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Proactive Behavior in Basic Life Support Education for Adolescents in Densely Populated Areas

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ABSTRACT

Out-of-hospital cardiac arrest (OHCA) is most common in densely populated. Adolescent students are expected to contribute to the rescue as part of the social fabric. This study aimed to examine changes in the proactive behavior of school adolescents in basic life support education. The research used a pre-experimental design with one group pretest-posttest on 102 respondents at SMK Multimedia Mandiri Jakarta using descriptive and Wilcoxon tests. The results showed that the respondents were predominantly late-phase adolescents (59.8%), male (79.8%), not family members working in health services (95.1%), and not familiar with basic life support (79.4%); (2) The cooperative behavior of adolescents in basic life support education show an increase in cognitive aspects, with an average pre-test score of 52 (bad) to 83 (excelent) in the average post-test score; (3) The results of proactive behavior show a significant clout on the readiness of adolescents in providing basic life support in the community environment living in densely populated settlements ($p<0.001$). The proactive behavior of teenage students as part of the community in basic life support education is very important. In addition, this study has implications for the independence and readiness of school adolescents to assist victims of out-of-hospital cardiac arrest (OHCA), especially in densely populated areas.

Key Messages:

- Out-of-hospital cardiac arrest (OHCA) is a time-critical emergency that requires multiple partners to act in unison to save one life.
- Proactive behavior reflects how people integrate their environment into a relationship, influenced by behavioral factors such as habits and routines. This behavior is expressed through responses learned during socialization, resulting in patterns that reflect life choices shaped by environmental and social determinants of health

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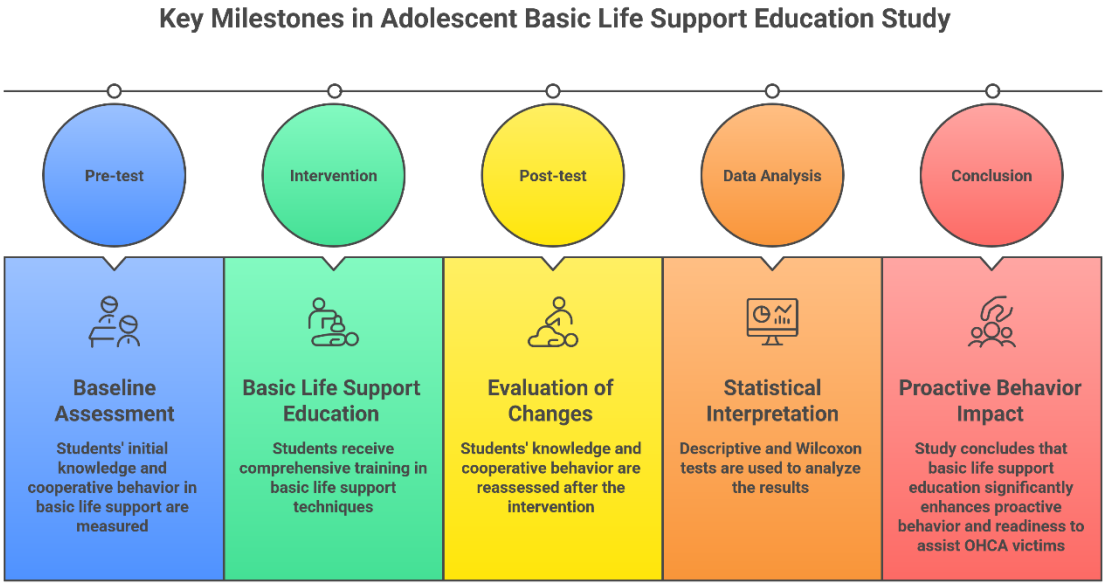
GRAPHICAL ABSTRACT



INTRODUCTION

The problem of medical emergencies that have not been resolved to date and is still a burden for developed countries and low economic countries is out-of-hospital cardiac arrest (OHCA) (1). The prevalence of out-of-hospital cardiac arrest (OHCA) worldwide is around 235 per 100,000 (2). In developed countries such as the United States, Australia and European countries, the prevalence of out-of-hospital cardiac arrest (OHCA) ranges from 30 to 97 per 100,000 (3). In Indonesia, the prevalence of out-of-hospital cardiac arrest (OHCA) is still high every year, around 300,000 up to 350,000 (4). This event cannot be predicted in time and place, so that it can happen anywhere and at any time (5). The high incidence of out-of-hospital cardiac arrest (OHCA) places significant pressure on the healthcare system (3).

