

BRIEF REPORT

Quality of Cardiopulmonary Resuscitation in Emergency Department Based on the AHA 2015 Guidelines; a Brief Report

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Abstract: **Introduction:** Adhering to existing guidelines on cardiopulmonary resuscitation (CPR) can increase the survival rate of the patients. The present study has been designed with the aim of determining the quality of CPR performed in the emergency department based on the latest protocol by the American heart association (AHA). **Methods:** In this prospective cross-sectional study CPR process was audited in patients above 18 years old in need of CPR presenting to the emergency departments of 3 teaching hospitals based on the AHA 2015 guidelines. Less than 60% agreement was considered as fail, 60-70% as poor, 70-80% as moderate, 80-90% as good, and 90-100% as excellent. **Results:** 80 cases of CPR were audited (55% male). Location of arrest was the hospital in 58 (72.5%) cases and 48 (60.0%) of the cases happened during the day. 28 (35.0%) cases had orotracheal intubation before the initiation of CPR. 30 (37.5%) patients had a shockable rhythm at the initiation of CPR. Based on the findings, out of the 31 studied items, 9 (29.03%) had excellent agreement, 10 (32.25%) had good, 4 (12.90%) had moderate, 2 (6.45%) had poor, and 6 (19.35%) had fail agreement rate. **Conclusion:** Based on the findings of the present study, the quality of applying the principles of basic and advanced CPR in the emergency department of the studied hospital had intermediate, poor and fail agreement with the recommendations of the AHA 2015 in at least one third of the cases.

Keywords: Physical Education and Training; Cardiopulmonary Resuscitation; Clinical Audit; Emergency Service, Hospital; Internship and Residency

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1. Introduction

Through the centuries, human has used various and interesting methods for resuscitation of people close to death. Paracelsus was the first person that used blacksmith bellows for blowing in the lungs of people who had faced sudden death. This method was commonly used for about 300 years in Europe. In the middle of 20th century the term cardiopulmonary resuscitation (CPR) was used for describing the technique of simultaneous cardiac massage and mouth to mouth respiration in a person without a pulse (1,

2). This technique has significantly improved in a few years, especially regarding use of resuscitation operation in the hospital.

In 2000, the international liaison committee on resuscitation held the first international conference of resuscitation for developing international guidelines for CPR and emergency cardiac care so that all individuals working in medical teams and rescuers follow the same protocols when performing resuscitation (3). Based on these conditions, high quality CPR is associated with: ensuring sufficient chest massage, proper depth, allowing chest recoil, minimizing the delay in massage, and avoiding too much ventilation.

Currently, despite many attempts at CPR being unsuccessful, it is still an internationally accepted treatment operation (4, 5). Adhering to latest existing guidelines and performing these guides with high quality in CPR can increase the

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survival rate of the patients. Proofs of this claim are studies that show with correct training and giving proper feedback to the resuscitation team, percentage of successful CPR and its proper performance increase significantly (6-9). Yet, some researchers express that there isn't a proper agreement between what happens at the clinic with international CPR guidelines (10, 11). These inadequacies lead to improper perfusion in the cardiac and brain tissues and result in the poor outcome of the patient.

Normally, evaluating the existing state is the first step taken in planning for other steps to improve the quality. Therefore, the present study has been designed with the aim of determining the quality of CPR performed in the emergency department based on the latest protocol by the American heart association (AHA).

2. Methods

2.1. Study design and setting

In this prospective cross-sectional study on resuscitation, patients above 18 years old in need of CPR presenting to the emergency departments of Loghmane Hakim, Imam Hossein, and Shohadaye Tajrish Teaching Hospitals, Tehran, Iran, from March 2017 to March 2018 were evaluated. Protocol of this study was approved by the ethics committee of Shahid Beheshti University of Medical Sciences. In the evaluated emergency department all CPRs were performed by a team of emergency medicine and internal medicine residents.

2.2. Data gathering

The standard technique was defined based on the latest standard guidelines of AHA 2015 for CPR. The evaluated items included: status of CPR initiation, status of applying pressure on the chest, the proper place for applying pressure, the number and depth of pressure applied, the number of ventilations per minute, ceasing pressure application for 10 seconds, evaluating the patient's pulse, using electric shock, rapid initiation of CPR after shock, using vasopressor, switching personnel for applying pressure, using anti-arrhythmic medications, time interval between vasopressor doses, timing of using vasopressor drugs, timing of reaching safe airways, duration of CPR performance, correct prescription of alternative drugs, considering the 5H/5T, airway management, continuous evaluation of patient's situation, expressing measures such as checking level of consciousness, respiration and pulse, status of the team members (proper, improper), status of oxygen therapy and monitoring of the patient and establishing venous flow.

A trained senior emergency medicine resident was responsible for data gathering (approved by 3 emergency medicine professors) in various shifts (day, night), using consecutive

sampling by being present at the bedside of patients who needed CPR.

2.3. Statistical analysis

Considering 29% proper CPR performance (8), 95% confidence interval, 90% power, and the minimum considerable clinical significance of 10% the sample size was estimated to be 79 cases. In this study, based on Likert scale, less than 60% agreement rate with the AHA 2015 guidelines was considered as fail, 60-70% as poor, 70-80% as moderate, 80-90% as good, and 90-100% as excellent.

