Dentistry, School of Dentistry, University of Granada, Granada, Spain
[3]Department of Emergency Medicine, University Clinical Hospital San Cecilio, Granada, Spain
[4]Intensive Care Unit, Santa Ana Hospital, Motril, Granada, Spain

Abstract. – OBJECTIVE: This longitudinal descriptive study aimed to evaluate cognitive skills acquisition in basic Cardiopulmonary Resuscitation (bCPR) among a group of Year 5 and Year 6 primary school pupils. The study made use of online tools due to the impossibility of conventional methods during the COVID-19 lockdown.

MATERIALS AND METHODS: Pupils received formal training in bCPR. Training was imparted uniformly by a teacher at the school (qualified in Basic Life Support -BLS- and Advanced Life Support -ALS- training by the CPR National Plan). The skills acquired (those proposed as essential for bCPR training by the European Resuscitation Council) were evaluated fifteen weeks later. Skills acquisition was evaluated by means of an online questionnaire developed specifically for the study.

RESULTS: In all the cognitive skills included in bCPR training, the acquisition level achieved was over 65%. Acquisition of knowledge of the anatomical areas at which cardiac massage must be applied and the means of emergency systems activation was high, while 25.5% of pupils knew the order in which maneuvers should be performed. Pupils' self-confidence and self-perception of their capacity to act when faced with a real CPR situation increased significantly.

CONCLUSIONS: Primary school pupils learned all the cognitive skills involved in bCPR, showing high levels of skills acquisition and positive self-perception of their capacity to apply them.

Key Words:
COVID-19, Online tools, Training, Basic cardiopulmonary resuscitation (bCPR), Primary school pupils.

Introduction

Some 80% of extra-hospital cardiorespiratory arrests (EHCRA) have an etiology deriving from shockable rhythms: ventricular fibrillation (VF) and pulseless ventricular tachycardia (PVTC). Arrhythmias are treated by means of defibrillation. For each minute that this is delayed, the probability that it will be effective decreases by 10-12%. Dr. Drinker's survival curve[1] describes the reduction in the probability of survival for each 60 seconds that the patient spends without receiving correctly applied assistance. Although it is difficult to estimate the incidence and survival rates after EHCRA, some studies[2-4] propose a percentage of around 10%. In light of Dr. Drinker's survival curve[2] this low survival rate may be explained by the fact that on average emergency services in Spain take 11 minutes to reach the patient. So, following EHCRA, early recognition of cardiac arrest and immediate activation of emergency services, as well as applying chest compressions at once, will double or even quadruple the chances of survival[5].

70% of EHCRAs occur in the presence of a family member or other person. However, the rates of citizens capable of implementing BLS when faced with a CRA are below 20% in most countries, although in some countries they reach between 60 and 80%. This represents an evident public health problem that can only be solved by involving the general public. It is highly likely that the first person to intervene in a case of EH-

Corresponding Author: Gerardo Gómez-Moreno, DDS, Ph.D, MS; e-mail: ggomez@ugr.es

CRA will not be a healthcare professional. This highlights the importance of CPR training for the general public[6]. The current sequence of steps for CPR is the BLS algorithm recommended by the European Resuscitation Council (ERC) (2015)[7].

Imparting basic CPR skills to the general public presents two problems: firstly, the difficulty of remembering the skills that have been imparted, and secondly, the costs involved in implementing public training programs. For these reasons, recent debate[8] has focused on the performance and cost effectiveness of online learning. It would appear that blended learning, a combination of face-to-face learning with distance learning, offers a range of advantages. The current COVID-19 pandemic has made it necessary to develop and implement blended learning – often as the first and only choice. While cognitive aspects can be taught online, face-to-face learning remains necessary for imparting procedural skills. So, various CPR training initiatives involving blended learning have been implemented. However, voluntary CPR training for adults remains insufficient to train the 15-20% of the population required to improve survival rates following EHCRA. In this context, the introduction of compulsory training in CPR in primary education offers a promising means of achieving sustainable improvements to the low rates of BLS skills among the general population[9].

