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EDUCATIONAL STRATEGIES FOR INCREASING CARDIOPULMONARY RESUSCITATION ABILITY IN LAY PERSON SCOPING REVIEW

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ABSTRACT
Objectives: Cardiac arrest can be experienced by anyone and evenincidentcardiac arrestdo not recognizeplace andtime.This article aims to maximize cardiopulmonary resuscitation training strategies with a focused review of articles on CPR training strategies for lay people. Methods:In this Scooping Reviewan international journal search was conducted on the topic by browsing the online databases of ProQuest, EBSCO, and ScienceDirect, using the keywords “strategy” AND “education” AND “improvement” AND “ability” AND “citizen” OR “lay person” OR “person layman” AND “bystander” AND “CPR” OR “cardiopulmonary rescucitation”. Literature wasselected based on inclusion criteria, i.e. according to topic, full text articles, English, quantitative methods, experiments, CPR educational themes, full text, open access and articles published inthe last 10 years (2013-2023), while the sample exclusion criteria were research thattherein isinvasive actions and there areparticipants with a background in nursing or other health professions. The stages of searching and selecting journal articles are adapted from the PRISMA flowchart Results:At initial disbursement, 858 articles were obtained with 7 studies that met the inclusion criteria. Articles were obtained using a pre-post intervention design (1 article), a prospective cohort intervention (3 articles), a cross-sectional experimental study (1 article), a retrospective design and qualitative methods (2 articles). Based on the articles obtained, there are 3 articles on educational strategies to improve cardiopulmonary resuscitation abilities in ordinary people, which include education, simulation, team, and comprehensive programs. Conclusion:Appropriate media can have a major impact on improving knowledge, attitudes and skills to performing CPR
Keywords: CPR, lay person, strateg

INTRODUCTION

Sudden cardiac arrest or sudden cardiacarrest is the process of stopping the heartbeat which causes circulation to stop. Cardiac arrest is characterized by the absence of a pulse and respiratory arrest (Tjin, 2019). World Health Organization(WHO) Displays data on the prevalence of disease incidence which changed frominitially being dominated by communicable diseases now in 2013 changing 67% from 57,000 to non-communicable diseases, namely, heart disease. The main cause of cardiac arrest is basically heart disease itself. Out of Hospital Cariac Arrest (OHCA).the incidence rate is twice as high as in the hospital itself (AHA, 2015).

OHCA is a major concern of the world community. Europe, found 300,000,000 people each year affected by cardiac arrest outside the hospital. Meanwhile, in America,nearly 500,000 cases occur annually (Bhanji et al., 2015). Indonesia with a population of one of the largest in the world contributes a number that is not small. Wnt et al. (2015) stated that the majority of Indonesian peopleare not familiar enough to provide first aid forcardiac arrest. Therefore, delays in reporting and providing high-quality CPR are the causes of low survival rates in cardiac arrestpatients.

OHCA can happen to anyone andanywhere, regardless of time and place a person may experience a cardiac arrest. Therefore, we need people who are ready toprovide CPR assistance properly and correctly. This effort can be realized by having a CPR bystander as a first aid solution in cases of sudden cardiac arrest (AHA, 2015). The need for immediate CPR is to increase the survival rate of patients who experience cardiac arrest, because thiscan provide a three times greater chance of increasing the patient's survival rate when OHCA occurs. (Hasselqvist-Ax et al., 2015). Ordinary people who understand CPR or arecalled CPR Bystanders are still low in the Southeast Asian region when compared to other developing countries (Wang et al., 2016). Efforts to increase the understandingof ordinary people or bystanders about handling OHCA properly and correctly require the right approach. If CPR training is combined with technological sophistication, CPR accuracy will be better (Groff et al., 2016).

*Bystanders*has a minimum number of standards that should exist in developingcountries, namely 28-46% of the total population. Other literature also shows that in Singapore the number of bystanders ranges from 22-25% (Long et al., 2011). Indonesia, with a relatively large population,cannot be ascertained on the number of bystanders who can carry out CPR properly and correctly. Wang et al (2016) explained that providing CPR training to the communitycan increase CPR bystanders in the community. However, many obstacles and challenges are faced, such as a lack of trainers or mentors or even the main facilitiesare not available.

