O R I G I N A L   A R T I C L E

Correlation between quality of cardiopulmonary resuscitation and self-efficacy measured during in-hospital cardiac arrest simulation; preliminary results

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Abstract. *Background:* The concept of self-assess it's a central mechanism in human agency for behavior change and should translate to desirable practice patterns. There are no many studies that have investigated the relationship between the perception of the ability to perform cardiopulmonary resuscitation (CPR) and the quality of the same. The aim of this work is to investigate the relation between physiological and psychosocial variables in cardiac resuscitation in order to improve the involvement and motivation of professionals in training courses. *Methods:* During the year 2012, 322 medical staff of Ospedale-Universitario of Parma were trained to basic life support defibrillation (BLSD). Before started the course the partecipants were randomly selected among the staff working in the same department to create a team of two persons and involved in a simulation that reproduced the first five minutes that occurs for a cardiac arrest in a medical or surgical department in our hospital before the intervention of the hospital emergency team. Before and after simulation to each participant was asked to answer a self-efficacy questionnaire on a 10-point scale on the management of cardiac. During simulation were registered the activation time of the emergency response system, hands-on time, defibrillation time, number of compression and correct compression rate. *Results:* Activation time of the emergency response system was 70.52 ± 78.77 seconds. In 55 teams was not made the allert. The defibrillation time was 148.63 ± 58.43 seconds. In 44 teams the defibrillator were used within 120 seconds, in 36 (22.1%) it was not used. Hands-on time average was of 166.20 ± 62.9 seconds. The mean number of compression was 216.22 ± 115.57. The percentage of satisfactory compression was 9.97 ± 21.23 %. The level of self-efficacy was under the average for the 35.6%, while the 26.8% of the participants had a medium level of 5 and the 38.5% of the sample declared to feel an efficacy level included in 6-10. The sense of self efficacy after the simulation was constant in the 38.3% of the sample, while increased in the 30.5% and decreased in the 31.2%. We found no significant correlations between self-efficacy levels and specific results in scenario acting before simulation, instead, after the simulation the skills performances are much more correlated with self-efficacy. *Conclusions:* The medical staff reported an individual's perception of good efficacy in the management of simulation of cardiac arrest, but it does not correspond to a high skills. An open question is if and how these psychosocial variables may play a role in improving the quality of CPR and if knowledge of the low capacity to manage a cardiac arrest can be translated into the need for the medical staff to be regularly engaged in BLSD retraining.

Key words: basic life support defibrillation (BLSD), Self-efficacy

Introduction

The concept of self assess it's a central mechanism in human agency for behavior change and should translate to desirable practice patterns (1-4). A few studies reported that the medical staff have limited ability to accurately self assess (5, 6, 13, 14). Particularly, in cardiopulmonary resuscitation investigations has not been described, if the perception of self assessment to manage a cardiac arrest corresponds to reality (10, 15). In a field like cardiopulmonary resuscitation were skill retention starts declining early after initial training and often reaches pre-training levels after 1 or 2 years (16-18), the incorrect assessment of their capacity can be a cause of failure need for learning. The aim of the present study was to explore if there's a correlation between individual self efficacy and psychomotor skills in simulation training basic life support defibrillation (BLSD) courses.

Methods

Study Cohort

During 2012, in Parma Hospital, there were done 16 BLSD training courses addressed to groups of 20 health professionals. Those courses typically include 5 hours of video, lecture, practical instruction and simulation about the recognition and treatment of BLSD events (20). The participants of the present study were: 200 (62.5%) women and 114 (37.5%) man with a mean age of 37.5±9.18. The service affiliation were mainly represented to cardiopulmonary, surgical, emergency, geriatric-rehabilitation departments. The distribution of professional were 128 nurses (45.39%), 73 medical doctors (25.88%), 56 social welfareoss operator (19.85%), 49 practicing doctors (17.37%) and 16 other (5.67%). Of all professionals, 225 (70.31%) had a previous trained course more than 24 months before, 67 (20.93%) hadn't never trained and 30 (8.76%) had trained during the last 2 years. The study

was approved by board of direction of Azienda Ospedaliero Universitaria of Parma and written informed consent was obtained from all participants.

Procedure

Each participant was identified by a number in order to maintain the anonymity and privacy. Each one of the 320 participants was asked to answer to the one item (Table 1) on his/her self efficacy in performing resuscitation skill: they rated the question on a 10-point scale, according to the single-item technique (7,8,12). The question was proposed twice: before and after the simulation.

