

Time for a Closer Look at Cardiac Arrest Ventilation

Luca Gambolò¹, Pasquale Di Fronzo¹, Marta D'Angelo¹, Daniele Solla¹

¹SIMED - Società Italiana di Medicina e Divulgazione Scientifica

Authors:

Luca Gambolò MD, SIMED (Società Italiana di Medicina e Divulgazione Scientifica), Parma (Italy), email: luca.gambolo@gmail.com

Pasquale Di Fronzo RN, SIMED (Società Italiana di Medicina e Divulgazione Scientifica), Parma (Italy), email: pasqualedifronzo89@libero.it

Marta D'Angelo MD, SIMED (Società Italiana di Medicina e Divulgazione Scientifica), Parma (Italy), email: marta.dangelo17@gmail.com

Solla Daniele MD, SIMED (Società Italiana di Medicina e Divulgazione Scientifica), Parma (Italy), email: solladaniele8@gmail.com

Corresponding Author:

Marta D'Angelo MD, SIMED (Società Italiana di Medicina e Divulgazione Scientifica), Parma (Italy)

email: marta.dangelo17@gmail.com

Background

Out of Hospital cardiac arrest (OHCA) is the sudden cessation of circulation, OHCA has an incidence of about 1 in 1000 inhabitants.[1] OHCA is a primary health problem around the globe.[1] The current overall survival rate is approximately 10%[1]; and depends upon various critical factors, including the location of the incident, the proximity to a first responder, the availability of defibrillation for shockable rhythms, and the quality of bystander cardiopulmonary resuscitation (CPR) [1,2].

Guidelines concur with the practice of maintaining a ventilation rate of 10 breaths per minute following the insertion of a tracheal tube (TT) or a supraglottic airway (SGA) in adult patients [3].

Excessive ventilation during CPR, especially when minute ventilation surpasses 30 liters per minute, significantly reduces patient survival rate [4,5]. In animal experiments with varying ventilation rates (12, 20, and 30 breaths per minute), higher ventilation rates were associated with increased intratracheal pressures, decreased coronary perfusion pressures, and lower survival rates [4,5]. During CPR, lung hyperinflation can mimic cardiac tamponade, impeding circulation [6] and induce hypocapnia, triggering vasoconstriction in brain arteries and diminishing cerebral blood flow, potentially jeopardizing long-term neurological outcomes [7]. EMS clinicians should take measures to prevent hyperventilation during out-of-hospital cardiac arrest (OHCA) resuscitation [8].

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Implementation of study and results

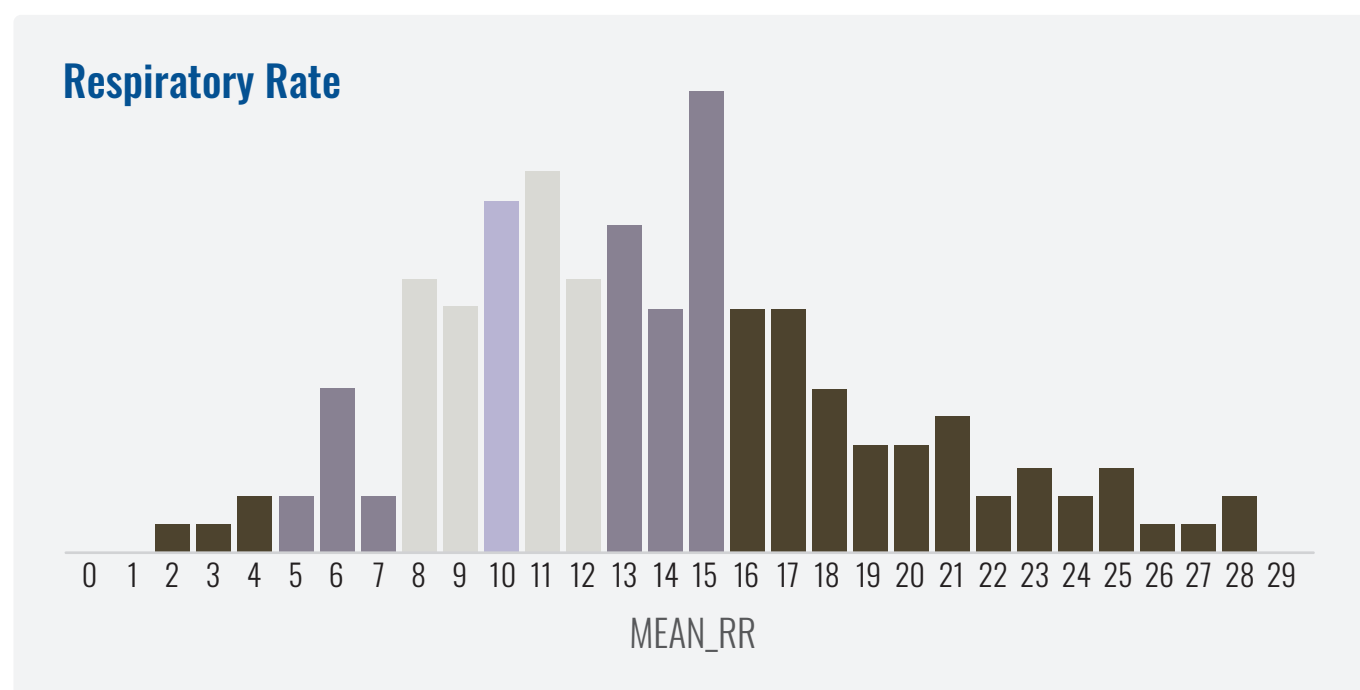
We conducted a retrospective observational study. An analysis was performed in all retraining courses carried out by the SIMED (Italian Society of Medicine and scientific Divulcation) training center in the year 2023, for all subjects who had conducted an American Heart Association (AHA)-certified Basic Life Support and Defibrillation (BLSD) course for healthcare professionals in the period 2021-2022. BLSD course provides training by simulation with

