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Nurses' Competence in Adult Cardiopulmonary Resuscitation

A Descriptive Literature Review

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<p>Cardiopulmonary resuscitation (CPR) refers to an urgent, life-saving intervention conducted in response to cardiac arrest in which nurses play a vital role as primary healthcare providers. The provision of immediate, precise, and skilled nursing intervention becomes imperative when faced with medical emergencies such as cardiac arrest.</p> <p>The purpose of the study was to describe the nurses' competence in adult CPR. This study aimed to provide a deeper updated understanding of the nurses' competence and the factors relevant to competency in adult CPR.</p> <p>The study employed a descriptive literature review and used scientific search engines CINAHL and Medline. Ten articles were selected for this study based on cited inclusion and exclusion criteria. Inductive content analysis was utilized as the data analysis method.</p> <p>Findings indicated that knowledge and skills were identified as nurses' competencies in adult CPR, while relevant factors are work experience, work environment, attitude, emotions, and training. Those who reported undergoing frequent training, and working in different settings exhibited good CPR knowledge, and longer work experience indicated a good indicator of skill competencies. The work environment influenced the application of CPR skills by exposing nurses to varying conditions. Nurses exhibited a significant favorable emotional reaction to successful CPR outcomes.</p> <p>In conclusion, the study underscored the central role of knowledge, skills, and factors in shaping nurses' competence in adult CPR. Furthermore, this study is valuable for healthcare institutions, enabling them to prioritize the relevant factors identified to enhance nurses' competencies further.</p>	
Keywords	nurse competence, cardiopulmonary resuscitation, nurses' knowledge and skills.

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1 Introduction

Cardiopulmonary resuscitation (CPR) refers to an urgent, life-saving intervention conducted in response to cardiac arrest, which is characterized by the cessation of heart activity (American Heart Association 2023). The proficiency of nurses in resuscitation of adult patients is of crucial significance in ensuring their survival and the overall outcomes in critical scenarios. Nurses play a vital role as primary healthcare providers in the prompt resuscitation of cardiac arrest and other critical emergencies. The provision of immediate, precise, and skilled nursing intervention becomes imperative when faced with medical emergencies such as cardiac arrest. In connection with the study, the training in trauma resuscitation has a significant impact on the enhancement of nurses' knowledge, underscoring the imperative of equipping trauma care practitioners with appropriate training to ensure the provision of optimal care. (Chowdhury, Almarhabi, Varghese, and Leenen 2022: 2.) It is imperative that nurses place the utmost importance on the pursuit of further education to enhance their knowledge and skills in adult resuscitation practices as well as other emerging evidence-based protocols (Rajeswaran, Cox, Moeng, and Tsima 2018: 1). Moreover, healthcare professionals who possess up-to-date cognitive and psychomotor abilities play a crucial role in preserving lives and enhancing patient outcomes (Mota, S.2023: 186).

Performing adult CPR successfully requires a deep understanding of the subject, the ability to quickly adapt to changing clinical circumstances, and the skillful coordination of resuscitation efforts among healthcare professionals from different fields (Mokhtari, Saghafinia, Motamedi, and Hosseini 2012: 104).

The primary purpose of this descriptive review study was to describe the nurses' competence in adult CPR. This study aimed to provide a deeper updated understanding of the nurses' competence and the factors relevant to competency in adult CPR.

2 Background and key terms

2.1 Nurses' competence in adult cardiopulmonary resuscitation

According to World Health Organization (WHO), 85% of cardio-vascular disease deaths globally in 2019 were due to heart attack and stroke. Cardiopulmonary arrest could occur in an unexpected situation. (Rikhotso, Perrie, Scribante, and Zainub 2021: 41.) Nurses were the initial responders and played a crucial role in delivering primary healthcare services. CPR held substantial importance as a fundamental element of basic life support (BLS) and was widely recognized as the initial course of action in addressing a cardiac arrest, serving as an interim measure prior to the administration of defibrillation and advanced life support (ALS). (Mokhtari, Saghafia, Motamedi and Hosseini 2012: 104.)

The life-saving technique of adult CPR encompassed the application of chest compressions and the administration of rescue breaths. Chest compression involved the application of external pressure to the chest in order to physically facilitate circulation of blood and oxygen to critical organs such as the brain and heart. The American Heart Association (AHA) and other resuscitation organizations emphasized the significance of high-quality chest compressions characterized by appropriate depth, rate, and minimal interruptions to maintain perfusion. Cardiac arrest and respiratory failure are frequently identified as the initial indicators. Adult CPR assumed paramount importance in such circumstances due to the fact that each passing minute without it reduced the likelihood of survival. (Berg et al 2020: 142.) Inadequate resuscitation skills and substandard CPR among nurses have been identified as factors contributing to unfavorable outcomes among patients who have suffered cardiac arrest (Rikhotso, Perrie, Scribante, and Zainub 2021: 41).

2.2 Attitude towards adult cardiopulmonary resuscitation

Meanwhile, discussed in the study that a significant proportion of nurses possessed a commendable level of knowledge pertaining to adult CPR. However, it was noteworthy that only a limited number of nurses exhibited a favorable attitude toward actively engaging in the practice of CPR. (Chowdhury et al. 2022: 196.)

Present study indicated that health professionals possessed inadequate knowledge and exhibited suboptimal attitudes towards adult CPR. Research revealed that both

groups experienced a decline in knowledge and skills over a period of time. However, the experimental group, which received supplementary training, exhibited superior retention of practical skills compared to the control group. (Marler et al 2020).

Insufficient knowledge and skills about adult CPR within the nurses' population may impede the efficient administration and successful outcomes of individuals undergoing cardiac arrest (Rajeswaran, Cox, Moeng, and Tsima 2018: 1). This was an implication that adequate training should have been provided to increase nurses' confidence in the practice of resuscitation. A continuous adult CPR training and exposure were extremely important for improving the outcomes of patients having cardiac emergencies.

(Munezero, Atuhaire, Groves, and Cumber 2018: 1). Studies indicated that the implementation of CPR training programs possessed the capacity to enhance the theories and concepts of nurses, thereby playing a significant role in reducing anxiety levels and enhancing confidence and effectiveness in managing cardiac arrest situations. This improvement can be observed both in individual nurses and when they work collaboratively as part of a team. Health professionals who consistently participated in CPR training exhibited more favorable attitudes towards CPR. (Mota, S.2023: 182.)

