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The effect of basic trauma and cardiac life support training in increasing the competence of emergency room nurses

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ABSTRACT

Introduction: Nurses on duty in the emergency room (ER) play an important role in the early identification of a life-threatening patient condition, immediate action, and the subsequent care of critically ill patients. Continuous training and improvement need to be done to improve the ER nurses' competency. This research aimed to analyze the differences in nurses' competencies.

Methods: This quantitative study employed a quasi-experiment design. The sample size comprised 50 nurses of ER in Surabaya with a total sampling technique. Variables used on this study were demographical data as the independent variables and dependent variables including knowledge, attitude and skills. Intervention was given by two methods, online training for knowledge and attitude, while offline training for skill improvement. After ensuring the distribution and homogeneity of the data, a paired t-test was employed for parametric statistical data analysis.

Results: There were differences in pre-test and post-test scores in the domain of knowledge, attitude and skill (p = 0.000), respectively. The mean of knowledge, attitude, and skills had increased significantly. Hence, the training is proven to improve those competencies as well as the sub-topic items.

Conclusions: Basic Trauma and Cardiac Life Support (BTCLS) training has improved nurse competency; it is advised to hold this training, especially in the ER. Indeed, it can improve healthcare services quality and improve patient safety at health facility. In addition, future research can modify the training time, training delivery methods, and content of BTCLS training materials to adjust with the current situation of the COVID-19 pandemic.

Keywords: attitude; competency; emergency nurse; knowledge; skill; training

Introduction

The nurse plays a crucial role in determining health services in hospitals, not only because nurses work on the frontline, but also being a majority compared to other health workers (WHO, 2020). By implementing professional nursing care, good quality health services can be accomplished. Nurses who work in the emergency room (ER) must adopt critical situations and provide nursing care with speed and accuracy that is different with other nursing situations (Laoh and Rako, 2014). Nurses on duty in the ER play a vital role in the early identification of a life-threatening patient condition, immediate action, and the subsequent care of critically ill patients (Cunningham *et al.*, 2017). Compared to other patient care units, the ER and ICU are places where the number of critically injured patients is the most, so it is essential to ensure that nurses working in these units have adequate competence (Sankar *et al.*, 2013).

Nurses must perform continuous self-development by increasing knowledge, attitudes, and skills to provide proper emergency services. Training is the effort to ensure that nurses have competency in emergency cases. This method is an option that does not require much cost but can provide the expected effect even if it is carried out by utilizing limited resources (Cunningham *et al.*, 2017). The competence of nurses in handling emergency cases is essential to increase the success rate, accuracy, and quality of emergency service in treating patients (Mason *et al.*, 2005). Therefore, competency in handling emergency cases is one of the most important factors determining healthcare service quality (Li *et al.*, 2016).

Corona Virus Disease 2019 (COVID-19) is a global crisis that happened in late 2019 and rapidly spread all over the world (Yie *et al.*, 2021). In this constraint, nurses are included in the first line in hospitals that provide healthcare services (Buchan *et al.*, 2019). Therefore, a nurse must have sufficient understanding in recognizing COVID-19 disease, including identifying the pathogen, signs and symptoms, how it spreads, how to break the chain of infection, and the treatment that must be given appropriately (Burnett, 2018; Corless *et al.*, 2018). Nurses' competency regarding COVID-19 disease will contribute to their environment because their competence will provide health protection for themselves and the surrounding community. The efforts to improve the nurses' competency are an investment during the COVID-19 pandemic (Ridley, Sanderson and Haines, 2021). This effort not only provides positive outcomes in dealing with the COVID-19 pandemic but also prepares for another outbreak that may occur in the future (Purba, 2020). To maximize healthcare personnel's capabilities and increase protection, vigilance, and control against COVID-19 infection, hospitals should provide training for nurses, either on-site or online (Wu *et al.*, 2020). The online training was an effective method for improving the competency of nursing workforce either in academic or clinical setting (Wong and Greenhalgh, 2013; Tobase *et al.*, 2017; Vaona *et al.*, 2018). Dr. Soetomo Hospital Surabaya routinely conducted emergency nursing training once a year and was designed for nurses to handle emergency problems. This training used an appropriate approach by referring to scientific foundations and good nursing processes. Hence, the training participant is expected to be able to demonstrate life saving skills, minimize organ damage, and reduce patient mortality and disability. This training was provided to new nurses who will be transferred or assigned to the ER. Competence is a set of abilities for individuals to carry out a job correctly and consists of knowledge, attitudes, and skills. However, research regarding the effect of the training using online and on-site approach toward nurse's competency has not been done.

