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Article

Evaluating the Preparedness of Healthcare Providers for Prone Position CPR across Jordan's Healthcare Sectors

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Abstract: Background: Health care providers (HCPs) may required to initiate a cardiopulmonary resuscitation (CPR) while patients are in a prone position. Healthcare providers must possess the necessary knowledge, skills and experience to do cardiopulmonary resuscitation in a prone position (PPCPR) confidently. **Aim:** This study aimed to assess healthcare providers' (HCPs) preparedness to perform cardiopulmonary resuscitation in a prone position at specialized units in Jordan's healthcare sectors. **Methods:** In eight tertiary hospitals, a descriptive cross-sectional survey was carried out. An on-line questionnaire was conducted among 332 healthcare providers who are employed in operating rooms, intensive care units or interventional procedure rooms. **Results:** Preparedness levels among healthcare providers were 24.4% excellent, 2.1% acceptable and 73.5% poor. The average preparedness score was 32.38 (SD = 39.90), indicating significant variability. A lack of targeted training was associated with lower preparedness levels. Notably, providers with Advanced Cardiac Life Support (ACLS) training showed significantly higher preparedness. **Conclusion:** The HCPs in Jordan are poorly prepared to perform PPCPR whenever indicated. However, the study findings represent a significant step towards improving HCPs' preparedness to perform PPCPR. They serve as a baseline assessment and highlight the gaps in HCPs' readiness, which help their organizations to develop and implement a targeted training strategies and interventions. Nevertheless, incorporating these training in the hospital orientation, training programs, and clinical guidelines is equally important to enhance their capabilities for better outcomes.

Keywords: cardiopulmonary resuscitation; prone position; preparedness

Introduction

Healthcare providers (HCPs) place patients on prone position for many treatments purposes. Prone position is required during a specific surgical procedures to anatomically access the internal organ posteriorly (Kwee et al., 2015). Also prone position have been use purposely to perform some interventional diagnostic and therapeutic procedures (Catelli et al., 2022; Mukund et al., 2019). Differently, prone position improved patient oxygenation when ventilated critically ill patients with acute respiratory distress syndrome (ARDS) (Kallet, 2015). Evidence showed that the prone position contributes significantly to reducing mortality among critically ill patients with moderate to severe ARDS if used at an earlier stage and not less than 12 hours per day (Munshi et al., 2017). ARDS frequently presents among critically ill patients; around 10% of patients develop ARDS during ICU stay (Laffey et al., 2016). Moreover, ARDS prevalence has risen to 17% among COVID-19 patients (Ghelichkhani & Esmaeili, 2020). Therefore, the need to use a prone position increased significantly during the COVID-19 pandemic (Guérin et al., 2020). However, turning a patient into the prone position or reverse is not an easy procedure; requires four to five competent trained HCPs to prone patients safely (Ghelichkhani & Esmaeili, 2020), including a specialized physician to secure the airway during the procedure and resolve any potential complications (Lucchini et al., 2020). Nevertheless, an emergency could happen at any given time, when turning patients or when they are

in a prone position, such as cardiac arrest (Moscarelli et al., 2020). The occurrence of cardiac arrest most likely increased in prone position patients (Barker et al., 2020).

The significance of prone position Cardiopulmonary resuscitation has gained recognition in medical contexts, especially in light of the COVID-19 pandemic (McCraw et al., 2022). The American Heart Association (AHA) 2020 cardiopulmonary resuscitation (CPR) guidelines and recommendations state clearly that it may be reasonable to initiate a cardiopulmonary resuscitation (CPR) for an inpatient with a secured airway while in a prone position until a patient is safely turned to a supine position. Additionally, the guidelines emphasize starting high-quality chest compression and defibrillation as soon as possible, significantly increasing the survival rate post-cardiac arrest (Atkins et al., 2022). However, reversing patients from prone to a supine position in an emergency is associated with significant risk and complications. It might cause a delay in starting first chest compressions and defibrillation. It takes at least three minutes to safely turn the patient into a supine position (Burki et al., 2019; Mullen & Byrd, 2013).

