Vietnamese nursing students' knowledge in Cardiopulmonary resuscitation (CPR) and perceptions of training in CPR

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ABSTRACT

Background
Cardiopulmonary resuscitation (CPR) increases significantly the chance of survival in cases of a cardiac arrest. The ability to respond quickly and effectively to a cardiac arrest rests on nurses being competent, prepared and up-to-date. Nursing student’s knowledge in CPR and perceptions of their own training are crucial for the pursuit of the education of professional nurses.

Aim
Investigate the prerequisites for a good care of patients in need of CPR by assessing Vietnamese nursing students’ knowledge in CPR as well as their perceptions on their education in CPR.

Method
A quantitative, cross sectional-study was conducted. A modified version of a questionnaire developed by the Swedish council of CPR was used. Nursing students at University of Medicine and Pharmacy in Ho Chi Minh City were asked to participate. The gathered data were analyzed with descriptive statistics, t-test and chi²-test.

Result
The participants answered right on 41 % of the questions (571/1404). The mean-score was 5.25 and the score ranged from 0 to 9 out of 13 points on the questionnaire. Participants answered correctly on most questions regarding basic CPR and were foremost wrong about questions regarding defibrillation. There was no association between a high result on the questionnaire and students rating a high grading on preparedness and/or satisfaction. No significant difference could be found based on gender.

Conclusion
The knowledge in CPR, based on this survey, is generally low. One plausible explanation could be that the questionnaire did not fit the education of the participants.

Keywords: Cardiopulmonary resuscitation, cardiac arrest, education, nursing students.
SAMMANFATTNING

Bakgrund
Hjärt- och lungräddning (HLR) ökar avsevärt chanserna att överleva vid ett hjärtstopp. Att kunna reagera snabbt och effektivt på hjärtstillestånd kräver att sjuksköterskor är kompetenta och förberedda. Sjuksköterskestudenter kunskaper i HLR och deras uppfattningar om sin utbildning är avgörande för den fortsatta utbildningen av professionella sjuksköterskor.

Syfte
Undersöka förutsättningarna för en patientsäker vård inom HLR, genom att kartlägga vietnamesiska sjuksköterskestudenters kunskaper i HLR samt att undersöka deras uppfattning om sin utbildning i HLR.

Metod
En kvantitativ, tvärsnittsstudie genomfördes. En modifierad version av ett frågeformulär utvecklat av Svenska rådet för hjärt- och lungräddning (HLR-rådet) användes. Sjuksköterskestudenter i en klass från University of Medicine and Pharmacy, i Ho Chi Minh City blev omeddla att delta. Den insamlade informationen analyserades med beskrivande statistik, t-test och chi2-test.

Resultat
Deltagarna svarade rätt på 41% av frågorna (571/1404). Det totala medelvärdet var 5.25 och poängen skilde sig från 0 till 9 av 13 poäng på frågeformuläret. Deltagarna svarade korrekt på de flesta frågor angående grundläggande HLR och svarade främst fel på frågor angående defibrillering. Det fanns inget samband mellan ett högt resultat på frågeformuläret och elever som ansåg sig vara förberedda och/eller nöjda med sin utbildning. Ingen signifikant skillnad i resultat kunde hittas baserat på kön.

Slutsats
Kunskaperna i HLR, baserat på den genomförda studien, är generellt låga. När det kommer till vissa frågor kan en orsak vara att frågeformuläret inte var anpassat efter deltagarnas utbildning.

Nyckelord: Hjärt- och lungräddning, hjärtstopp, utbildning, sjuksköterskestudent.
INDEX

BACKGROUND .................................................................................................................. 1
  CARDIAC ARREST, DEFINITIONS AND RISK FACTORS .................................................. 1
  CONSEQUENCES FOR PATIENTS ..................................................................................... 1
  PERFORMING CPR ....................................................................................................... 2
  CPR IN THE WORLD ...................................................................................................... 3
  IMPORTANCE OF EDUCATION ...................................................................................... 4
  NURSING THEORY ....................................................................................................... 5
  PROBLEM STATEMENT ................................................................................................. 6
  AIM .................................................................................................................................. 6

METHOD ............................................................................................................................ 7
  DESIGN ............................................................................................................................ 7
  SAMPLE ........................................................................................................................... 7
  CONTEXT .......................................................................................................................... 7
  DATA COLLECTION ......................................................................................................... 8
  PROCEDURE .................................................................................................................... 9
  ETHICAL CONSIDERATIONS .......................................................................................... 9
  PROCESSING AND ANALYSIS ...................................................................................... 10

RESULT ................................................................................................................................ 10
  THE PARTICIPANTS’ KNOWLEDGE IN CPR ................................................................. 10
  DIFFERENCES IN KNOWLEDGE .................................................................................... 13

DISCUSSION ...................................................................................................................... 13
  RESULT DISCUSSION ..................................................................................................... 14
    Knowledge in CPR ....................................................................................................... 14
    Perceptions of training ................................................................................................. 16
    Relevance of conducted study .................................................................................... 17
  METHOD DISCUSSION .................................................................................................... 17
    Language and cultural barriers .................................................................................... 18
    Validity, reliability and generalizability ....................................................................... 19
    Ethical considerations ................................................................................................. 20
  CONCLUSION .................................................................................................................. 21

REFERENCES .................................................................................................................. 22

APPENDIX 1 ..................................................................................................................... 27

APPENDIX 2 ..................................................................................................................... 31
BACKGROUND
Some people claim that the first record of the mouth-to-mouth method was done by the prophet Elisha in the Old Testament and it is shown that the first successful defibrillation on a human-being was in the late 1940s (Nilsson, 2007). Cardiopulmonary resuscitation (CPR) has been in use in clinical practice for more than 50 years and even though a lot has happened during these years, cardiac arrest is up to today a global problem, causing hospitalizations, healthcare costs, suffering and death (Khatibzadeh, Farzadfar, Ezzati, Oliver & Moran, 2013).