The International Liaison Committee on Resuscitation (ILCOR) and the World Federation of Societies of Anesthesiologists (WFSA) have developed an initiative known as "*Kids Save Lives*." This aims to introduce CPR training for school-age children all over the world[6]. The scheme received the backing of the WHO in 2015. It argues that teaching CPR to all school children will produce a notable improvement in CRA survival rates everywhere. School children have a less inhibited approach to CRA, the most inhibiting factor in taking practical measures in real life being the fear of making mistakes. They also respond better to instruction and are keen to learn how to help others. Moreover, by starting training at an early age it is hoped that children will not forget the skills they acquire. It is also likely that they will go on to teach CPR to their families, pupils and teachers being important multipliers, so that the proportion of skilled individuals among the general population should increase considerably[10-12]. For this reason, the compulsory training of school children could have a major impact on improving CRA survival rates through the interventions of passers-by, and also, become a successful mean of spreading CPR skills among the population at large[6,11].

The aim of this pilot study was to analyze the levels of cognitive skills acquisition in basic Cardiopulmonary Resuscitation (bCPR) in a group of Year 5 and Year 6 Primary School pupils using an online tool, as it was impossible to employ conventional methods due to the COVID-19 lockdown.

Materials and Methods

Study Design

This longitudinal descriptive study with follow-up was approved by the University of Granada Ethics Committee (Reg. Nº 1362/CEIH/2020). The study population comprised 157 pupils attending *"La Inmaculada" Hermanos Maristas* Primary School (Granada, Spain), all in year 5 or year 6 and aged 10-12 years (Third Cycle of Compulsory Primary Education).

Training Process Characteristics

Firstly, formal training in basic Cardiopulmonary Resuscitation was provided. Subsequently, the cognitive skills acquired by the pupils were evaluated. Training was imparted uniformly by a teacher at the school (qualified BLS and ALS instructor by the CPR National Plan). Before pupil training began, two one-day workshops were held to impart (and certify) bCPR skills to a total of 50 primary school staff[12]. For the school pupils taking part in the study, two training sessions were designed based on the international recommendations of the ERC[1]. As this was a large-scale training scheme, a considerable quantity of training equipment was needed, in this case, the *Resusci Anne Simulator marketed by* Laerdal® (Stavanger, Norway). The teaching imparted is the same as for adults although the vocabulary used must be adapted to make it easily understood by a younger age group. All training was given as part of the school timetable.

Evaluation Process Characteristics

Skills acquisition was evaluated 15 weeks after the training phase. The evaluation method (as in all medical disciplines) had to be adapted in response to the state of alarm and lockdown declared by the Spanish government in response to the COVID-19 pandemic[13]. This meant developing a specific online questionnaire – the subject of the present study – designed to meet these circumstances. The parameters evaluated were

those established by the European Resuscitation Council (ERC) as essential to bCPR training (Table I). Due to the lockdown, the parameters were evaluated *via* an IT platform in the form of an online questionnaire. The online questionnaire was produced using the online tool Microsoft Forms® (Redmond, WA, USA) and was delivered to the pupils via the platform Microsoft Teams® (Redmond, WA, USA) together with a task belonging to the Physical Education syllabus. The participants were asked to complete the questionnaire simultaneously within a set timetable to avoid any consultation between the children.

Results

When the evaluation results have been collected, they underwent quantitative statistical analysis. Regarding cognitive bCPR skills, these were assessed as 12 dichotomous variables (Yes/No answers). For all the cognitive skills that make up bCPR (variables 2-12) 60% of the pupils responded positively (Table II). Of the skills that obtained more than 60% positive answers, all except one (variable 4) obtained over 70%. It should be noted that the evaluation under COVID-19 lockdown was performed 15 weeks after the training sessions. Analysis of the 12 variables showed that the skills that were acquired most effectively were: 1) knowledge of the anatomical spot where continuous cardiac massage should be applied; 2) knowledge of the emergency telephone number to call and how to make the call; 3) knowledge of how long to continue CPR. The children's self-perception of the skills learnt and their capacity to apply them is shown in Table III.

Discussion

Traditionally, skills training and the evaluation of its efficacy have been based on face-to-face classroom activity[14]. The state of alarm and lock-

Table I. Real time PCR primers.