Efforts to increase the number of bystanders can be carried out by maximizingthe role of specially educated groups, namely groups at the active education level. (Choi et al., 2015). The European Resucitation Council (ERC) and WHO, whichfocus on developing effective CPR skills, provide a signal that CPR training needs to be carried out from school education or, introduction of CPR can also be included in the composition of the school education curriculum (Bohn et al., 2015).

The capacity of special groups in implementing first aid for OHCA cases is verylarge, especially students. Students with activities that regularly mingle with thecommunity have a high chance of becomingFirst Responders in OHCA cases. Students who participate in Youth Red Cross (PMR) activities can become Role-Models or initiators in providing first aid for OHCA casesbecause most of them are involved in emergency and evacuation activities (Swasanti et al., 2014). PMR can have animpact on increasing first aid capacity. The important thing to note is that by increasing

first responders, it is possible that the survival rate of patients will increase (Ibebunjo et al., 2013).

DESIGN AND METHODS

Based on the scoping review method,a search was made for international journalson the topic by browsing online databases from ProQuest, EBSCO, and ScienceDirect,using the keywords “strategy” AND “education” AND “improvement” AND “ability” AND “citizen” OR “lay person” OR “layman” AND “bystander” AND “CPR” OR “cardiopulmonary rescucitation”. Literature was selected based on inclusion criteria, i.e.according to topic, full text articles, English, quantitative methods, experiments, education theme of CPR implementation, fulltext , open access and articles published in the last 10 years (2013-2023).While the sample exclusion criteria were research thatdid not have a nursing profession and invasive measures.The stages of searching and selecting journal articles were adapted from the PRISMA flowchart as shown in Figure 1.1

RESULTS AND DISCUSSION

Suddent Cadiac Arrest (SCA) or cardiacarrest is a sudden cessation of cardiac function followed by cessation of breathing and loss of pulse (Patel et al., 2019). The American Heart Association (AHA)defines SCA as the sudden loss of heart function in someone who has previously been diagnosed with heart disease or not. SCA can be fatal, if the right steps are not taken immediately (AHA, 2017). Cardiac arrest is severe damage or cessation of the electrical and physiological activity of theheart (Haldeman et al., 2015). (Suharsono, n.d.) explained that SCA is a sudden cessation of heartbeat due to variouspossibilities in individuals who have beendiagnosed with heart disease or not, as a result the supply of oxygen throughout the body is disrupted or even stopped.Understanding In general, cardiac arrest is aphysiological cessation of heart function which causes a cessation of the supply of oxygen-rich blood throughout the body. Itcan occur in people who have previously been diagnosed with heart disease or not.

