Comparing two airway approaches to optimise CPR performance in a simulated adult cardiac arrest

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Introduction

In 2021, global survival rates for non-traumatic out-of-hospital cardiac arrest (OHCA) in adults ranged from 8% (1) to 9.1% (2), improving to 11.7% in Queensland, Australia (3). Survival is highly dependent on optimal performance in the chain of survival (CoS), with high-quality cardiopulmonary resuscitation (H-Q CPR) as a critical link (4-7). Key H-Q CPR metrics include chest compression rate of 100 to 120 per minute, chest compression depth of 5 to 6 centimetres, chest compression fraction (CCF) of at least 80%, chest recoil, and appropriate ventilations while avoiding hyperventilation (8). Other vital CoS links include early defibrillation and advanced resuscitation measures, such as advanced airway management and early drug administration (4, 9, 10).

The choice of airway during OHCA may impact survival (11, 12). Whilst one randomised controlled trial (RCT) showed no difference between endotracheal tube intubation (ETI) and bag valve mask (BVM) ventilations (13), another RCT found improved survival using supraglottic airways (SGAs) compared to ETI (14). SGAs offer ease of insertion with minimal interruption, superior airway patency over BVM, and are easier to perform than both BVM and ETI (15). Although less secure than ETI, SGAs can be effectively used across different skill levels and have been shown to improve CCF, a key predictor in ventricular fibrillation (VF)/pulseless ventricular tachycardia (pVT) OHCA (16). This study aimed to compare two airway management approaches to optimise CPR performance in a simulated adult cardiac arrest.

Figure 1: Out of Hospital Cardiac Arrest Chain of Survival (3)

Methods

A prospective observational study compared two airway management approaches performed by third year paramedicine students on a simulated shock-refractory VF adult manikin. Performances were video recorded and analysed for adherence to H-Q CPR metrics, defibrillation timings and advanced resuscitation measures. The methods compared were the "early i-gel" and the "stepwise" approach which included the BVM progressing to SGA (17).

Results

Two performances were undertaken by the same students (n=2), each testing a different airway management approach. The scenario began when the patient was identified to be in cardiac arrest, marking the initiation of chest compressions. There was no significant difference in the time to initial defibrillation between the "early i-gel" and "stepwise" groups (00:24 vs. 00:29, respectively).

The "stepwise" group enabled the delivery of the first BVM ventilations 29 seconds earlier than the "early i-gel" group (00:49 vs. 1:18). However, the "early i-gel" group achieved first ventilations via the SGA i-gel 50 seconds earlier than the "stepwise" group (1:18 vs. 2:08).

Delays were noted in the "stepwise" compared to the "early i-gel" group for intravenous (IV) cannulation (6:08 vs. 4:04), and the administration of drugs: the first dose of Amiodarone (8:53 vs. 6:36), Adrenaline (10:35 vs. 8:31), and the second dose of Amiodarone (12:53 vs. 10:43).

Overall, the "early i-gel" group achieved a slightly higher CCF compared to the "stepwise" group (94.9% vs. 93.6%).

