

Comparison of simulation and video based CPR education on high school students knowledge and skills

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Abstract

Background: Cardiac arrest is an emergency condition that requires immediate, rapid, and appropriate assistance, as delays can worsen the condition and increase mortality rates. Knowledge and skills in cardiopulmonary resuscitation (CPR) are important to apply in various social settings, including among school students. Early education is expected to improve these skills.

Method: This study is a quasi-experiment with a pre-test and post-test design on two intervention groups, involving 80 students selected using cluster sampling. Data were collected via questionnaires and skill assessment sheets and analyzed using the Wilcoxon and Mann-Whitney tests.

Results: CPR education significantly improved knowledge and skills in both groups ($p < 0.001$). The Mann-Whitney test revealed a difference in skill effectiveness, with the simulation method having a mean rank of 46.23, higher than the video method's 34.78 (p -value = 0.027). Meanwhile, there is no difference in knowledge between simulation and video (p -value=0.327)

Conclusion: CPR education significantly improved high school students' knowledge and skills in both the simulation and video groups. While there was no significant difference in knowledge outcomes between the two methods, simulation was more effective than video in improving students' CPR skills.

Keywords: CPR; Knowledge; Students; Skill

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death worldwide (1). One of the most common cardiovascular diseases is cardiac arrest, which is characterized by sudden loss of consciousness, respiratory arrest, and no pulse. This condition is caused by a lack of blood supply to the brain, which, if not treated immediately, will lead to organ failure and death (2,3). Cardiac arrest is a medical emergency that requires immediate, prompt, and appropriate assistance because if it is not treated immediately, it can cause other problems that worsen the condition and increase mortality rates (4).

The 2023 Indonesian Health Survey (SKI) on heart disease in all age groups, based on doctors' diagnoses, shows that Indonesia has a rate of 0.85% with a total of 877,531 individuals affected. In Jambi, the incidence of heart disease is 0.47% and will continue to increase if the lifestyle and social environment of the community remain poor. In addition, the majority of heart disease patients

die before receiving specialist help, especially in cases of cardiac arrest. The first aid that can be given in cases of cardiac arrest is chest compressions or cardiopulmonary resuscitation (CPR) (5).

Cardiopulmonary resuscitation (CPR) is a first aid measure performed to restore and maintain the function of vital organs such as the heart and lungs in cases of cardiac arrest and respiratory arrest (6). This assistance involves applying pressure to the chest area or chest compressions and opening the airway (7). Chest compressions on cardiac arrest victims have been proven to reduce mortality rates; chest compressions, as a form of basic life support, should be performed until medical assistance arrives (8). This is a particular concern for each country to increase public knowledge regarding CPR (9).

Based on previous research and recommendations from the American Heart Association (AHA), children aged 15 years and above are ready and able to receive knowledge related to CPR because it can give

them confidence and have a positive influence in dealing with situations that require CPR (10). High school students are at an age where, when given proper stimulation, their curiosity, memory, and motivation will increase. This is inseparable from the learning process they undergo in the school environment (11).

The AHA guidelines state that cases of out-of-hospital cardiac arrest (OHCA) occur more frequently at home, and teenagers who generally still live at home with their families are expected to be first responders in administering CPR at home and at school (10). CPR simulation training conducted as early as possible opens up greater opportunities for adolescents to play a role and reduce dependence on health services, so that the positive impact is not only received by the students themselves but also by victims and health services (12).

Research by Nikmah, conducted in Bandung at Karya Pembangunan Margahayu High School with a sample of 10th and 11th grade students, showed that before the intervention, the majority of students (62%) did not have sufficient knowledge and skills or were lacking (2). Another study conducted by Susilo at the State Vocational High School 1 Bawen, Semarang, showed that the level of knowledge and skills of students was categorized as not good enough, as evidenced by the average score, which was still below 80 (13). Therefore, CPR education is needed in every school as a form of student awareness and involvement in reducing mortality rates and increasing knowledge and skills related to CPR (14)

Knowledge and skills are the result of an object observed through the five senses, thereby obtaining knowledge (15). Actions based on knowledge and skills can improve the effectiveness and quality of work in certain fields (16). The ability to provide first aid, such as performing chest compressions or helping someone who is having difficulty breathing, can make a big difference before professional medical help arrives, it is necessary to conduct CPR-related learning in the form of training and education (17). Education is an effort made by a person to influence others

with the aim of increasing knowledge about a particular subject (15). The subject or topic to be discussed is then adapted to the media to be used. One media format that supports increased knowledge of CPR is simulations and videos (18).

