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## Original article

## Factors that influence the self-reported confidence of pediatric residents as team leaders during cardiopulmonary resuscitation: A national survey

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## ABSTRACT

**Objective:** The leadership skills of pediatric residents during cardiopulmonary resuscitation (CPR) may have major impacts on their performance. These skills should be addressed during the pediatric residency training program. Therefore, we aimed to identify the perceptions of residents regarding their level of confidence in providing or leading a real pediatric CPR code, and to identify different factors that might influence their self-confidence when assuming the role of a team leader during a real CPR.

**Design & setting:** Cross-sectional paper-based and online electronic surveys were conducted in February 2017, which included all Saudi pediatric residency program trainees.

**Interventions:** A survey questionnaire was distributed to Saudi pediatric residency trainees throughout the Kingdom. The main aim was to assess their perceived level of confidence when running a real pediatric CPR code either as a team leader or as a team member.

**Results:** The survey was distributed and sent by email to 1052 residents, where it was received by 640 and 231 responded (response rate = 36%). Almost one-fifth of the respondents (19.5%) did not have a valid pediatric advanced life support (PALS) certificate. The most frequently reported obstacles to life support training were lack of time (45.8%) and its financial cost (22.7%). The mean self-reported confidence as a CPR team member was reported significantly more frequently than being a CPR team leader (mean standard deviation, SD) = 7.8 (2.1) and 6.7 (2.4) respectively,  $P < .001$ ). The self-reported confidence as a CPR team leader was reported significantly more frequently in males compared with female respondents (mean  $\pm$  SD =  $6.7 \pm 2.4$  and  $5.9 \pm 2.4$ , respectively;  $P < .013$ ). There was a significant positive effect of recent attendance at a real CPR event on the perceived self-rated confidence of residents as a CPR team leader ( $P < .001$ ). Residents who reported that they had often assumed a real CPR leadership role had significantly greater perceived self-confidence compared with those who assumed a member role ( $P < .05$ ). Furthermore, residents without a valid PALS certificate had significantly less confidence in leading CPR teams than their peers who were recently certified ( $P < .05$ ).

**Conclusions:** The self-reported confidence as team leader during CPR was higher among residents who were certified in life support courses, exposed to CPR during their training, and those who assumed the role of a team leader during CPR. Our findings suggests the need to incorporate life support training

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courses and simulation-based mock code programs with an emphasis on the leadership in the curriculum of the pediatric residency training program.

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## 1. Introduction

It is estimated that about 1% of newly born babies require resuscitation [1] and it was reported that approximately 16,000 American children (8–20 per 100,000 children each year) suffer a cardiac arrest each year [2].

A vital goal of training programs for pediatric residents is the acquisition of knowledge and skills to provide vital organ resuscitation and physiological stabilization to acutely ill or injured children. Residency training programs provide an environment for learning and the acquisition of practical experience in resuscitation. At present, four courses are offered nationally in Saudi Arabia to train health care providers in neonatal and pediatric resuscitation: pediatric basic life support (BLS), pediatric advanced life support (PALS), neonatal resuscitation program (NRP), and pediatric fundamental critical care support (PFCCS). These life support courses provide a platform for training healthcare providers, including residents, in how to identify critically ill patients and resuscitate them in a timely manner. However, certification in these life support courses does not necessarily reflect the readiness of a resident to conduct a cardiopulmonary resuscitation (CPR) code [3]. Assuming the role of a team leader is critical in resuscitation but this role is not standardized by an appropriate set of guidelines [4].

Leadership skills are important and they should be addressed during the pediatric residency training program [5]. Leadership is one of the seven roles in the CanMEDS physician competency framework [6,7]. The CanMEDS framework was adopted by the Saudi Commission for Health Specialties, including Saudi Pediatric Board training [8,9].

Effective leadership is important for managing critically ill patients and during resuscitation efforts [1,2,10,11]. Teams that function with an effective team leader adhere to protocols better, commit fewer medical errors, and perform the necessary medical procedures in time without delays, which might have favorable impacts on patient outcomes [12].

The current Saudi Pediatric Residency Training Program curriculum does not include specific educational courses in leadership skills despite their importance [9].

Therefore, this study aimed to identify the perceived level of confidence among participants in running a real pediatric CPR code as a team leader and as a team member, as well as identifying the different factors that might influence the self-confidence of residents when assuming the role of a team leader during a real pediatric CPR.