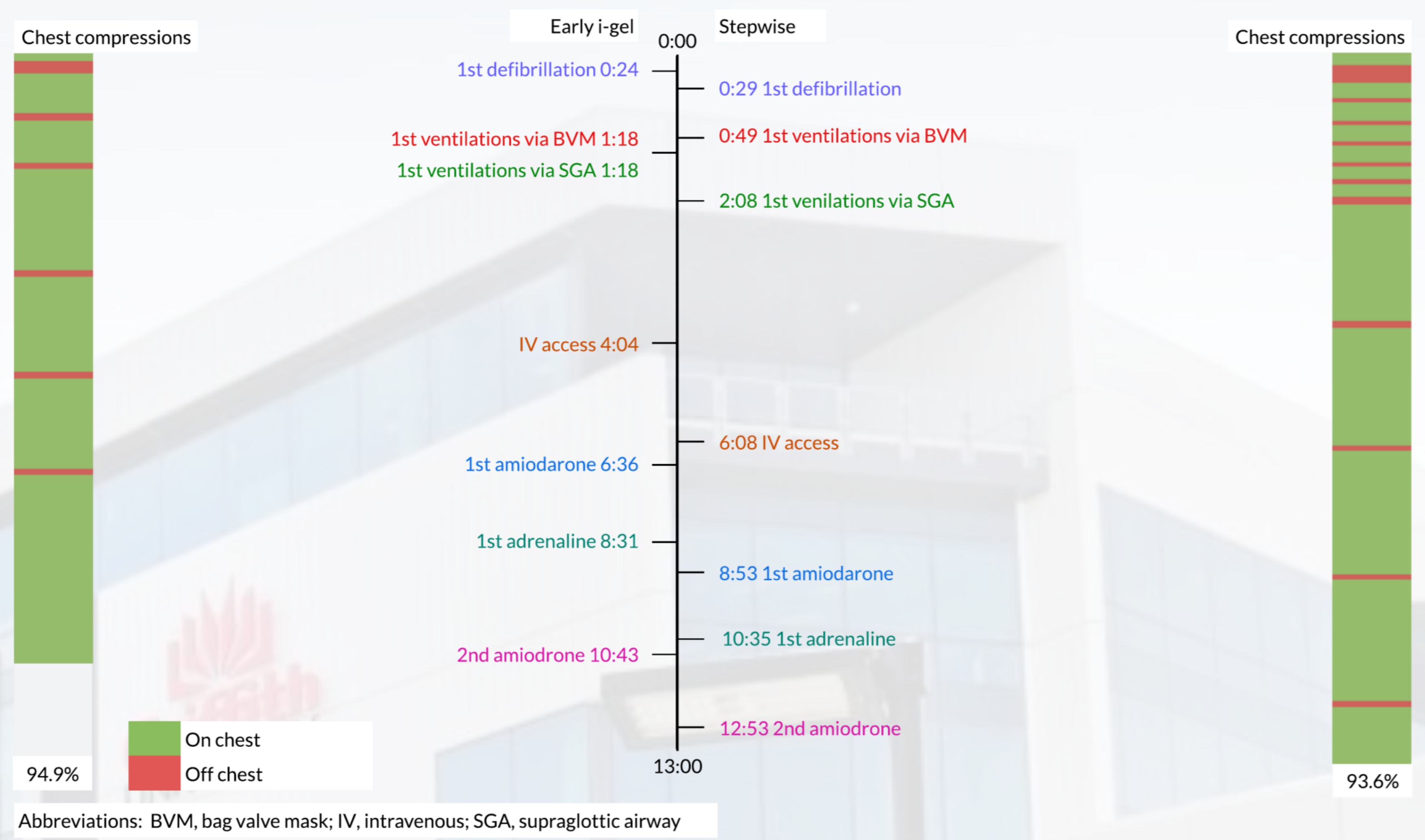

Figure 2: Timeline comparing two airway approaches – "Early i-gel" vs. "Stepwise"

Discussion

This study suggests that the "early i-gel" approach may offer advantages over the "stepwise" approach in managing adult cardiac arrest in a simulated setting. The timely insertion of the SGA i-gel optimises oxygenation and ventilation while minimising complications such as gastric insufflation (18). Furthermore, current literature indicates that earlier advanced resuscitation measures, including early advanced airway management and early drug administration, may be associated with higher rates of return of spontaneous circulation (ROSC), further suggesting that the "early i-gel" approach may be superior (19, 20).

Key aspects included in both approaches to enhance CPR performance were the novel "Prep/Do" method, which ensures appropriate forward planning concurrently with performing actions, and the "COACHED" method for safe and timely defibrillation (21). The "early i-gel" approach offers a model that may enhance CPR performance in simulated settings, particularly in low-resource situations involving only two officers. This approach could also prove effective in clinical settings with similar limitations. Notably, although the "stepwise" approach was performed after the "early i-gel" approach and might have been expected to show better results due to skill progression, the overall performance was still superior in the "early i-gel" approach. Skill progression, where repeated practice improves performance, may have contributed to this observed enhancement (22).

Although the findings are promising, they are limited by the small sample size and the controlled, simulated setting. These limitations restrict the generalisability of the results to real-world clinical settings, although this approach still represents an achievable model. This model could further inform education and clinical practice to improve CPR performance.

To validate these findings, future research with larger sample sizes in both simulated and clinical settings is needed. Such studies would provide more robust evidence to determine the optimal airway management strategy during CPR and could inform clinical practice.

References

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This QR code also contains learning resources (videos of the two approaches) and author contact details.

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