Simulation is an effective learning method for improving individuals' knowledge and skills in handling emergency situations, such as cardiac arrest or respiratory arrest (19). Through simulation, participants can practice directly in situations that resemble real-life scenarios, so that they better understand the steps that must be taken quickly and accurately, such as chest compressions and artificial respiration (12). With repeated practice and constructive feedback, simulation helps participants memorize CPR procedures and increases their confidence in providing first aid (20).

In addition to simulations, improving students' knowledge and skills can also be done using video media, because videos are a form of audio and visual information delivery. The videos shown demonstrate the procedures or steps for performing CPR to restore heart and lung function. The use of CPR educational videos is very useful because it can clarify the concepts and techniques that participants must master, facilitate visual understanding of the movements, and improve retention and skills in performing life-saving actions quickly and effectively (21).

However, there has been no research specifically examining the level of knowledge and skills of students in Jambi Province regarding CPR. In fact, one of the efforts nurses can make to reduce mortality rates due to cardiac arrest is through providing appropriate education to students. Therefore, the purpose of this study is to determine the most appropriate and effective educational media for improving students' knowledge and skills regarding CPR.

METHOD

This study is a quasi-experimental study with two groups. Group 1 received an educational intervention using the simulation method, while Group 2 received an

intervention using videos. The study was conducted at SMA N 1 and SMA N 10 Jambi City for two weeks in April 2025. Measurements were taken twice, namely before the intervention (pre-test) and after the intervention (post-test). The population in this study consisted of 11th-grade students, totaling 718. The sample size was determined using the Lameshow formula with a standard normal value (z) of 0.1 (1.64) and a margin of error (d) of 10% (d=0.1). To minimize the dropout rate, the number of respondents needed to be increased by 15%, resulting in 39.70 respondents per group, rounded up to 40, for a total of 80 respondents. The sampling technique used in this study was cluster sampling.

The inclusion criteria for this study were 11th-grade students who had never participated in CPR training and were willing to participate as respondents. The exclusion criteria for this study were students who did not complete the consent form, students who did not fill out the consent form, and students who were absent. The instrument used to measure knowledge level was a questionnaire derived from previous research, which was then modified and tested for validity at SMA N 4 Kota Jambi, with the validity test results exceeding the table r (0.329), indicating that the questionnaire was valid.

Research on the simulation group was conducted to assess students' knowledge and skills regarding Cardiopulmonary Resuscitation (CPR).

In the video group, participants watched an educational video on CPR procedures with a duration of approximately 15–20 minutes. The video demonstrated the steps of basic life support, including assessment of responsiveness, calling for help, checking breathing, and performing chest compressions. After the video screening, a short question-and-answer session was conducted to clarify the material and ensure participants' understanding of the CPR procedure

The instruments used were questionnaires to measure knowledge and skill assessment sheets to assess students'

practical abilities. Measurements were carried out using a pre-test and post-test design, in which students were evaluated before and after receiving intervention in the form of a simulation. The meetings were held twice within a week, so that significant changes in students' knowledge and skills could be observed after participating in continuous simulations.

Meanwhile, the group that used videos as an educational tool aimed to improve students' knowledge and skills related to cardiopulmonary resuscitation (CPR). The instruments used included questionnaires to measure cognitive aspects and skill assessment sheets to evaluate students' practical abilities. The evaluation used a pre-test and post-test design to compare results before and after the intervention.