Qualitative variables
1. Sex
Quantitative variables
2. Age
3. Days of training completed
Evaluation of bCPR cognitive skills
Qualitative variables (Dichotomous questions: Yes/No)
1. Does he/she know the order in which bCPR procedures are carried out?
2. Does he/she know how to interpret the shouting and shaking technique to check for unresponsiveness?
3. Does he/she know which vital sign (respiration) to check to detect cardiopulmonary arrest?
4. Does he/she know the technique for detecting cardiopulmonary arrest? (Head-tilt-chin-lift/look, listen, feel)
5. Does he/she what telephone number to call to activate emergency services and how to make the call?
6. Does he/she understand the importance of continuous correctly applied cardiac massage?
7. Does he/she know where on the anatomy to apply continuous correctly-applied cardiac massage?
8. Does he/she know how to give chest compressions correctly?
9. Does he/she know how to give mouth-to-mouth resuscitation and the order in which the maneuvers are carried out?
10. Does he/she know how many compressions make up each cycle?
11. Does he/she know how many insufflations make up each cycle?
12. Does he/she know how long to continue CPR for?
Evaluation of self-perceptions of learning received and ability to act
Qualitative variables (Ordinal questions: Incapable/Low capability/Able/Very able)
1. Self-perception of ability to act in a real CPA situation before receiving training.
2. Self-perception of ability to act in a real CPA situation after receiving training.
Qualitative variables (Ordinal questions: Incapable/Low capability/Able/Very able)
3. Difficulty experienced in bCPR training
Qualitative variables (Dichotomous questions: Yes/No)
4. Belief in ability to teach an adult how to carry out the principal maneuvers involved in bCPR.
Quantitative variables
5. Self-assessment (0-10) of knowledge and understanding of bCPR

Table II. Comparison of variables analyzed.

Variable evaluated	Yes (%)	No (%)
1. Does he/she know the order in which bCPR procedures are carried out?	25.5	74.5
2. Does he/she know how to interpret the shouting and shaking technique to check for unresponsiveness?	74.5	25.5
3. Does he/she know which vital sign (respiration) to check to detect cardiopulmonary arrest?	84.9	15.1
4. Does he/she know the technique for detecting cardiopulmonary arrest? (Head-tilt-chin-lift/look, listen, feel)	66	34
5. Does he/she what telephone number to call to activate emergency services and how to make the call?	96.2	3.8
6. Does he/she understand the importance of continuous correctly applied cardiac massage?	80.2	19.8
7. Does he/she know where on the anatomy to apply continuous correctly-applied cardiac massage?	98.1	1.9
8. Does he/she know how to give chest compressions correctly?	84	16
9. Does he/she know how to give mouth-to-mouth resuscitation and the order in which the maneuvers are carried out?	71.7	28.3
10. Does he/she know how many compressions make up each cycle?	79.2	20.8
11. Does he/she know how many insufflations make up each cycle?	75.5	24.5
12. Does he/she know how long to continue CPR for?	86.8	13.2

Table III. Main results obtained in the study.

POPULATION CHARACTERISTICS AND ATTENDANCE					
Sex		**Age**		**Training days attended**	
Male	61 (57.5%)	**10**	22(20.8%)	**1**	12 (11.3%)
Female	45 (42.5%)	**11**	48 (45.3%)	**2**	94 (88.7%)
		12	36 (34%)		

BCPR cognitive skills				
Best acquired		**Worst acquired**		**Average mark** (Out of 10)
Does he/she know where on the anatomy to apply continuous correctly applied cardiac massage?	98.1%	**Does he/she know the order in which bCPR procedures are carried out?**	25.5%	7.69 (SD=1.41)
Does he/she what telephone number to call to activate emergency services and how to make the call?	96.2%	**Does he/she know the technique for detecting cardiopulmonary arrest? (Head-tilt-chin-lift)**	66%	
Does he/she know how long to continue CPR for?	86.8%	**Does he/she know how to give mouth-to-mouth resuscitation and the order in which the maneuvers are carried out?**	71.7%	

SELF-PERCEPTION OF TRAINING AND ABILITIES ACQUIRED								
Perception of ability before training		**Perception of ability after training**		**Perceived difficulty of training**		**Willingness to teach an adult**		**Average mark** (Out of 10)
Very able	9 (8.5%)	**Very able**	21 (19.8%)	**Very easy**	8 (7.5%)	**Yes**	102 (96.2%)	7.96 (SD=1.09)
Able	33 (31.1%)	**Able**	70 (66%)	**Easy**	58 (54.7%)			
Low capability	45 (42.5%)	**Low capability**	14 (13.2%)	**Difficult**	38 (35.8%)	**No**	4 (3.8%)	
Incapable	19 (17.9%)	**Incapable**	1 (0.9%)	**Very difficult**	2 (1.9%)			