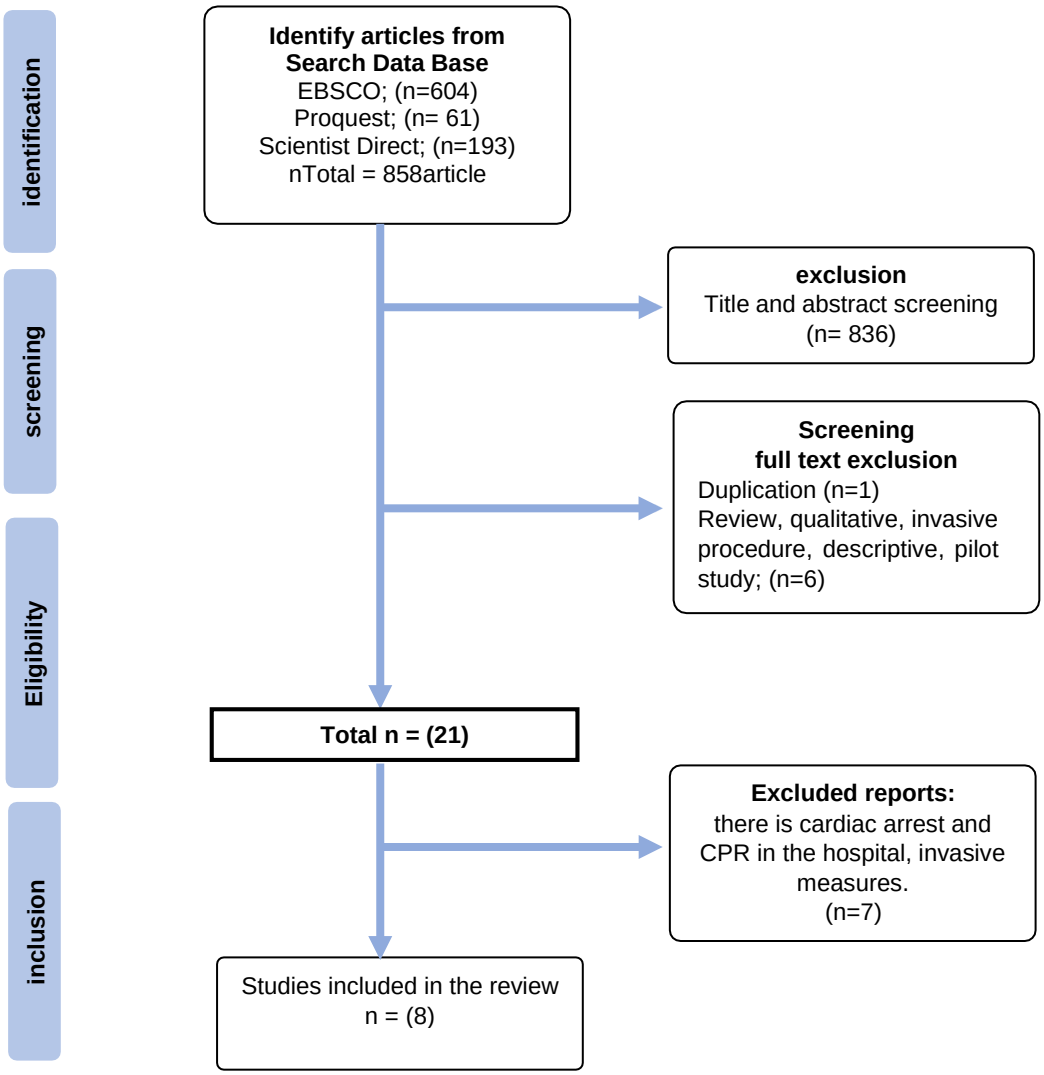

Figure 1. Flowchart for selecting articles following the PRISMA guidelines.

SCA originates from circulatory disorders caused by various congenital or congenital diseases (Chen et al., 2018). Causes of cardiac arrest include ischemic heart disease, congestive heart failure, left ventricular hypertrophy, congenital coronaryartery abnormalities, arrhythmogenic right ventricular dysplasia, hypertrophicobstructive cardiomyopathy, and cardiactamponade. Non-structural cardiac causesinclude Brugada syndrome, Wolf-Parkinson-White syndrome and congenital long QT syndrome (Patel, 2019). Ischemicheart disease is a disease that often causes SCA (Geri et al., 2017). Ischemia according to IMC is defined as inadequate blood supplyto an organ caused by a blocked blood vessel (eg heart). Another name for ischemicheart disease is coronary heart disease (CHD) or coronary artery disease. The termsof the names above are names in cases of heart with blockages in the heart arteries thatcarry oxygen-rich blood to the heart. Blockage in the coronary arteries caused byplaque that accumulates to form resistance is called atherosclerosis. This plaque decreases the coronary blood flow rate and even causes blood flow to stop. When bloodflow to the heart muscle is completely blocked, heart muscle cells die and cause a myocardial infarction (IM). Less than fifty percent of the signs and symptoms of obstruction go unnoticed. However, if you don't get proper treatment right away, it will increase the chance of sudden cardiac arrest. This is caused by strenuous activity oremotional stress which hinders the heart's need for oxygen-rich blood supply and ultimately disrupts the heart's electricity. Disorders of the heart's electricity cause heart rhythm disturbances or even sudden cardiac arrest (IMC, 2010). In general, SCA that occurs outside the hospital is caused by two things, namely SCA caused by medical and non-medicalcauses.