Cardiac arrest, definitions and risk factors
A cardiac arrest means that the pumping ability of the heart, for sudden and unexpected reasons, stops working. This means that the victim immediately loses consciousness and signs of life. In order to survive, the heart rate needs to be restored immediately (Hjärt- och lungfonden, 2017). Anyone could be a victim, healthy as well as ill, but there are several factors that increase the risks, such as: coronary disease, obesity, diabetes, hypertension and smoking (Dunlay, Weston, Jacobsen & Roger 2009). Depending on risk factor prevalence and quality of health care, the pattern of cardiac arrest risk factors varies across the world. For instance, ischemic heart disease is the dominating cause of heart failure in high-income countries. Non-ischemic cardiomyopathies and rheumatic heart disease is more frequent in low-income countries, while ischemic heart disease is especially rare in African countries south of Sahara. Hypertension is a common risk factor all over the world. In East Asia, where the prevalence of smoking in men is 60% and chronic obstructive pulmonary disease is highly prevalent, cardiopulmonary diseases are more common in heart failure patients. In Sub-Saharan Africa, Latin America and Caribbean, cardiomyopathy is common due to infectious cardiomyopathies are more usual in these regions. Furthermore, in Sub-Saharan Africa and East Asia rheumatic heart disease is reported as a risk factor of heart failure – most likely on the ground of limited treatment of endemic rheumatic fever (Khatibzadeh et al. 2013).

Consequences for patients
The effects of ischemia and reperfusion in connection to a cardiac arrest might generate brain damage and sometimes it yields permanent disability for the victim. It is more common with psychosocial and cognitive issues among those surviving cardiac arrest with brain injury as a
complication; depression, anxiety and post-traumatic stress disorder are increased and social interactions are reduced. When making decisions about performing resuscitation, the risk of permanent disability must be taking into consideration (Welbourn & Efstathiou, 2018). The result of CPR depends on different factors that, for instance, are related to the patient status and resuscitation management. A study shows that shockable rhythm and a CPR duration of less than 15 minutes is a predictor for the return of spontaneous circulation, survival and no serious neurological outcome (Ji-ke, et al. 2013). Also, Welbourn and Efstathiou (2018) states that the neurological outcome is better with a shorter duration of CPR. Considering the injuring consequences of CPR, the difficult choice about when to terminate resuscitation attempts in those patients with no return of spontaneous circulation must be made by healthcare professionals (Welbourn & Efstathiou, 2018).

Cardiac arrest can affect the mental health of the patient. Studies has shown that survivors of sudden cardiac arrest report depression, lower self-esteem, lack of autonomy, reduced participation in social event and fear to suffer from a new cardiac arrest (Uren & Galdas, 2014). Although patients experienced and phrased gratitude to be given a second chance at life, the survivors emphasized putting family first, a reduction of stress and living a healthier life (Kertilsdottir, Albertsdottir, Akadottir, Gunnarsdottir & Jonsdottir 2013).

**Performing CPR**

Cardiovascular disease is one of the leading causes of death. Around the world millions are dying and the World Health Organization (WHO) estimates that more than one third of global deaths each year, are from cardiovascular diseases (WHO, 2015). CPR doubles or even triples the chance of survival in cases of a cardiac arrest. Immediate actions are crucial for the patients’ chance of survival. If a defibrillator is used within three minutes from collapse, a survival of 70 % has been detected (Valenzuela et al., 2000). The ability to respond quickly and effectively to a cardiac arrest rests on health care personnel, e.g. nurses, being competent, prepared and up-to-date (Nguyen, 2016).

In case of an in-hospital cardiac arrest, it is recommended to do 30 high quality compressions and 2 ventilations, or constant chest compressions with positive pressure ventilation, until a tracheal tube is in place. The aim is to detect and alert a cardiac arrest within one minute, start
CPR within one minute and start defibrillating within three minutes - if there is a shockable heart rhythm (Olasveengen et al. 2017).

The recommendations for an out-of-hospital cardiac arrest, is that the bystander start performing chest compressions and for those who are able and willing, rescue breaths are suggested. However, the evidence regarding rescue breaths and its effects on survival are unclear. The term: Chain of survival is important in this context. It includes; identify cardiac arrest, early alarm, early CPR with focus on chest compressions, rapid defibrillation and advanced emergency medical services as well as post-cardiac arrest care. A well-functioning chain of survival can increase the patients' chances of survival and recovery after a cardiac arrest (Olasveengen et al. 2017).

**CPR in the world**

In Sweden, there is a CPR council responsible for establish guidelines, to compile statistics and to gather data regarding cardiovascular diseases. Another main task for the council is to conduct evidence-based education regarding CPR (HLR-rådet, 2018b). In Sweden, there is also available data in registers on number of cardiac arrests that occur each year and the outcome. Hence, reliable statistics are available for research use. For example, available data show that there has been a clear improvement of survival after a cardiac arrest, i.e. the survival has increased from 4-5% since the turn of the millennium up to 11 % in 2017. Also, most of the survivors (>90 %) had an acceptable cerebral function by the time of discharge (Svenska hjärt-lungräddningsregistret, 2018). This can be related to better education for health care personnel, both in hospital care, in pre-hospital care and education for civilians (Blomberg, 2013).

The Swedish CPR-council is a member of the European Resuscitation Council (ERC). ERC is a part of the global organization International Liaison Committee on Resuscitation (ILCOR) with the purpose of gathering international science, evidence and international guidelines regarding how CPR is to be conducted (ILCOR, 2018). Kang, Seo, Binh and Nguyen (2018) show that the difference in disease patterns between high-income countries and low- and middle-income countries (LMICs) are decreasing. However, in the United States, Sweden and other high-income countries there is a great amount of data, while in LMICs, there is a limited amount of the similar type of data. According to a report from ERC, there is no significant difference in the number of cardiac arrests in hospitals between North America, Australia,
Europe and Asia. However, less people with a cardiac arrest in Asia receives resuscitation in comparison to the other continents (Nolan et al., 2010).

In Asia, the organisation Resuscitation Council of Asia (RCA) has gathered some of the countries to implement the guidelines of ILCOR while taking into consideration their own local culture and economic factors (RCA, 2018). However, some of the countries in Asia do not have their own resuscitations council. One of them is Vietnam, even though the second most common cause of death in Vietnam is cardiac arrest (WHO, 2018) and 15 % of all hospitalization is related to cardiovascular diseases. In Vietnam, the estimated mean hospital stay is 8.7 days for patients with cardiovascular disease and the cost per patient is 1000 USD (Reyes, 2016).