## 2. Materials and methods

A cross-sectional questionnaire-based survey was conducted in February 2017. The target population comprised of Saudi Pediatric Residency program trainees in Saudi Arabia. The survey was distributed during the 5th Saudi Pediatric Association Conference. Attendees at this scientific conference were invited to complete the survey. The survey was also circulated by email via the Saudi Commission for Health Specialties e-mailing group for pediatric residents in order to improve the recruitment process and reach the entire target population, some of whom might not have been in the

conference venue. An online, web-based, survey tool ([www.surveymonkey.com](http://www.surveymonkey.com)) was used to collect the responses for analysis. Two reminders were sent within four weeks to those who did not respond initially.

The questionnaire was drafted by the authors based on a review of previous studies regarding leadership skills in pediatric residents during CPR. The final version was prepared at a multidisciplinary team focus group meeting. Experts from our pediatric department reviewed the questionnaire. It was then piloted in our department and tested to ensure its clarity before sending it to the targeted group.

After receiving institutional review board approval, the survey was piloted within the authors' institution. Some questions that were not clear to the pilot participants were removed from the survey.

The study aimed to investigate the perceived level of confidence among participants in running a real pediatric CPR code as a team leader and as a team member.

The questionnaire was divided into the following three sections:

The first section asked the responding resident to enroll in the study and provide their demographic details, including their level of training, training center, gender, and age.

The second part asked questions about the life support courses that they attended previously and the date of the last PALS course attended. Furthermore, they were asked about the obstacles that prevented them from attending these courses.

The last section asked whether the participants had any real pediatric CPR experiences during their residency, before rating their confidence level in acting as a pediatric CPR team leader or member during these recent codes. Ratings were given on a Likert-like scale ranging from 1 to 10, where 1 denoted "not confident" and 10 indicated "very confident." Next, they completed questions regarding their understanding of the characteristics of an effective CPR team leader based on binary dichotomous multiple response characteristics, which allowed them to select more than one option.

This study received prior ethical approval by the Institutional Review Board (IRB) of King Saud University (IRB #15/0520).

## 3. Statistical analysis

Data were represented as means and standard deviations (SDs) for continuous variables, and frequencies and percentages for categorical and binary dichotomous variables. Multiple response dichotomy analysis was applied to the multiple response questions. The parametric *t*-test and one-way analysis of variance were used to compare demographics and PALS certification levels in order to determine statistically significant differences in the mean perceived self-rated confidence in leading a pediatric CPR while at work, where post-hoc test adjustments were employed as needed. Multivariate linear regression was employed to assess the combined and individual effects of the characteristics of residents (age, sex, PALS certification time, time since most recent real CPR attended, and the usual roles in real CPR events) on their self-reported confidence in leading a real pediatric CPR. SPSS IBM Version 21 was used for all analyses and the alpha significance level was set to 0.05.

#### 4. Results

The survey was disseminated to 1052 residents, where it was received by 640; only 231 responded (response rate = 36%).

Table 1 shows the demographic characteristics of the respondents. All of the respondents (231 [100%]) were BLS certified, 190 (82.3%) were NRP certified, 42 (18.2%) were PFCCS certified, and 49 (21.3%) were certified in other life support courses, such as advanced trauma life support, advanced cardiac life support, or pediatric advanced emergency assessment, recognition, and stabilization.

Among the respondents, 202 (87.45%) were PALS certified. Fifteen residents (6.5%) were PALS certified within or less than one month prior to the survey, 100 (43.3%) were PALS certified within one month to one year prior to the survey, 71 (30.7%) were PALS certified within 1–2 years prior to the survey, 16 (6.9%) were PALS certified more than 3 years prior to the survey, and 29 (12.6%) residents had not yet received their PALS certification at the time of survey.

Furthermore, 63 residents (27.3%) had attended a real pediatric CPR code within one month before the survey, 126 (54.5%) reported that their most recent real pediatric CPR experience was month to one year before the survey, 13 (5.6%) reported attending a real pediatric CPR code 1–2 years prior to the survey, and only two (0.9%) residents reported attending a real pediatric CPR code more than 3 years prior to the survey. Interestingly, 27 (11.7%) of the residents reported no real pediatric CPR code experience.