The simulation involved two participants randomly selected among the staff working in the same department: doctors and nurses 19 (14.73%), two doctors 38 (29.45%), two nurses 33 (25.58%), nurses and oss 26 (20.15%), two oss 5 (3.87%) and medical and oss 8 (6.22%). The simulation reproduced the first five minutes that occurs for a cardiac arrest in a medical or surgical department in our hospital before the intervention of the hospital emergency team. In a hospital room equipped for simulation CPR, manikin was placed on the bed; 20 meters outside the room LIFEPAK 500T AED Trainer was placed on emergency trolley. Prior to the simulation, teams were instructed that the patient were hospitalized from 24 hours for hyperpyrexia and pneumonia. The scenario started when one of the two medical staff comes into the room and found the patient unconscious, not breathing and with no pulse; the scenario ends after 5 minutes.

Measuring Parameters of CPR Quality

During the simulation there was no involvement of instructors in the scenario. The teams' performance were simultaneously recorded by two independent observers that registered: activation time of the emergency response system, hands-on time, defibrillation time, number of compression and correct compression rate (11, 22, 23). The activation time of the emergency response system was defined as the time from the patient's unconscious

Table 1. Self-efficacy item

How much do you feel confident in performing a resuscitation attempt ?

1				5					10

Not at all --------------------------------- Quite Confident ------------------------------- Completely Confident

Table 2. Skills measures during the five minutes cardiac arrest simulation and correlation between skills measures and self-efficacy before and after the simulation

	Mean (SD)	Self-efficacy PRE	Self-efficacy POST
Activation time of the emergency response system, sec	n=106* 82.76 (81.8)	- .114	- .168*
Defibrillation time, sec	n=109† 148.37 (57.6)	- .247**	- .169*
Hands-on time, sec	n=140 164.44 (64.8)	.123	.240**
Chest compression, n°	n=140 208.14 (113.9)	.059	.166*
Correct compression rate, %	n=140 10.18 (22.3)	- .032	.212**

evaluation to the call of the hospital emergency team. Hands-on time was defined as cardiac massage; defibrillation and ventilation were rated as continuous cardiac massage if the interruption was ≤ 10 sec. Defibrillation time was defined as the time from diagnosis of cardiac arrest to defibrillation. Chest compression rates and correct chest compression were detect and record by the manikin: AED Resusci Anne SkillReporter (Laerdal Medical Corporation, Stavanger, Norway). Correct compression rate are considered all those with depths ≥ 5 cm, with complete relaxation and correct hands position.

Statistical Analysis

The continuous variables are expressed as mean values ± standard deviation (SD), and the nominal variables as absolute numbers and percentages. Statistical analysis was performed using a statistical software package (SPSS for Windows). We have proceeded with an analysis of bi-variate correlations between those physiological and psychosocial variables (r of Pearson).

Results

The Skills performances measured have a Gaussian distribution. Activation time of the emergency response system was 70.52 ± 78.77. In 55 (43.4%) teams was not made the allert. The defibrillation time was medially of 148.63 ± 58.43, with a minimum of 28 seconds and a maximum of 286; 63 (54.7%) of the teams had a per-

formance under the average and only the 5 (4.3%) had a time by 60 seconds. In 39 (24.4%) teams the defibrillator were used within 60-120 seconds. In 36 (13.53%) teams the defibrillator was not used. Hands-on time average was of 166.20 ± 62.9, with a minimum of 0 and a maximum of 293 seconds: the 82 (56.2%) of the sample was over the average. The average number of compression was 216.22 ± 115.57, from a minimum of 0 and a maximum of 458; in 66 (51%) of the participants were over the average. The percentage of correct chest compression was medially of 9.97 ± 21.23 % with a minimum of 0% and a maximum of 94%: the 109 (74.5%) of the participants were under the average. As regards the self-efficacy we found no significant correlation between self efficacy levels and specific results in scenario acting before simulation. Instead, after the simulation the skills performances are much more correlated with self-efficacy. The correlations between the perception of self-efficacy and skills in females are more significant and also in the assessments pre there is significant for activation time of the emergency response system, defibrillation time and Hands-on time (Table 3).
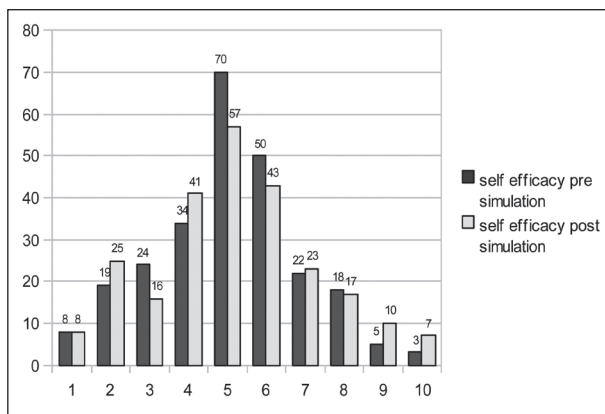
Figure 1 shows the changes in the level of self-efficacy: it were under 5 for the 95 (30.25%), while the 67 (21.33%) of the participants had a medium level of 5 and the 96 (30.57%) of the sample declared to feel an efficacy level included in 6-10. The sense of self efficacy after the simulation was constant in the 99 (38.3%) of the sample, while increased in the 79 (30.5%) and decreased in the 81 (31.2%).