SCA events due to medicalconditions may have a higher survival rate(SR) than SCA cases caused by non-medical cases, for example in shockablerhythm cases (Claesson et al., 2017). Treatment must be according to the etiologythat causes SCA to occur (Chen et al., 2018).Early recognition of SCA is important. Although this seems trivial, it is sometimes difficult to be sure. Nearly half of the processof introducing SCA is impossible because itsoccurrence is uncertain (Berg et al., 2019). Inthe process of identifying SCA attacks, the operator should ask bystanders about the victim's unresponsiveness and quality of breathing (normal or abnormal). If the victimis unresponsive with absent or abnormal breathing, bystanders and operators must assume that the victim is having a cardiac arrest (Hazinski et al., 2015).

Table 1. Characteristics of the selected studies in the scoping review

Study, year and design	Samples, settings and measurements	Results
(Khan et al., 2022) Quasi Experimentet, Pre and post tests were conducted among CPR trainees from various non-health backgrounds from July 2018 to October 2019.	Participants were tested for CPR knowledge and skills before training (pre-test), immediately after training (post-test), and 6 monthsafter training (re-test). The pre and post tests were completed by 652 participants, while the retention test after 6 months was completed by 322	The mean knowledge scores related to recognition of OHCA, and initiation of CPR increased significantly (p <0.001) from the pre-test [47.8/100, Standard Deviation (SD) ±13.4] to the post-test (70.2 /100, SD ± 12.1). The mean CPR knowledge after 6months (retention) slightly decreased

	participants.	from (70.2/100, ±12.1) to (66.5/100, ±10.8). Retention of CPR skills for various components (check scene safety, check response, check breathing, and correct heel-hand placement) deteriorated significantly ($p < 0.001$) from 77.9% on the post-test to 72.8% on the repeat test. Participants performed slightly better at achieving adequate chest compression rates from 73.1% in the post-test to 76.7% in the re-test ($p = 0.27$).
(Stroop et al., 2020) Data were collected prospectively and analyzed retrospectively.	EMS in Gütersloh is operated by the municipality and administered by the local fire department. Patient data were considered if they were treated for OHCA. Traumatic arrest was excluded because it required a different intervention, had very poor survival, and probably lower bystander CPR rates	No significant difference was found between EMS- initiated CPR and smartphone-initiated CPR.
(Linderoth et al., 2021) A retrospective study was performed with follow-up on OHCA cases where video was added to the communication.	The study was conducted at Copenhagen Emergency Medical Services in Denmark, which covers an area of 2,559 km2 and has a population of around 1.8 million people. More than 88% of adults in Denmark have a video-enabled smartphone.	Among the 90 bystanders included were four cases of OHCA, where CPR was initiated after live video transmission began. Six bystanders experienced signs of life from cardiac arrest patients during CPR. Five patients began to move, one patient opened his eyes, and three patients made sounds. Agonal breathing was present in 14 (26.9%) patients some time during the video.
(Hardeland et al., 2017) A prospective, interventional study implementing targeted interventions in the Norwegian EMCC (Oslo and Akershus).	Five hundred and twelve and 330 OHCA calls were assessed for elimination gibility during the period before and after the intervention, respectively. Three hundred and thirty-one and	There were no significant differences in patient characteristics or outcomes in the included OHCA cases during the two periods, except for the ambulance response interval, which was one minute shorter in the post- intervention period.