**Table 1**  
Characteristics of respondents.

Residents Characteristics (Number = 231)	Number and percentage
<b>Sex:</b>	
Female	122 (52.8%)
Male	109 (47.2%)
<b>Age:</b>	
21–30 years	200 (86.5)
31–40 years	29 (12.6)
41–50 years	2 (0.9)
<b>Training Level:</b>	
R1	57 (24.7)
R2	46 (19.9)
R3	52 (22.5)
R4	45 (19.5)
Board eligible	22 (9.5)
Fellow	9 (3.9)
<b>Latest PALS course attended:</b>	
One month ago or less	15 (6.5)
One month to one year ago	100 (43.3)
Around two years ago	71 (30.7)
Three years or more ago	16 (6.9)
Never attended a PALS course	29 (12.6)
<b>Latest real CPR code attended:</b>	
One month ago or less	63 (27.3)
One month to one year ago	126 (54.5)
Around Two years ago	13 (5.6)
Three years or more ago	2 (0.9)
Never attended a real pediatric CPR	27 (11.7)
<b>Role assumed in attended CPR code events:</b>	
Team leader	24 (11.4)
Team member	131 (62.1)
Either team leader or team member	56 (26.5)
<b>Life support courses attended other than PALS:</b>	
BLS	231 (100)
NRP	190 (82.3)
PFCCS	42 (18.2)
Others	49 (21.2)

R = residency training year; PALS = pediatric advanced life support; CPR = cardiopulmonary resuscitation; BLS = basic life support; NRP = neonatal resuscitation program; PFCCS = pediatric fundamental critical care support.

Our analysis showed that 24 residents (10.4%) reported their roles within a real pediatric CPR code as team leaders, 131 residents (56.7%) indicated that their roles were as CPR team members, and 56 residents (27.2%) had assumed mixed roles in the CPR team (alternating between team leaders and team members).

Table 2 shows the perceived obstacles that prevented the respondents from attending life support training courses. Lack of time to attend life support courses was the most frequently reported obstacle (182 [78.7%]), and the least frequently reported obstacle (15 (6.5%)) was the belief that it is only necessary to attend a course once. The other obstacles are shown in the table. The self-reported confidence in being a CPR team member was reported significantly more frequently than that in being a team leader (mean  $\pm$  SD = 7.8 (2.1) versus 6.3 (2.4);  $P < .001$ ). Moreover, the self-reported confidence in being a CPR team leader was reported significantly more frequently by male respondents than females (mean  $\pm$  SD = 6.7 (2.4) versus 5.9 (2.4);  $P < .013$ ).

Fig. 1A shows that there was a significant positive correlation between the mean self-reported confidence in being a pediatric CPR team leader and the number of training years from residency training year 1 to fellow ( $P < .001$ ). The junior trainees (R1 and R2) had a mean confidence level of 5.3 out of 10 and the senior trainees had a mean confidence level of 7.1 ( $P < .001$ ). There were significant negative correlations between the mean self-reported confidence in being a pediatric CPR team leader and the time since the latest PALS course (Fig. 1B) and real pediatric CPR code attendance (Fig. 1C) ( $P < .05$  and  $P < .001$ , respectively).

We also found that residents who frequently assumed a team leadership role during a real pediatric CPR code reported significantly higher perceived self-confidence compared with those who assumed a team member role, or alternated between team leader and team member roles ( $P < .05$ ).

#### 5. Discussion

Life support courses are an integral part of general medical education, but particularly critical care education. Simulation-based courses are increasingly utilized in clinical practice training and education to improve knowledge and skills, and thus safety and outcomes for patients [13]. Moreover, if CPR is provided in an appropriate and timely manner, the likelihood of the victim surviving can be doubled or tripled [14].

Intra-hospital pediatric cardiopulmonary arrests (CPAs) are infrequent events [3,6,15–18] and they have potentially good outcomes if the patients are successfully resuscitated [19,20]. Given the rarity of these actual events, the skills required for the successful resuscitation of acutely ill or injured children must be taught to pediatric residents through a structured curriculum, which is designed to provide them with the required knowledge and skills to manage these events.

The leadership skills of the medical team leaders who provide CPR are an important part of the effective management of patients [21].

In this study, we aimed to identify the possible factors that might affect the self-confidence of physicians from pediatric residency training programs as leaders in pediatric CPR code event.

We found that residents who attended a real pediatric CPR code or PALS course before the survey had significantly higher self-reported confidence in acting as team leaders during pediatric CPR code events. Our results are comparable to those obtained in another study, which showed that attending a PALS course significantly increased the short-term knowledge of pediatric resuscitation among all professional groups who attended the course [22]. Another study reported a significant decline in the knowledge and skills acquired from life support training courses over time [23].