Actions taken to reduce the number of patients dying due to out-of-hospital cardiac arrest (OHCA) are the implementation of basic life support (1). This action has been proven effective and positively impacted (6) because it increases life expectancy by 29.7% (7). The United States (3), Singapore (8), Japan (1), and Saudi Arabia (9) have reported life expectancy rates for victims of out-of-hospital cardiac arrest (OHCA). Meanwhile, in Indonesia, the life expectancy level of victims with OHCA has not been identified (10).

The lack of identification of the life expectancy of victims with out-of-hospital cardiac arrest (OHCA) in Indonesia does not mean that the government is silent and does not resolve this health problem. The Indonesian government has established guidelines for managing health crises (11). However, obstacles were found, namely, a shortage of health personnel resources (12), transportation obstacles such as traffic jams, long access to health services, and densely populated environments cause out-of-hospital cardiac arrest (OHCA) victims to die (5). The public certainly wants to help. Still, they don't understand the steps to help (10). A strategy is needed to overcome obstacles and reduce the high mortality rate due to out-of-hospital cardiac arrest (OHCA) by implementing proactive behavior developed by Nola Pender (13). Proactive behavior based on the health promotion model is a way to change the behavior of individuals or families or communities by identifying detrimental factors by taking action to improve health (14).

The steps for implementing proactive behavior are determining characteristics, changes in cognitive behavior, and behavioral outcomes (13). The lack of understanding about out-of-hospital cardiac arrest (OHCA) assistance has become an impetus for empowering communities by providing basic life support education to children until older people (15). However, based on their development at the childhood stage, they focus on playing; at the adult stage, they think logically and think a lot, and at the elderly stage, their memory decline. The teenagers stage is the most appropriate group for providing

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primary life support education (16) because, based on cognitive development, adolescents can store declarative(17,18), procedural, and conceptual information in the long term (19). The basic life support education to be provided must specify learning outcomes and methods to improve cognitive behaviour (2). Researchers have found many published articles involving teenagers in basic life support knowledge in Indonesia, but they are limited to community service articles that only focus on knowledge. Researchers have not found articles that use a proactive behavioral approach to school adolescents in densely populated residential areas in Indonesia (20).

This article aimed to examine changes in the proactive behavior of school adolescents in basic life support education. The specific objectives of this study are to analyze the characteristics of respondents who take basic life support education, analyze the understanding of basic life support education in school adolescents in densely populated residential areas as a form of improving cognitive behavior, and analyze the influence of basic life support education as an outcome of proactive behavior in school adolescents in densely populated residential areas.

METHODS

This research uses a pre-experiment method with a one-group pretest-posttest design (21). The consecutive sampling method (22) based on fulfilling criteria and a predetermined research range (23) by recruiting teenagers as respondents in vocational high schools. All respondents received pre- and post-tests regarding basic life support education. Researchers used G*power (24) to determine the number of samples in this study. Researchers used the G* Power 3.1 software by selecting the proportion one-group sign test. Next, the researcher selected two-tailed input parameters to determine whether there was a difference in teenagers' understanding levels. It is known that the assumption of an effect size (f^2) of 0.20 indicates a large effect, alpha (α) 0,05 (0.05 (possibility of error), power of the test 0.95 (25). The minimum total sample required in this research is 79 respondents, adding 20% as an anticipated sample. The inclusion criteria include teenagers aged 12 to 18 years, studying at SMK Multimedia Mandiri Jakarta, not participating in competitions or exams, and having the consent of the respondent's parents. Exclusion criteria: teenagers are sick.