2.3 Continued competence and enhancement

To ensure the continued competence and enhancement of nurses' skills in adult CPR, a systematic training program must be implemented. This program should prioritize skill acquisition, as empirical evidence indicated that training has a greater impact on skill development compared to knowledge acquisition (Mersha, Egzi, Tawuye, and Endalew 2020: 1). A study conducted showed that registered nurses in three district hospitals were initially observed to be low, suggesting the presence of substantial gaps in their knowledge and skills related to CPR. A notable enhancement in performance was observed immediately following the training session, however, a decline in nurses' performance was evident during the re-evaluation test conducted six months later. This underscored the challenge associated with sustaining proficiency in adult CPR and emphasized the necessity of continuous healthcare education to deliver the highest quality of emergency medical treatment to patients. (Rajeswaran, Cox, Moeng, and Tsima 2018: 1). In addition, a recent study supported that there was greater possibility of reduction of acquired skills in the period after the training. It was identified that the time of one year or less as having the largest reduction in retention. The significance of training was widely recognized as an indicator for minimizing the decline of skills over time. The combination of theoretical and practical activities in training programs was identified as the most efficacious and pertinent approach for enhancing

knowledge and skills related to CPR. It was important to acknowledge that educational programs addressing the issue encouraged security, and self-assurance, both of which contributed to an overall improvement in the quality of service offered. (Araujo, Araújo, Moretti, and Chagas 2022: 6.)

The key terms used were nurse competence, cardiopulmonary resuscitation, nurses' knowledge and skills.

3 Purpose, aim and study questions

The primary purpose of this descriptive review study was to describe the nurses' competence in adult CPR.

This study aimed to provide a deeper updated understanding of the nurses' competence and the factors relevant to competency in adult CPR.

The study questions were:

1. What are the competencies of qualified nurses in adult CPR?
2. What are the key factors that have relevant impact on the competency of nurses in adult CPR?

4 Methodology and method

4.1 Data collection method

This study employed a descriptive literature review to produce reliable knowledge to answer its study question. A descriptive literature review is a study which gives an examination, provides a pattern of recent or current literature and answer questions about a certain topic. Its main goal is to furnish the reader with a comprehensive foundation that enhances understanding of existing knowledge, while also underscoring the criticality of further study. (Cronin, Ryan and Coughlan 2008.) The literature review method aimed to discern prior accomplishments, facilitating consolidation, progression from prior research, summarization, prevention of redundancy, and identification of any omissions or gaps in the existing body of knowledge (Grant and Booth 2009:97).

The method of conducting a descriptive review entails the following stages such as selecting topic, searching, filtering, categorizing, codifying, rigorous analysis, writing result and referencing. In this study, the topic was about nurses' competencies in adult CPR. Then, a search for related literature was conducted according to the decided study topic. Next, extensive data collection was gathered and analyzed from existing literature, aiming to provide relevant information that addresses the study questions. Upon the selection of relevant literature, it was then analyzed using inductive content analysis. The results were subsequently discussed. Finally, all the references used in this study were cited, ensuring that all source materials were included in the reference list. (Cronin, Ryan and Coughlan 2008.)

4.2 Data search and selection

For this study, the searching process was limited to published studies obtained from electronic sources primarily from scientific databases. The search engines used were CINAHL and Medline.

In table 1, the PICO was used in planning the search strategy of the study. It focused on Patient Group (P), Interest (I) and Co (Context). (Frandsen, Bruun Nielsen, Lindhardt, and Eriksen 2020.) Then, it used the search terms "nurses", "competence" and "adult resuscitation". From the search terms, search strategies were planned.

Table 1. Tool used for planning search strategy

P	Patient Group	Nurses
I	Interest	Competence
Co	Context	Adult cardiopulmonary resuscitation

The keywords that were used for both databases were "nurs*" (P) AND "competence OR skills OR knowledge" (I) AND "adult resuscitation OR cardiopulmonary resuscitation" (Co). The database search yielded the following results: 179 literature studies from CINAHL and 316 literature studies from Medline. Of the total 495 literature studies, 82 articles were removed due to duplication. The studies were further reduced to 38 after a selection based on the titles. It was further reduced to 22 after a selection

based on the abstract. The remaining literature was carefully examined for full-text study and resulted to 10 articles for inclusion.

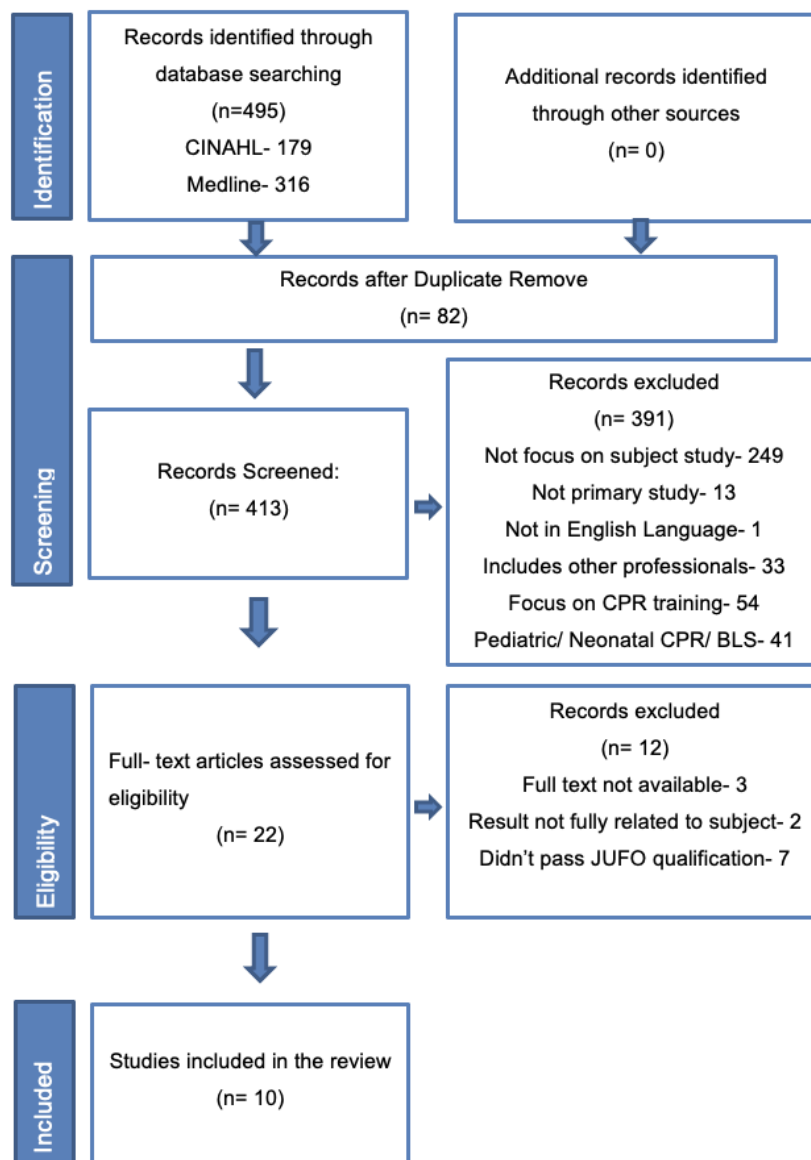
Table 2 showed the Inclusion and exclusion criteria, and the literature review corresponded to the period from 2018-2023. It encompassed studies that centered on nurse competence in adult CPR, were written in English, and had undergone peer review. The articles were assessed using the JBI checklist, and searched through the Julkaisuforum (JUFO) publication channel.