**Table 2**  
Perceived obstacles to attending life support training courses reported by the respondents.

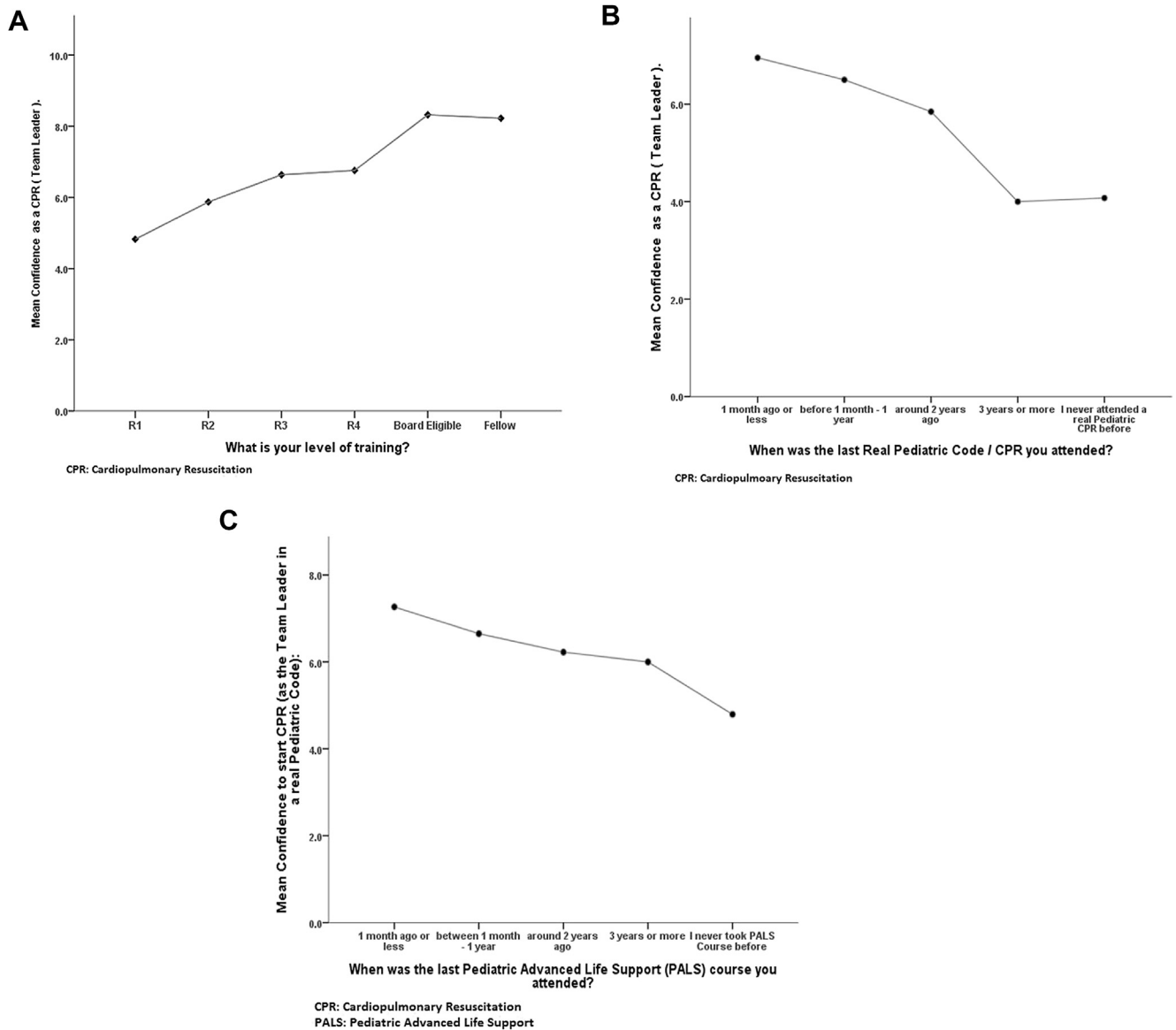
Total number = 231	
Obstacles	Number and percentage (%)
Lack of time	182 (78.8)
Financial cost of the courses	90 (38.9)
Courses are not available within the hospital	48 (20.8)
These courses are intended for training critical care professionals only	25 (6.3) (10.8)
I have taken the course once and there is no need to renew	15 (6.5)
Other obstacles	37 (16.02)

Assessing the impact of NRP certification or neonatal resuscitation course attendance on the perceived self-confidence of respondents in serving as a pediatric CPR code team leader was beyond the scope of this study.

