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The Knowledge and Practice of Cardiopulmonary Resuscitation (CPR) among Nursing Students

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Abstract: *Cardiac arrest is the sudden cessation of a person's cardiac activity and is often fatal if corrective life-saving interventions are not performed quickly. The American Heart Association advocates the need for high CPR competency among healthcare providers to increase the cardiac arrest survival rate. This study aimed to determine the knowledge and practice of nursing students on the acquisition and retention of CPR. A quantitative descriptive-correlation design was used, and a sample of 76 nursing students of Universiti Malaysia Sabah were recruited via a non-probability purposive technique. Data were collected using an online survey questionnaire that consists of 3 sections: Demographic, knowledge of CPR, and practice of CPR. They were analyzed using the correlation method. The results of this study are about the knowledge and practice of CPR. Nursing students' knowledge of the acquisition of CPR could be higher (39.36%), as is their practice (31.95%). The correlation coefficient between knowledge and practice is insignificant (rho = -0.073, p 0.531).In this study, both the knowledge and practice of CPR are independent.*

Keywords*: Knowledge, Practice, Cardiac arrest, CPR, Nursing students*

INTRODUCTION

According to the American Heart Association, emergency medical services (EMS) personnel assessed 350,000 cases of out-of-hospital cardiac arrest (OHCA) annually in the United States, with 290,000 patients who experienced in-hospital cardiac arrest (IHCA) (Panchal et al., 2020). However, regardless of advances in resuscitation medical science, the cardiac arrest survival rate remains poor, with only 10% and 25% for OHCA and IHCA, respectively (Cheng et al., 2020). According to the American Heart Association 2020 report, less than 40% of adults received lay-person-initiated CPR, and only 12% received automated external defibrillators (AEDs). The American Heart Association (2020) advocates the need for high CPR competency among healthcare providers to increase the cardiac arrest survival rate. Cardiac arrest is the sudden cessation of a person's cardiac activity and is often fatal if corrective life-saving interventions are not performed quickly. It is crucial to do cardiopulmonary resuscitation because an emergency can occur to anyone, anywhere, at any time, no matter who they are or where they are (Andriyani et al., 2019).

Among life-saving interventions that are critical to cardiac arrest survival include early recognition of cardiac arrest, initiation of CPR, and the use of AED (Cheng et al., 2020). Panchal et al. (2020) assert that prompt initiation of CPR is the most critical intervention that determines cardiac arrest survival and subsequent neurological sequelae. The ability or competency of healthcare providers to execute CPR competently during a cardiac arrest has a significant impact on patient survival.

The CPR clinical competency of healthcare personnel ultimately lies in the quality of CPR training he or she has received (Roel & Bjørk, 2020). However, from the study pooling some research into the review, it is concluded that CPR clinical competency is merely knowledge acquisition and retention of CPR knowledge and psychomotor skills (Riggs et al., 2019). The consensus from numerous studies on

CPR training shows that CPR knowledge skills acquired during training significantly correlate with subsequent improvement in hands-on competency among nursing students (Donoghue et al., 2021; Lactona & Suryanto, 2021). However, Cheng et al. (2020) criticize the shortcomings of the current approach to teaching CPR, which often results in poor knowledge-skills retention among learners within weeks of completing the CPR course.

METHODS

This quantitative study used a non-experimental, descriptive-correlation design to empirically determine the correlation between CPR knowledge and practice among nursing students. Data obtained from respondents were analyzed using descriptive and inferential statistics to examine the relationship between respondents' CPR knowledge and practices.

This study used 76 selected respondents from a population of 92 nursing students by non-probability purposive sampling. This study's respondents are nursing students currently enrolled in the Diploma in Nursing Program at the Faculty of Medicine and Health Sciences, University Malaysia Sabah. They were invited to participate in the study if he or she fulfilled the inclusion and exclusion criteria. The inclusion criteria were second-year and third-year nursing student who had attended CPR training in their first-year nursing diploma program and consented to participate in the study. The exclusion criteria were students who had deferred study for more than six (6) months before the commencement of the study and students who were repeating the semester.