The research activity took place in two meetings over one week, with the aim of obtaining a more measurable picture of the effectiveness of using video media in improving students' knowledge and skills. The pre-test and post-test results were processed to obtain categories of good (≥80%), fair (60-79%), and poor (<60%). Furthermore, a normality test was conducted, and the results indicated that the data were not normally distributed; therefore, the data table presented the median, IQR, min-max, CI, and p-value. To assess the effect of the media, the Wilcoxon and Mann-Whitney tests were used to compare the media.

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine and Health Sciences, number 1120/UN21.8/PT.01.04/2025, ratified on April 17, 2025.

RESULTS

Table 1. Frequency Distribution Of Characteristics Of Grade XI Students (N=80)

Characteristics	Description	Simulation Group		Video Group	
		f	%	f	%
Gender	Male	20	50	20	50
	Female	20	50	20	50
	Total	40	100	40	100
Age	15 Years	1	2.5	2	5
	16 Years	15	37.5	15	37.5
	17 Years	24	60	23	57.5
	Total	40	100	40	100

It is known that the total number of respondents was 80, grouped into a simulation group of 40 respondents and a video group of 40 respondents. The characteristics of the respondents were divided into male and female with an equal number of 20 students (50%, 50%) aged 15-17 years, dominated by 17-year-old students (60%). The total number of respondents in the video group was 40, with the characteristics of the respondents divided into males and females with an equal number of 20 students (50%, 50%) aged 15-17 years, dominated by 17-year-old students (57.5%).

Table 2. Frequency Distribution of Knowledge and Skills Before and After Education

Level of Knowledge (Before)	Simulation Group		Video Group	
	f	%	f	%
Good	0	0	2	5
Fair	21	52.5	29	72.5
Poor	19	47.5	9	22.5
Total	40	100	40	100
Knowledge Level (After)	f	%	f	%
Good	37	92.5	30	75
Fair	3	7.5	10	25
Poor	0	0	0	0
Total	40	100	40	100
Skill Level (Before)	f	%	f	%
Good	0	0	0	0
Fair	0	0	0	0
Poor	40	100	40	100
Total	40	100	40	100
Skill Level (After)	f	%	f	%
Good	34	85	31	77.5
Fair	6	15	8	20
Poor	0	0	1	2.5
Total	40	100	40	100

The level of knowledge possessed by most respondents in the (simulation) group before the RJP education intervention was in the adequate (52.5%) and poor (47.5%) categories. The level of knowledge possessed by most respondents in the (video) group before the RJP education intervention was in the adequate (72.5%) and poor (22.5%) categories.

Based on Table 2, the level of knowledge possessed by most respondents in the simulation group after the CPR education intervention was in the good category (90%). The level of knowledge possessed by most respondents in the video group after the CPR education intervention was in the good category (75%).

The skills possessed by most respondents in the simulation group before the CPR education intervention were in the poor category (100%). The skills possessed by most respondents in the video group before the CPR education intervention were in the poor category (100%). It is known that the skills possessed by most intervention respondents after the CPR education intervention using the simulation method were in the good category (85%). The skills possessed by most respondents in the video-on group after the CPR education intervention using video media were in the good category (77.5%).

Table 3. The Effect of Basic Life Support Education on the Level of Knowledge and Skills in CPR

Knowledge	n	Median	IQR	Min Max	CI		p value
					Low.	Up.	
Simulation							
Pre-test	40	60.00	25	20-75	51.87	61.13	P <0.001
Post-test	40	85.00	10	75-100	83.16	88.09	P <0.001
Video							
Pre-test	40	67.50	15	35-80	61.44	68.81	P <0.001
Post-test	40	85.00	13	75-100	81.43	86.32	P <0.001
Skills							
Simulation							
Pre-test	40	33.30	5	25-36	31.68	33.96	.001
Post-test	40	88.80	11	69-100	85.39	90.36	.001
Video							
Pre-test	40	33.30	3	25-33	30.61	32.52	.001
Post-test	40	84.70	10	64-94	81.30	86.39	.001

The Wilcoxon test showed a significant improvement in students' knowledge after CPR education in both the simulation and video groups ($p < 0.001$). These findings indicate that both simulation-based and video-based CPR education were effective in increasing students' knowledge

The Wilcoxon test also showed a significant improvement in CPR skills after the intervention in both groups ($p < 0.001$). This indicates that both educational methods were effective in improving students' practical CPR skills.