The Vietnamese healthcare system is dominated by the public sector, which means that the government is responsible for healthcare polices, legal regulations and guidelines to promote high quality and safe service to the Vietnamese people (Kang et al., 2018). The Vietnamese government is responsible for the emergency medical services (EMS), and there is a nationwide policy in urban areas where there is a universal three-digit phone number established. Ambulances with a physician, nurse and driver dispatches responding to emergency calls. Although, functioning EMS system only exist in a few areas. For example, in Hanoi there is a total of 14 ambulance units that serve approximately 7.5 million people (Hoang, Dao, Nakahara & Sakamoto, 2018)

According to Kang et al. (2018) Vietnam is depending on international aid regarding the development of an emergency system, including CPR. For instance, Korea Association of Cardiopulmonary Resuscitation, belonging to the American Heart Association, has been involved in the education of instructors and implementing advanced cardiopulmonary life support and basic trauma life support at the nursing faculty in Hue University of Medicine and Pharmacy.

**Importance of education**

The chance to survive a cardiac arrest is directly correlated to the quality of CPR, based on the international guidelines and the educational effectiveness (López, Martín, Pereza, Molina & Herrero, 2011). According to Lindsay and Jenkins (2013) it is shown that students who gets education with scenarios, perform a better and safer care for patient with a rapid clinical
deterioration when they experience a real situation later in their work-life. Harder (2010) deems that using simulation reduces the risk for errors, it improves clinical assessment and is important for learning. He believes simulation promotes critical thinking and enhances self-confidence (Harder, 2010). Studies have shown that nursing students biggest fear is to "hurt the patient", "do something wrong" or to "miss something important" and not being able to perform patient safe care (DeBourg & Prion, 2011). Güner (2014) says that a high-quality education using simulation can give students confidence in their skills as they become registered nurses. Further, he states that education is the basis to succeed as a nurse and is exceptionally significant for safe, quality patient care (Güner, 2014).

**Nursing theory**

The theoretical framework of this research project is Patricia Benner nursing theory, which highlights proficiency, clinical wisdom, engagement and ethical judgement ability (Urenfeldt, 2012). According to Benner, proficiency is a personal stage that contains possibilities to continued professional development. Benner describes nursing as a caring relationship, an “enabling condition of connection and concern” (Benner & Wrubel, 1989, p.4), where caring is elementary since caring allow the possibility of giving and receiving help as well as causing meaningful ways to master a situation. Caring creates a context, which is the core in nursing. The science behind caring shall be guided by ethics of care, moral and responsibilities. The view of nursing practice, per Benner, is the care and study of perceptions of health, illness and disease and the connection between these three elements (Brykczyński, 2018). Benner use a phenomenological description of person. It is a view that is individual and situation oriented, where conscience, engaged discernment and the ability to act, constitute the foundation in caring for another human being (Uhrenfeldt, 2012). Benner also says that the person is embodied, which means the capacity of the body to respond to meaningful situations. Embodied intelligence can be a highly developed skill that experts, such as experienced nurses, hold. Benner has a perception that the human cannot be isolated from the context he or she is in and the person does not come into the world predefined, but gets defined in course of living a life (Brykczyński, 2018).

Benner chooses to use the word *situation* rather than *environment*. A situation entails social surroundings, with social definitions, meaning and purpose. Humans can be bound by their comprehensions in a situation. The meaning of this is that every person’s past,
present and future, which includes the person’s perspectives, will influence the current situation (Brykczynski, 2018).

Benner has a holistic view of health and says that health is not only an absence of disease or illness. It is described as something subjective and Benner rather use the word well-being, which is the person’s experience of health or wholeness (Brykczynski, 2018).

The nursing theory of Benner highlights competence and experience as prime components in the nursing profession. Therefore, education is of importance for nurses to give patients the best possible care. The view of human and situation in one context and that every individual’s own perceptions/baggage affect the person’s action in a situation is suitable in this study. If nurses have knowledge, experience, embodied intelligence and clinical wisdom, different situations will be handled masterly and therefore patients will receive a better care.

**Problem statement**
Cardio vascular disease is one of the leading causes of death in the world (WHO, 2015). Research shows that immediate start of CPR is vital for increased chance of survival (Valenzuela et al., 2000). To optimize a quality CPR, improvements in resuscitation and an implemented system that support that delivery is required. The ability to respond quickly and effectively to a cardiac arrest situation rests on nurses being competent, prepared and up-to-date (Nguyen, 2016). It is important both in hospital care as well as in the society, where a nurse can be a bystander. In Asia, less victims receive resuscitation in comparison with the rest of the world, even though as many people suffer from cardiac arrest (Nolan et al., 2010). In Vietnam, no national resuscitation council exists (RCA, 2018). Nursing students are soon to be responsible for people’s lives. Student’s knowledge in CPR and perceptions of their own training are crucial for the pursuit of the education of competent nurses.

**Aim**
To investigate the prerequisites for a good care of patients in need of CPR by assessing Vietnamese nursing students' knowledge in CPR as well as their perceptions on their education in CPR.
Research questions:

- What knowledge do nursing students have regarding CPR, after participation in CPR-training?
- What are the nursing student’s perceptions of the training in CPR?
- Are there factors (age, gender, perceptions of training) that distinguish nursing student’s level of knowledge?

METHOD

Design

To answer our research questions, a cross-sectional study was conducted. A cross-sectional study is a non-experimental study, which is suitable when it comes to questions regarding correlation, mapping and to compare different groups in a specific population. It also allows the researchers to examine a large amount of data with limited economical recourses. In cross-sectional designs, data is collected at one point, which establish a picture of the reality here and now (Polit & Beck, 2012).

Sample

A convenience sample was used. Nursing students in year 3 were approached at the University of Medicine and Pharmacy (UMP) in Ho Chi Minh City in Vietnam on the 19th of November 2018. The inclusion criteria was that the students should have had education in CPR. In total, 108 participants were asked to contribute, and all participated. The class contained 150 students and 108 showed up for the information meeting about the questionnaire. Hence, 42 students were never asked to participate.