Table 3. Correlation between skills measures and self-efficacy before and after the simulation by gender

	Self-efficacy All Partecipans		Self Efficacy PRE		Self Efficacy POST	
	PRE	POST	Male	Female	Male	Female
Activation time of the emergency response system	- 0.114	- .168 *	.081	- .275 **	- .036	- .224 *
Defibrillation time	- .247**	- .169 *	.039	- .297 **	.056	- .246 **
Hands-on time	.123	.240 **	- .156	.208 **	.057	.326 **
Compression	.059	.166 *	- .043	.121	.071	.211 **
Correct compression rate	- .032	.212**	- .084	.007	.137	.231 **

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Figure 1. Changes in the level of self-efficacy pre-post simulation

Discussion

High-quality CPR and prompt defibrillation may be the most important actions during cardiac arrest (11, 19, 21). A preliminary assessment is guided from data driven by single skills that demonstrate a poor quality of CPR in the first five minutes of cardiac arrest simulation before the arrival of the emergency team. The poor quality of resuscitation performance is evident by the positive correlation between compression number and hands-on time and negative correlation between the defibrillation time and the chest compression number. This information is not a surprise (9) and a number of explanations have been considered like arrest events occur infrequently from the perspective of any given rescuer or rescuers are infrequently trained. Nevertheless analyzing the correlations between the individual level of

confidence and the skills performance before simulation there is not significant correlation between self-efficacy levels and specific results in scenario acting. The medical staff felt quite confident in their ability to perform BLSD that don't correspond to satisfactory skill performances. In a systematic review on the accuracy of physician self-assessment compared with observed measures of competence (6), the preponderance of evidence suggests that physicians have a limited ability to accurately self assess. Most of the studies (6) on the correspondence between self-assessment and external assessment, as stable external objective measures, demonstrated weak or no association between the two. Some studies found a reasonable association between physicians' self assessment abilities and external assessment in specific areas such as cultural and linguistic sensitivity, self and external tests and in chart audit (6). The causes of the medicals overestimating could be the human tendency to give a positive self conception. Interesting, after the simulation, the skills performances correlated with self-efficacy declared. When professionals are requested to evaluate their ability after a simulation they are able to give a much more real judgment. We can assume that there is a difference between knowledge and the know how to do that is not perceived by the people.

Assuming different self evaluation for women and men we wanted to investigate whether there is a gender difference. Analyzing gender differences were observed that the woman have a lower sense of self efficacy and they are more realistic evaluation of their performances.

In men, the skill does not change the perception of the degree of performace. The sense of self efficacy

is important in order to make people be involved in emergency situations. In the case of cardiac resuscitation is important that the motivation to act corresponds to an efficient result, that can be obtained if professionals are extremely involved in training courses and see a real improvement of their abilities based on a real evaluation of their formative needs.

In adults, a strong motivation for learning is represented by the knowledge that competence is not fully known, and that in the near future will have to put it into practice. The initial simulation may be a tool that can create the basis for a correct self-assessment for women but not for man. You could be to reflect on the training tools that take into account gender difference.

The limits of this work can be originated by the complexity of reproducing a real scenario, that can have influenced the quality of the performance of professionals. and by the kind of self efficacy measure, that is a self administered questionnaire.

Furthermore since the assessment of skill was made on the team and not on individual performance has not been possible to assess the gender difference in the quality of the performance, but the gender difference in self assessment.

Conclusion

There is not correspondence between self efficacy and real skill performance during CPR simulation of cardiac arrest in medical staff in particular it is important to stress that an individual sense of good efficacy in managing emergency situations doesn't correspond to high skill performance.

Despite considerable efforts to improve the treatment of cardiac arrest, most report reported a poor survival outcome. If patient outcomes are to improve, the evaluation of the contribution of all the potential risk factors and interventions is essential. An open question is how these psychosocial variables may play a role in improving the quality of CPR and if knowledge of the low capacity to manage a cardiac arrest can be translated into the need for the medical staff to be regularly engaged in BLSD retraining.

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