	230 OHCA calls duringthe pre- and post-intervention periods met predetermined inclusion criteria and were included for further analysis	
(González-Salvado et al., 2018) CAREBAS is a 6-month prospective study used to assess the effect of two educational intervention.	A total of 114 patients were included in this study. Of these, 3 in each group were excluded from the T2analysis because they left the program or did not fulfill the required minimum 80% training sessions for any reason including work, illness or injury. All patients who attended an exercise- based cardiac rehabilitation program between February 2016 and February 2017 and their families were invited to participate in this study. Eligible participants arethose who are >18 years old, medically stable and physically an d psychologically able to attend the training. All subjects gave their written consent to participate.	Exercise-based cardiac rehabilitation programs provide an optimalframework for implementing BLS learning among cardiac patients and their families, by leveraging existing resources. Integration of CPR live rolling refreshers into exercise training improves patient retention of the BLSprotocol, as well as self- perceived confidence andpreparation for action. This formula can be exported to other programs with affordable inversions, resulting in increased numbers of trained citizens and observer-initiated BLS. Further studies are needed to assess the long-term retention of these skills andthe impact of such strategies on the patient's familiar setting.
(Meinich-Bache et al., 2018) researcher designan experimentalby using a smartphone camera with an algorithm that is adapted to the training needs of giving CPR	on the ground beside the patient. From the movement detected, the algorithm estimates ches tcompressions rate and hands-off time and provides: (1) real-time objective feedback to observers, (2) real-time objective feedback to operators during emergency calls, and (3) reports CPR summary. 2.1.	observers, compression levels, camera positions and noise conditions. This technology can be used to measure and improve the quality of phone CPR and minimize hands-off time.
(Lu et al., 2018) randomized controlled simulation study during the study period at the National Taiwan University	Participants eligible for enrollment include healthcare providers aged 20-	Standard high quality CPR for healthcare providers are also reviewed during demonstrations.

Hospital(NTUH) ED.	65 years, currently holding a clinical license to practice nursing or medicine and board certification in an acute care facility, currently involved in caring for adultpatients in an acute care facility, and currently hold a valid ACLS certificate issued by a recognized organization such as the AHA or otherrelevant authority. Individuals who were medical students, younger than 20 or older than 65 years, without an active ACLS certificate, or individuals primarily involved in caring for pediatric patients were excluded from thestudy.	Thereafter, participants were randomly allocated to the intervention or control group by simplerandomization using a coin toss.27 Without any trial, all participants were asked to perform CPR for two minutes, with chest compressions and ventilations at a 30:2 ratio. They performed CPR on a QCPR Resusci Anne training dummy (Laerdal Medical, Stavanger, Norway) placed on the floor
(Krikscionaitiene et al., 2016)randomized controlled trial comparing observer CC quality using Andrew'smanoeuvre (four-handed CC) versus standard HO-CPR (two-handed CC) during simulated DA-CPR	The setting is two classes in the Disaster Medicine Department of the Lithuanian University of HealthSciences. Laypeople aged 50 years and over wererecruited from August to November 2013. We posted invitation letters with the online Google registration form and shared them via Facebook.	Sixty-eight lay rescuers were considered for participation in this study (Fig. 2). There were 49 female participants and 19 male participants. One man was excluded from the study because of high blood pressure. Descriptions of all study groups are presented in Table 1. The male and female groups were compared according to age, height, weight, and weakness scale. Therewere 4 women in the control group who attended previous BLS training (mean time from last training was 24 months). Other participants had no previous BLS training experience. Data obtained from 66 bystanders were used for further analysis.

Table 2. Intervention summary

NO Author and year	Strategy or program
(Stroop et al., 2020)	***Education programs*** Using a cell phone positioning system, people with smartphones can be found and sent to assist suspected patientsOHCA. Thisapproach has been implemented in several countries. However, the literature placing use of such systems in relation to OHCA casualty outcomes is scarce. The most important study addressing this issue was published in 2015 by Ringh et al. These authors recruited 9828 lay volunteers in metropolitan settings. About half are trained in CPR. The mobile positioning system is activated at the dispatch center in parallel with a dispatch ambulance during OHCAsuspect. All volunteers withina 500 m radius of the patient received computer-generated phone calls and text messages with patient location information. The rate of CPR performed by lay observers increased by 14%using this intervention. No effect was shown in terms of ROSC rate and 30-day survival. Contrary to Ringh's research, the volunteers in our study were not completely laypeople and mostof them had a medical background. As this could impact the motivation and quality of resuscitation measures, we differentiated the data for lay-bystander-initiated CPR and MobileRescuer-initiated CPR and evaluated them separately. Nearly half of all alarms triggered, Mobile-Rescuers arrive at thescene. This result shows a high level of commitment among the volunteers in our project. Other authors only reported a much lower response rate of 23%.
(Linderoth et al., 2021)	***Education programs*** The training includes simulation-based scenarios with unconscious patients and cardiac arrest cases with a focus on high-quality, real-time guided CPR at the same time (video- instructed DA-CPR). When the medical dispatcher receives a call of suspected OHCA, they first initiate ambient CPR using the audio call already connected to prevent delayed chest compressions. After that, the medical operator asked if there were more