Context

The nursing education in Vietnam is considered to have low quality, since the universities foremost are failing to keep up with new sciences (Nhan Dan, 2017; Zodpey et al., 2018). However, UMP is one of two universities with the highest quality of education in Vietnam. At UMP, the nursing program is 4 years and the CPR training, both theoretically and practically, is performed in year 2.
Data collection
A modified version of an already existing questionnaire developed by the Swedish council of CPR, which is used in Sweden when educating about resuscitation (HLR-rådet, 2018b) was used in the current study. However, some alternatives were modified and some questions were removed to fit Vietnamese circumstances. The original questionnaire contained 16 questions, while the modified version used in the current study included 13 questions (Appendix 1). The questionnaire is based on international research, science and evidence-based fact regarding cardiovascular resuscitation and how it is recommended to be performed. The reliability is considered as good; the survey is replicable, due to its availability online. The validity is affected because the original questionnaire is developed to work as a test immediately after a completed education. The questions included in the questionnaire is vital for understanding CPR and how to conduct CPR, however it is not especially comprehensive. Hence, the participant might have knowledge that is not examined as well lack of knowledge about issues that was not questioned.

The questionnaire is translated by the authors from Swedish to English, and then to the participant’s native language, Vietnamese. The UMP assisted regarding translation to Vietnamese as well as translating the open question to English. The teacher responsible for CPR education at the university, controlled the questionnaire before handout, to make sure that the questions were relevant and that the translation was correct. The questionnaire contains 13 questions regarding how to conduct CPR, symptoms, treatment and what equipment to use. The participant chooses between 3-4 alternatives, where one alternative was the right answer. One right answer gave one point and the maximum score on the questionnaire was 13. If a participant left a question unanswered or answered incorrectly, zero point was given. In addition to these fact-based questions, the questionnaire contained questions regarding the students’ age and gender. Further, there were two questions about the students’ perception of the CPR training; i.e. how prepared they were performing a patient safe CPR and how satisfied they were with their training. For these questions the respondent could choose a number between 1 and 5 (1 = Not prepared / Not satisfied and 5 = Very Prepared / Very Satisfied). One open question was incorporated at the end of the questionnaire to detect what the students thought was crucial in their education in order to perform a patient safe CPR (Appendix 1).
Procedure
This study was performed in collaboration with UMP in Ho Chi Minh City. It has been approved by Uppsala University as well as Tran Thuy Khan Linh (RN, MSN, PhD, Lecturer) at the nursing department at UMP. Further, the project was funded by two Minor Field Scholarships from the Swedish International Development Cooperation Agency.

Together with a Vietnamese teacher, nursing students (fulfilling the inclusion criteria) in one class were informed about the project and asked to participate. The students received the questionnaires (Appendix 1) with included information sheet (Appendix, 2), which described the project and informed the participants about their rights. All students were counted, as well as how many questionnaires that was handed out. The estimated time for answering the questionnaire was about ten minutes and the collection of the survey was done immediately. Copies of the questionnaire were made to enable translations of the open question from Vietnamese to English at the same time as the authors could correct the questionnaires. The authors then compiled the data in Windows Excel as well as entered it into SPSS, the Statistical Package for the Social Sciences.

Ethical considerations
The information given together with the questionnaire (Appendix 2) was in accordance to the ethical guidelines from Northern Nurses Federation (NNF), i.e. in an easy, understandable language and in the participants own native language (NNF, 2003). Further, NNF recommend full anonymity. Therefore, the students were informed that data will be handled with confidentiality and that participating is voluntary and anonymous (Appendix 2). The participants’ were assured that only the authors and the supervisors will be the ones reading the answers and the participants can choose to leave the questionnaire blank. The information that was given, asserted the participant that the project is conducted with assurance that the data collection is done with the utmost respect for the privacy of the participants – following the guidelines of NNF. The participants were asked about participation, both orally and in writing.

When making a study the researcher always must consider the probable value of new knowledge against the risk for privacy violation for the individual participant (Vetenskapsrådet, 2017).
Processing and analysis

To present the results about the participants’ knowledge in CPR the authors used frequencies (n), proportions (%), mean-scores and standard deviations (SDs). Firstly, 10% of the gathered questionnaires were quality controlled by comparing them to the Excel-sheet with all collected data, no in-corrections were found. Secondly, the data were compiled into a histogram to find out if there were a normal curve. Thereafter the authors conducted the Shapiro-Wilks normality test. The histogram had a Gaussian distribution and the result from the normality test guided the authors to use parametric statistics to analyze different groups.

To find out if students with a higher rating of preparedness and satisfaction had a higher result on the questionnaire, t-tests were performed. To perform this analysis the students rating on the background questions were divided in different groups: Those being very prepared/very satisfied (rating 5) were compared with those being less prepared/less satisfied (rating of 1-4), and those being very prepared/very satisfied (rating 4-5) were compared with those being less prepared/less satisfied (rating of 1-3). Chi²-tests were used to explore if there were any differences in preparedness and satisfaction based on gender. T-tests were used to explore if there were differences in knowledge based on the characteristics and the student's perceptions of their training. The chosen level of significance was p<0.05.

RESULT

The participants’ knowledge in CPR

A total of 108 students participated, 13 males and 95 females. All participants were nursing students in the same class, which was year 3. The participants were born in 1996, 1997 and 1998, with a majority of the participants born in 1998. The participants answered right on 41% of the questions (571/1404). The mean score for all participants was 5.25 (SD ±1.49) and the median score was 5 (31% of the participants). The score ranged from 0 (0.9% of the participants) to 9 (0.9% of the participants). Questions were left unanswered 49 times by 16 participants, which equals to 3.5% of all expected answers.