This study aimed to analyze the differences in nurse competencies, in terms of knowledge, attitude, skills, in ER after attending BTCLS training.

Materials and Methods

Study Design

This quantitative research employed a quasi-experimental study, using a one-group pre-test-post-test design, with BTCLS training as an intervention. BTCLS training was held on 12-16 September 2021 and combining both offline and online sessions to reduce physical interaction during the COVID-19 pandemic. Before the training, the first observations (pre-test) measured the participants' competencies (knowledge, skills, and attitudes). Then the second observation (post-test) was made again after the training by re-measuring the participants' competencies (knowledge, skills, and attitudes). The first three days of BTCLS training were conducted online. The first day of BTCLS training includes participant registration, technical meeting, health protocol presentation as well as knowledge competency pre-test, while the second and third day of BTCLS training consisted of online lecture materials that includes the role of emergency nurses in improving quality profession during the pandemic, Basic Life Support, trauma of thorax and abdomen, triage, electrocardiogram (ECG) and acute coronary syndromes, burns, and fluid therapy. All of the online sessions of BTCLS training were held by Zoom Meetings. The fourth and fifth day of BTCLS training were conducted offline while maintaining health protocols. All of the participants and instructors took antigen swab test before the offline sessions of BTCLS training. Participants were divided into small groups following the six stations namely basic life support skills, initial assessment, transport skills, airway and breathing skills, ECG skills, and advanced life support skills. On the fourth day, the instructors held the pre-test of both the attitudes and skills of the participants during each station before giving out the demonstrations of the right methods for attitudes and skills. And lastly, the participants went through post-test for knowledge, attitudes, and skills on the fifth day.

Respondent

The sample size comprised 50 nurses with a total sampling technique. The participants worked in ER Dr. Soetomo Hospital Surabaya. The independent variable in this study was BTCLS training. The dependent variable is nurses' competence, which consists of knowledge, skills, and attitudes.

Instrument

Instruments for assessing knowledge, skills, and attitudes were obtained from the official assessment, Education and Training Board of the Regional Supervisory of the Indonesian National Nurses Association (PPNI) East Java; hence there was no need to test for validity and reliability (Zúñiga *et al.*, 2016; Stevanin *et al.*, 2017). The knowledge assessment consists of 35 multiple choice questions according to the material contained in the BTCLS training. Meanwhile, attitude and skill measurement are shaped as a checklist for the participant's emergency care completeness, and the BTCLS training assessors assessed it. The assessors were competent assessor whose having field experience on BTCLS and has been recognized as certified assessor in this area. Each assessment for knowledge, skill, and attitude is considered good if the total score is > 75% and not good if the score is < 75%.