Table 2. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Studies published from year September 2018- August 2023	Studies published before the period September 2018
Studies published in English language	Studies published in other languages other than in English
Peer- reviewed studies.	Non-peer reviewed studies like expert articles and editorials
Primary Studies	Non- primary studies like review articles
Studies that focus on nurses competence on adult CPR	Studies that focus on another medical professional competency on adult CPR or pediatric CPR
Studies that passed the assessment of JBI checklist and with level 1-3 in Julkaisuforum (JUFO).	Studies that failed in JBI checklist and level 0 or no result in Julkaisuforum (JUFO).

The methods and results of the review was described with enough detail for readers to assess the reliability or trustworthiness of the reviews. Figure 1, listed below, illustrates how the data searching and selection were conducted. It used the PRISMA 2009 Flow Diagram, which were divided into four categories: identification, screening, eligibility, and included (Moher, Liberati, Tetzlaff, Altman, and The PRISMA Group 2009.)

Figure 1. Prisma 2009 flow diagram



The articles included in this study were assessed using JBI's Critical Appraisal Tools for qualitative studies. Three questions from the JBI appraisal list were selected, and all studies were assessed using the following questions. (Lockwood, Munn and Porritt 2015.)

For the JBI's Critical Appraisal Tools:

1. Is there congruity between the research methodology and the research question or objectives? (Checklist question no. 2)
2. Is there congruity between the research methodology and the interpretation of results? (Checklist question no. 5)
3. Are participants, and their voices, adequately represented? (Checklist question no. 8)

The results of the assessment were identified as "Pass" or "Fail." For an article to receive a "Pass" result, it needed to answer at least two of the designated appraisal questions. Otherwise, it would be marked as "Fail." The results have been included in Appendix 2 "Summary of Reviewed Articles."

4.3 Data analysis method

The study utilized inductive content analysis as a methodology for analyzing the data. Inductive content analysis is a frequently utilized approach in qualitative research of data analysis. The process comprises of three main phases namely preparation, organizing and reporting. (Elo and Kyngäs 2008:109.) The process of abstraction is utilized to condense and categorize data, so facilitating researchers in addressing study questions by developing concepts, categories, or themes. (Kyngäs, Mikkonen and Kääriäinen 2019:14.)

First, all of the chosen literatures were studied in order to grasp all of the related findings. Second, determined the relevant findings from the selected literature that addressed the identified study questions.

In the initial coding, data organization into a wide conceptual framework was the goal. (Vears and Gillam 2022.) To do this, all content pertaining to the research questions was highlighted, allowing portions to be identified and labeled in accordance with a section's general theme or category. The content was carefully reviewed in order to comprehend the section's subject matter before searching for larger categories.

In the second coding, all the data was analyzed carefully without losing its idea or result. (Elo and Kyngäs 2008:111.) The data were categorized into small parts. These open codes were subsequently merged with other open codes sharing similar content, forming sub category. The coding resulted to 17 sub categories.

Lastly, all data has been coded in to sub category, it was then grouped together into similar generic category. (Elo and Kyngäs 2008:111.) This hierarchical organization was then further aggregated into broader concepts which furthered structured into main category. These main category answered the study questions. In this inductive content analysis, new elements in the data were discovered each time additional research were analyzed.

The concepts, categories, and themes that have been identified (sub-category, generic category and main category) form the basis upon which the results of the content analysis are reported. Significantly, due to the sensitivity of this analytical method to the data itself, each category and result was reexamined and interpreted. To ensure unbiased content analysis results, both authors identified and code all categories (Elo and Kyngäs 2008:111). Refer to Table 3 for sample of inductive content analysis example.

Table 3. Inductive content analysis example

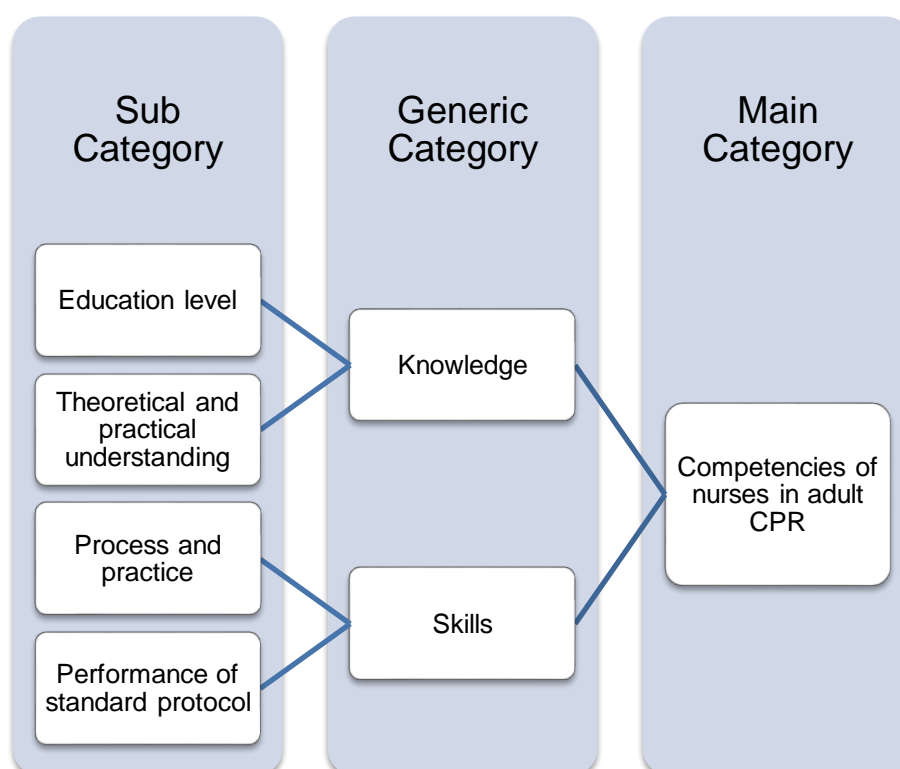
Inductive Analysis Table				
Meaning Unit	Reduction/ Coding	Sub- category	Generic- category (Subtitle)	Main- category
More than half (53.65%) of answer choices for BLS knowledge were correct. There was a significant difference in knowledge score based on education level where those with a bachelor's degree had more knowledge. Those who said they had received training in CPR or received information about CPR had significantly higher scores than those who did not receive it. (Article 2)	Nurses with bachelor's degree had more knowledge.	Education level	Knowledge	Competencies of nurses in adult CPR
	Different level of knowledge with education			
	Training received in CPR	Completed training	Training	Key factors relevant to competency of nurses in adult CPR
	Received more information about CPR			
The mean times for code bell activation and initiation of CPR decreased significantly following the interval simulation training ($P<.05$). A clinically significant decrease was seen in the mean time-to-task placement of a backboard on code team arrival. (Article 7)	Higher scores than those who did not get CPR training			
	Changes in code bell activation and CPR initiation times after simulation	Impact of training	Training	Key factors relevant to competency of nurses in adult CPR
	Nurses performed decreased mean time to-task of a backboard code team	Process and practice	Skills	Competencies of nurses in adult CPR

