

A study of influential factors on chest compression in cardio pulmonary resuscitation from the perspective of personnel of pre-hospital emergency of central hub in Iran in the first half year, 2016

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Abstract

Introduction: According to the latest guidelines of cardio pulmonary resuscitation (CPR), the American Heart Association, advises 6 centimeters for maximum chest compression in CPR; but unfortunately, so far has not mentioned any explanatory guidelines to factors affecting the amount of chest compression. Therefore, this study was aimed at assessing factors affecting the chest compression cardiopulmonary resuscitation from the perspective of personnel of pre-hospital emergency of central hub in Iran.

Methodology: The present study is descriptive analytical conducted randomly among 306 individuals of emergency service personnel in central hub of Iran. Data were collected by self-made questionnaire and analyzed by SPSS, with descriptive statistics (frequency, mean, standard deviation).

Results: 306 individuals participated in the study and mean age was calculated as 34.75 ± 3.45 . According to personnel of the emergency service, chest compression in CPR depends on rib curve, skeletal abnormality of chest, injured weight, elasticity of chest and stability of chest and the most influential factor on chest compression was (0.99.34) rib curve.

Conclusion: Results of this study show that chest compression is not the same among all individuals and not consistent with instructions of American Heart Association. It is possible that chest compression in CPR is more than 6 centimeters or less than 5 centimeters.

Key words: Emergency medicine, Chest, CPR

Introduction

Heart and brain failure is a very serious situation in which heart beat and respiration stops completely. This situation requires quick and correct reaction. Heart and brain failure in Iran is the second factor causing death. On a global scale, heart failure outside the hospital is the most important cause of death(1), but unfortunately according to quantitative advancements observed in the last 30 years, the level of rescue of heart failure in patients is less than 10 percent out of the hospital(2-3).

Heart pulmonary failure is one of the most important causes of death in the modern world. Having enough knowledge in CPR of patients with pulmonary heart failure is one of the requirements of medical staff (4-5).

In the USA, 2 million individuals die annually and 25 percent of them are as a result of acute pathophysiology and these cases happen before old age and in the absence of incurable disease. Among them, of 250,000 individuals undergoing CPR operations, most of them die. Many of the patients have irreversible damage. The goal of CPR is reducing this kind of death (6).

CPR is a process to survive vital functions of heart, pulmonary system and brain that saves individuals' life and prevents sudden death. It can save individuals' life due to heart failure (7-8). The survival of those patients is due to different clinical features and due to locations, as emergency medical services differ (9-10).

Although many factors play a role in low possibility of survival among heart failure patients, if CPR operations are on time, results will improve (11). Therefore delay in CPR operations should be avoided because not performing these actions results in brain death in less than 4 to 6 minutes (the golden time) and if survival operations are performed quickly, in 40 to 60 percent of cases they can rescue individual lives (12-13).

If blood circulation stops for 35 seconds, cell metabolism is stopped. This failure continues for 5 minutes and irreparable injuries occur in brain tissue. Heart massage in CPR circulates blood by increasing pressure of chest and direct compression of chest. It delivers oxygen to heart and brain. According to the latest changes in CPR in Heart Association instructions of 2015, in CPR, heart massage should be conducted for 2 or 5 centimeters for adults for heart massage with higher depth and more than 2.4 inches or 6 centimeters should be avoided. Given that the use of external cardiac massage with hand massage is preferred to mechanical method of heart massage, but unfortunately revivalists conduct this contrary to the recommendations (Press firmly, quickly press) depth chest compression is not enough and resuscitation will fail (14-15). This results in negative consequences for society including irreparable injuries, increasing time and energy consumption, low motivation and self-esteem among personnel, reduction of operation quality and dissatisfaction in the society(16).

It is obvious that inattention to weak operation of revival teams result in death and increase negative consequences. So, authorities in emergency triage need ways to overcome these problems and the first step is identification of success obstacles. The present study tries to study influential factors on chest compression in CPR.