Table 1 BTCLS Training Participants Based on Age, Gender, Education, and Length of Work

Characteristics	n	%
Gender		
Male	26	52
Female	24	48
Age		
25 – 30 years	11	22
31 – 35 years	27	54
36 – 40 years	7	14
> 40 years	5	10
Unit		
1st floor ER	25	50
Contagious ER	7	14
ER-ROI	2	4
Aster HCU	4	8
HCU Pandan II	1	2
Others	11	22
Education Level		
Bachelor	21	42
Associate Degree (D3)	27	54
Associate Degree (D4)	2	4
Period of Employment		
< 1 year	11	22
1-5 Year(s)	8	16
> 5 Years	31	62

BTCLS training is a nursing training to handle emergency problems caused by trauma and cardiovascular disorders. The training aims to enable nurses to provide life support to save lives and minimize patients' disability and organ damage. Nurse competency is the ability of each nurse to handle emergency cases under training standards. The competency consists of (1) knowledge: what nurses know about handling emergency cases; (2) attitude: how nurses handle emergency patients; (3) skill: nurses' ability to handle emergency patients according to applicable standards and procedures. Knowledge competency data are nominal. Meanwhile, the measurement scale for skill and attitude is ordinal data.

Data Collection

This research was divided into three stages, namely the preparation stage, implementation, and the final stage. The preparation stage is a preliminary study. The researcher conducted interviews with the Director of Medical & Nursing Services, the Director of Professional Education & Research, the Head of ED's Nurse, and the Head of the Nursing Division. Interviews were conducted to overview existing training and evaluation of emergency nursing throughout this period. Then further discussions were held with representatives from the Indonesian Emergency and Disaster Nurses Association (HIPGABI) to determine emergency nursing training tailored to the COVID-19 pandemic situation.

Data Analysis

The researcher identified the participants and conducted preliminary observations (pre-test). Furthermore, recording and documentation were accomplished during BTCLS training. The final observation (post-test) was conducted to see the effect of the training. In addition, the researcher also conducted additional interviews with the BTCLS training organizers. The final stage was data analysis using the SPSS program. The researcher first looked at the distribution and homogeneity of the data. A paired t-test was employed for parametric statistical data analysis.

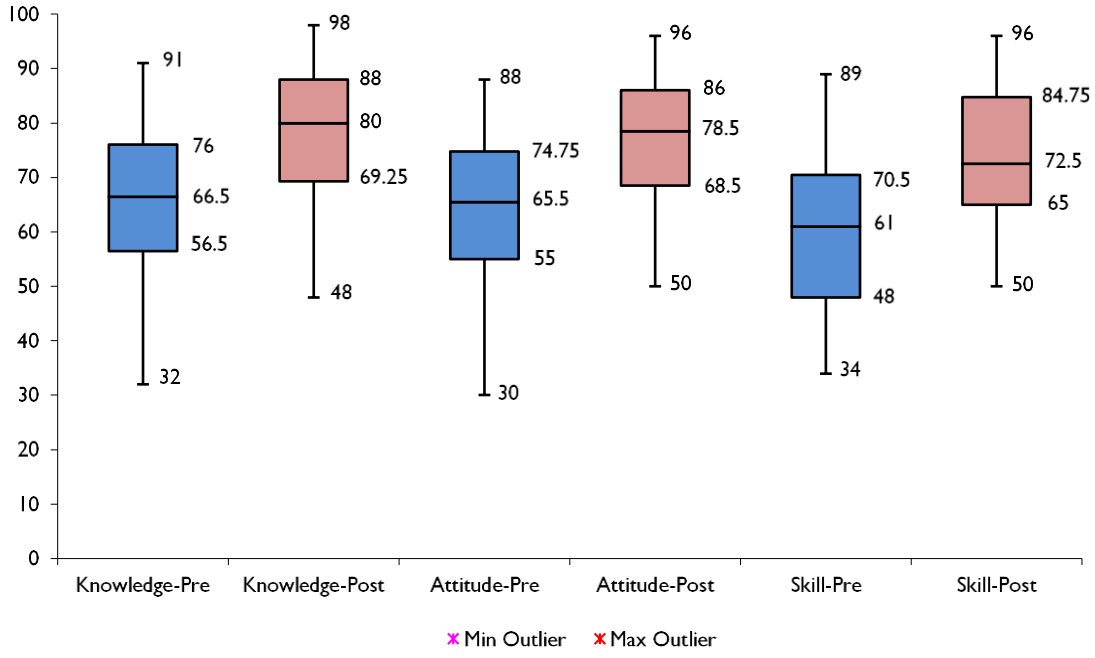

Figure 1. Boxplot graph of nurses' competency before and after BTCLS training

Ethical Consideration

In addition, at the implementation stage, the researcher also obtained ethical clearance from the health research ethics committee, Dr. Soetomo Surabaya Hospital. This research was conducted with ethical principles: informed consent, anonymity, and confidentiality. This study received ethical clearance from the ethics commission, with letter number 0240/KEPK/VII/2021, valid for one year since first issued on August 23rd, 2021.