down declared by the Spanish government in response to the COVID-19 pandemic suddenly put an end to classroom learning at all educational levels. This obliged educators to seek alternative means of teaching based on IT platforms and online training and evaluation. In this study, the training program had already been provided in face-to-face classes during the months just before the pandemic arrived in Spain. But the evaluation phase of the program had to be designed and implemented during the month of March, since it was impossible to bring the schoolchildren together at school for assessment due to the lockdown and school closure. Faced with this situation, it was necessary to design a tool that would provide cognitive skills assessment to all the participants in bCPR training.

Primary school is considered a suitable setting for initiating bCPR training for several reasons: almost 100% of the population attends primary school[15]; young people tend to frequent the public spaces (streets, shopping centers, parks, etc.) where EHCRAs occur; having received bCPR training, they can act as potential resuscitators. Since 2003-2004, both ILCOR and AHA have recommended the introduction of resuscitation training in primary education[15]. It has been shown that children act as 'multipliers' by sharing their newly acquired knowledge with family members and others[9,12,16]. The results of the present study support this idea, given that as many as 96.2% of the participants stated that they were willing and able to teach bCPR to an adult. In this way, there is increasing evidence that primary school pupils are an appropriate and receptive group for bCPR training. Nevertheless, some investigations have shown that it is only after the age of 13 years (or 50 kg body weight) that an individual reaches the physical conditions required to apply CPR techniques effectively[15]. There is a direct association between age, weight, height and BMI and the depth of chest compressions applied[17,18]. In any case, the age recommended for training individuals in manual CPR skills (cardiac massage and mouth-to-mouth resuscitation) remains unclear, although different studies have established an age range of 10-13 years. The population evaluated in the present study fell within this range. When evaluating the outcomes of bCPR training, several studies[12,19-21] have not found differences in cognitive skills acquisition between different age groups, which makes it clear that primary school pupils are able to learn and retain bCPR and BLS skills and knowledge.

The results of the present work concur with findings in the studies cited above. Within our study population, the level of cognitive skills acquisition was over 65% 15 weeks after training. Moreover, in response to the question "How did you find CPR training?" more than 60% replied that it was "easy" or "very easy," while only 1.89% classed it as "very difficult." As in other similar studies, the questionnaire evaluated knowledge (cognitive skills) and psychological aspects related to bCPR, but not technical performance of the maneuvers imparted. Nevertheless, the most important aspect of the training was not the acquisition of high-quality CPR skills but rather to improve the participants' attitude to CPR and to instill a sense of its importance; this is known as "generating a culture of cardiopulmonary resuscitation". The present results showed that two hours theoretical and practical training had a positive effect on the pupils' confidence and self-perception of the abilities they acquired, so that the number of participants who felt prepared to offer assistance doubled as a result of training (from 40 to 85%). This reflects and reinforces the findings of other studies regarding the impact these short training sessions have on pupils' confidence in their own knowledge and capability[22,23].

A study[22] conducted at a school in Munich in 2013 showed that students' learning was retained and remained high nine months after training although their self-confidence decreased considerably. In the present study, evaluation took place 15 weeks after training, and it would be interesting to carry out a second evaluation at some point in the future and attempt to establish an appropriate time lapse before refresher training becomes necessary.

When it comes to imparting training of both cognitive and psychological capacities related to CPR for primary school children, other factors come into play, such as psychosocial strengths and obstacles deriving from their age. One of the items in the questionnaire analyzed the feelings involved in not intervening in a possible CRA. Among the most common responses was "I would be afraid of making a mistake that makes the situation worse". This is a similar finding to other studies[24], which have highlighted this fear as the most inhibiting factor when the individual is faced with a real CRA situation. Other common psychosocial barriers were "adults will not let me act because I am a child," and "I would be disgusted or too shy to give mouth-to-mouth resuscitation". The latter offers an argument in

favor of children only giving CPR in the form of chest compressions. But the study population's young age had very positive aspects. Their interest, keenness, and receptiveness to new knowledge was outstanding. Moreover, primary school children are much less influenced by social pressures and less anxious about participating in CPR than at later stages of education[25].