5 Outcomes

This study included ten (10) literature studies conducted in different countries such as Ethiopia, Yemen, Ghana, Nigeria, Iran, Lebanon, United States, Sweden, Spain and Qatar. The literature studies included methodologies such as descriptive cross-sectional survey which are a total of six studies, institutional-based cross sectional study, qualitative exploratory descriptive study, qualitative content analysis, and quality improvement project. The studies were from 2018-2022 with nurses as participants and sample sizes varied from 13 - 6,055.

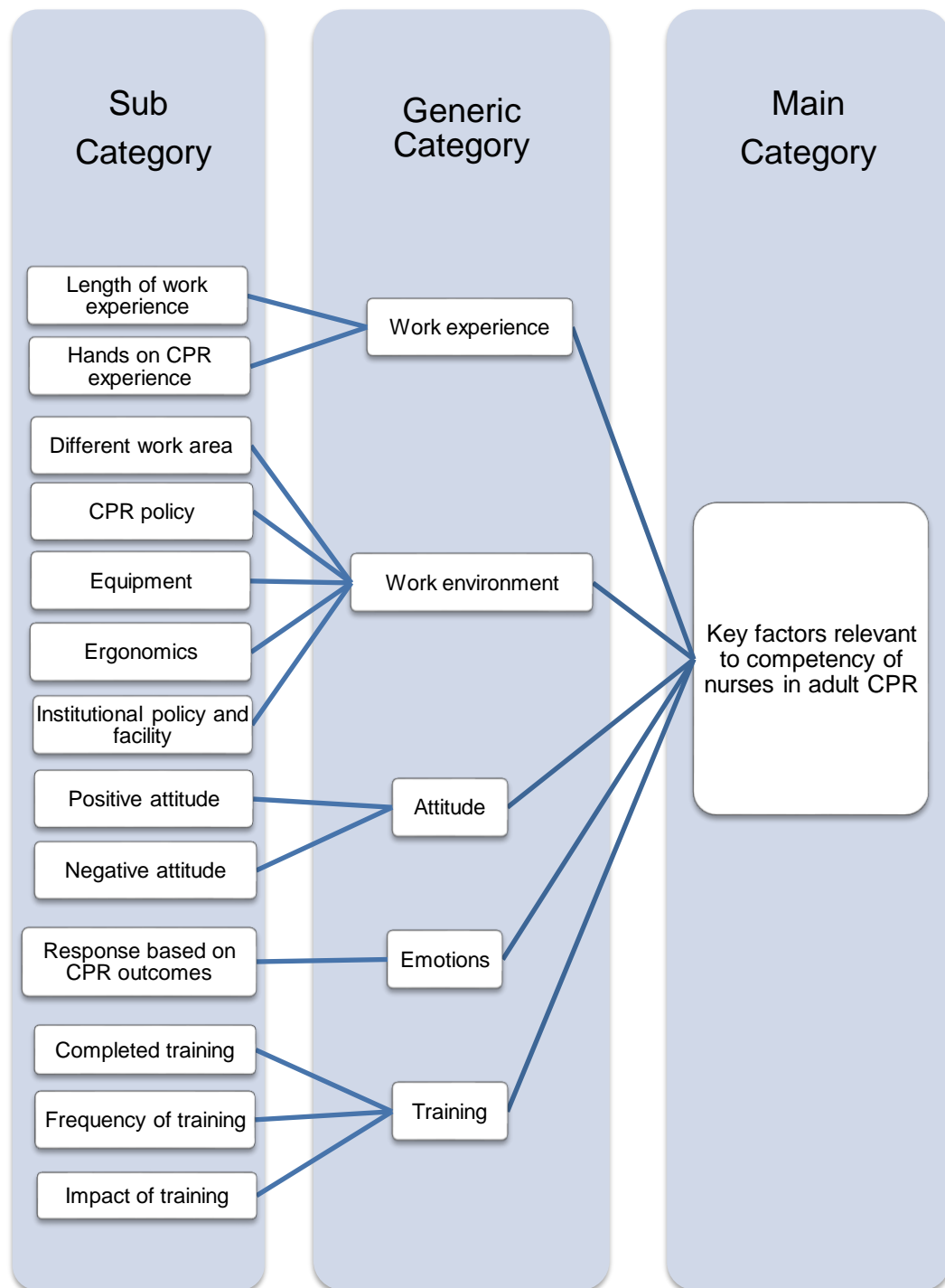
The study resulted to 7 generic category and 17 sub-categories that identified the nurse competencies and the factors affecting their performance on adult CPR. The inductive content analysis answered the study question “What are the competencies of qualified nurses in adult CPR”. The result was shown in Figure 2.

Figure 2. Competencies of nurses in adult CPR



For the second study question, “What are the key factors that have relevant impact on the competency of nurses in adult CPR?”. The result was shown in Figure 3.

Figure 3. Key factors relevant to competency of nurses in adult CPR



5.1 Competencies of nurses in adult CPR

Based on the analyzed data, competencies of nurses in adult CPR included knowledge and skills.

