Original Article

Basic Life Support Training Method in Undergraduate Nursing Students: a Comparative Research

Dian Ika Puspitasari[1], Nailiy Huzaimah[1]

[1] Department of Nursing, Faculty of Health Sciences, Wiraraja University, Sumenep, Indonesia.

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ABSTRACT

Background: *Basic life support (BLS) is one of the skills in Emergency Nursing that is a mandatory achievement for undergraduate nursing students. During the past COVID-19 pandemic, the training method changed to an online learning system. This study aimed to determine differences in increasing students' knowledge and skills in carrying out BHD procedures according to the American Heart Association (AHA) 2020 guidelines*

Methods: *This research was a quantitative-experimental pre and post-test design. The population in this study were undergraduate nursing students at the Faculty of Health Sciences, Wiraraja University, in July 2021. Sampling used a simple random sampling technique (n=74), then divided randomly into two groups, the learning group using the offline method (K1; n= 36) and the learning group using the online method (K2; n=38). In this study, the independent variables were BLS knowledge and skill. Data analysis used the Mann-Whitney and Wilcoxon Sign Rank Test because the research data was homogeneous but not normally distributed (α=0.05).*

Results: *The results of the difference test between the two paired groups were p<α; knowledge K1 (0.000), knowledge K2 (0.001), skill K1 (0.002), skill K2 (0.003).*

Conclusion: *The research results showed no difference in knowledge and skills in BHD according to the 2020 AHA guidelines between offline and online learning groups using the simulation method*

Corresponding Author : Dian Ika Puspitasari
Affiliation : Department of Nursing, Faculty of Health Sciences, Wiraraja University, Sumenep, Indonesia
Email : dian.fik@wiraraja.ac.id
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Introduction

Basic life support (BLS) is one of the skills in Emergency Nursing that is a mandatory achievement for undergraduate nursing students. BLS skills and certificates are mandatory prerequisites for most healthcare job vacancies. Therefore, ensuring the acquisition of BLS knowledge and skills in undergraduate nursing students is critical. Focusing more on discussing BLS skills during the past pandemic, BLS instructors felt concerns and doubts regarding training methods related to policies applied during the pandemic.

During the past COVID-19 pandemic, physical or social distancing became one of the strategic policies to control the transmission of COVID-19 (Jarvis et al.,

2020; Koh et al., 2020; Suprayitno et al., 2021). This policy ultimately has an impact on the learning system. BLS training was initially carried out conventionally or offline. After the emergence of this policy, the method changed to using an online learning system (Seymour-Walsh et al., 2020). The initial assumption was that the online learning system to improve the psychomotor domain was still a dilemma. The online learning system was still assumed to be less effective, especially for improving skills aspects. This research aims to determine differences in increasing students' knowledge and skills in carrying out BHD procedures according to the American Heart Association (AHA) 2020 guidelines.

The demand to rapidly transition from classroom to online learning has made many teachers, lecturers, and instructors anxious.. Nursing instructors are concerned with authentic e-learning assessment and the ability to assess nursing students in a limited online environment (Authement & Dormire, 2020). Nursing is a skills-based profession and relies heavily on the competence of nurses at the bedside so that they can meet the expected health outcomes for each individual or client. Online learning can never replace the experiential learning students gain in laboratory and clinical exposure (Valdez, 2021). However, learning must still be carried out to achieve learning goals so students can achieve their best competencies.

Previous research has explained that the simulation method is suitable and significantly improves individual skills. Simulation methods have been applied to medical residency students' ACLS training and medical students' learning about initial assessment and patient management and have produced significant results (Steadman et al., 2006; Wayne et al., 2005). Research conducted in nursing higher education proved that BLS learning with simulation methods using Zoom meetings effectively improved BLS knowledge and skills (Suwaryo et al., 2021). This research compared undergraduate nursing students' BLS knowledge and skills between online and offline simulation methods in the Integrated Laboratory, Faculty of Health Sciences, Wiraraja University.

Methods

This research was a quantitative-experimental pre and post-test design. The population in this study were seventh-semester nursing students at the Faculty of Health Sciences, Wiraraja University in July 2021. Sampling used a simple random sampling technique (n=74), then divided randomly into two groups, the learning group using the offline method (K1; n= 36) and the learning group using the online method (K2; n=38). Both groups received BLS training intervention at the Integrated Laboratory of the Faculty of Health Sciences, Wiraraja University. The instructors were trained personnel certified as trainers; the lecturer was from the Faculty of Health Sciences, Wiraraja University.