Healthcare providers are familiar with resuscitating patients in the supine position due to the frequency of its occurrence, training, and the availability of specific algorithms and guidelines. The role of HCPs in performing prone position cardiopulmonary resuscitation (PPCPR) whenever required and how they are prepared to respond to such life-threatening situations are crucial. To achieve that, HCPs must implement a set of integrated coordinated lifesaving actions to increase patient survival rates (Kwangha, 2012). Additionally, HCPs need to be equipped with adequate knowledge, training, orientation, skills, and experience in order to perform PPCPR confidently (Buddhapriya, 2018; Carter et al., 2018; Heidelberg, 2017; Mageto et al., 2017; Yusra et al., 2017). Nonetheless, adequate equipment are necessary for healthcare professionals to perform prone position CPR successfully (Semanco & Hansen, 2022). Considering these attributes for the preparedness concept will help explore the healthcare provider's performance in doing PPCPR. However, HCPs perceive that they are well prepared to perform CPR in terms of knowledge and skills. Differently, Ulmer et al. (2022) found that HCPs' response to life-threatening situations is still of concern (Ulmer et al., 2022).

It is noteworthy that although CPR in the prone position appears promising, its application necessitates specific training, guidelines, tools and specialized equipments. In order to guarantee the safe and efficient performing of CPR in the prone position, healthcare professionals must be well-versed in the appropriate techniques and indications. Sustained investigation and thorough assessments of healthcare readiness are essential to confirm the function and maximize application of this resuscitation strategy. However, limited evidences exist to evaluate the HCPs' preparedness to perform PPCPR worldwide in general and Jordan namely.

Aim

The purpose of this study is to assess the readiness of healthcare providers in performing PPCPR within different specialized units across the healthcare sectors in Jordan. More specifically, this study aims at determining the current level of knowledge, training, and preparedness of healthcare providers in performing PPCPR.

Methods

Design

A quantitative descriptive cross-sectional design was used to gather in-depth information about participants' demographics, understand the relationships between different variables, and accurately describe the preparedness level of participants.

Setting

The study was conducted at eight tertiary hospitals in three different healthcare sectors in Jordan, mainly two governmental hospitals, four private hospitals, and two academic hospitals. These hospitals were established to provide a specialized services in operating rooms, intensive care units, or interventional procedure rooms.

Sampling

All Jordanian health providers working at operation theaters, intensive care units, or interventional procedural rooms were eligible to participate and were able to understand written English. They should provide direct patient care, have at least a diploma, and have completed at least one year of experience in their units and field. Lastly, they attended hospital and unit orientation. A convenience sample of 332 Jordanian HCPs voluntarily participated and completed the online PPCPR preparedness questionnaire.

Instruments

The PPCPR preparedness questionnaire was developed and constructed by researchers (Al Hroub et al., 2023). The tool consists of two parts: part one includes the participant's demographics and part two consists of 26 items; the first 14 items used a yes and no scale, while the last 12 items used a four-point Likert scale. The PPCPR questionnaire is divided into three domains: competency and confidence, which includes twelve items; planning and training, which provides for ten items; and support and resource availability, which consists of four items. The scoring system includes three preparedness levels: more than 80 is considered an excellent preparedness level, from 70 to 79 is an acceptable level, and less than 70 is considered a poor preparedness level (Hosme & Lemeshow, 2000).

Researchers developed and constructed the PPCPR preparedness questionnaire and revealed tool items based on an extensive literature review. The tool content validity and face validity were assured by a panel of experts who were not part of the study population, and based on their feedback, the tool was modified accordingly (Al Hroub et al., 2023). Additionally, senior HCPs in their field completed the piloting of the tool. The tool's reliability was verified through Alpha Cronbach, which was 0.959, indicating very good internal consistency. Finally, the exploratory factor analysis resulted in a three-factor solution that explained 69.51% of the variance. Therefore, the tool was found to be valid and reliable in assessing the HCPs' preparedness to perform PPCPR (Al Hroub et al., 2023).

Data collection Procedure

Data Collection Procedure: All healthcare providers available during the data collection period from February to May 2023 and who met the inclusion criteria were approached and invited to participate in the study. The primary author distributed the questionnaire electronically to the target population via email. The questionnaire, accompanied by a cover letter, detailed the study's objectives, the research measurements, and the estimated time required for completion. To ensure completeness, all questionnaire items were marked as mandatory. To maintain confidentiality, investigators were restricted access to the completed questionnaires. Participant data were anonymized through coding and stored on a password-protected computer.