As shown in Figure 1, the questions with the highest amount of right answers were question number 2 (What symptoms can be an early sign of cardiac arrest?), with 79% (85/108) of the participants answering correctly (Central chest pain with left arm radiation), as well as question 12 (If you find a patient with suspected cardiac arrest, what should you do first?) with 79% (85/108) of the participants answering correctly (Evaluate signs of life, alert and
start CPR 30: 2). Despite the high amount of right answers on early signs, many participants were uncertain of question number 4 (What symptoms are the criteria of diagnosing a cardiac arrest?) with only 22 % (24/108) answering correctly (Unconsciousness and no, or abnormal, breathing) and 70 % choosing the incorrect alternative (Unconsciousness, no pulse or breathing).

The question with the lowest amount of right answers was question number 6 (How often should the person who does chest compressions be replaced?) (Figure 1). Only 7 % (8/108) answered correctly (Always after two minutes). For this question over 70 % picked an incorrect alternative (After two minutes, if the person feels tired).

Also question number 9 (Can defibrillation hurt a patient who has a pacemaker or ICD?) had a low amount of right answers with 20 % (24/108) answering right (No, but if possible, avoid placing the defibrillator plates over pacemaker). Over 75 % of the participants believed that the defibrillator could hurt the patient. Further, question number 5 (Can a heart be damaged by chest compressions), 23 % (25/108) answered correctly and 65 % of the participants thought that the heart could be damaged.

**Figure. 1:** Participants amount of right answers in percent, question by question.

![Result on the fact-based questionnaire](chart.png)
**Preparedness for CPR and satisfaction of CPR training**

On the question regarding preparedness (Do you think you are prepared to provide a patient safe CPR, due to your training?) 14 % (15/108) chose the rating number 5 (Very prepared), 42 % (45/108) chose number 3 and 2 % (2/108) number 1 (Not prepared) (Figure 2).

When comparing gender with participant preparedness (rating 1-4 vs rating 5), there was no significant difference ($\chi^2 =0.03$, df= 1, p=0.87). A similar result was detected when grouping the rating of preparedness differently (rating 1-3 vs rating 4-5) ($\chi^2 = 0.42$, df= 1, p=0.52).

On the question regarding satisfaction (Over all how satisfied are you with your CPR training?) 15 % (16/108) of the participants selected number 5 (Very satisfied), almost 38 % (41/108) chose rating number 4 and 18 % (19/108) chose number 2 (Figure 2). Also here, the chi-square test was used to compare gender with participant preparedness (rating 1-4 vs rating 5), but no significant difference was found ($\chi^2 = 0.52$, df= 1, p=0.47). With an altering in the group rating (rating 1-3 vs rating 4-5) a similar result was noticed ($\chi^2 = 0.37$, df= 1, p=0.55).

**Figure. 2** Percentage of participants grading preparedness (Background question 1: B1) and satisfaction (Background question 2: B2).

After asking 108 nursing students, what they consider is most important in their education, in order to perform patient safe CPR, the answers were categorized into 4 different groups: Practical training (36/108), theoretical education (3/108), observation (3/108) and
collaboration between practical, observational and theoretical education (34/108). In total 29 % (31/108) of the participants did not answer the question.

**Differences in knowledge**

There was no significant difference in mean score on the knowledge survey between participants being more prepared (rating 5) (M=5.40, SD=1.24), and those being less prepared (rating 1-4) (M=5.23, SD=1.53), \(t(106)=-0.42\) \(p=0.68\). Also, when dividing the preparedness groups differently, no significant difference in mean score was detected between participants being more prepared (rating 4-5) (M=5.36, SD=1.46) and those being less prepared (rating 1-3) (M 5.07, SD=1.54), \(t(106)=0.96, p=0.33\).

A t-test was used to investigate if there were differences between high scores on the questionnaire and how satisfied the participants were with their CPR training. However, there was no significant difference in mean score for those less satisfied (rating 1-4) (M=5.30, SD=1.34), and those who were very satisfied (rating 5) (M=5.00, SD=2.22), \(t(106)=0.72, p=0.47\). Also, when dividing the groups differently, less satisfied (rating 1-3) (M=5.36, SD=1.26) and very satisfied (rating 4-5) (M=5.16, SD=1.67), there was no significant difference between the groups. \(t(106)=0.71, p=0.48\).

Further, there was no significant difference in knowledge between gender, male students (M=5.54, SD=1.66) and female students (M=5.21, SD=1.47), \(t(106)=0.74, p=0.46\).

**DISCUSSION**

The students responding to the questionnaire had a mean score of 5.25 (range 0 to 9). The total amount of right answers was equal to 41 % of the total possible score. The amount of right answers on each question varied from 7 % to 79 %. Many participants (79 %) answered correctly on the two questions regarding early signs and what to do in case of a cardiac arrest. However, 78 % of the participants answered incorrectly about how to diagnose a cardiac arrest. Also, 75 % of the participants thought that a defibrillator could hurt the patient and 70 % wrongly thought that the rescuer should be replaced after two minutes if being tired. In total, 3.5 % of the questions was left unanswered which is measured as such a low amount of the total answers and that it could not have affected the result.
There was no association between how the students graded themselves as prepared for conducting CPR and their result on the questionnaires. Also, there was no association between satisfaction of the CPR training and results on questionnaire. No significant difference could be found based on gender. Below, the findings will be discussed based on the research questions.

Result discussion

Knowledge in CPR

When it comes to diagnosing a cardiac arrest, it is crucial for nurses to immediately be able to recognise it and to take appropriate actions (Nguyen, 2016). Therefore, it is worrying that our result shows that 79 % of the participants selected the wrong alternative (Unconsciousness, no pulse or breathing) when it is enough to diagnose a cardiac arrest with unconsciousness and no, or abnormal, breathing (Olasveengen et al 2017). However, an explanation might be that the alternatives are quite similar, but since so many chose the alternative including “no pulse” it could be a lack of knowledge in diagnosing a cardiac arrest or a fault in the education. As Olasveengen at al (2017) states, the aim in hospital care is to detect and alert a cardiac arrest within one minute, start CPR within one minute and start defibrillating within three minutes. A well-functioning chain of survival can increase the patients' chances of survival and recovery after a cardiac arrest. The incorrect opinion among nursing student in the current study on how to detect a cardiac arrest, might result in a delay of alarming, i.e. time will be wasted by looking for a pulse, which means CPR and the important chain of survival will be delayed, resulting in devastating consequences for the patient.