The instrument used in this study was a self-rated online questionnaire formatted according to the 2020 American Heart Association. The questionnaire has three main sections. Section A consists of five (5) questions designed to elicit information about nursing students' demographic information, which includes age, gender, Year/Semester, and previous experiences in witnessing or performing CPR on patients. Meanwhile, section B consists of ten (10) closed-ended questions focused on knowledge of three essential parts of CPR: airway management, rescue breathing, and circulation. In section C, the ten (10) scenario-based closed-ended questions are formatted to assess if nursing students can perform CPR according to the Basic Life Support sequence of actions and AHA recommended guidelines. A pilot study was conducted to enable the author to identify the appropriateness and shortcomings of the research instrument before its implementation in the entire study. Twenty (N=20) respondents were recruited through convenient sampling, and these respondents were not included in the subsequent full-scale study. Cronbach's alpha was used to measure the questionnaire's reliability. Cronbach's alphas range from 0 to 1, and 0.7 or higher is acceptable reliability (McNeish, 2018). Cronbach's alpha from the pilot study of the questionnaire is 0.839, which suggests a high level of internal consistency (reliability) of the items in the questionnaire.

The data collection commenced after the researcher obtained ethical clearance from the ethical committee. The questionnaire was made available to all participants who consented to use the Google platform. To prevent an inadvertent error of missing data, the online questionnaire was formatted so that participants were required to answer every item before they were allowed to submit the completed questionnaire. A 2-week time frame was provided for participants to answer the questionnaires. Raw data collected through the online questionnaire was compiled using a Microsoft Excel spreadsheet. Raw data scored by participants captured through the online questionnaire was compiled in a Microsoft Excel spreadsheet, which was subsequently imported into the Statistical Package of Social Science (SPSS) software version 27 for analysis. The data was analyzed using both descriptive and inferential statistical methods.

RESULT

Table 1 describes the demographic characteristics of the participants. Data are obtained and analyzed based on the information filled in by the participants in section A. This section captured participants' demographic data such as age, gender, Year/Semester, and prior CPR experience.

Table 1 Demographic characteristics of the respondents (n=76)

Characteristics		Frequency	Percent
Age	18 - 25	72	94.7
	26 - 30	3	3.9
	> 30	1	1.3
Gender	Female	65	85.5
	Male	11	14.5
Year / Semester	Year 2 / Semester 1	30	39.5
	Year 3 / Semester 1	46	60.5
Has experience in performing CPR on patients	Yes	1	1.3
	No	75	98.7
Has experience in witnessing healthcare workers performing CPR on patients	Yes	11	14.5
	No	65	85.5
	Total	76	100

Table 1 describes the characteristics of the respondents. The majority were in the age group of 18-25 years old (*n*= 72, 94.7%). Minorities were 26-30 (*n*= 3, 3.9%) and above 30 years old (*n*= 1, 1.3%). Likewise, about gender, most of the respondents were female (n= 65, 85.5%), and only eleven (n= 11, 14.5%) were male. Fourth-six respondents (*n*= 46, 60.5%) were in Year 3 Semester 1, and thirty (*n*= 30, 39.5%) were in Year 2 Semester 1. Only one respondent (*n*= 1, 1.3%) said "Yes" to the question "has experience in performing CPR on patients," while seventy-five respondents (*n*= 75, 98.7%) said "No." Meanwhile, for the question "Has experienced witnessing healthcare worker performing CPR on the patient," eleven respondents (*n*= 11, 14.5%) and sixty-five respondents (*n*= 65, 85.5%) respectively said "Yes" and "No."