Ethical consideration

The Institutional Review Board (IRB) at King Hussein Cancer Center reviewed and approved the study, approval number (22 KHCC 177). Participants provided informed consent by completing the online questionnaire, thereby affirming their understanding of and agreement to participate in the research. A comprehensive cover letter was included with the questionnaire, detailing the study's purpose, procedures, potential risks, benefits, and other relevant information. Completion of the online questionnaire also served as explicit confirmation of the participant's willingness to engage in the study. These steps ensured that participants' consent was well-documented and adhered to ethical standards.

Data analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), version 21. To achieve the study's objectives, both descriptive and inferential statistics were employed at a significance level of 0.05. Descriptive statistics were utilized to characterize demographic details according to their respective measurement levels. One-way ANOVA and t-tests were performed to assess differences in mean preparedness scores among demographic groups. Pearson's correlation was used to explore the relationships between the PPCPR preparedness subscales.

Result

A total sample of 332 HCPs participate in the study, comprised of 229 nurses, 81 physicians, and 19 allied healthcare professionals; nurses were more representative, with 69.6 %, and the majority of the sample was male (59.3 %). The participants’ mean age of 34.27 years (SD = 8.26) ranged from 22 to 68 years. The majority of participants had bachelorette degrees, 70.2%. Additionally, 50.3 %, 36.4 %, and 13.3% were from private, government, and academic hospitals. HCPs in critical care represent 61.1 % of the sample, while 24.4 % work in the operational room, and 14.5 % of participants work in the procedural room. Lastly, 56.9 % of participants had valid advanced cardiac life support tanning (ACLS) at the time of participation (Table 1).

Table 1. Demographic and Professional Characteristics of Participants (n=332).

Characteristics	N	%
Gender		
Male	197	59.3
Female	135	40.7
Educational Level		
Three-year diploma	14	4.2
Bachelor’s (BCs)	233	70.2
Master	65	19.6
PhD	20	6.0
Profession		
Nursing	229	69.6
Physician	81	24.6
Allied health care providers	19	5.8
Sector		
Government hospital	121	36.4
Private sector	167	50.3
Academic	44	13.3
Unit		
Operational room	81	24.4
Critical care units	203	61.1
Interventional procedural room	48	14.5

ACLS Certification		
Yes	189	56.9
No	143	43.1
Characteristics	Mean	SD
Age	34.27	8.26
Total years of experience in profession	10.11	7.70
Years of experience in current unit	6.45	5.53

There were no significant differences between participants’ gender, age, years of experience, educational level, units, sector, and preparedness level ($p > 0.05$). In contrast, there was a significant difference among participants who had valid advanced cardiac life support tanning programs and preparedness levels ($p < .05$) (Table 2). Which may reflect reasonable resuscitation training and professional development opportunities in Jordan.

Table 2. Comparison between Preparedness and Participant Characteristics (n=332).

Characteristics	n	Mean	SD	T or F	p
Gender					
Male	197	9.45	10.09	-0.46	0.65
Female	135	9.96	10.14		
Educational Level					
Three-year diploma	14	11.57	11.21	0.40	0.75
Bachelor’s (BCs)	233	9.56	10.02		
Master	65	9.11	9.95		
PhD	20	11.25	11.17		
Profession					
Nursing	229	9.89	10.08	0.58	0.54
Physician	81	9.57	10.25		
Allied Health Care Providers	22	7.55	9.92		
Sector					
Government Hospital	121	9.44	10.45	1.02	0.36
Private Sector	167	10.28	10.15		

Academic	44	7.89	8.79		
Unit					
Operational Room	81	8.01	9.29	1.91	0.15
Critical Care Units	203	10.49	10.35		
Interventional Procedural Room	48	8.90	10.13		
ACLS Certification					
Yes	189	10.76	10.43	-2.30	0.02**
No	143	8.20	9.47		

Note: Statistical significance is denoted by ** if $p < 0.05$.