	than two bystanders present and if video-enabled smartphones were available. If both conditions are met, the medical operator adds live video to the emergency call. According to the video instructed flow chart (Appendix 1), the medical operator mainly evaluates the correctness of the hand position, the compression rate, the compression depth, and whether there is chest recoil. Based on this information,
(Hardeland et al., 2017)	***Education programs*** In-depth analysis of the quality of care during the baseline period utilizing observations, interviews and a step-by-step cardiac arrest process was used to develop a customized educational and training bundle that covered the key learning objectives identified by the operators and the research team. 14 These key issues were included in traditional, e-learning web-based lectures. and simulation training. The intervention was targeted at increasing recognition of cardiac arrest, and shortening the time to first chest compressions and consisted of four distinct elements; (1) Lecture that includes a presentation on their key process quality measures at baseline, general education on agonal breathing (including video clips of agonal breathing), pre-and in-hospital arrest care, and practical tips on interrogation strategies and ongoing coaching. This session lasts half a day. (2) Simulation training where participants simulate five scenarios in turn as dispatchers and callers. This scenario is further complicated by themes that are developed based on challenges identified during the baseline period (child arrest, healthcare provider as caller, difficult/depressed caller). All scenarios are followed by debriefing with six to eight participants and two or more moderators in each group. This session lasts approximately three hours and follows lectures. (3) Structured operator feedback in which the operator is provided with a written performance evaluation after each cardiac arrest call containing information on cardiac arrest recognition, potential reasons for not recognizing cardiac arrest, and relevant time intervals.

(González-Salvado et al.,2018)	***Education programs*** Different training strategies were applied in each group during the cardiac rehabilitation program. Patients in the G-Stan attended conventional aerobic resistance and strength training. Patients in G-CPR received rolling refresher CPR directly on theMiniAnne© man ikin integrated in training sessions at 30-second/2-week incremental intervals starting at 30 seconds, until they achieved continuous 2-minute compression-only CPRtraining at week 7 and 8. No specific reminders about the BLS protocol were given to any of the groups during the program or afterwards.
(Khan et al., 2022)	***Education programs*** Scenario-based training is provided to participants to help them reflect on real situations and increase their understanding. In addition, the facilitator continues to provide participants with feedback on CPR techniques as they demonstrate the manikin. Furthermore, we conduct a post-training evaluation to improve the training experience for the next training participant.
(Krikscionaitiene et al.,2016)	***Education programs*** On the basis of randomization results, the investigator told the EMS officer to read out the standard text (control group) or standard instructions plus CC with Andrew's maneuver (intervention group). Next, the instructor places an iPhone 4 withthe speaker turned on next to the dummy's head and invites theparticipants to enter the class. The instructor asks the operator (by saying "Begin") to start the simulation and the operator readsthe text of the standard MPDS ProQA® software (release v12.1,2010) aloud: "Listen carefully, and I will tell you how to do resuscitation. Place the heel of your hand on her sternum in the center of her chest, right between her nipples. Place your other hand on top of that hand. Push down firmly 5 cm with only the heel of your bottom hand touching your chest. Now, listen carefully. Pump your chest hard and fast, at least twice persecond. Let the chest rise deep between pumps. We will do this up help can take over. Counting out loud so I can count with you.One two three four…."
(Lu et al., 2018)	***Education programs*** Participants were recruited and eligibility

	assessed. All enrolled participants received a two-minute demonstration of the smartwatch feedback feature by one of our researchers prior to the experiment.High-quality CPR standards for healthcare providers were also reviewed during demonstrations. Thereafter, participants were randomly allocated to the intervention or control group by simple randomization using a coin toss.27 Without any trial, all participants were asked to perform CPR for two minutes, with chest compressions and ventilations at a 30:2 ratio. They performed CPR on a QCPR (Laerdal Medical, Stavanger, Norway) Resusci Anne training manikin placed on the floor in one of our ED observation units.
(Meinich-bache et al., 2018)	***Education programs*** The observer sits next to the patient with a smartphone in his hand. He pressed the emergency call button and placed the smartphone on the ground. For approximately 20 seconds, the observer checks the patient's pulse and respirations before starting chest compressions. Next, four continuous compression intervals of 120 seconds and a 20 second pause while checking breathing are followed. The total sequence time is approximately 580 seconds, which isa typical response time for medical assistance.