Of the ten questions concerning knowledge of CPR, four were answered correctly by more than 70% of the participants, and five were less than 50%. One question was answered correctly by 68.4% of the participants. Most participants (*n*= 54, 71.1%) were aware of the importance of the position of head tilt chin lift in maintaining a victim's airway patency. On the contrary, only 38.2% (*n*= 29) of the participants knew that excessive ventilation should be avoided when performing rescue breathing. Most participants (*n*= 63, 82.9%) knew that minimizing pauses during compression and having adequate compression depth and rate are essential components of high-quality CPR. However, 61.8% (n= 47) of the participants failed to recognize the vital characteristics of first-rate CPR, which included starting chest compression within 10 seconds of recognition of cardiac arrest, pushing hard and fast, and minimizing interruption. Although knowing the adequate compression depth is an important component of performing high-quality CPR, 59.2% (*n*= 45) of the participants needed to be aware that the correct chest compression depth was between 2 and 2.4 inches. Most participants (*n*= 65, 85.5%) were aware of the 30 2 compressions to ventilations ratio when giving CPR. When performing two-rescuer CPR, 68.4% (*n*= 52, 68.4%) of the participants were aware of the switching role after every five cycles of CPR. Although many participants (*n*= 68, 89.5%) knew the exact location for checking an adult's pulse at the carotid artery during CPR, only 26.3% (*n*= 20) knew that a pulse check should last at most 10 seconds. In addition, 72.4% (*n*= 55) of the participants responded incorrectly about when to stop CPR.

Of the ten scenario-based questions concerning the practice of CPR, five questions were answered correctly by more than 70% of the participants, and three questions were less than 50%. Two questions were answered correctly by 50% and 51.3% of the participants, respectively, and 46.1% (*n*= 35) were aware that the jaw thrust technique could be used to open a neck injury victim's airway. The majority of participants (*n*= 68, 89.5%) were aware of the action to stop chest compression and put the victim in a lateral position if the victim vomited while CPR was being performed. Even though 81.6% (*n*= 62) of the participants were aware that checking the victim's chest rise during rescue breathing is important in assuring a proper rescue breath, only 51.3% (*n*= 39) were aware that if the victim's chest did not rise, they should repeat the head tilt - chin lift and attempt the breath again. Most participants (*n*= 62, 81.6%)

were aware of using a bag-valve mask to prevent the risk of contracting an infection during rescue breathing for in-house cardiac arrest calls. 71.1% (*n*= 54) of the participants knew the BLS sequence for an adult collapsing victim. When a victim collapses on the floor, 76.3% (*n*= 58) of the participants knew that checking for responsiveness was the first step in the BLS sequence. However, when responding to a nonresponsive victim with a weak pulse and no breathing, only 46.1% (*n*= 35) of the participants were aware that the following BLS sequence was calling for help. In addition, 78.9% (*n*= 60) of the participants failed to recognize the clinical criteria for initiating CPR: unresponsiveness, no pulse or weak pulse, and no breathing or gasping. Half of the participants (*n*= 38, 50%) were aware of post-arrest care if the patients had sustained a return of spontaneous circulation.

Table 2 The Descriptive analysis of respondents about CPR

	Descriptive Statistics					
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	
Knowledge	76	20	35	27.53	.39	3.43
Practice	76	18	33	23.94	.31	2.78

Table 2 describes how nursing students' knowledge of the acquisition and retention of CPR is low; the mean was 27.53, the standard deviation was 3.43, and the standard error of the mean was 39.36%. The practice scores were relatively better than the knowledge scores, with a mean of 23.95, a standard deviation of 2.79, and a standard error of 31.95%.

Table 3. Bivariate Statistical Analysis using Spearman's Rho

	Correlation Coefficients	P value
Knowledge	-0.073	0.53
Practice		

Table 3 shows the correlation coefficient value was -0.073 (*r* = -0.073), and the p-value was 0.531 (*p* =0.531). The result revealed a weak negative linear relationship between the variables of knowledge and practice.

DISCUSSION

Life-saving training, such as CPR training, is mandated for all healthcare professionals, and they must be competent in performing CPR while managing high-risk populations experiencing cardiac arrest. Nurses are frequently the first healthcare professionals who deal with cardiac arrest patients. A Nigeria study assessing the knowledge, attitude, and practice of CPR among nurses in a teaching hospital revealed that most participants (96.3%) agreed to conduct CPR immediately before informing the Doctor (Ihunanya et al., 2020). Thus, having more excellent knowledge and skills to initiate CPR is indispensable until the advanced resuscitation team arrives.