Research shows that regardless if the rescuer feels tired or not the quality of the chest compressions decreases after two minutes (Axelsson, Nestin, Svensson, Axelsson & Hertlitz, 2006). One difficult question for the participants was when to replace the rescuer performing chest compressions. Most of the participants knew it should be done after 2 minutes, but 79 % thought that it should only be done if the rescuer was tired. Maybe students have learned that the rescuer should be replaced after two minutes, but do not know why it is important. Again, it could be a flaw in the education, but it could also be miscommunications between teachers and students.
Studies have shown that one of the nursing students biggest fear is to "hurt the patient" and not being able to perform a patient safe care (DeBourg & Prion, 2011). As seen in the current study, most of the participants are under the impression that chest compressions could hurt the patient's heart, as well as that the defibrillator might cause damage to a patient with pacemaker or ICD. One reason explaining these results could be that nurses in Vietnam do not use the defibrillator and therefore do not receive any education about it. In a worst-case scenario this could lead to that CPR is not performed because the nurse is unsure and afraid to do harm. It is important to make clear that neither chest compressions nor the defibrillator will seriously hurt the patient. To avoid misunderstandings and to make nurses sure in their decisions, it is crucial to highlight that it is better to start CPR than not to (HLR-rådet, 2018c). Also, according to Hoang, Dao, Nakahara and Sakamoto (2018), the amount of defibrillators are low in Vietnam, both in ambulances and in hospitals. In the society defibrillators do not exist at all, and this absence of experience in using them is widespread in the country, which might explain the lack of knowledge among the students as well.

Our study did not show any significant difference between high results and satisfaction and preparedness. No previous studies were found to show this connection either. The result did not differ among gender and looking into differences between ages was not relevant since all participants were born during the same three years. In a larger group with better proportion between males, females and different ages, other result might occur.

According to Benner, nursing is a caring relationship. The science behind caring shall be guided by ethics of care, moral and responsibilities. The view of nursing practice, per Benner, is the care and study of perceptions of health, illness and disease and the connection between these three fundamentals (Brykczynski, 2018). Having knowledge in CPR and the theory behind why CPR is conducted as it is recommended will facilitate for nurses to take their responsibilities and acting correctly in a cardiac arrest situation. Nurses not having enough knowledge could result in unwanted consequences for patients. Further, Benner says that proficiency is a personal stage that contains possibilities to continued professional development. According to the conducted study none of the background factors seemed to affect the participants knowledge. Although Benner states that humans can be bound by their context and by preconceived notions in a situation. So, apparently it is not about age, gender or view of oneself as prepared or satisfied that affect knowledge. More likely it is like Benner says that every person’s past, present and future, including the person’s perspectives, still will
influence a situation (Brykczynski, 2018). If students receive decent education and training in CPR they will handle a cardiac arrest situation better.

**Perceptions of training**

The chance to survive a cardiac arrest is directly correlated to the quality of CPR, based on the international guidelines and the educational effectiveness (López et al. 2011). Also, according to Güner (2014) education is the foundation to succeed as a nurse and it is exceptionally true for safe and quality patient care. Also, the nursing theory of Benner highlights competence and experience as prime components in the nursing profession (Brykczynski, 2018). Lindsay and Jenkins (2013) says that students educated with scenarios perform a better and safer care for patients. In the current study the students thought that practical training was particularly important for their education in CPR. The students also highlighted the importance of having a connection between practical training, observational and theoretical training in their educations. The students mainly named three different examples and they all answered very similar, however most students mentioned that practical training is of utmost importance for them to perform a patient safe CPR in a cardiac arrest situation. This could be found in Benner’s nursing theory as well, where she states that nurses will handle different situations masterly if they have knowledge and experience - then patients will receive a better care (Brykczynski, 2018).

On the question about the participants preparedness, a majority rated themselves as a number 3, which could interpreted as they felt neither very prepared nor not prepared. Maybe the participants were unsure of how to rate themselves and therefore chose the neutral middle option. According to Güner (2014) high-quality education using simulation can give students confidence in their skills as they become registered nurses. Also, Harder (2010) says that the use of simulation in the education minimize the risk for errors, it improves clinical assessment and is important for learning. Further, Harder (2010) states that simulation promotes critical thinking and enhances self-confidence. Although, Harder (2010) also says that the clinical skill did not increase in association with a higher self-confidence. As found in the current study, the students with high rating on preparedness did not perform better on the knowledge survey. Perhaps the participants would have rated their preparedness higher if they had received more training with scenarios and simulations, however it might not have an impact on the participants result on the knowledge survey or their actions in case of a real cardiac arrest situation.
The authors asked the participants how satisfied they were with their CPR training. The majority of the participants answered that they were satisfied, with 38% selecting number 4 and 15% number 5. No one out of 108 participants rated that they were not satisfied with their training. One reason could be that one of the students’ teacher was present during the test. According to Güner (2014) education is the basis to succeed as a nurse and to provide patient safe care. If students are afraid to utter their real opinion about their education the care of patient can deteriorate and the continued development of education impedes. However, the participants were assured that the survey was anonymous, so maybe they did express their opinion and truly are positive about their education.

**Relevance of conducted study**

The conducted study shows that nursing students have a generally low result on the fact-based questionnaire. Nurses assumes a major role in determining and implementing quality-aspects in clinical work (Nguyen, 2016). In Asia, less victims receive CPR in case of a cardiac arrest, compared with the rest of the world (Nolan et al., 2010). An untreated or poorly treated cardiac arrest causes physical and psychological suffering for patients. An inadequate performed CPR might lead to longer hospital stays, serious complications and deaths (Welbourn & Efstatthiou, 2018). Well-educated nurses are essential for patients to receive an adequate care. The ability to respond effectively to a cardiac-arrest, rests on nurses being competent and up-to-date and is substantially for people and society in reduced affliction and expenses. Since the Vietnamese healthcare system is dominated by the public sector, the government is responsible for healthcare polices, legal regulations and guidelines (Kang et al., 2018). They have the chance to implement the ILCOR guidelines on all hospitals and all universities to promote high quality CPR education and safe service to the Vietnamese people.