manikins. All course participants consented to the study. A dummy capable of recording the respiratory rate (RR) was used. An analysis was conducted on the RR of ventilation performed by healthcare professionals in the first scenario of the course.

We analyzed 159 nurses. Of these, 89 (55.9%) were female, with an average age of 26 years (SD: 2.1). The Respiratory mean Rate record by manikins was 14 (SD: 5.3).

The Interquartile Range was 6.6 and the range was 2-28. The respiratory rate distribution is present in the figure.

FIGURE - Histogram depicting the distribution of respiratory rates during assisted ventilation.



All participants passed the retraining course, with a theory test score of 24.2/25 and SD: 2.2.

According to the guidelines, we divided the trainee performances into slightly out of range (those that provided i.e., 8-9-11-12 ventilations per minute) 42/159 participants (26.4% of the sample) and completely out of range (those that provided less than 8 or more than 12 ventilations) 105/159 participants (66% of the sample). Participants that performed excellently with 10 ventilations per minute (as recommended by the guidelines) were 12/159 participants (7.5% of the sample).

Discussion

This study shows that during a retraining course carried out to certified operators within two years of the first training course, differences with the guidelines can be recorded. This element is very significant and should be investigated further, as the students showed a large level of satisfaction [9] after the courses and demonstrated a greater ability to handle emergencies [2], but not all students showed the same level of performance after two years.

Data indicate a mean respiratory rate of 14 breaths

per minute during resuscitation efforts underscores a critical issue: the apparent lack of adherence to established guidelines. In the context of cardiac arrest the first aid is essential [10], and an appropriate cardiopulmonary resuscitation is fundamental for the patients outcome [2,10], where optimizing patient outcomes is paramount, the failure to respect recommended ventilation rates is concerning. This departure from the guideline of 10 breaths per minute raises questions about the consistency and quality of care provided during high-stress resuscitation scenarios. Hyperventilation, associated with higher respiratory rates, can compromise coronary perfusion pressure, and hinder the chances of achieving the return of spontaneous circulation (ROSC). The deviation from guidelines is not an isolated incident and other authors have previously reported similar deviations.[6] These findings suggest a broader systemic issue within the field of resuscitation medicine. The recurrent failure to adhere to recommended ventilation rates during CPR underscores the need for a comprehensive review of resuscitation practices and a concerted effort to address these deviations to improve patient outcomes. Consistency in guideline adherence is crucial to ensuring that patients receive the highest quality of care during critical moments of cardiac arrest management.

The analysis of maintenance times for practical skills is a relevant topic for training. In fact, defining the duration of the certification should always be defined and updated together with the guidelines, in fact over the years the training methods are modified and therefore the learning methods could also be different and the memory times of the student guidelines.

Strengths and weaknesses

The research has some noteworthy aspects. Notably, the instructors who conducted both the training and retraining courses were the same individuals, and the training sessions were held at the same center. The retention rate was automatically recorded, and the sample of participants involved in the research was notably relevant.

However, despite these strengths, certain limitations existed. Primarily, it was a single-center study,

potentially introducing population selection bias. It's plausible that individuals opting for retraining might either be less prepared, those who have most significantly lapsed in their skill retention or those more interested in the topic. Finally, our investigation delved into a critical aspect of resuscitation one that might inadvertently take a backseat for instructors. Training predominantly emphasizes cardiopulmonary resuscitation over ventilation, despite the latter's significance.

Conclusion

The study underscores a concerning trend: nurses trained in Basic Life Support and Defibrillation (BLS/D) may experience a decline in the practical manual skills acquired during their initial training upon retraining. This emphasizes the need for potential revisions not only in updating BLS/D guidelines but also in reconsidering certification duration. Additionally, there should be a heightened emphasis placed on ventilation during training courses, recognizing its pivotal role in effective resuscitation efforts.

Acknowledgments

All the research has been conducted adhering to the recommendations contained in the Declaration of Helsinki and it complies with the International Guiding Principles that regulates research activities. All the authors have no Conflict of Interest to declare.

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