We created 10 multiple-choice questions on basic life support, based on the American Heart Association (AHA) guidelines, as an instrument to measure respondents' knowledge. Before distribution, we asked high school language teachers for help regarding language and understanding the questions. Next, we tested the level of understanding of the questions by distributing them to 10 high school students from other schools. The pre-test and post-test questions are the same. The questions asked included (Q1) the definition of basic life support; (Q2) the name of the action carried out in basic life support; (Q3) initial steps that must be considered before assisting; (Q4) the surface laying of victims with cardiopulmonary arrest; (Q5) initial assessment stage to determine the victim's level of awareness; (Q6) position of the victim's body before cardiopulmonary resuscitation is given; (Q7) the length of time evaluating the presence or absence of breathing and the patient's carotid pulse; (Q8) speed of cardiopulmonary resuscitation measures; (Q9) compression given during cardiopulmonary resuscitation measures; and (Q10) depth of compression in cardiopulmonary resuscitation measures. Researchers categorized the assessment results as fail with a score of <50, poor with a score of 50-59, fair with a score of 60-69, satisfactory with a score of 70-79, excellent with a score of 80-89, and e outstanding with a score of 90-100 (26).

A web-based cognitive evaluation survey via Google Forms was used in this study. The survey was set to filled in only once. For respondents who experienced difficulties with the pre-test and post-test questions, the research team immediately lent them their smartphones, helping them enter their registered email addresses and allowing them to work on the pre-test and post-test questions using the researcher's smartphone. The learning process used the lecture method; researchers needed a classroom, a laptop, and a projector. Furthermore, the demonstration method learning used a cardiopulmonary resuscitation mannequin and a defibrillator.

This research involved two stages. In the first stage, we inquired with the health department about out-of-hospital cardiac arrest (OHCA) incidents in the research team's work area, which is categorised as highly susceptible. This research was conducted in West Jakarta, in the Kebun Jeruk subdistrict in the Kedoya

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area, with a high population density, as shown in Figure 1. We selected adolescents (27) as study respondents and chose a school in a densely populated area. In the second stage, we submitted an ethics review. After obtaining approval, we contacted the school and met with them directly, and we requested permission from the respondents' parents, per the inclusion criteria. We introduced ourselves, established a trusting relationship, and explained the purpose and objectives of the research to the respondents. We asked the respondents' parents or guardians to sign a consent form and an informed consent form. Respondent data will be kept confidential. Research assistants, and we have received internationally accredited basic life support training certificates from the American Heart Association (AHA). The school determined the research implementation time.

Preparation and implementation of the research took six days. During the research, we gathered all respondents. Research assistants, and we directed respondents to use their smartphones to access the shared Google Form link and complete the pre-test questions. Respondents experiencing difficulties were immediately loaned smartphones, allowing them to independently complete the pre-test and post-test questions. After the pre-test, we divided all respondents into seven study groups. Each group comprised one researcher, two research assistants, and 15 respondents. The school provided a study space. The theoretical learning method was a 50-minute lecture. The material covered issues related to out-of-hospital cardiac arrest (OHCA), the importance of adolescents in assisting OHCA victims, and basic life support education guidelines(28), and a video on cardiopulmonary resuscitation, which can be accessed at https://youtu.be/d3YDqZsOEPo?si=2JeDqaGlL5Eg5SY- .

Next, we continued the study by providing learning materials through a demonstration method, gathering all respondents in the school hall, and having them study in groups. In the 40-minute demonstration, we demonstrated basic life support steps. Each group of respondents was given 120 minutes to practice independently with research assistants and us. Next, all respondents demonstrated basic life support. We provided two opportunities for respondents who did not meet the required steps for basic life support. The cardiopulmonary resuscitation demonstration evaluation lasted 240 minutes for respondents in each group. Next, we directed respondents to complete the post-test by entering their Google Form password and activating the randomization process, as the post-test questions were the same as the pre-test questions.