Table 4. Comparison of Media on Knowledge and Skill Levels

Variable	N	Mean Rank	Sum Of Ranks	P-value
Knowledge				
Simulation	40	42.99	1719.5	0.327
Video	40	38.01	1520.5	
Skill				
Simulation	40	46.23	1849.0	0.027
Video	40	34.78	1391.0	

Based on the Mann-Whitney test, there was no significant difference in knowledge between the simulation and video groups ($p = 0.327$). This finding indicates that both educational methods were similarly effective in improving students' CPR knowledge.

However, there was a significant difference in CPR skills between the two groups ($p = 0.027$). The simulation group had a higher mean rank than the video group, indicating that simulation was more effective than video-based education in improving students' CPR skills.

DISCUSSION

The results of this study indicate that both media used are equally effective in improving knowledge and skills. However, based on the comparison test results, it was found that simulation is a more effective learning method than video to improve the skill.

Simulation is a learning or training method that mimics real conditions, situations, or processes in a controlled manner, through direct demonstration, physical models, or digital media, with the aim

of providing practical experience without incurring real risks (10). Through simulation, students can learn skills, understand procedures, and hone their decision-making abilities safely, making it effective across fields such as education, health, the military, and industry (10).

The effectiveness of simulation is influenced by the stage of information reception, which prioritizes practice based on previous theory or material, giving students the opportunity to experience situations directly involving all five senses. This increases curiosity, the desire to try, and the urge to start doing what they know, so that the theory or material obtained previously can be immediately put into practice rather than just imagined (10). This enables students to obtain information more quickly and minimizes differences in perception (17).

Video is a visual medium that displays a series of moving images, often accompanied by sound, used to convey information, messages, or entertainment in an interesting and easy-to-understand manner (22). In the context of learning, videos serve as an educational tool that combines audio and visual elements to help students understand the material more clearly, increase their interest in learning, and facilitate the delivery of concepts that are difficult to explain with only text or static images (23).

When receiving information through videos, students may not be able to maximize their learning due to a lack of interactive engagement with the presenter. However, the direct actions shown in the video that correspond to the theory or material presented earlier reinforce students' understanding. Even though it cannot be done directly, the images shown in the video can stimulate curiosity and a more intense thinking process. Therefore, students' thinking process does not stop at understanding the theoretical material but also extends to visualizing how the CPR procedure should be performed in real situations. This study is consistent with the findings of Metrikayanto et al. (24) which showed that both the simulation method and self-directed video had an effect on students'

CPR knowledge and skills. In addition, no significant difference was found between the simulation method and self-directed video in terms of CPR knowledge, attitudes, and skills among high school students.

The simulation method was found to be more effective than video in improving students' knowledge and skills. Simulation allows students to actively perform CPR steps, receive immediate feedback, and correct mistakes during practice. This active involvement may strengthen psychomotor learning and increase confidence in performing CPR. Meanwhile, using video provides visual and auditory information but does not allow students to practice the procedure directly. Therefore, although both methods improved knowledge, simulation was more effective in improving CPR skills.

The results of this study can serve as a reference for nurses in efforts to reduce mortality rates and dependence on hospital health services. Interactive education using simulation methods can be an option for nurses in improving students' knowledge and skills in the school environment

CONCLUSIONS

CPR education using both simulation and video-based methods was effective in improving high school students' knowledge and skills. There was no significant difference between the two methods in improving knowledge, indicating that both methods were similarly effective for cognitive outcomes. However, simulation was significantly more effective than video-based education in improving CPR skills. Therefore, simulation can be recommended as a more appropriate educational method for enhancing practical CPR skills among high school students