Furthermore, inadequate knowledge and skills retention following CPR training courses among nursing and medical staff

has been documented over the past 20 years [24]. These variations in the loss of knowledge might be attributed to a lack of practice or infrequent application.

We found that the self-reported confidence in serving as a pediatric CPR code team leader was positively correlated with the number of training years, which might be explained by the



**Fig. 1.** A. Correlations between self-reported confidence in being a CPR team leader and the level of training, life support course attendance, and attending CPR code events. B. Correlations between self-reported confidence in being a CPR team leader and the level of training, life support course attendance, and attending CPR code events. C. Correlations between self-reported confidence in being a CPR team leader and the level of training, life support course attendance, and attending CPR codes.

acquisition of greater knowledge, more clinical practice and exposure, and the possibility of being involved in more real CPA situations. A previous study showed that out-of-hospital emergency physicians retained more advanced life support knowledge and skills compared with non-emergency course participants [25]. Almost 20% of our respondents had not yet renewed their PALS certificates or never attended PALS training. These findings might be attributed to the pre-enrollment requirements and continuation of residency training program within this country, and it may be necessary to improve the quality of the training program, and thus the knowledge and skills of physicians in order to ensure patient safety and obtain better outcomes in cardiac arrest situations. Moreover, incorporating life support education and training into the training program curriculum might ensure that up to date knowledge and skills are provided to trainees during their residency training.

The self-reported confidence in being a pediatric CPR code team leader determined in the current study among those who were recently involved in a real code might reflect the importance of clinical practice for enhancing confidence, and experience in managing these situations might play an important role in improving outcomes.

The rarity of in-hospital pediatric CPR events can potentially be addressed by running regular pediatric CPR mock codes, and actively involving residents in these codes and assigning them as team leaders in order to evaluate their performance, thereby providing them with the necessary knowledge, skills, and guidance to act appropriately as a team member or leader. It has been reported that implementing mock codes increased the survival rate to almost 50% [26]. Similarly, other innovative methods are being devised to ensure that residents are well prepared for resuscitation events [3].

Several factors were identified that might have determined why a limited number of residents reported self-confidence in being a CPR code team leader. These factors include the infrequent pediatric CPR codes that residents encounter in real practice and the lack of structured material for life support courses in the current training curriculum, especially BLS, PALS, PFCSS, and NRP. These barriers can be overcome by incorporating life support courses in the training curriculum, providing education in leadership skills, and regularly conducting pediatric CPR mock codes in order to ensure that knowledge is retained and updated among trainees at different levels.

Other barriers mentioned by the participants included a lack of time, financial costs, and the perception that these courses are more beneficial for critical care physicians. These barriers might be addressed by institutional or national regulations to support trainees with free registration and participation in courses, as well as increasing awareness of the importance and impact of completing these courses for the outcomes of CPR code events.

Finally, leadership workshops would be very helpful for improving and developing leadership skills among residents [27]. It is necessary to invest more in the competency of trainees because this would improve the performance of teams and provide better outcomes for patients.

We recommend that attending life support courses such as PALS, NRP, and PFCSS should be a mandatory requirement for the promotion of residents, and these courses should be incorporated in the training curriculum. Residents should be licensed after receiving these certificates because this would increase their level of self-confidence as team leaders during pediatric CPR.

## 6. Conclusion

The self-reported confidence as a team leader during pediatric

CPR was higher in residents who had been certified in life support courses, those who were exposed to real pediatric CPR during their training, and those who had assumed the role of a team leader during CPR. We suggest incorporating life support courses and simulation-based mock code programs with an emphasis on leadership in the pediatric residency training program curriculum.

## 7. Strengths and limitations

One of the strengths of our study is that it involved trainees from different centers throughout Saudi Arabia who had different levels of training, and this is the first study to investigate this issue in Saudi Arabia. However, this study had some limitations. One of the main limitations of our study is that we only reported the self-confidence of pediatric CPR team leaders but without actually testing its impact on CPR outcomes. However, we consider that perceived self-confidence is an important factor that influences the performance of any skill.

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