Methodology

This research is descriptive analytical. Research population included central hub personnel of emergency service in Iran, in the first half of 2016. According to Cochran's formula 1500 sample population, reliability co-efficient 95 percent and 30 samples were selected randomly.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N} \left(\frac{z^2 pq}{d^2} - 1 \right)}$$

Entrance feature of samples in this research was successful revival experience. At the beginning the research goal was explained for research units and participants and they participated in the study with their satisfaction.

Data collection tools were self-made questionnaire titled "study of influential factors in chest compression for CPR and included demographic data of personnel (name, last name, age, experience in emergency service, field of study). Answers were yes or no, yes (1) and no (0). If yes choice was selected the intensity is low (1), average (2), high (3). The maximum score was for yes (100 percent) and minimum score was for no (0 percent). If yes was selected, according to intensity, maximum score was for high (18) and minimum score was for low (6); validity of tools was determined. By studying books, and journals, research tools were prepared, modifications were performed based on the opinion of 15 professors of emergency medicine. Data collection tools were validated according to scientific reliability and by questionnaire test-retest method.

In this method, 20 samples received questionnaires and they were gathered after completion after two weeks when the same questionnaires were distributed and reliability of questionnaire was 95 percent.

Information of questionnaires was analyzed by SPSS, descriptive analysis (frequency, average, standard deviation) and inference statistics (t-test, K2) were analyzed.

Results

In this study 306 individuals participated and average age was 34.75 ± 3.45 . ; 27.3% of these individuals had work experience less than 5 years, 57.2% had work experience between 5 to 10 years and 15.5% had work experience more than 10 years. 91.75% studied emergency medicine, 3.5% studied nursery, 2.5% studied anesthesia services and 2.25% studied surgery services.

Table 1: Frequency percent of influential factors on chest compression in rib cage

Influential factors on compression of chest cage	percent		Influential factors on chest compression in rib cage	Influential factors on chest compression in rib cage	Influential factors on chest compression in rib cage
	yes	no			
Rib bend	99.34%	65%	low	Average	High
			67%	2.30%	94.3%
Skeletal abnormality in rib cage	98.03%	1.3%	34%	1.32%	98.34%
Elasticity of rib cage	98.03%	1.96%	2.66%	3%	94.34%
Injured weight	90.19%	1.96%	1.35%	3.66%	94.99%
Stability of ribs in rib cage		9.80%	3.26%	6.16%	90.58%

According to personnel of emergency medical services, the most important influential factors on chest compression in CPR were:

The proportion of chest compression depends on rib bend and the lower the rib bend the higher is chest compression (99.34%).

Chest compression depends on the injured person and since chest compression is lower in infants, chest compression is lower in thin individuals rather than fat ones (98.03%).

Chest compression depends on elasticity of chest cage and lower elasticity in rib cage results in higher chest compression. Chest compression depends on stability of ribs in rib cage and in old individuals stability of ribs is lower than the young. Stability of women's rib is higher than men (99.03%). Chest compression depends on stability of ribs in chest cage (Table 1).

Test retest showed that there is no significant relationship between education level, field of study workplace and research result. Q2-test showed that there is no significant relationship between average of dimensions with demographic features of emergency personnel ($p > 0.05$).

Conclusion

Results show that chest compression is affected by factors like rib bend, skeletal abnormality of rib cage, injured weight, elasticity of rib cage and rib stability. If rib bend is low, rib cage looks like barrel and elasticity of rib cage is low. Chest compression is higher CPR and if stability of ribs in chest cage is lower and the chest looks like a cone, is injured or is low-weight the rib bend is higher. So, chest compression in CPR is lower. According to the results,

we conclude that chest compression in CPR is different according to the mentioned factors and chest compression is not the same among all individuals.

In 2015, the latest instruction for CPR was published by the American Heart Association as a reference for CPR. According to the instructions the reviver should massage the heart with minimum depth of 2 inches or 5cm for adults. They should avoid massage with depth of 2.4 or 6cm and more than that, but results of the present study show that chest compression is affected by rib bend, skeletal abnormality in chest cage, injured weight, elasticity of rib cage and strength of ribs. According to those factors, chest compression in CPR may be lower than 2 inches or 5cm or more than 2.4 inches or 6cm, Therefore, results of this study are not consistent with instructions of the American Heart Association.

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