**Method discussion**

Using a quantitative, cross-sectional study was appropriate for the aim of the study. We wanted to map the knowledge among nursing students and to discover associations between factors influencing knowledge. Further, we wanted to establish a picture of the reality here and now when it comes to knowledge in CPR, therefore a cross-sectional study was suitable (Ejlertsson, 2012). The benefit of using a questionnaire as data collection is that it is possible to have a large number of participants and it is easier to replicate the study. Also, the ability to compare the participants answer is an advantage (Polit & Beck, 2012). Adding an open
question gave the participants an opportunity to describe by their own words their thoughts on their CPR training, which is also an advantage. However, almost one third of the participants (31/108) chose not to answer the open question. Also, the participants who did answer, all wrote very similar answers, therefore it is likely to assume that those not answering, probably would not have contributed with any new information. The authors deems that the low answer rate did not affect the result. The reason for the similar answers could be derived to the unfortunate formulated question, which gave three examples to clarify the question. These examples are identical to the participants’ answers and the participants have probably been influenced by the question. The design of the question was unfortunate, yet, the students shared usable experiences of their education.

The authors intended to learn about the participants’ opinions on their education and perception of training, but quantitative research is more based on the researcher's perspective. Instead, the use of qualitative research would have been more suitable, since it seeks to look through the respondents' eyes. Hindsight, a qualitative approach on the backgrounds questions could have gained the study (Alvesson & Sköldberg, 2008). Also, there is no possibility of asking follow-up questions when using a quantitative design. It would have benefitted the study if the authors would have had the ability to ask more in-depth question regarding why the participants rated themselves as they did (Bryman, 2001).

Further investigation in finding out students’ perceptions of their training is needed. To gain more in-depth knowledge in this field a qualitative method would be preferable (Polit & Beck, 2012). For a more profound research in students’ knowledge in CPR another method could have been used. For instance, including practical tests and a more comprehensive questionnaire.

**Language and cultural barriers**

One weakness is that the authors have a limited experience in conducting a cross sectional study. Another is that English is not the authors native language, yet they were the ones responsible for translating the questionnaire from Swedish to English. Teachers from both Uppsala University and UMP assisted in the process of translation and to modify the questionnaire to fit its context. It is a strength that several people were involved in translating and modifying the questionnaire.
Furthermore, the questionnaire was translated to the student's native language Vietnamese, which is a language the authors do not master. Therefore, controlling the questions after translation before handing out the questionnaire to the students, was impossible for the authors. However, different teachers from UMP read the questionnaire in Vietnamese to make sure the translation was right. Also, the teacher responsible for CPR education at UMP were assisting in the process of translating to Vietnamese to ensure that the meaning of the questions were correct.

It was problematic to review the questionnaire with the teacher responsible for education in CPR at UMP, due to lack of time. The authors only met this teacher just before the survey were planned to be conducted and the authors realised that some questions might not fit the context, despite the already modified questionnaire. The authors decided to proceed with the survey as it was, but to take into account that low results could depend on the fact that some questions contain facts that the students have not received in their CPR education.

When analysing the questions, it was clear that the participants had difficulties responding to some questions. The authors investigated what questions were especially hard and especially easy for the participants. Questions regarding basic CPR were most likely to have high amount of right answers. Questions regarding the defibrillator had a low amount of right answers, which is understandable since in Vietnam it is the doctors using the defibrillator and how to use the defibrillator is nothing the nurses get to learn. In-corrections in translation and therefore difficulties in understanding the questions, could also be a reason to the low amount of right answers. Another reason for the low result could be that the students had their CPR education in year 2. Perhaps a higher result would have been detected immediately after finished course when having the knowledge fresh in memory. Also, a higher result could have been found among students in later semesters, where they have had additional education in intensive care. If all students in the class had answered the questionnaire perhaps the result would have been different.

**Validity, reliability and generalizability**

Regarding the validity, the Swedish council of resuscitation uses this survey to determine the knowledge in CPR, although it is used immediately after a web-based education together with practical training. This modified version of the questionnaire with 13 questions might not represent the participants total knowledge in CPR. A low result does not necessarily mean
that the student would not be able to handle a real cardiac arrest situation. Although, something could be said about the participants overall theoretical knowledge in CPR, since the questions are relevant and contains basic and crucial facts about how CPR is to be conducted.

The reliability is assumed to be good since the survey is replicable due to its availability (Polit & Beck, 2012). However, the authors cannot guarantee the same results if replicating the study, since the participants in this study might not be representative for all nursing students in Vietnam. Also, as already mentioned, the authors cannot control the translation to Vietnamese and therefore it might be a risk of indifferences from the original questionnaire.

The authors cannot apply the result from one nursing class in one university to all nursing students in Vietnam. To be able to generalize the result, the study should have been done in multiple classes, in different semesters, and at multiple universities. In Vietnam, there is no resuscitation council responsible for CPR guidelines (WHO, 2018). Therefore universities might teach CPR differently and student’s knowledge might vary. To achieve a generalizable result, either all nursing students in Vietnam should have been asked to contribute or participants should have been selected randomly in large groups from all universities in Vietnam (Polit & Beck, 2012).

**Ethical considerations**

Since the study was voluntary and anonymous, we think the study have a reasonable balance between personal integrity and new research. Also, the participants were informed in their own language both verbally and in writing. However, the participants got the information orally by one of their teachers. Also, this teacher was present when the students were asked to participate and during the time they answered the questionnaire. This could have affected the students to feel compelled to participate in the study as well as worried to express their mind. In order for the participants to be able to express their mind, the authors should have made certain that no teacher were present during the survey. Therefore, it would have been better to use a real interpreter who is impartial. However, they were assured several times it was voluntary to participate. Another ethical dilemma is that the conducted study is somehow about examine knowledge and we were a bit worried that it could be perceived as we had come all the way from Sweden to quality check the education in Vietnam, which is not at all the intention. We have tried to be simple and modest and to make clear that we are interested
in seeing if perceptions about one's education affect knowledge and indirectly the quality of the care nurses provide to patients.