The present study's findings revealed that nursing students' knowledge regarding CPR needed to be improved, which may be attributed to the program's teaching method of lectures and task trainers. Some earlier studies in other populations have also revealed poor CPR knowledge among healthcare professionals. There was an association between the worksite of respondents and knowledge. Another

study from Bahrain also found that nurses with less qualification and experience needed more knowledge (du Plessis et al., 2022). However, the present study did not compare the knowledge scores with these mentioned variables. Furthermore, studies also documented poor to average knowledge retention scores among other healthcare professionals, such as medical practitioners, medical students, interns, junior doctors, registrars, and physiotherapists (du Plessis et al., 2022; Tomas & Kachekele, 2023);). The poor knowledge in these studies was due to limited attendance to CPR workshops, lack of materials or aids in CPR, and too busy to attend retraining courses,

Nonetheless, previous studies comparing the standard lectures and static manikin training methods to other approaches yielded more favorable findings. In a randomized controlled trial from a previous study, Moon and Hyun found that a blended learning CPR program that integrated videos and face-to-face lectures was effective in enhancing respondents' CPR knowledge, and respondents demonstrated a more positive attitude toward CPR (Gino et al., 2023; Moon & Hyun, 2019). The previous articles also stated that training should be given both for healthcare staff, like this study with the subject nursing student, and the people in the community (Ayuningtyas et al., 2023).

In today's clinical practice, there is a high demand for well-trained nursing graduates who can effectively respond to the needs of various healthcare services. Considering CPR is one of the vital procedures that all healthcare providers need to be competent, CPR training has been integrated into nursing education and other health programs. This study outlines that nursing students' knowledge and practice must be improved for most CPR components. However, their functional CPR practice is yet to be determined. It is essential to discuss the findings with the nursing educators to restructure their teaching and evaluation methods to retain nursing students' competency in CPR, minimize the gap between service deliveries, enhance the quality of education, and ensure the safety of patients. It is hoped that the educator can establish or modify a more appropriate CPR training program tailored to nursing students' needs in acquiring and retaining CPR knowledge and skills. Future studies should examine the effect of different training and evaluation methods on nursing students' CPR performance or further evaluate nursing students' BLS sequence of action in optimizing high-quality CPR.

The online survey method has weaknesses in this study, such as the possibility that participants could have answered the questionnaire more genuinely. We needed to find out if participants sought answers from other sources. Besides that, some potential confounding variables were not measured, such as participants' previous training experience before entering the nursing program, which needed to be listed in the study's questionnaire. A confounder can affect the studied variables and produce an imprecise conclusion about the relationship between two variables (Capili & Anastasi, 2023). In addition, this study could not directly assess CPR psychomotor skill performance due to the nature of the study procedure. Therefore, it is not easy to conclude the functional CPR practice of the participants.

The primary limitation is that the sample was drawn from only one public university's nursing students. Hence, the findings of this study would not be generalizable to nursing students at other higher-learning institutions. In addition, the curriculum instructional design differed throughout other higher learning institutions, and the quality of the CPR training program needed to be evaluated, making the generalization of the findings more challenging. Second, participants in the study are primarily placed in medical and surgical wards, meaning they need more experience performing CPR in the clinical areas. Their self-confidence, willingness, and attitude toward CPR behavior directly influence performing CPR and need to be considered in this study.

CONCLUSION

Based on this study's questionnaire, it can be concluded that nursing students need better knowledge and practice in acquiring and retaining CPR. Over half of the nursing students responded incorrectly on eight items, five on CPR knowledge and three on CPR practice. Finding CPR knowledge has demonstrated that nursing students needed better knowledge of chest compression techniques, improper delivery of rescue breaths, unsure of the duration of a pulse check, and unsure of when to discontinue CPR. Similarly, findings in CPR practice revealed that nursing students lacked knowledge

of the BLS sequence of actions, could not recognize signs of arrest event, and had poor knowledge of airway management in patients with neck injuries.

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