Before implementing the learning, a pre-test is carried out for knowledge and skills. The next stage is providing a learning intervention for 120 minutes, including a review of basic cardiovascular anatomy and physiology for 30 minutes, followed by BLS procedure material for 45 minutes and BLS simulation for the last 45 minutes. In K1, learning about BLS procedures was given offline using lecture and simulation methods at the Integrated Laboratory of the Faculty of Health Sciences, Wiraraja University. At the same time, K2 was carried out online using the same method but using the Zoom meeting

application. The tools and materials used include phantom CPR, bag valve mask (BVM), AED, mattress, handscoon, and face mask.

The research instrument used a BLS knowledge online questionnaire (Google Forms) to measure the knowledge and a BLS action assessment checklist based on the 2020 American Heart Association (AHA) algorithm to assess and evaluate participants' skills. Both instruments consist of BLS steps based on AHA BLS guideline 2020, which involve 1) verifying scene safety, 2) checking for responsiveness, 3) shouting for nearby help, activating the emergency response system (ERS), and getting AED, 4) check for breathing and pulse, 5) Chest compression, ventilation, and High-Quality Cardio Pulmonary Resuscitation (HQ-CPR), 6) evaluation and ROSC, 7) victim response, 8) rescue breathing, 9) recovery position. Implementing offline learning in K1 was carried out following the COVID-19 protocol; maintaining a safe distance and using personal protective equipment. Data analysis used the Mann-Whitney and Wilcoxon Sign Rank Test because the research data was homogeneous but not normally distributed (α=0.05).

All procedures in this study were conducted according to the Health Research Ethics Protocol. The 74 participants submitted online informed consent prior to participation. This study was approved by the Health Research Ethics Committees of the Faculty of Nursing, Jember University (No. 170/UN25.1.14/KEPK/2021).

Results

Seventy-four students from two classes participated in the BLS training, which was held in the Integrated Health Laboratory, Faculty of Health Sciences, Wiraraja University. In both groups, K1 and K2, there were men (22.2%; 15.8%) and women (77.8%; 84.2%). History of attending seminars on previous BLS topics in K1 and K2 includes two categories: attending (80.6%; 57.9%) and never attending (19.4%; 42.1%). Specific data consists of BLS knowledge and skills. The differences in the results of the descriptive analysis of BLS knowledge and skills data between K1 and K2 are presented in Table 1.

Table 1. Comparison OF knowledge and skill value in the pre-post test between K1 (Offline) and K2 (Online)

Assessment	Pre-test				Post-test			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Knowledge								
Offline	34,44	14,029	10	60	77,78	13,755	30	90
Online	41,84	15,571	10	70	75	19,694	10	90
Skill								
Offline	32,94	4,869	25	44	78,25	13,857	53	97
Online	35,82	5,05	28	44	79,66	13,973	47	97

The descriptive test results showed that the knowledge aspect in K1 has a pretest mean of 34.44 (SD 14.029) and posttest 77.78 (SD 13.755), while K2 has a pretest mean of 41.48 (SD 15.571) and posttest 75 (SD 19.694). The skills aspect in K1 has a pretest mean of 32.94 (SD 4.869) and posttest 78.25 (SD 13.857), while K2 has a pretest mean of41.48 (SD 15.571) and posttest 79.66 (SD 13.973).

The BLS knowledge and skills data is then subjected to a normality test to determine the next difference test. The results of the data normality test are presented in Table 2. Almost all criteria have a p-value <0.05 in the normality test results, and then different tests used the Mann-Whitney difference test and the Wilcoxon Sign rank. The results of the Mann-Whitney test are presented in Table 3 below.