5.1.1 Knowledge

Nurses who demonstrated a commendable level of knowledge displayed a favorable attitude towards the implementation of adult CPR (Mersha, Egzi, Tawuye and Endalew 2020: 1). The study revealed more than half of the participants possess accurate knowledge regarding basic life support including CPR. Participants who acquired a bachelor's degree exhibited significantly higher knowledge scores. Furthermore, study demonstrated that individuals who reported having received adult CPR training or information exhibited significantly elevated scores compared to those who did not receive such information. (Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020: 4; Alkubati et al. 2020: 1; Veetil et. al 2023: 4.) Nurses demonstrated knowledge by having theoretical and practical understanding of CPR (Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020; 3-4; Amoako-Mensah et al, 2023: 1; Ihunanya, Michael, and Amere, 2020; 1. Noureddine, Avedissian, Khatib, and Irani, 2021; 3040; Silverplats, J et al. 2022; 1; Tíscar-González, Blanco-Blanco, Gea-Sánchez, Rodriguez Molinuevo, & Moreno-Casbas, 2019, 7; Veetil et al 2023,1). Primary factors that influenced the level of competence in CPR were the individual's proficiency and familiarity with adult CPR techniques. Proficiency in adult CPR protocols and the skillful implementation were crucial factors in assessing an individual's knowledge for CPR. (Amoako-Mesah, Achempim-Ansong, Gbordzoe, Adofo, Sarfo 2023: 4.) The data revealed that knowing adult CPR has a significant and statistically meaningful influence on the practical application of adult CPR. The results highlighted the significant correlation between knowledge and the effective implementation of adult CPR procedures, as demonstrated by the participants' adherence to established protocols. (Ihunanya, Michael, and Amere: 3). Healthcare professionals demonstrated a sense of assurance in their understanding of adult CPR, suggesting their readiness to effectively employ their acquired expertise in the event of cardiac arrest. Moreover, it was indicated that healthcare professionals possess the necessary knowledge to determine the appropriate course of action. (Silverplats, Strömsöe, Strömsöe, Äng, and Äng 2022: 4). The attitudes of nurses were directly influenced by their self-reported levels of knowledge on cardiopulmonary arrest. This suggested that the nurses' perceptions and attitudes towards adult CPR were notably impacted by their self-assessment of their knowledge in this domain. (Tíscar-González, Blanco-Blanco, Gea-Sánchez, Rodriguez Molinuevo, and Moreno-Casbas, 2019: 5). The study's findings indicated that the most significant predictor for obtaining a higher knowledge score in both components was being a nurse. In other words, one's occupation as a nurse emerged as the primary

and influential factor associated with elevated knowledge scores in the study's analysis (Veettil et. al 2023: 4).

5.1.2 Skills

Skills was also recognized as nurses' competency in performing adult CPR (Amoako-Mensah et al, 2023: 7). The skills were demonstrated through performance in process and practice (Amoako-Mensah et al, 2023: 7; Peverini, et al. 2022; 406). There was a recognized correlation between knowledge and skills when it comes to competencies of nurses in CPR; nevertheless, there existed a diversity in the proficiency of CPR skills among nurses. Skills competence can be cultivated through ongoing and consistent CPR practice. (Amoako-Mensah et al, 2023: 7.) Nurses' skills were also identified through the performance of CPR following the standard protocol (Ihunanya, Michael, and Amere, 2020; 1; Veettil et al 2023,1). Nurses' practical skills were assessed based on their response to the initial approach, as well as their application of compression and ventilation techniques per guidelines outlined by AHA (Veettil et al 2023,5).

5.2 Key factors relevant to competency of nurses in adult CPR

Based on the analyzed data, key factors that were relevant to competency of nurses in adult CPR were work experience, work environment, attitude, emotions, and training.

5.2.1 Work experience

Nurses' length of work experience showed positively associated with a good attitude towards adult CPR (Mersha, Egzi, Tawuye and Endalew 2020: 1; Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020: 1). A study demonstrated that nurses exhibited a moderate range of good practices which indicated nurses practiced in adult CPR (Ihunanya, Michael, and Amere: 3). Moreover, a study showed that work experience was identified as a significant barrier to the effective implementation of adult CPR (Janatolmakan, Nouri, Soroush, Andayeshgar, Khatony 2021: 2). In addition, the longer experience in clinical practice was a good predictor of nurses' competence in adult CPR (Veettil et. al 2023: 4).

5.2.2 Work environment

The results of the study indicated that several factors were found to be positively associated with good knowledge in adult CPR which included the number of work

settings (Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020: 1; Mersha, Egzi, Tawuye and Endalew 2020: 1). Furthermore, it is noteworthy that environmental factor has exerted a significant influenced on the efficacy and proficiency or resuscitation practices within the nursing profession (Amoako-Mesah, Achempim-Ansong, Gbordzoe, Adofo, Sarfo 2023: 4). Moreover, a study showed that the presence and suitability of the workplace were identified as significant barriers to the effective implementation of adult CPR (Janatolmakan, Nouri, Soroush, Andayeshgar, Khatony 2021: 2). Being assigned to a non-monitored ward resulted in heightened levels of stress and concerns regarding the potential for errors and complications (Silverplats, Strömsöe, Ströomsöe, Äng, and Äng 2022: 4).

5.2.3 Attitude

The analysis of data revealed that the nurses exhibited strong positive emotions upon witnessing the successful recovery of patients after resuscitation interventions. In contrast, instances where the results were less favorable, nurses exhibited an aptitude for experiencing psychological distress and harbouring negatives emotions. (Amoako-Mesah, Achempim-Ansong, Gbordzoe, Adofo, Sarfo 2023: 4.) It has been examined the impact of varying intervals between training sessions on stress and anxiety. Findings suggest that shorter intervals between training have been associated with a reduction in stress and anxiety, whereas longer intervals have been linked to increased stress and anxiety. (Silverplats, Strömsöe, Ströomsöe, Äng, and Äng 2022: 4.)

5.2.4 Emotions

Emotions were also relevant to the competence of nurses in adult CPR. Nurses exhibited a significant favorable emotional reaction when patients successfully gained consciousness following successful resuscitation. On the contrary, in instances where resuscitation efforts proved unsuccessful or yielded less favorable outcomes, nurses were observed to encounter psychological distress and manifest negative emotions. (Amoako-Mensah et al, 2023; 1; Silverplats, J et al. 2022; 1.)

5.2.5 Training

The study revealed there was a positive association observed between nurses who have received training in adult CPR and the presence of favorable attitude (Mersha, Egzi, Tawuye and Endalew 2020: 1). Nurses' who reported having undergone adult

CPR training or having been provided with information regarding CPR exhibited notably higher scores compared to those who did not receive training or information (Alkubati et al. 2020: 1). Moreover, a study showed that insufficient training among the CPR team was identified as a significant barrier to the effective implementation of CPR (Janatolmakan, Nouri, Soroush, Andayeshgar, Khatony 2021: 2). Furthermore, it has been observed that nurses who have undergone CPR training have not been able to renew their training certificates in recent years due to scarcity of training centres and time constraints. Nurses employed in community settings had undergone comparatively less training in comparison to their counterparts working in hospital settings. (Peverini et.al 2023: 2). The nurses' response to the activation of the code bell and initiation of CPR was found to be significantly enhanced because of training (Nouredine, Avedissian, Khatib, and Irani 2021: 3). Participants who had gone through a CPR training course more than twelve months ago exhibited higher likelihood of experiencing anxiety (Silverplats, Strömsöe, Ströomsöe, Äng, and Äng 2022: 4). Lastly, the act of directly observing the performance of CPR drills yielded a favorable result (Veettil et. al 2023: 4).