Statistical Package for the Social Sciences (SPSS) was used for data analysis, with statistical significance set at <0.05. This study contains all the data. Relevant demographic and study factors were summarized using descriptive statistics. The analysis examined the distribution of 10 multiple-choice questions on basic life support education, using descriptive statistics to analyze pre-test and post-test responses. The Wilcoxon test was used to assess the effect of respondents' abilities before and after basic life support education.

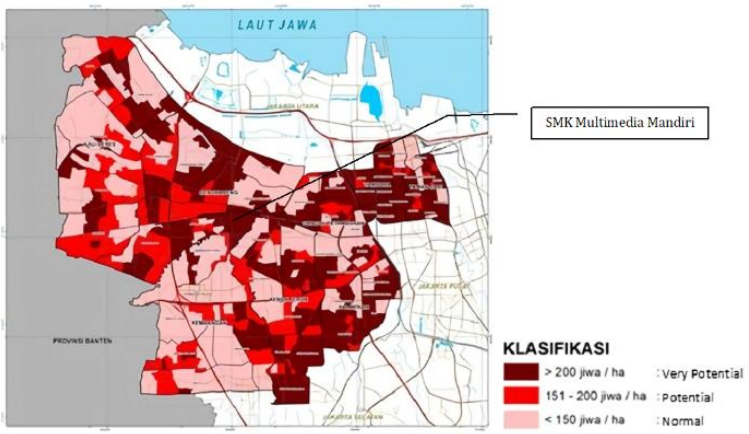

Figure 1. Population distribution in West Jakarta and location of basic life support education research sites

CODE OF HEALTH ETHICS

This research was carried out after passing the research ethics test at the Faculty of Nursing, Esa Unggul University with Nomor: 0924-01.078 /DPKE-KEP/FINAL-EA/UEU/II/2024.

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RESULTS

Characteristics

The researchers recruited 102 respondents. The respondents in this study were predominantly late adolescents (18 to 20 years), accounting for 59.8%. More male respondents participated, with 79.4% not having family members working in health services and 79.4% having never heard or read about basic life support (Table 1).

Table 1. Characteristics of respondents

Variable		Respondent	
		n	%
Age	Early Adolescence (12 to 14 years old)	1	1
	Middle Adolescence (15 to 17 years old)	40	39.2
	Late Adolescence (18 to 20 years old)	61	59.8
Sex	Male	81	79.4
	Female	21	20.6
The family is a health worker	No	97	95.1
	Yes	5	4.9
Have heard and read about basic life support	No	81	79.4
	Yes	21	20.6

Respondents' understanding of basic life support education.

Respondents' understanding of basic life support education is supported by the learning process provided and by the increased understanding shown in the pre-test and post-test, as seen in Figure 2. The pre-test results show they do not understand the names of the actions performed in providing basic life support (62.7%), the initial steps to take when finding a victim of cardiopulmonary arrest (62.7%), and the depth of compressions (58.8%). The post-test results on each question show that all respondents are starting to understand basic life support education. However, only 69.8% of respondents understood the meaning of basic life support, and 68.6% remembered the names of the actions performed during it.

In Table 2, 42.2% (n=43) of respondents who took the pre-test had scores <50 or were in the fail score category, and the mean score was 52, indicating that basic life support education was in the poor group. After respondents received basic life support education, 46.1% (n=47) scored 90-100, the outstanding score category, with a mean score of 83, indicating that the education was excellent.