One of the most common questions raised by the children when they finished training concerned the use of an external automatic defibrillator (EAD). Many countries do not allow EAD use by minors although it has been shown that with a little training, a child as young as six years can use an EAD safely[24]. It could be beneficial to include EAD training, providing this complies with the legislation in force locally.

Analysis of the present results, together with previously published scientific literature[18,20,23] confirm the need to establish a formal and standardized teaching method within primary education (years 5 and 6), incorporating CPR training into the syllabus[26,27]. Further research is needed to establish the correct methods and to analyze retention of the skills acquired. Procedural skills training and training in positive attitudes towards CPR may be additional options, accompanied by assessment of their efficacy in practice.

Conclusions

Primary school pupils in years 5 and 6 were able to learn all the cognitive skills included in bCPR uniformly. After training, they showed a high level of skills acquisition and good self-perception of their ability to act in a CPA situation. The evaluation of skills acquisition was carried out thanks to the development of an online tool developed specially for this study.

Conflict of Interest

The Authors declare that they have no conflict of interests.

References

1) Soar J, Nolan JP, Böttiger BW, Perkins GD, Lott C, Carli P, Pellis T, Sandroni C, Skrifvars MB, Smith GB, Sunde K, Deakin CD; Adult advanced life support section Collaborators. European Resuscitation Council Guidelines for Resuscitation 2015: Section 3. Adult advanced life support. Resuscitation 2015; 95: 100-147.

2) Rosell Ortiz F, Mellado Vergel F, López Messa JB, Fernández Valle P, Ruiz Montero MM, Martínez Lara M, Santiago Vergara Pérez S, Vivar Díaz I, Caballero García A, García Alcántara A, García del Águila J. Supervivencia y estado neurológico tras muerte súbita cardiaca extrahospitalaria. Resultados del Registro Andaluz de Parada Cardiorrespiratoria Extrahospitalaria. Rev Esp Cardiol 2016; 69: 494-500.

3) Fernández JÁ, Soto MÁ. M, Zapata MR. Supervivencia en España de las paradas cardíacas extrahospitalarias. Med Intensiva 2001; 25: 236-243.

4) Gräsner JT, Bossaert L. Epidemiology and management of cardiac arrest: what registries are revealing. Best Pract Res Clin Anaesthesiol 2013; 27: 293-306.

5) Peña SB. Supervivencia extrahospitalaria tras una parada cardiorespiratoria en España: Una revisión de la literatura. Emergencias 2013; 25: 137-142.

6) Böttiger BW, Bossaert LL, Castrén M, Cimpoesu D, Georgiou M, Greif R, Grünfeld M, Lockey A, Lott C, Maconochie I, Melieste R, Monsieurs KG, Nolan JP, Perkins GD, Raffay V, Schlieber J, Semeraro F, Soar J, Truhlář A, Van de Voorde P, Wyllie J, Wingen S; Board of European Resuscitation Council (ERC). Kids Save Lives - ERC position statement on school children education in CPR.: "Hands that help - Training children is training for life". Resuscitation 2016; 105: A1-3.

7) Monsieurs KG, Nolan JP, Bossaert LL, Greif R, Maconochie IK, Nikolaou NI, Perkins GD, Soar J, Truhlář A, Wyllie J, Zideman DA; ERC Guidelines 2015 Writing Group. European Resuscitation Council Guidelines for Resuscitation 2015: Section 1. Executive summary. Resuscitation 2015; 95: 1-80.

8) García-Suárez M, Méndez-Martínez C, Martínez-Isasi S, Gómez-Salgado J, Fernández-García D. Basic Life Support Training Methods for Health Science Students: A Systematic Review. Int J Environ Res Public Health 2019; 16: 768.

9) Semeraro F, Wingen S, Schroeder DC, Ecker H, Scapigliati A, Ristagno G, Böttiger BW. KIDS SAVE LIVES implementation in Europe: A survey through the ERC Research NET. Resuscitation 2016; 107: e7-9.

10) Cruz A, Suárez I, Guillamón L, Cruz D, Jiménez F, Ruiz F. Analysis of the development of the forgetfulness curve within a program of training in Basic Life Support for students of the Degree of Medicine from the University of Granada. Pilot study. Actualidad Médica 2017; 102: 140-144.

11) Díaz-González EE, Danis-Lozano R, Peñaloza G. Schools as centers for health educational initiatives, health behavior research and risk behavior for dengue infection in school children and community members: a systematic review. Health Educ Res 2020; 35: 376-395.