6 Discussion

The literature reviews revealed the proficiencies essential for nurses to effectively execute adult CPR encompassed a combination of knowledge and practical skills. Consequently, it was imperative for nurses to demonstrate a proficient level of adult CPR skills, alongside a comprehensive understanding of the theoretical aspects. Nevertheless, it had been noted that certain nurses may exhibit deficiencies in their knowledge and skills, and others may exhibit commendable performance in their professional roles. (Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020: 4; Alkubati et al. 2020: 1; Veettil et. al 2023: 4.)

The literature revealed the identified correlation between knowledge and practical skills of adult CPR and underscored the importance of theoretical knowledge in achieving successful resuscitation. (Ihunanya, Michael, and Amere: 3). Healthcare personnel, who possessed a strong grasp of CPR knowledge, exhibited a preparedness to effectively utilized their experience in practical scenarios (Silverplats, Strömsöe, Ströomsöe, Äng, and Äng 2022: 4). Furthermore, the findings shed light on the fact that nurses' attitudes towards adult CPR were strongly impacted by their self-reported levels of expertise. This suggests a complex interaction between perception, attitude, and self-evaluation in this crucial area (Tíscar-González, Blanco-Blanco, Gea-Sánchez,

Rodriguez Molinuevo, and Moreno-Casbas, 2019: 5.) The nursing profession emerged as the primary factor influencing elevated levels of knowledge attainment. (Veettil et al 2023: 4.)

The literature also underscored the notion that nurse proficiency in adult CPR extended beyond mere theoretical understanding to embrace a practical and procedural component, namely skills. The proficient execution and practical application together with strict adherence to protocols, is crucial in guaranteeing the provision of CPR interventions of the highest standard. (Ihunanya, Michael, and Amere, 2020; 1; Veettil et al 2023: 1.)

Key factors influencing nurse competencies in adult CPR were work experience, the work environment, attitude, emotions, and training. The correlation between nurses' professional background and their attitudes, behaviors, and proficiency in adult CPR was complex, encompassing favorable connections as well as potential obstacles. (Mersha, Egzi, Tawuye and Endalew 2020: 1; Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020: 1.) It was identified a positive correlation between the number of work settings and nurses' knowledge in adult CPR. This finding highlighted the significance of exposing nurses to a variety of clinical environments in order to enhance their comprehension. (Abraham, Amare Haile Kiros, Hailu, and Nigussie, 2020: 1; Mersha, Egzi, Tawuye and Endalew 2020: 1). Nevertheless, the study raised doubts about the observed correlation by emphasizing the significance of the work environment as substantial obstacles to the implementation of CPR, especially in non-monitored wards (Janatolmakan, Nouri, Soroush, Andayeshgar, Khatony 2021: 2; Silverplats, Strömsöe, Strömsöe, Äng, and Äng 2022: 4). The emotional aspect significantly impacted nursing reactions to resuscitation outcomes. Based on the findings of the study, nurses were satisfied when resuscitation efforts succeeded and negative outcomes led to psychological distress and negative emotions among nurses. (Amoako-Mesah, Achempim-Ansong, Gbordzoe, Adofo, Sarfo 2023: 4.)

The training of nurses played an essential part in shaping their attitudes towards the responses when faced with CPR events. The literature suggested a significant correlation between nurses' education in adult CPR and their having a positive attitude, underscoring essential impact of training on the development of favorable perspectives. (Mersha, Egzi, Tawuye and Endalew 2020: 1; Alkubati et al. 2020: 1.) On the other hand, a lack of adequate training among members of the CPR team presented a hindrance to the successful execution of CPR, underscoring the importance of

thorough and continuous training initiatives (Janatolmakan, Nouri, Soroush, Andayeshgar, Khatony 2021: 2). Positive association between the duration since the most recent CPR training and the probability of encountering anxiety, underscoring the significance of consistent and current training (Silverplats, Strömsöe, Strömsöe, Äng, and Äng 2022: 4). In conclusion, continuous and customized training programs have a significant impact on improving readiness, attitudes, and reactions of nurses in adult CPR scenarios. This has important implications for both individual healthcare practitioners and healthcare organizations.

The aforementioned discoveries collectively contribute to the expanding body of scholarly works on the complex interplay between the knowledge, attitudes, and competencies of nurses in adult CPR. These findings underscored the necessity for focused educational interventions and continuous professional development within the healthcare industry.

6.1 Ethics and validity

The basic principle of research integrity are reliability, honesty, respect, and accountability. Reliability is the assurance of ensuring the quality of research, design, analysis, and use of resources. Honesty characterized by transparency, fairness, completeness, and impartiality. Respect for colleagues, participants and environment. Accountability from planning to publication, its management and administration, and broader societal effects. (TENK, 2023a.) The study followed a responsible conduct of research by following the principles of integrity, meticulousness, and accuracy (TENK, 2023b: 11-12). During the topic search, diligent attention was given to ensuring the careful observance of all ethical considerations. The study was conducted ethically from the planning phase, implementation phase, and reporting phase. In the planning phase, the study did not require permission to conduct this thesis. Participated in trainings and workshops from Metropolia University to ensure sufficient knowledge in good ethics practices. All studies, authors, or sources were duly cited in the text and the references section of this thesis. The study underwent a Turnitin check to verify its originality and ensure freedom from plagiarism. The results indicated a satisfactory outcome. Data integrity was maintained through stringent data management procedures, encompassing precise and secure record-keeping.

Furthermore, full transparency was maintained in the reporting of data, offering a comprehensive narrative of the research process and outcomes. All literature review

studies were assessed by JBI's Critical Appraisal Tools for qualitative studies. (Lockwood, Munn, and Porritt 2015).

6.2 Conclusion, utilization of the results and recommendation

This study concluded the central role of knowledge, training, and experience in shaping nurses professionals' attitudes and competence in adult CPR. Accurate CPR knowledge, preferably with a bachelor's degree, and comprehensive training significantly enhance proficiency and effective CPR practice. Work experience and supportive workplace environment positively influence nurses' competence. Additionally, direct observation of CPR drills yielded favorable outcomes.

The utilization of the results of this study has the capacity to generate valuable insights for healthcare institutions and educational programs, enabling them to make informed decisions regarding the prioritization of ongoing CPR training and the provision of support for recertification efforts. The imperative nature of enhancing knowledge and skill consistency, alongside strict adherence to established protocols, cannot be overstated. Additionally, the findings underscore the importance of establishing a work setting that fosters the implementation of effective resuscitation techniques and helps healthcare practitioners in maintaining their preparedness for adult CPR.