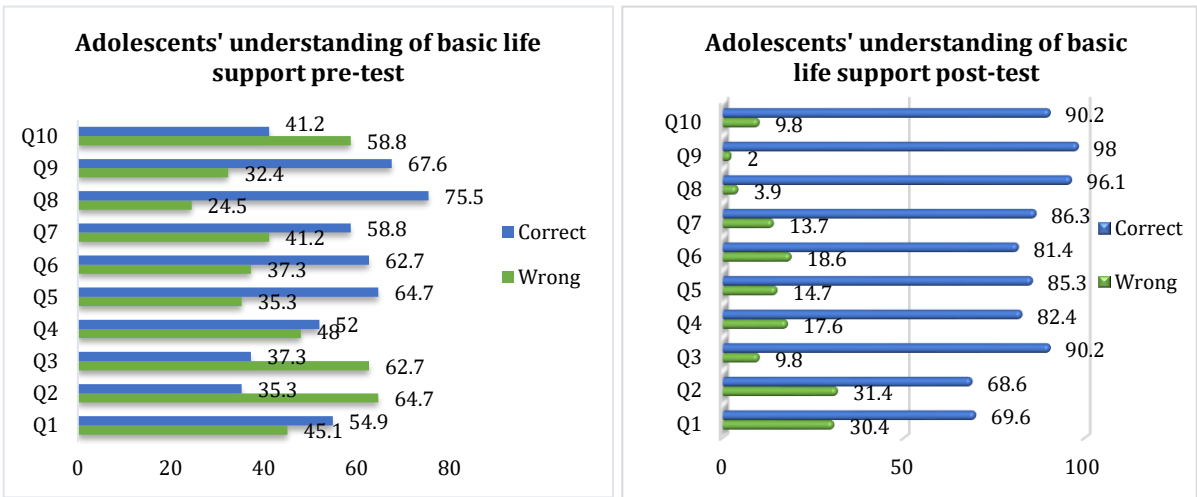

Figure 2. Changes in respondents' knowledge before and after receiving basic life support education.

Figure 2 shows the comparative efficacy of a basic life support (BLS) educational intervention by contrasting pre-test and post-test knowledge scores among adolescent respondents across ten specific assessment parameters (Q1–Q10). The baseline pre-test data reveals significant initial knowledge deficits in

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several domains, most notably in Q2, Q3, and Q10, where incorrect responses predominated at 64.7%, 62.7%, and 58.8%, respectively. Following the educational program, the post-test results demonstrate a significant and consistent increase in the proportion of correct responses across all evaluated questions. Most strikingly, areas reflecting the lowest initial comprehension exhibited substantial gains; for instance, correct responses for Q3 surged from 37.3% to 90.2%, and Q10 increased from 41.2% to 90.2%, while knowledge pertaining to Q9 peaked at near-universal mastery (98.0% correct). These robust upward trends across the entire assessment comprehensively indicate that the targeted BLS education was highly effective in systematically enhancing the adolescents' foundational understanding and successfully rectifying prior knowledge gaps regarding crucial life-saving procedures

Table 2. Understanding basic life support for school teenagers' pre-test and post-test

Variable		Pre-test		Mean Pre-test	Post-test		Mean Post-test
		n	%		n	%	
Basic life support learning materials	Fail (< 50)	43	42.2	52	0	0	83
	Poor (50-59)	15	14.7		6	5.9	
	Fair (60-69)	14	13.7		8	7.8	
	Satisfactory (70-79)	16	15.7		11	10.8	
	Excellent (80-89)	9	8.8		30	29.4	
	Outstanding (90-100)	5	4.9		47	46.1	

Influence before and after receiving basic life support education.

The Wilcoxon test in Table 3 shows differences in respondents' understanding before and after basic life support education. It is known that 87.3% (n=89) experienced an increase in knowledge of basic life support. The high number of respondents who reported an increase in basic life support education was found to have a significant influence ($p < 0.001$).

Table 3. Differences between pre-test and post-test in basic life support learning material

Variable	Pre-post changes; n (%)		
		n	%
Basic life support test	Decrease	2	1.9
	Increase	89	87.3
	Stay	11	10.8
	p-value	< 0.001	

*Wilcoxon Test

DISCUSSION

Out-of-hospital cardiac arrest (OHCA) is unpredictable, especially in densely populated areas (29). Densely populated settlements with narrow road access problems, dominated by people with low economic income, low education, and minimal knowledge, mean that victims cannot be helped (29,30). Not surprisingly, living in densely populated settlements has a high mortality rate (2). Health problems require a health promotion model in nursing practice (13,31).