Table 3 indicates that the overall average score for PPCPR preparedness among healthcare professionals (HCPs) was 9.66 (SD = 10.10), with scores ranging from 0.00 to 26.00. This range suggests generally poor preparedness. Specifically, the average score for the Planning and Training subscale of PPCPR preparedness was 3.24 (SD = 3.99), while the Competency and Confidence subscale averaged 4.64 (SD = 5.17). These results indicate that participants demonstrated low levels of training, competence, and confidence in performing PPCPR. Furthermore, the Support and Resource Availability subscale also indicated poor preparedness, with an average score of 1.78 (SD = 1.74). However, a significant correlation was observed between these three domains of PPCPR preparedness ($p < 0.01$), as detailed in Table 4.

Table 3. Average score of prone position cardiopulmonary resuscitation (PPCPR) preparedness (n=332).

Domain	Minimum	Maximum	Mean	SD
Competency and Confidence	0.00	100.00	38.68	43.12
Planning and Training	0.00	100.00	32.38	39.90
Support and Resource Availability	0.00	100.00	44.43	43.62
Total Preparedness	0.00	100.00	37.14	38.84

Table 4. Correlation of Scale Domains (n=332).

Scale Domains	Competency And Confidence	Planning And Training	Support And Resource Availability
Competency And Confidence			
Pearson Correlation	1	.758**	.760**
Sig. (2-tailed)		<.001	<.001

Planning And Training			
Pearson Correlation	.758**	1	.806**
Sig. (2-tailed)	<.001		<.001
Support And Resource Availability			
Pearson Correlation	.760**	.806**	1
Sig. (2-tailed)	<.001	<.001	

Note: Correlation is significant at the 0.01 level (2-tailed).

Table 5 presents the distribution of levels of preparedness among healthcare providers for prone position cardiopulmonary resuscitation (PPCPR). The data reveals a concerning scenario, with 73.2% of participants classified as having poor preparedness. Only a small fraction, 24.7%, were rated as excellent, and an even smaller group, 2.1%, was considered acceptable. This distribution underscores a significant need for enhanced training and resources to improve PPCPR preparedness across the board, reflecting an urgent need for interventions to boost both competence and confidence among healthcare professionals.

Table 5. Percentage of the Level of Preparedness.

Level	Frequency	Percent (%)
Excellent	82	24.7
Acceptable	7	2.1
Poor	243	73.2
Total	332	100.0

Discussion

The current study aimed to assess HCPs’ preparedness to perform PPCPR at specialized units at different healthcare sectors in Jordan. The study sample included multidisciplinary healthcare providers, physicians, nurses and aligned healthcare professionals. Similarly, it covered all major healthcare sectors in Jordan, including governmental, private and academic hospitals. Specifically, specialized units such as ICU, OR, and interventional procedural rooms were covered in this study. Overall, PPCPR, in general, remains under investigation; there is insufficient evidence on this topic (Moscarelli et al., 2020), while most of the literature investigates the supine position of CPR. This study is as unique as it reveals some essential information about how the HCP is prepared to perform PPCPR in Jordan.

The overall study results revealed the poor level of preparedness from healthcare providers to perform PPCPR in all different healthcare sectors in Jordan. Lack of preparedness was observed equally in all preparedness dimensions (Support and Resource availability, Planning and Training, and PPCPR Competency and Confidence). There are no differences in the preparedness level distribution among different professions or specialty units. This is similar to studies conducted in the MENA region in which healthcare providers demonstrate suboptimal and inadequate CPR knowledge, attitudes, and practices in regular supine position CPR (Adal & Emishaw, 2023;

Mohammed et al., 2020). In fact, it is more reasonable to have this outcome with PPCPR because it is less used.

The study also reported a positive correlation between the three preparedness dimensions, which is imperative, as all dimensions are part of an integrated and well-structured process. On the other hand, there is no association between preparedness to perform PPCPR and other factors like gender, level of participant's education, or profession. In addition, it was not linked to the working sector or unit.