Table 2. Normality test with Shapiro Wilk

Assessment	Group	P value
Pre-test knowledge	Offline	.053
	Online	.019
Post-test knowledge	Offline	.000
	Online	.000
Pre-test skill	Offline	.007
	Online	.004
Post-test skill	Offline	.005
	Online	.024

Table 3. Test results of differences in pre-test and post-test knowledge and skills scores between K1 and K2 with Mann Whitney

Pre – Post Tests	Offline		Online		P value
	n	Mean	n	Mean	
Pre-test knowledge	36	18,5	38	19,5	0,841
Pre-test skill	36	18,5	38	19,42	0,841
Post-test knowledge	36	77,78	38	75	0.883
Post-test skill	36	78,25	38	79,66	0.696

Table 4. The Wilcoxon test in BLS knowledge and skills pre- and post-test between K1 and K2

Assessment	Pre-test		Post-test		P value
	Mean	SD	Mean	SD	
Knowledge-Offline Group	34,44	14,029	77,78	13,755	0.000
Knowledge-Online Group	41,94	15,824	75,56	19,777	0.001
Skill-Offline Group	32,94	4,869	78,25	13,857	0.002
Skill-Online Group	35,75	4,907	79,86	13,43	0.003

The results of the difference test between the two unpaired groups in Table 3 above show that p>α for both knowledge and skills. It means that H0 is accepted; there was no difference between the offline and online methods groups in the pre-test and post-test knowledge and skills scores. Next, a difference test was carried out on two paired groups using the Wilcoxon Sign Rank Test. The Wilcoxon test results are presented in Table 4.

The results of the difference test between the two paired groups in Table 4 above showed p<α for both knowledge and skills variables in both the offline and online groups. It means that H0 was rejected; there was a difference between the pre- and post-test scores on the knowledge and skills variables in the offline and online method groups. The average increase in knowledge score in K1 (offline group) was 43.34, while in K2 (online group) it was 33.62. The

average increase in skill scores in K1 (offline group) was 45.31, while in K2 (online group) it was 44.11.

Discussion

The research results on nursing undergraduate students showed that the general characteristics of participants in the K1 and K2 groups were predominantly male. Most participants in the K1 group had previous experience attending BLS-related seminars, while in K2, almost half of the participants had never had experience attending BLS-related seminars. Previous information factors can influence the baseline value of participants' knowledge and skills. However, there was no significant difference in the mean pre-test BLS knowledge and skills data.

The average pre-test score for BLS knowledge and skills in both groups (K1 and K2) was below the pass or competent range (minimum 75). It could be because previous exposure to BLS knowledge still needed to be improved. Some students had pre-test scores that almost reached the minimum passing score. It could be because of exposure to seminars on BLS that they attended or information they obtained previously. There was no difference in the pre-test and post-test scores for knowledge and skills between the offline method group (K1) and the online method group (K2).

Both groups received the same learning method, namely simulation, starting with a lecture method and audio-visual media to recall primary material on the physiology of the cardiovascular system. For the K1 group who received offline BLS training, the post-test results showed an increase in the average knowledge score of 43.34 and skills of 45.31. In the K2 group who received online BLS training, post-test results showed an increase in the average knowledge score of 33.16 and skills of 43.84.

Both variables, knowledge, and skills, increased significantly in both groups, offline and online (K1 and K2). The average post-test score in the knowledge and skills aspect is still close to the minimum value. The range between the minimum and maximum scores on the post-test is also significant. For the knowledge variable, the minimum and maximum value range reaches 60 (K1; offline) and 80 (K2; online), while for the skill variable, the minimum and maximum value range reaches 44 (K1; offline) and 50 (K2; online).

Many factors can influence learning success. Factors that influence the learning success of health students include individual characteristics, individual learning styles, learning content, delivery of learning objectives, methods, learning environment, motivation and enthusiasm, instructor factors, and availability of tools (Diep et al., 2019; Saputra & Lisiswanti, 2015; Shamsuddin & Kaur, 2020). The post-test results showed that one participant got a deficient score of 10 in the online group. External and internal factors can contribute to this case. The pandemic period is very vulnerable to stress, so an individual's psychological condition can affect learning outcomes. Apart from that, the readiness of students' equipment for online learning, such as the availability of Androids, laptops, and internet access, may also contribute to this problem. Students who are less able to develop necessary clinical skills through online learning can worsen their mental health burden (Del Rio & Malani, 2020) and ultimately increase tension in the learning process. This tension can also contribute to the non-achievement of learning outcomes.