The health promotion model in nursing practice, based on Nola J. Pender is a framework that aims to change lifestyle by supporting overall health and behaviour (Alligood, 2018; Da Silva de Aguiar et al., 2021). The health promotion model classifies three groups of propositional determinants, including individual characteristics, changes in cognitive behaviour, and behaviour outcomes (14). Individual characteristics describe the groups invited to support health programs (13); Cognitive behaviour change describes strategies to increase an individual's or group's understanding of supporting health programs; Behavioral outcomes explain the readiness of an individual or group to overcome the health obstacles they experience (13,14).

Teenage is a transition period between childhood and adulthood, accompanied by rapid physical, cognitive, social, and emotional maturity (27). Based on cognitive development, adolescents can store long-term declarative, procedural, and conceptual information (19) Adolescents are divided into young

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adolescents aged 11 to 14, middle adolescents aged 15 to 17, and older adolescents aged 18 to 20 (27). The cognitive development stage in adolescents has a sense of curiosity, cares about social problems, and can see issues comprehensively, including health problems, which is the impetus for providing basic life support education (27).

Basic life support is a series of actions to help individuals who experience cardiac and pulmonary arrest (32). This action determines the victim's survival by understanding each stage of basic life support assistance (6). Stages of aid to victims with out-of-hospital cardiac arrest (OHCA) related to basic life support measures include verifying the safety of the scene, checking the victim's consciousness, asking for help from people nearby, activating the emergency response system by contacting via mobile device, and asking someone else to bringing an external defibrillator (AED); perform high-quality cardiopulmonary resuscitation (CPR) by paying attention to fast compressions (push fast) 100-120 x/minute, push hard with a depth of 5 cm, full chest recoil, minimum interruptions, compression changes for 2 minutes if more from 1 rescuer, avoid excessive ventilation, and if there is no advanced airway, the chest compression-ventilation ratio is 30:2; and defibrillation (6,32); and administering defibrillation if an AED device is available, immediately continue CPR for 2 minutes until the AED device allows a rhythm check (32). During defibrillation, rescuers should not touch the victim (6). Basic life support measures are stopped if the patient's heart rhythm and breathing are spontaneous, the rescuer feels tired, the rescuer feels his safety is threatened, and the emergency team arrives to provide advanced life support (32). The next step for survivors is to receive post-cardiac arrest health services, and victims receive healing services (6,32).

Characteristics of teenagers' interest in basic life support education in health promotion model

Basic life support is interested in being followed by teenagers. Respondents classified as early adolescents (12 to 14 years old) were less interested in participating. The disinterest of young adolescents aged 12 to 14 years in basic life support education is due to the developmental stage at that age; young adolescents focus on rapid body changes, think individually, curious for new values and things, try out various roles, are attracted to peers, and easily experience low self-esteem. Apart from that, psychologically, young adolescents experience rapid mood swings, daydream more, and become irritable (27). Meanwhile, middle and advanced adolescents have the capacity to think abstractly, have intellectual strength, are interested in social problems that occur in society, are sensitive to environmental issues, can see problems comprehensively, have open insight, are related to various fields in improving skills as capital in their future front, and has emotional resilience (15,27). This causes middle and late teens to be interested in basic life support education (15).

Teenage male respondents dominate. This is because adolescent males have a high sense of curiosity, feel challenges related to technical learning, and have self-confidence so they do not feel embarrassed (27). Other research shows that nothing influences gender because gender is not a barrier to getting to know basic life support education (15). Most respondents' families do not work in health services, so they need to become more familiar with basic life support. Their ignorance regarding basic life support education certainly causes them to tend to be afraid of assisting cardiac arrest victims outside the hospital and can only help inform emergency services or simply pay attention to the victim (33). Of course, attitudes and actions are needed to provide basic life support education (15,33).

Respondents have yet to hear or read much about basic life support. It is known that public literacy in Indonesia is still low, so it is natural that people need to learn the importance of basic life support in helping OHCA (34). It is known that public literacy in Indonesia is still low, so it is natural that people need to learn the importance of basic life support in helping OHCA (33).

Behavior, cognitions, and affect on teenagers' understanding of the basic life support education health promotion model.