REFERENCES

1. Lubis E, Karim UN. Pelatihan Meningkatkan Keterampilan Caregiver Dalam Melakukan Bantuan Hidup Dasar (BHD) di Universitas Binawan Jakarta Timur. *Journal Human Resources 24/7 Abdimas: Abdimas*. 2023;1(2).
2. Nikmah BA, Ginting M, Sujana T. Pengaruh Pemberian Pelatihan Bantuan Hidup Dasar (BHD) terhadap Pengetahuan dan Tindakan BHD pada Siswa SMA Karya Pembangunan Margahayu. *Jurnal Kesehatan Kusuma Husada*. 2024;15(1):106–12.
3. Prayitno H, Puspitasari P, Setiawan DR. Pengaruh Pendidikan Bantuan Hidup Dasar Terhadap Pengetahuan Anggota Unit Kegiatan Mahasiswa Tim Kesehatan Sarjana Keperawatan Stikes Dharma Husada Bandung. *Jurnal untuk Masyarakat Sehat (JUKMAS)*. 2020;(2).
4. Noviandry H, Syakura A, Hafidah L, Suryadi EA, Sari AP, Kuzzairi K, et al. Pelatihan Bantuan Hidup Dasar (BHD) Awam untuk Siswa SMA. Nur Aini Fauziyah. 2024;5(2):16. DOI: 10.46306/jabb.v5i2
5. Kementerian Kesehatan Republik Indonesia. Laporan Tematik Survei Kesehatan Indonesia Tahun 2023. Jakarta; 2024.
6. Astuti Z, Nurjannah M. Basic Life Support. KHD Production; 2019.
7. Ambohamsah I, Arfa F, Tanjung R. Penyuluhan Dan Pelatihan Bantuan Hidup Dasar(BHD) Kecamatan Mapili Kabupaten Polewali Mandar. *Jurnal Abdidas. Universitas Pahlawan Tuanku Tambusai*; 2021;2(6):1356–61. DOI: 10.31004/abdidas.v2i6.481
8. Purwacaraka M, Erwansyah RA, Hidayat SA. Video Edukasi Resusitasi Jantung Paru (RJP) dan Membuka Jalan Nafas Untuk Menambah Pengetahuan Mahasiswa Sarjana Keperawatan Tingkat Akhir Sebagai

- Pemberi Pertolongan Pertama Di Masyarakat. *Lambung Inovasi: Jurnal Pengabdian kepada Masyarakat. Lembaga Penelitian dan Pemberdayaan Masyarakat - LITPAM*; 2023;8(2):319–26. DOI: 10.36312/linov.v8i2.1248
9. Nirmalasari V, Winarti W. Pengaruh Pelatihan BHD terhadap Pengetahuan dan Keterampilan Mahasiswa Kesehatan Masyarakat. *Jurnal Keperawatan Widya Gantari Indonesia*. 2020;4(2).
 10. Amyadin A, Supirno S, Malik SA, Amir A. Sosialisasi dan Simulasi Bantuan Hidup Dasar (BHD) Awam pada Pekerja Palabuhan Ampana. *Jurnal Kolaboratif Sains*. 2024;7(7):2671–7. DOI: 10.56338/jks.v7i7.5665
 11. Syapitri H, Hutajulu J, Gultom R, Sipayung R. Simulasi Bantuan Hidup Dasar di SMK Kesehatan Sentra Medika Medan Johor. *Communnity Development Journal*. 2020;1(3):218–22.
 12. Sari MN, Chrisanto EY, Isnainy UCAS. Pengaruh simulasi pelatihan bantuan hidup dasar (BHD) terhadap pengetahuan dan motivasi siswa tentang penanganan kejadian kecelakaan lalu lintas. *Holistik Jurnal Kesehatan. Universitas Malahayati Bandar Lampung*; 2021;15(3):507–17. DOI: 10.33024/hjk.v15i3.4754
 13. Susilo T, Maksun M, Mustain M. Pengaruh pendidikan kesehatan tentang bantuan hidup dasar (BHD) terhadap tingkat pengetahuan anggota PMR di SMK N 1 Bawen. *Jurnal Abdi Kesehatan dan Kedokteran. Lembaga Chakra Brahmanda Lentera*; 2022;1(1):27–36. DOI: 10.55018/jakk.v1i1.7
 14. Fauzan S, Kahtan I, Herman H. Pengaruh Pemberian Pendidikan Kesehatan Bantuan Hidup Dasar (BHD) Awam melalui Video terhadap Tingkat Pengetahuan Anak Sekolah Menengah Atas (SMA) di Kota Pontianak. *Jurnal Keperawatan dan Kesehatan*. 2021;12(2):66–74. DOI: 10.54630/jk2.v12i2.158
 15. Notoadmodjo S. *Promosi Kesehatan dan Perilaku Kesehatan*. Jakarta: Rineka Cipta; 2014.
 16. Fariya M, Utami S. Pengaruh Metode Simulasi Bantuan Hidup Dasar (BHD) Henti Jantung terhadap Keterampilan dan Efikasi Diri Mahasiswa. *Jurnal Kesehatan Samawa [Internet]*. 2025;(2). Available from: <http://e-journalppmunsa.ac.id/index.php/jks>
 17. Ade D, Hadju V, Perdana N. Pengaruh Latihan Bantuan Hidup Dasar Terhadap Tingkat Pengetahuan dan Keterampilan dalam Menolong Korban Tenggelam pada Siswa Madrasah Aliyah Negeri 2 Kota Tidore Kepulauan. *Journal of Health Quality Development*. 2024;4(1):6–12.
 18. Ramadia A, Redho A, Nofa FS. Pelatihan Bantuan Hidup Dasar terhadap Pengetahuan dan Keterampilan Anggota PMR. *Jurnal Keperawatan Silampari. IPM2KPE*; 2021;5(1):584–90. DOI: 10.31539/jks.v5i1.2972
 19. Hizrian EF, Yulendasari R, Isnainy UCAS. Efektifitas Simulasi Pelatihan Bantuan Hidup Dasar (BHD) Terhadap Peningkatan Pengetahuan Dan