CPR bypassr existing in the community is associated with possibly increased levels of SR in SCA-OHCA patients. The AHA and the American Red Cross (ARC) are seeking to increase CPR training in the public domain without specifying which individual specificqualifications should be targeted for inclusionin training. However, the AHA and ARC instructed health workers to involve the community in efforts to improve and introduce CPR with the slogan "EveryoneCan Play a Role in Efforts to Promote and Facilitate CPR Training". This means that everyone plays a role in the promotion and provision of CPR training facilities (Blewer etal., 2017). Real Time Feedback (RTF) is definedas the medium used to respond directly to changes in the quality of the CPR provided (Gruber et al., 2012). The use of RTF is focused on increasing the effectiveness of CPR training with the aim of reducing the gapin providing high-quality CPR (Cortegiani et al., 2018). RTF provides an opportunity for trainees to improve their own CPR whilelooking at the RTF provided (Tanaka et al., 2019). Previous studies on the use of RTF have been carried out by experts. There areseven commercial tools that are widely recognized as tools for conducting CPR training, namely, “CPR-plusTM(Stroop et al.,2020)(Kelly Medical Products, Princeton, USA), CPREzyTM (Health Affairs, London, UK), Zoll PocketCPRTM (Zoll Medical, Chelmsford, USA), Laerdal CPRmeterTM (Laerdal, Stavanger, Norway), Philips HeartStart-MRxTM monitor/defibrillator (Philips , Medical, Chelmsford, USA), Laerdal CPRmeterTM (Laerdal, Stavanger, Norway), Philips HeartStart-MRxTM monitor/defibrillator (Philips, Andover, USA) with Q-CPRTM technology (Laerdal), ZollAED plusTM, and Zoll AED proTM with Real-CPR-HelpTM (Zoll Medical)”. Some of the above tools have been used in fifteen CPR courses, five of which were applied to clinicalcases (Gruber et al., 2012).

The development of RTF technologycombined with communication tools such asmobile phones can provide wider opportunities for anyone who wants to learn CPR. Gruber et al (2012) explained that the use of seven CPR training tools requires a software connection on a smartphone with hardware on a mannequin, although not everyone has a mannequin. However, currently with the cam-app 2.0 QualityCardiopulmonary Resuscitation (QCPR), accompanied by an online center servicecommand can direct the delivery of high- quality CPR (Meinich et al., 2018) using onlya smartphone.The advantage is that you don't need a connection to the mannequin, you just need to display your body posture and CPR movements. The images decodedby the smartphone will be converted intohigh-quality CPR rendering data.

Discussion on the capacity ofadolescents in providing first aid in cases of cardiac arrest related to the Youth Red Cross(PMR). PMR is a forum for student activitiesoutside of formal school activities and into extracurricular activities (PMI, 2013). The Youth Red Cross (PMR) is a forum for fostering and developing the youth of PMI members (Nuchrawaty, 2008). The Red Cross's major scope is in the humanitarian field. In particular, there is the Youth Red Cross (PMR) which is part of extracurricular activities at school. In general, PMR acts as a volunteer, in blood donation activities, fundraising and so on. Special PMR activitiesfor first aid in accident cases are more directed at trauma and not for first aid for heart attacks (Pardjamin, 2007).

CONCLUSION

Educational strategies to increase the ability of cardiopulmonary resuscitation in lay person are more associated with the useof media smartphones based android or iOS. The use of the right media can have a big impact in improving knowledge,motivation and precision perform CPR. Futher researches needed to develop those skills either by the android device or any other support equipment.

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