12) Böttiger BW, Van Aken H. Kids save lives--Training school children in cardiopulmonary resuscitation worldwide is now endorsed by the World Health Organization (WHO). Resuscitation 2015; 94: A5-7.

13) Zangrillo A, Beretta L, Scandroglio AM, Monti G, Fominskiy E, Colombo S, Morselli F, Belletti A, Silvani P, Crivellari M, Monaco F, Azzolini ML, Reineke R, Nardelli P, Sartorelli M, Votta CD, Ruggeri A, Ciceri F, De Cobelli F, Tresoldi M, Dagna L, Rovere-Querini P, Serpa Neto A, Bellomo R, Landoni G; COVID-BioB Study Group. Characteristics, treatment, outcomes and cause of death of invasively ventilated patients with COVID-19 ARDS in Milan, Italy. Crit Care Resusc 2020; 22: 200-211.

14) Cano E. La evaluación por competencias en la educación superior. Profesorado: Revista de Currículum y Formación de Profesorado 2008; 12: 1-16.

15) López-Messa JB, Martín-Hernández H, Pérez-Vela JL, Molina-Latorre R, Herrero-Ansola P. Novedades en métodos formativos en resucitación [Novelities in resuscitation training methods]. Med Intensiva 2011; 35: 433-441.

16) Stroobants J, Monsieurs K, Devriendt B, Dreezen C, Vets P, Mols P. Schoolchildren as BLS instructors for relatives and friends: Impact on attitude towards bystander CPR. Resuscitation 2014; 85: 1769-1774.

17) Jones I, Whitfield R, Colquhoun M, Chamberlain D, Vetter N, Newcombe R. At what age can schoolchildren provide effective chest compressions? An observational study from the Heartstart UK schools training programme. BMJ 2007; 334: 1201.

18) 18. Plant N, Taylor K. How best to teach CPR to schoolchildren: a systematic review. Resuscitation 2013; 84: 415-421.

19) Banfai B, Pek E, Pandur A, Csonka H, Betlehem J. 'The year of first aid': effectiveness of a 3-day first aid programme for 7-14-year-old primary school children. Emerg Med J 2017; 34: 526-532.

20) Bohn A, Van Aken HK, Möllhoff T, Wienzek H, Kimmeyer P, Wild E, Döpker S, Lukas RP, Weber TP. Teaching resuscitation in schools: annual tuition by trained teachers is effective starting at age 10. A four-year prospective cohort study. Resuscitation 2012; 83: 619-25.

21) Fleischhackl R, Nuernberger A, Sterz F, Schoenberg C, Urso T, Habart T, Mittlboeck M, Chandra-Strobos N. School children sufficiently apply life supporting first aid: a prospective investigation. Crit Care 2009; 13: R127.

22) Haseneder R, Skrzypczak M, Haller B, Beckers SK, Holch J, Wank C, Kochs E, Schulz CM. Impact of instructor professional background and interim retesting on knowledge and self-confidence of schoolchildren after basic life support training: a cluster randomised longitudinal study. Emerg Med J 2019; 36: 239-244.

23) Wilks J, Kanasa H, Pendergast D, Clark K. Emergency response readiness for primary school children. Aust Health Rev 2016; 40: 357-363.

24) 24)Bohn A, Van Aken H, Lukas RP, Weber T, Breckwoldt J. Schoolchildren as lifesavers in Europe - training in cardiopulmonary resuscitation for children. Best Pract Res Clin Anaesthesiol 2013; 27: 387-396.

25) Chamberlain DA, Hazinski MF; European Resuscitation Council; American Heart Association; Heart and Stroke Foundation of Canada; Australia and New Zealand Resuscitation Council; Resuscitation Council of Southern Africa; Consejo Latino-Americano de Resuscitación. Education in resuscitation. Resuscitation 2003; 59: 11-43.

26) Connolly M, Toner P, Connolly D, McCluskey DR. The 'ABC for life' programme - teaching basic life support in schools. Resuscitation 2007; 72: 270-279.

27) Kitamura T, Nishiyama C, Murakami Y, Yonezawa T, Nakai S, Hamanishi M, Marukawa S, Sakamoto T, Iwami T. Compression-only CPR training in elementary schools and student attitude toward CPR. Pediatr Int 2016; 58: 698-704.