3. Results:

80 cases of CPR were evaluated in the mentioned emergency department (55% male). Location of arrest was the hospital in 58 (72.5%) cases and 48 (60.0%) of the cases happened during the day. 28 (35.0%) cases had orotracheal intubation before the initiation of CPR. 30 (37.5%) patients had a shockable rhythm at the initiation of CPR. The rate of adherence to the principles of CPR by the resuscitation team has been summarized in table 1. Based on the findings, out of the 31 studied items, 12 (38.70%) had moderate or worse agreement with the principles recommended by the AHA 2015 guidelines.

4. Discussion

Based on the findings of the present study, the quality of applying the principles of basic and advanced CPR in the emergency department of the studied hospital had intermediate, poor and fail agreement with the recommendations of the AHA 2015 in at least one third of the cases. The final success rate of in-hospital CPR that leads to discharge of the patient from hospital has been estimated to be 9% to 12% (10-12). Ko et al. assessed the quality of CPR in pre-hospital settings and showed that performance of CPR had an acceptable quality in only 29% of the cases (8). Hossein-Nejad et al. also performed a study in Rasool Akram Hospital and showed that in only 25 (75.75%) of their studied CPR cases chest massage, pulmonary ventilation, pulse check, insertion of peripheral vein and intubation were performed correctly (13).

Taha et al. in 2014 expressed that performance of quality CPR had a considerable effect on the survival of the patients and evaluated various factors affecting the initiation of spontaneous blood circulation and survival of the patients after cardiopulmonary arrest in hospital. These researchers showed that applying pressure in the chest is done in 99.2% of the patients, applying pressure with at least 2 inches of depth in 92.4% of the patients, and stopping it for less than 10 seconds is done in only 48.7% of the patients (14). Sutton et al. also showed that CPR of children in hospital is not in agreement with the AHA guidelines in most cases (7).

A study by Christopher Crowe et al. in 2015 in the United



Table 1: The rate of adherence of the resuscitation team to the principles of cardiopulmonary resuscitation (CPR) based on the recommendations of American heart association (AHA) 2015

Activity	Number (%)
Asking for help, ringing the bell, rapidly informing the CPR team	78 (97.5)
All members of CPR team being present	74 (92.5)
Having a predefined place and role for CPR team members	46 (57.5)
Starting CPR without delay	58 (72.5)
Proper management of the team by the leader	64 (80.0)
Loudly expressing the measures taken by the team	14 (17.5)
Applying the basic principles of airway management	28 (53.8)
Applying advanced principles of airway management	47 (81.1)
Doing intubation at the proper time	47 (81.1)
Delay in intubation	23 (28.7)
Proper number of ventilations in the intubated patient	44 (55.0)
Applying the 30 to 2 ratio in cardiac massage	10 (20.8)
Performing proper number of cardiac massages per minute	40 (50.0)
Applying the standard depth for cardiac massage	48 (60.0)
Doing the cardiac massage correctly	64 (80.0)
Allowing chest recoil after applying pressure	48 (60.0)
Applying the 80% ratio of massage duration to the total time of CPR	80 (100.0)
Not putting cardiac massage before venipuncture	8 (8.7)
Massagers changing every 2 minutes	61 (76.3)
Checking the pulse for 10s between massages every 2 minutes	65 (81.5)
Connecting the patient to monitor or defibrillator	80 (100.0)
Using electroshock if needed	24 (80.0)
Precautions for connection for the team before performing a shock	16 (66.7)
Applying the proper cycle of shock-massage	16 (66.7)
Proper medication with the proper dose after giving each shock	22 (91.7)
Performing massaging for 2 minutes after each shock	48 (96.0)
Prescribing epinephrine each 3 to 5 minutes	50 (100.0)
Assessing and treating the cause of arrest during CPR	36 (45.0)
Covering the patients during CPR	70 (87.5)
Applying the standards of giving bad news to the relatives	71 (87.7)
The in-charge physician informing the relatives	63 (87.7)

Table 2: The overall status of applying the principles of resuscitation in the studies cases based on the standards of American heart association (AHA) 2015

Status	Number (%)
Excellent	9 (29.03)
Good	10 (32.25)
Moderate	4 (12.90)
Poor	2 (6.45)
Fail	6 (19.35)

States with the aim of evaluating the quality of CPR in emergency department and the effect of receiving simultaneous audio visual feedback and receiving a report after the incident. The results of the study showed a significant improvement in some CPR indices such as depth of chest massage and the speed of massage, and no considerable change in some indices such as chest massage not being continuous (9). In addition, the results of a systematic review introduced planning, leading and communication as the 3 main entangled mechanisms of coordination during CPR performance

(15).

It seems that by using tools such as continuous and up to date training as well as getting reports and giving audio visual feedback during CPR we can take steps towards improving the quality of CPR and increase its agreement with the existing standards. This can lead to an increase in the number of successful CPR cases and survival of more patients.

5. Conclusion

Based on the findings of the present study, the quality of applying the principles of basic and advanced CPR in the emergency department of the studied hospital had intermediate, poor and fail agreement with the recommendations of the AHA guidelines 2015 in at least one third of the cases.

6. Appendix

6.1. Acknowledgements

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6.2. Author contribution

All the authors of this article met the standard criteria of authorship based on the recommendations of international committee of medical journal editors.

6.3. Funding and support

All the expenses of this study were paid by the researchers.

6.4. Conflict of interest

Hereby, the authors declare that there is no conflict of interest regarding the present study.

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