Results

The normality test of the three competencies shows that the data obtained are normally distributed. Kolmogorov-Smirnov test results for pre-test knowledge p = 0.200, post-test knowledge p = 0.200, pre-test attitude p = 0.116, post-test attitude p = 0.200, pre-test skill p = 0.107, and post-test skill p = 0.094.

The homogeneity and normality test are assumptions of the hypothesis test formula for the t-test and ANOVA. Before testing the data by t-test and ANOVA, the assumptions of normality and homogeneity must be met. The next test is the homogeneity test, which determines the data variance. Levene's test results are as follows, knowledge p = 0.199, attitude p = 0.127, and skill p =

Table 2 Results of the pre- and post-data analysis training of BTCLS of nurses in Dr. Soetomo Hospital Surabaya

Variable	Δ Mean	Δ Std. Deviation	t	p-value
Knowledge (pre- and post-test data)	12.940	4.181	21.881	0.000
Attitude (pre- and post-test data)	14.300	5.273	19.176	0.000
Skill (pre- and post-test data)	14.380	5.102	19.928	0.000

Table 3 Results of the pre- and post-data analysis competencies in detail BTCLS training of nurses in Dr. Soetomo Hospital Surabaya

Variable	Δ Mean	Δ Std. Deviation	t	p-value
Knowledge				
Trauma	0.127	0.175	5.144	0.000
Life Support	0.154	0.187	5.844	0.000
Cardiac	0.313	0.210	10.540	0.000
Attitude				
Orientation phase	0.458	0.447	7.240	0.000
Show a listening attitude	0.197	0.368	3.775	0.000
Provide an opportunity to ask questions or clarify	0.700	1.015	4.876	0.000
Documents according to standard	0.760	1.333	4.030	0.000
Termination phase	0.907	0.771	8.316	0.000
Wash your hands according to standard	1.060	1.163	6.443	0.000
Aseptic and antiseptic principles for sterile procedures	1.100	2.092	3.718	0.001
Protection with universal precautions	1.100	2.092	3.718	0.001
Handling medical and non-medical waste	0.500	1.515	2.333	0.024
Skills				
Preparation	0.850	0.649	9.264	0.000
Assessing Patients	0.820	0.569	10.185	0.000
Airway	0.825	0.552	10.577	0.000
Breathing	0.845	0.463	12.916	0.000
Circulation	0.830	0.519	11.316	0.000
Disability	0.713	0.522	9.669	0.000
Exposure	0.750	0.672	7.892	0.000
Foley Catheter	0.927	0.592	11.068	0.000
Gastric Tube	0.873	0.466	13.251	0.000
Heart Monitor	0.760	0.797	6.743	0.000
Pulse Oximetry, X-Ray	0.520	0.707	5.202	0.000
Secondary Survey	0.667	0.738	6.390	0.000

0.088. The three competencies have the same variance, and the assumption of homogeneity has been met.

Table 2 show the results of the BTCLS training effect on nurse competencies (knowledge, attitude, and skills). In column 'p,' the effect is marked with a significance value below 0.05. There are differences in the pre-test and post-test scores of the nurse competency test. Each competency has a significance value of less than 0.000. Hence, this quasi-experimental research hypothesis concludes that BTCLS training significantly affects nurses' knowledge, attitude, and skills. The mean of knowledge has increased significantly by 12.94. This pattern also occurs in other nurse competencies: attitude and skills. The results show that the post-test scores of the majority of nurses are improved. The boxplot graph explains an increase in the post-test scores on knowledge, attitude, and skills compared to the pre-test scores (Figure 1).