Instructor factors and the availability

of training tools will also greatly influence learning outcomes. Instructors who are also just adapting to significant changes to the learning system during the pandemic can become a barrier to achieving learning success. Online education requires instructors to increase their competency in three main areas: pedagogy, technology, and content knowledge. Some challenges for instructors include needing more technology skills, better time management, and a lack of infrastructure. To implement a new competency-based and online education system, institutions and individuals must realize the importance of online education, identify obstacles, and immediately seek solutions to achieve success (Nimavat et al., 2021). BLS training equipment at the Integrated Laboratory of the Faculty of Health Sciences, Wiraraja University, has met standards, including phantom CPR, AED, BVM, handscoon, and face mask. However, the online learning equipment could be more optimal, especially the laptop camera and microphone used by the instructor when carrying out the BLS simulation. A study proves the importance of electronic equipment in online practical or laboratory learning to produce images and voices of instructors that are clear and acceptable to participants or students (Baladoh et al., 2017).

The results of this research show that by applying the simulation method, there is no significant difference in BLS knowledge and skills between offline classes (K1) and online classes (K2). Simulation methods have long been favored in learning, especially those that touch psychomotor aspects. Simulation helps create a learning environment that contributes to knowledge, skills, security, and self-confidence (Norman, 2012). The simulation method is considered suitable and significantly improves aspects of individual skills. Simulation methods have been applied to medical residency students' ACLS training and to medical students' learning about initial assessment and patient management and have been proven to provide significant results (Steadman et al., 2006; Wayne et al., 2005). Research conducted in nursing higher education proves that BLS learning using the simulation method of Zoom meetings is effective for improving BLS knowledge and skills (Suwaryo et al., 2021). The simulation method used in this research was combined with lecture methods and audiovisual presentations before carrying out the simulation.

The post-test results of both groups (K1 and K2) in the knowledge aspect increased on questions about verifying scene safety, checking for responsiveness, activating the emergency response system (ERS) and getting AED, checking for breathing and pulse, Chest compression, ventilation, and HQ CPR, victim response, and rescue breathing. During the post-test on questions about shouting for nearby help, evaluation and ROSC, and recovery position, errors in answers still occurred. The post-test results of the K1 group in the skills aspect experienced an increase in the technique of verifying scene safety, checking for responsiveness, activating the emergency response system (ERS) and getting AED, checking for breathing and pulse, chest compression, ventilation, and HQ CPR, evaluation and ROSC, victim response, rescue breathing, and recovery position. Procedural errors often occur at the "shouting for nearby help" stage. In the K2 group, some skills still needed improvement in chest compression techniques, ventilation, HQ CPR, rescue breathing, and recovery position.

Psychomotor skills are undeniably more accessible to teach and learn face-to-face or offline (Seymour-Walsh et al.,

2020). However, online learning has been widely developed for higher education institutions in health. Several types of online learning include online classes, live web simulations, webcasting, and online chat rooms (Ish et al., 2022). Doubts and concerns about online learning methods are slowly starting to disappear. A systematic review explains that acquiring knowledge and skills shows no significant differences between the Synchronous distance education (SDE) and traditional education groups. However, some eligible studies reported technical difficulties, such as internet problems, as the main challenges (He et al., 2021). Skill development can be created without face-to-face contact in the same space and time. Developing these skills will also increase equitable access to students and health practitioners in regional, rural, and remote areas (Seymour-Walsh et al., 2020).

Some of the skill techniques that are part of the BLS procedure are still considered lacking in online learning groups due to the instructor's equipment being less supportive when simulating BLS, such as a laptop camera that is inadequate for capturing images in low-light locations, as well as the instructor's voice being low when performing it. Simulation because the instructor is far from the laptop. It could cause messages or information not to be conveyed to participants. Furthermore, it is a challenge for all parties, including educational institutions, instructors, and students, to find the right solution to face the changes occurring in the health education world.

Conclusion

According to the 2020 AHA guidelines between offline and online learning groups using the simulation method, the research results showed no difference in knowledge and skills in BHD. Several BLS procedure techniques still needed to be added to the online learning group: chest compression, ventilation, HQ CPR, rescue breathing, and recovery position techniques. The instructor can improve the online learning method in BLS training by emphasizing and repeating simulations on complex skill techniques. Suggestions for training or educational institutions are that they can develop instructors' or institution's equipment and provide training for instructors regarding online or hybrid learning to increase instructors' capacity in determining suitable online learning methods.

Authors Contributions

The authors carrie out tasks from data collection, data analysis, making discussions to making manuscripts.

Conflicts of Interest

There is no conflict of interest in this study.

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