- Motivasi Tentang Penanganan Kejadian Kecelakaan Lalu Lintas (KKL) Pada Masyarakat Awam Di Desa Bumi Sari Kecamatan Natar. MAHESA : Malahayati Health Student Journal. Universitas Malahayati Bandar Lampung; 2022;2(4):743–60. DOI: 10.33024/mahesa.v2i4.7492
20. Kistan K, Najman N. Pelatihan Bantuan Hidup Dasar bagi Siswa Pramuka SMAN 13 Bone. Kreatif: Jurnal Pengabdian Masyarakat Nusantara [Internet]. 2022;2(4):135–43. Available from: <https://journal.amikveteran.ac.id/index.php/kreatif>
 21. Sholehah B, Ningsih NK, Umiyati U. Hubungan Simulasi Resusitasi Jantung Paru (Hand Only CPR) dengan Tingkat Pengetahuan dan Keterampilan Bantuan Hidup Dasar (BHD) pada Siswa Madrasah Aliyah Zainul Hasan 4 Pakuniran Probolinggo. TRILOGI: Jurnal Ilmu Teknologi, Kesehatan, dan Humaniora. Universitas Nurul Jadid; 2022;3(3). DOI: 10.33650/trilogi.v3i3.4707
 22. Oktafiani M, Fitriana NF. Pengaruh Pembelajaran Audiovisual terhadap Pengetahuan Anggpta PMR Bharaku SMK Negeri 1 Kutasari tentang Bantuan Hidup Dasar (BHD). Jurnal Kesehatan Tambusai. 2022;3(1):133–41.
 23. Susilana R, Riyana C. Media Pembelajaran: Hakikat, Pengembangan, Pemanfaatan, dan Penilaian. Bandung: CV Wacana Prima; 2009.
 24. Metrikayanto WD, Saifurrohman M, Suharsono T, Magister P, Peminatan K, Darurat G. Perbedaan Metode Simulasi dan Self Directed Video Terhadap Pengetahuan, Sikap dan Keterampilan Resusitasi Jantung Paru (RJP) Menggunakan I-Carrer Cardiac Resuscitation Manekin Pada Siswa SMA Anggota Palang Merah remaja (PMR). Vol. 6, Jurnal Care 2018.