Healthcare institutions should prioritize continuous CPR training and recertification programs for healthcare professional. Consistently staying updated and engaging in regular practice are utmost important for the preservation and improvements of CPR proficiency, and it is imperative that these resources are easily accessible. It is imperative for healthcare facilities to cultivate a work environment that fosters support and places value on the utilization of CPR knowledge and skills. This encompasses the provision of essential resources and the acknowledgment of the significance of nurses' proficiency in adult CPR. It is imperative to undertake endeavors aimed at mitigating obstacles associated with the work environment, patient conditions, and family engagement. This may entail the establishment of explicit protocols and procedures for managing familial individuals in the context of cardiopulmonary resuscitation incidents, as well as the creation of circumstances that mitigate stress and minimize distractions. To mitigate the stress and anxiety experienced by healthcare providers, it is advisable to arrange CPR training sessions at more frequent intervals. Regular training refresher sessions can contribute to the preservation of confidence and preparedness in effectively addressing instances of cardiac arrest. The effect of education and training on the commencement and quality of cardiopulmonary resuscitation CPR administered

by nurses to patients is significant. These key elements are determining variables towards the effectiveness and efficiency of CPR interventions. In addition, key factors are also indicators toward a quality and successful CPR implementation. Therefore, continued education and a systematic training considering training frequencies and CPR exposure is recommended.

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Results of the data base searches

Appendix 1. Result of the data base searches

DATABASE	SEARCHTERMS	LIMITERS	NUMBER OF HITS	SELECTED BASED ON TITLE	SELECTED BASED ON ABSTRACT	SELECTED BASED ON WHOLE TEXT
CINAHL	Nurs* AND competence OR skills OR knowledge AND adult resuscitation OR cardiopulmonary resuscitation	Abstract Available, Peer Reviewed, September 2018-August 2023, English	179	22	12	5
MEDLINE	Nurs* AND competence OR skills OR knowledge AND adult resuscitation OR cardiopulmonary resuscitation	Abstract Available, Peer Reviewed, September 2018-August 2023, English	316	16	10	5
Total			495	38	22	10

Summary of reviewed articles

Appendix 2. Summary of reviewed articles

Author(s), Year, Country	Topic/ Title	Methodology & Methods	Participants	Main Outcomes	Limitation	Data Quality Appraisal
1. Abraham, Amare & Nigussie, 2020, Ethiopia	Factors associated with knowledge and attitude towards adult cardiopulmonary resuscitation among healthcare professionals at the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia: an	Institutional- based cross- sectional study	Health professionals (physicians, nurses, anaesthetists, health officers and midwives) n= 406	Among the study participants, 25.1% had good knowledge and 60.8% had good attitude towards adult CPR. Work experience (adjusted OR (AOR): 5.02, 95% CI 1.25 to 20.20), number of work settings (AOR: 6.52, 95% CI 2.76 to 15.41), taking CPR training (AOR: 2.76, 95% CI 1.40 to 5.42), exposure to cardiac arrest case (AOR: 2.16, 95% CI 1.14 to 4.07) and reading CPR guidelines (AOR: 5.57, 95% CI 2.76 to 11.20) were positively associated with good knowledge. Similarly, taking CPR training (AOR:	The study was conducted including different health professional. The study did not investigate the practice level of professionals. The study might be subjected to social	JBIC Appraisal: Pass JUFO: Level 1

	institutional-based cross-sectional study			<p>1.74, 95% CI 1.42 to 1.53) and reading CPR guidelines (AOR:2.74, 95% CI 1.55 to 4.85) were positively associated with good attitude.</p> <p>In the bivariable logistic regression analysis, variables such as sex, age, work experience, number of work settings, educational status, exposure to cardiac arrest case, CPR training and reading international CPR guidelines were significant.</p> <p>(Article 1)</p>	desirability bias.	
2. Alkubati, McClean, Yu, Albagawi, Alsaqri & Alsabri 2022,	Basic life support knowledge in a war-torn country: a survey of nurses in Yemen	Descriptive cross-sectional survey	All nurses of emergency and critical department n=200	More than half (53.65%) of answer choices for PBLS knowledge were correct. There was a significant difference in knowledge score based on education level where those with a Bachelor degree had more knowledge. Those who said	This study only assessed the theoretical knowledge of participants and did not assess the	<p>JB I Appraisal: Pass</p> <p>JUFO: Level 2</p>

Appendix 2

2 (2)

Yemen				they had received training in CPR or received information about CPR had significantly higher scores than those who did not receive it. (Article 2)	practical skills of participants in performing basic life support. This study only assessed the theoretical knowledge of participants and did not assess the practical skills of participants in performing basic life support.	
3. Amoako-Mensah, Achempim-	Perceptions of Nurses Regarding Quality of Adult Cardiopulmonary	Qualitative exploratory descriptive study	Registered nurse in Emergency wards,	Data analysis revealed that nurses were filled with positive emotions when patients regained consciousness following	This study was limited to using a purposive technique,	JB I Appraisal: Pass

Ansong, Gbordzoe, et al 2023, Ghana	Resuscitation in Ghana: A Qualitative Study		Intensive Care Unit (ICU), and Medical wards with more than 6 months experience n=13	resuscitation. When otherwise happens, they tend to become tortured psychologically and filled with negative emotions. Besides environmental factors such as the time of initiating CPR following a cardiac arrest, the availability and appropriateness equipment and medications, workplace ergonomics, and institutional regulations affected the quality of resuscitation practices of nurses. Participants perceived that attitudes of condemnation, prejudice, apathy, and skills deficiency also impacted the quality of resuscitation practices. Significant aspects of self-reported behavioural competence that affected resuscitation were knowledge and skills of CPR, confidence in	which did not capture the view of other multidisciplinary healthcare team members. Also, using a qualitative approach limits the generalisation of findings.	JUFO: Level 2
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				initiating CPR, and the need for effort maximization. (Article 3)		
4. Ihunanya, M., Michael, & Amere, 2020, Nigeria	Knowledge, Attitude and Practice of Cardiopulmonary Resuscitation Among Nurses in Babcock University Teaching Hospital in Ilishan-Remo, Ogun State, Nigeria	Descriptive survey design	Nurses working in various units of Babcock University Teaching Hospital, Ilishan n=135	<p>The results showed that whereas 74.9% of the respondents had good knowledge of cardiopulmonary resuscitation, 65.2% of the respondents had practiced CPR on patients and 56.3% of the respondents had negative attitude towards it. Further analysis showed that knowledge of cardiopulmonary resuscitation had significant influence on its practice.</p> <p>65.2% of the participants checked patient pulse rate before commencing CPR, 74.1% ensured that patient was laid in supine position on a relatively hard surface before commencing cardiopulmonary resuscitation. The</p>	Limitation is not cited in this study	<p>JB Appraisal: Pass</p> <p>JUFO: Level 1</p>