Conclusion

The knowledge in CPR, based on the conducted survey, is generally low with 41% (571/1404) correct answers. Participants answered correctly on most questions regarding basic CPR. However, 78% of the participants were wrong about how to diagnose a cardiac arrest. The participants were wrong about questions foremost regarding the defibrillator, which might have a connection to what education the participant receive. There was no significant difference in mean score on the knowledge survey between participants being more prepared and less prepared, or between the participants being more satisfied and less satisfied with their training. Also, no significant difference was found on the knowledge survey based on gender.
REFERENCES


APPENDIX 1

KNOWLEDGE BASED QUESTIONNAIRE IN CPR

1. What is important after completing the education in CPR?
   1. Understand the importance of early alarm, early CPR and early defibrillation*
   2. Treat a patient with respiratory arrest based on the CPR Council guidelines
   3. Be able to treat a patient with manual defibrillation
   4. Know how to use the medicines used for cardiac arrest

2. What symptoms can be an early sign of cardiac arrest?
   1. Unconsciousness with completely normal breathing
   2. Low blood sugar
   3. Fever and vomiting
   4. Central chest pain with left arm radiation*

3. What are the treatment goals for cardiac arrest in healthcare?
   1. Start of CPR as soon as possible, alarm within 5 minutes, defibrillation within 7 minutes, and follow-up care of all resuscitation treatment.
   2. Start CPR as soon as possible, alarm within 3 minutes and follow-up of all completed resuscitation treatment
   3. Start of CPR within 1 minute, alarm within 1 minute, defibrillation within 3 minutes at Ventricular fibrillation/Ventricular Tachycardia and follow-up of all resuscitation treatment*

4. What symptoms are the criteria of diagnosing a cardiac arrest?
   1. Unconsciousness and no, or abnormal, breathing*
   2. Unconsciousness, no pulse or breathing
   3. No pulse or breathing
   4. Deep unconsciousness

5. Can a heart be damaged by chest compressions?
   1. Yes, there is a high risk of arrhythmias
2. No, not if you perform the compressions a bit slower than usual
3. No*
4. Yes, you can cause a cardiac arrest

6. **How often should the person who does breast compressions be replaced?**
   1. When the person's breathing is affected
   2. After two minutes, if the person feels tired
   3. Always after two minutes*
   4. The person does not need to be replaced at all

7. **What conditions are treatable with a defibrillator?**
   1. Asystole and ventricular fibrillation
   2. Ventricular fibrillation only
   3. Pulseless electrical activity and asystole
   4. Ventricular fibrillation and ventricular tachycardia*

8. **If a person chokes but still can breathe and cough - what should you do?**
   1. I do back blows as hard as I can
   2. I encourage the person to cough, and stay with the person*
   3. I give the person a glass of water
   4. I run away to call the ambulance

9. **Can defibrillation hurt a patient who has a pacemaker or ICD?**
   1. No, but if possible, avoid placing the defibrillator plates over pacemaker*
   2. No, but the electric current does not do any good
   3. Yes, in case of improper placement of the defibrillation plates
   4. Yes, the heart can be damaged

10. **Which one of the following emergency equipment should be prioritized when being in place?**
    1. CPR board
    2. Oxygen
    3. The defibrillator*
    4. Oropharyngeal airway
11. **Which equipment is the first choice for rescue breaths?**
   1. Respiratory mask*
   2. Oropharyngeal airway
   3. Respiratory mask and Ambu-bag
   4. Intubation

12. **If you find a patient with suspected cardiac arrest, what should you do first?**
   1. Evaluate signs of life, alert and start CPR 30:2*
   2. Evaluate the patient and start CPR 30:2
   3. Get the emergency chart and then look for signs of life/vitals
   4. Get someone with higher medical skills

13. **CPR at drowning - are there any differences?**
   1. Yes, do only rescue breath the first few minutes
   2. Yes, if possible, do five rescue breaths already in the water if you have been training it before*
   3. Yes, try to empty the airways on water
   4. Yes, just do chest compressions because the lungs are filled with water

*Indicates the right answer
Student background

1. Do you think you are prepared to provide a patient safe CPR, due to your training?

Rate your answer from 1-5, by circling one number. (1 = Not prepared at all, 5 = Very prepared)

1  2  3  4  5

2. Over all how satisfied are you with your CPR training.

Rate your answer from 1-5, by circling one number. (1 = Not satisfied at all, 5 = Very satisfied)

1  2  3  4  5

3. In your opinion, what was important in your education for you, as a future nurse, to be able to provide a patient safe CPR (for example practical training, theory, observation).

Answer:

YEAR OF BIRTH: _______

GENDER:  Male ☐   Female ☐   Other, please specify: ________________

YEAR OF EDUCATION:  Year 1 ☐ Year 2 ☐ Year 3 ☐ Year 4 ☐

Thank you for your contribution in our survey!:}
APPENDIX 2

INFORMATION SHEET

Aim
To investigate the prerequisites for a good care of patients in need of CPR by assessing Vietnamese nursing students' knowledge in CPR as well as their opinions on their education in CPR.

Background
We are two nursing students from Sweden working on our bachelor thesis here in Vietnam. We chose to travel here since we have a global interest and are curious of differences in education and healthcare. We are eager to learn from you, both as soon to be nurses and to learn about your country and culture. We chose our subject since cardiovascular disease are one of the leading cause of death in the world. Immediate care is crucial for the patient’s chance of survival and to minimize permanent damage. The ability to respond quickly and effectively to a cardiac arrest situation rests on nurses being competent, prepared and up-to-date. Student’s thoughts and opinions of their own training are crucial for the pursuit of the education of competent nurses, therefore we ask for your contribution.

Participating in this study will help us to finish our bachelor thesis.

Data and privacy
The data collection is done with the utmost respect for your privacy and there is no way to identify your individual answers. The questionnaire takes about ten minutes. Data will be handled with confidentially, only the authors and supervisors will have access to the completed questionnaires. Participating is voluntary and anonymous and you can choose to leave your questionnaire empty. The findings could be published but there are no traces to you as a student.
**Responsible for this study**

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By filling in the questionnaire you consent to participate and confirm that you understand the information above. It is voluntary and if you do not want to participate you can hand in the questionnaire empty.