Providing basic life support education to adolescents has been shown to increase their understanding, even though adolescents are known to find it difficult to develop the motivation to learn (18). Motivation to learn can be increased by involving teenagers in examining OHCA problems. The existence of these problems encourages teenagers to feel curious and engaged in solving these problems

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(2). Apart from that, fostering motivation to learn can be done by designing learning in basic life support education. The role of instructors in providing basic life support education is very important (27).

The success of the learning process leads instructors to set learning objectives using Bloom's taxonomy as a hierarchical structure for identifying thinking skills(35). This research guides respondents to understand basic life support education. The next step requires a learning strategy to answer the learning objectives (15). At this stagwe, instructors must be familiar with adolescent development to achieve active, focused learning and foster a caring attitude to assume shared responsibility for overcoming OHCA (2). As for answering learning objectives, the instructor determines the learning method. Learning methods in basic life support education can use the Miller pyramid. Miller's pyramid is a learning method nursing applies to measure a person's competency achievements and skill development. Based on the learning objectives based on Bloom's taxonomy, the learning method in the Miller pyramid prioritizes the knowledge base. Based on Miller's pyramid, the learning method used is lecture as "know" and demonstration using teaching aids as "know-how" (36). The lecture method is the most basic learning activity, causing students to become passive and bored when following it (37). Instructors must have interactive strategies to focus attention and minimize distractions (12,37). Instructors must have interactive strategies to focus attention and minimize distractions (37). The relevance of the material presented to teenagers includes the problems they are facing, the importance of the role of teenagers in helping to solve these problems, and basic life support material (32). The success of this method can be seen from the absence of sleepy and bored facial expressions and the students' activeness in asking and answering questions. The length of the lecture learning method has yet to be found relevant to delivery time (15). Instructors who succeed in building a willingness to learn basic life support education can continue with the following learning method, namely demonstrations using teaching aids (38). Demonstrations with teaching aids have been proven to motivate teenagers and focus attention on the learning process so that the hippocampus function automatically records what has been taught. Exams are a step to assess the success of learning methods given to teenagers based on an agreement to answer learning objectives (19). Based on the learning method in the Miller pyramid, multiple choice questions are the appropriate test to determine the success of basic life support education. Assessing the results of participants' level of understanding can be in the form of numbers that are converted into categories. The categorizations include failed, inadequate, sufficient, satisfactory, good, and extraordinary. The higher the value obtained from the learning results, the learning method is considered successful (38).

Influence of basic life support education on teenagers as a behaviour outcome health promotion model.

Basic life support education impacts school teenagers in densely populated areas. The influence of basic life support education provided to teenagers cannot be separated from the role of the instructor. The instructor prioritizes the learning process by involving teenagers' physiological and psychological functions (15). Physiological functions include activating the sensory system by directing teenagers to listen to material presented by the instructor, being engaged in questions and answers or discussions between the instructor and teenagers (4), the instructor demonstrating basic life support actions, and allowing teenagers to carry out basic life support simulations (5). The learning process is physiological, the instructor provides learning materials according to the cognitive development of adolescents who can store declarative, procedural and conceptual information in the long term even though the basic life support educational learning time obtained is limited (8,27). In psychological learning, the instructor understands the developmental stages of sensitive and caring teenagers who want to solve problems comprehensively (2,31). The involvement of physiological and psychological functions provides a reaction that encourages teenagers to understand basic life support education so that teenagers become confident and ready to give help to OHCA victims so that the victim's life expectancy is high even though they are in a densely populated environment (3,33). This can encourage future researchers to conduct further research by identifying the level of life expectancy of patients who receive help from the community who have received basic life support education in densely populated areas.

The limitations of this research were that it was conducted at only one school, took only 1 day and

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7 hours to complete, and the exam to evaluate understanding of basic life support education was multiple-choice only.

CONCLUSION

Basic life support education for school adolescents, based on a health promotion model in nursing practice, has an influence in densely populated areas, including characteristics, cognitive behavior, and behavioral outcomes, considering that sudden cardiac arrest (OHCA) can occur. The health promotion model in nursing practice can ensure that school adolescents are prepared and enthusiastic to assist OHCA victims.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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