				computed mean score on nurses level of practice of CPR as shown in table 7 revealed a mean score of 14.9 which fell within the range of good practice (scores of 15.0-19.0), indicating that nurses practiced cardiopulmonary resuscitation. (Article 4)		
5. Janatolmakan, Nouri, Soroush, An- dayeshgar, & Khatony 2021 Iran	Barriers to the success of cardiopulmonary resuscitation from the perspective of Iranian nurses: A qualitative content analysis	Qualitative content analysis	Nurses from different wards including Critical Care Unit (CCU), Intensive Care Unit (ICU), and emergency department n=14	The barriers to successful CPR were developed in three main categories and nine subcategories. Some of the barriers to CPR success were delayed attendance of the CPR team and start of CPR, inadequate experience and skill of the CPR team, poor access to special units, insufficient and deficient CPR equipment, poor CPR location, critical clinical conditions of the patient, and	Limitation is not cited in this study	JB Appraisal: Pass JUFO: Level 1

				interference of the patient's family members. (Article 5)		
6. Noureddine, Avedissian, Khatib, & Irani 2021 Lebanon	Towards better out-of-hospital cardiopulmonary resuscitation: A survey of nurses	Cross- sectional descriptive design	Nurses who work in hospitals and PHC centres n=692	Most nurses received cardiopulmonary resuscitation training, but 19.8% did not renew their certification in the past two years, because of limited training centres and lack of time. Only one third of the sample knew the first step to be taken in an arrest, yet 61% knew the compression-to- breath ratio. Nurses who work in community settings had significantly less frequent training in resuscitation than hospital nurses. Most nurses were willing to resuscitate in the community. In deciding to perform out-of-hospital cardiopulmonary resuscitation, the nurses were mostly influenced by	The sample may not represent all nurses in Lebanon, as it is restricted to those who were working at the time of the study. The questionnaire did not undergo rigorous psychometric testing	JB Appraisal: Pass JUFO: Level 3

				<p>their training, courage, recent practice, policy, fear of infection and hesitation to do mouth-to-mouth breathing. Receiving training, fear of being sued, religious beliefs, geographic location and believing in the importance of training laypeople in resuscitation</p> <p>predicted the nurses' willingness to perform resuscitation in the community. (Article 6)</p>		
7. Peverini, Lawson, Petsas- Blodgett, Oermann, & Tola 2023, United States	Time-to-Task in Interval Simulated Cardiopulmonary Resuscitation Training: A Method for Maintaining Resuscitation Skills	Quality Improvement project	RNs from preoperative, intraoperative, and postanesthesia nursing areas n=29	<p>The mean times for code bell activation and initiation of CPR decreased significantly following the interval simulation training ($P<.05$). A clinically significant decrease was seen in the mean time-to-task placement of a backboard on code team arrival. (Article 7)</p>	<p>All simulations lack a sense of realism and may not equate to an actual cardiac arrest.</p>	<p>JBI Appraisal: Pass</p> <p>JUFO: Level 1</p>

8. Silverplats, Strömsöe, Äng, Södersved, Marie-Louise, et al 2022, Sweden	Attitudes towards cardiopulmonary resuscitation situations and associations with potential influencing factors—A survey among in-hospital healthcare professionals	Cross- sectional surveys	HCPs were physicians, nurses, nursing assistants, and other university- educated staff Year 2009 n=3,085 Year 2015- 2016 n=2,970 Total n= 6,055	In the event of a possible cardiac arrest situation, 61% of the HCPs would feel confident in their CPR knowledge, 86% would know what to do, and 60% would be able to take command if necessary. In the latest real-life CPR situation, 30% had been worried about making mistakes or causing complications, 57% had been stressed, and 27% had been anxious. A short time since the latest real-life CPR performance and a high number of previous real-life CPR performances were associated with lower odds of worrying about making mistakes/ causing complications, lower odds of feeling stressed or anxious, and higher odds of feeling calm. Regardless of previous real-life CPR experience, there were differences	There were differences in the focus and time intervals of the surveys.	JB Appraisal: Pass JUFO: Level 1
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				in attitudes between groups of professions, where physicians showed increased odds of worrying about making mistakes/causing complications and nurses showed increased odds of stress. Working on a non-monitored ward meant increased odds of stress and worrying about making mistakes/causing complications. Twelve months or more having passed since the latest CPR training course was associated with increased odds of anxiety. (Article 8)		
9. Tíscar- González, Blanco- Blanco, Gea- Sánchez,	Nursing knowledge of and attitude in cardiopulmonary arrest: cross-sectional survey analysis	Cross-sectional survey analysis	Registered nurse in hospital and primary care organization n=347	The Knowledge and Attitude of Nurses in the Event of a Cardiorespiratory Arrest (CAEPCR) questionnaire comprised three sections: sociodemographic	One limitation of the study was Cronbach's alpha for the attitudes	JBI Appraisal: Pass JUFO:

Ascensión, & Moreno-Casbas, 2019, Spain				information, theoretical and practical understanding, and attitudes of ethical issues. Cronbach's alpha for the internal consistency of the attitudes questionnaire was 0.621. The knowledge that nurses self-reported with regard to cardiopulmonary arrest directly affected their attitudes. Their responses raised a number of bioethical issues. (Article 9)	questionnaire, which did not reach the ideal value of 0.70	Level 1
10. Veetil, Anodiyil, Khudadad, Kalathingal, Hamza, Ummer, & Alnuaimi, 2023,	Knowledge, attitude, and proficiency of healthcare providers in cardiopulmonary resuscitation in a public primary	Cross Sectional Study with two parts : Descriptive cross-sectional and Direct Observation	Physician and nurses practicing in health centers n= 569	Only one-half (48.7%) formally received training on basic life support within the last year. Furthermore, 62.7% have tried to revive a dying person with no pulse. All the participants recognize the importance of knowing how to revive a dying adult or child as part	A limitation of this study was the inability to collect the data from all 27 HCs (only half of them were evaluated) due to the	<p>JB I Appraisal: Pass</p> <p>JUFO: Level 1</p>

Qatar	healthcare setting in Qatar.			of their job. The study showed that being a nurse was the most important predictor of a higher knowledge score in both components. Attending more resuscitation courses (3–6 courses in the last 3 years) ranked second in importance, and a longer experience in clinical practice (5–10 and >10 years) ranked third in predictive power. In addition, the direct observation of CPR drill performance revealed a satisfactory outcome. (Article 10)	limitations of the COVID-19 pandemic.	
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