Table 3 shows differences in post-test knowledge and pre-test knowledge in trauma, life support, and cardiac. Each of these categories has a p-value below alpha (0.05). Furthermore, the table also shows the difference of post-test attitude and pre-test attitude in the categories of orientation, listening, an opportunity to ask questions or clarify, standardized documents, termination, hand washing, aseptic and antiseptic principles, protection, and handling of medical and non-medical waste. Finally, the table describes the differences in each category of questions on skill competence. All categories of skill competency questions, including airway, breathing, circulation, disability, exposure, foley catheter, gastric tube, heart monitor, pulse oximetry and x-ray, and secondary survey showed significant differences

Discussions

This research showed that there were significant differences between knowledge before and after training. This finding aligns with Ha and Nuntaboot's (2020) research on nursing education and training as predictors of nurse competence. However, the difference is that the research results emphasize on narrative views' of participants on the training (Ha and Nuntaboot, 2020). This finding also parallels with prior research conducted by Fong *et al.* (2021). It is more relevant since the same methodology -quasi-experimental without a control group- was employed to examine the effect of orientation on nurse competence especially focus on increased knowledge (Fong *et al.*, 2021). Item analysis was also accomplished in this study, with good results in knowledge (trauma, life support, and cardiac). There was a significant difference in the percentage of trainees who answered correctly. Structured training is required in order to increase the competency of health workers in health facilities, including nurses.

This research demonstrated that there were significant differences between attitudes before and after training. This finding supports prior research on emergency, that training affects the knowledge and skills of healthcare personnel (Yildiz, Selimen and Dogan, 2014; Ameh *et al.*, 2016). However, the difference is that those studies only examined partial competencies (Yildiz, Selimen and Dogan, 2014; Ameh *et al.*, 2016). This study also included item analysis, which yielded positive findings in terms of attitude. There was a significant difference in the percentage of trainees who behave correctly in the orientation phase, listening attitude, opportunity to ask questions/clarification for patients, documents according to standards, termination phase, washing hands, aseptic principles and antiseptic, universal precaution protection, and handling medical and non-medical waste. Future training in increasing attitude should consider the general and specific competency of nurses.

This research revealed that there were significant differences between skills before and after training. This finding confirms prior research conducted by Kim and Shin (2016) in the area of maternal and child emergency nursing. Overall, this research on improving the emergency nurses' competency supports research from Ojifinni, Motara and Laher (2019) to include basic life support (BLS) and cardiopulmonary resuscitation (CPR) in the formal training to improve nurse competency. Park and Kim (2017) also put forward the same suggestion to conduct specific education and training regarding an emergency training to improve the nurses' competency. In this study, item analysis was also performed, and the results were positive for nurses' skill competency. There was a highlighted finding for nurses who acted correctly on preparation, assessing patients, airway, breathing, circulation, disability, exposure, foley catheter, gastric tube, heart monitor, pulse oximetry, x-ray, and secondary survey. Skill of nurses should be viewed as critical competency as it is related to patient safety and improving the quality of healthcare.

This study has several limitations, including without using a control group; since this research is the first to be conducted to assess the increase in knowledge, attitude, skills, and a category of questions at the research locus. Hence, it is hoped that further research can be conducted with re-assessments within a certain period (three months, six months, or one year) so that training can be refreshed to adjust with the needs of nurses.

Conclusions

There was an increase in emergency nurses' competency in term of knowledge, attitude, and skill after attending the BTCLS training. Repeated educational programs can improve these three domains as well as the contents of the domain. For future BTCLS training, recommendations include training time, training delivery methods, and content of BTCLS training materials. In addition, future research can modify the

training method as an intervention group and add a control group to the standard training method.

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