In training and professional development, it was remarkable that most of those who reported excellent preparedness received training or PPCPR drill within the last 12 months. Moreover, having valid ACLS was positively associated with preparedness and confidence; this may highlight the importance of advanced lifesaving courses in improving the competence of healthcare providers in resuscitation. Another study supports this by endorsing that ACLS training contributed to nurses' competence in CPR (Jeong et al., 2022). Multiple related factors influence the readiness of healthcare professionals to perform CPR in prone positions. First, such readiness is associated with specialized training programs, such as ACLS certification, and they are directly correlated with the level of readiness. This element supports the idea that detailed practical training plays a crucial role in improving the skills and confidence levels required for proper performance during emergencies. These findings are consistent with previous systematic review study which showed that training HCPs with CPR protocol in the prone position reflected positively on HCPs' performance (Anez et al., 2021). Moreover, the absence of orientation training programs and specific protocols for managing prone position CPR indicates significant organizational and policy-related issues. Overall, improving the readiness of healthcare providers demands the development of a multifaceted approach that caters to the training needs of individuals and enhances the organizations' systems of support, creating an optimal environment for proper emergency performance.

Healthcare providers in Jordan are keen and have the initiative to seek knowledge and learn about PPCPR. However, they identified that PPCPR is not part of a unit-based orientation program in their organization, and the majority did not attend educational drills about PPCPR within the last 12 months. Additionally, working units do not have a structured plan on how to handle cardiac arrest while patients are in the prone position; this may highlight deficiency in these crucial areas. In the literature, CPR proficiency is significantly influenced by planning and training. Studies showed that healthcare workers attending more CPR training were associated with significantly increasing knowledge (Veettil et al., 2023). They led to definitive improvement in the outcome of CPR (Sodhi et al., 2011).

On the team level, the study reported a low level of confidence in the team to perform PPCPR, including knowledge, skills, team dynamics, and roles. In fact, most believe that patients will not receive the best possible safe care if they have PPCPR in their unit. ACLS training was reported in another study to enhance communication skills, leadership, team dynamics, and competency in CPR resuscitation (Amatya, & Shrestha, 2021).

Limitation

There are several limitations to the current study which must be considered. Firstly, the cross-sectional nature of the study constraint our ability to establish causality or record any changes in PPCPR preparedness, providing only a static image. Secondly, the data is based on self-reports, which may introduce respondent bias, whereby the study participants tended to overestimate or underestimate their preparedness based on what they believe. Specifically, all individuals may share a positive attitude toward the importance of basic life support. Finally, the lack of objective measures to test actual PPCPR competencies implies that respondents' preparedness may be over- or underestimated with regard to the real practical skills in emergency events.

Recommendations

Considering the findings and limitations of the study, provided numerous directions for future research. Longitudinal studies to assess the changes in PPCPR preparedness in longitudinal perspective should be supplemented by a comparison of this preparedness before hospitals' training programs and after them. Moreover, objective skill assessments, such as simulations or drills to assess

the actual preparedness should replace self-evaluation scores. Comparative studies of providers from various geographical and available resources settings could provide a more detailed understanding of the differences in readiness for PPCPR. Different training modalities should also be tested. This can include virtual and augmented reality for PPCPR in addition to other traditional teaching methods, in which the latter is likely to be found more effective. Studies on training effect on policies and frameworks end envelopes provide information on systemic readiness for PPCPR. Finally, the integration of PPCPR training into the educational curricula of medical and nursing schools should be researched to find whether it results in more competent providers.

Conclusion

The HCPs in Jordan are poorly prepared to perform PPCPR whenever indicated. However, the study findings represent a significant step towards improving HCPs' preparedness to perform prone position CPR. They serve as a baseline assessment and highlight the gaps in HCPs' readiness, which help their organizations develop and implement targeted training strategies and interventions. Nevertheless, incorporating this training in the hospital orientation, training policies, and clinical guidelines is equally important to enhance their capabilities for better outcomes. Planning is crucial also to ensure all stakeholders are ready and know their role during PPCPR. More research is needed in this regard.

Implications for Clinical Practice: The findings emphasize the urgent need for hospitals to integrate PPCPR training into their standard orientation and ongoing training programs. Providing comprehensive ACLS training and regular PPCPR drills will enhance HCPs' competence and confidence, leading to improved patient outcomes during emergency situations involving prone position CPR.

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