Airway management in cardiac arrest – not a question of choice but of quality?

'Knowledge without practice is useless. Practice without knowledge is dangerous' - Confucius

In recent years, the importance of airway management in cardiac arrest has seen a paradigm shift. High quality chest compressions is emphasised as the key skill in basic life support and there is equipoise in basic and advanced airway interventions in advanced life support [1, 2]. Current guidelines recommend that, after a primary cardiac arrest, high quality chest compressions and, if appropriate, attempt to restore a circulation with defibrillation take priority over airway and ventilation interventions. When cardiac arrest follows airway and/or respiratory problems, earlier airway interventions to restore adequate oxygenation may be preferable.[3]

The optimal method of achieving oxygenation and ventilation in cardiac arrests is not currently known with main studies reporting conflicting results [4]. In a retrospective review of 86 628 adults with in-hospital cardiac arrest (IHCA) using a propensity-matched cohort, tracheal intubation within the first 15 minutes was associated with a significantly decreased survival to hospital discharge compared with not being intubated [5]. In contrast, another retrospective series of 702 patients showed an inverse relationship between time to intubation during IHCA and survival to discharge and favourable neurological outcome, with the study recommending intubation within 8.8 min of arrest for both favourable neurological outcome and survival to hospital discharge [6].

The type and duration of training required for performing advanced airway management during CPR remains largely unknown. In their recent study, Kim et al. presented data on tracheal intubations under direct laryngoscopy attempted by Emergency Department (ED) residents for non-traumatic adult (>18 years old) cardiac arrests in an urban ED in South Korea [7]. An arbitrary cut-off was used to define successful intubation as 'qualified' if performed within 60 seconds or 'highly qualified' if performed within 30 seconds. Based on average training and exposure of their residents, the authors used linear regression analysis and modelling, to estimate that for a 90% probability of qualified successful intubation (<60

seconds), 157 experiences equivalent to 1218 days (3.3 years of training) would be required. To achieve 90% highly qualified successful intubation (<30 seconds) would require 243 experiences, equivalent to 1973 days (5.4 years) of training.

This study presented an innovative method in order to estimate training required for skilful and successful intubations during ED cardiac arrests. Video reviews were taken from a system that routinely records ED staff during cardiac arrests and as these recordings are already part of everyday clinical practice, it is likely that there is minimal Hawthorne effect. Cardiac arrest research often reiterates the fact that the basics should be done well. It is commendable that intubations by the residents in this observational study resulted in a modest mean delay in chest compressions of only 8.6 seconds for the intubation attempt. However, nearly a third of intubation attempts were unsuccessful at the first attempt, and there were 11 oesophageal intubations (albeit they were all recognised) in the 93 patients that were included.

There were some limitations to this study. Only data from emergency department from one single hospital has been presented where the ED residents perform 40 to 60 tracheal intubations every year. Whilst training and experience of participating residents was standardised for the study centre, technical ability during clinical practice could vary. The study excluded immobilised trauma patients, and it would be reasonable to hypothesise that intubation in these excluded patients would be more difficult, and first-time success rate lower. Unfortunately, no patient outcomes are presented. Although this is beyond the scope of this study, survival and good neurological outcome are important measures to consider when evaluating any intervention in the cardiac arrest patient.

It is difficult to draw firm conclusions on intubation training based on this study. The number of intubations performed by similarly-qualified ED staff vary markedly in systems across the world. Many ED staff will not have the exposure to the number of suggested intubation experiences as the study concluded. The authors have created simple models to present the number of intubations required to achieve a certain competency, but this is a prediction based on a mathematical model. It has less relevance when assessing an individual ED clinician, especially when many other factors such as their decision-making capabilities and response to stressful situations may also influence their performance. The role of iterative

training and how many intubations per year would be needed to *maintain* competence once it has been obtained was also not discussed. Furthermore, if technical proficiency in intubation is related to the amount of times the skill is performed, then perhaps the responsibility to perform intubation in cardiac arrest situations should lie with those most trained such as anaesthetists in the era of the multi-disciplinary team. Should the emphasis of ED training be more focused on effective initial airway management than tracheal intubation?

The authors are right to highlight that the literature does not provide evidence of improved clinical outcomes for patients who are intubated rather than ventilated with a bag-mask device. Knowledge derived from studies concerning victims of out-of-hospital cardiac arrest could not be directly translated to the ED cardiac arrest population. Patients who are likely to be resuscitated in ED include a) patients who deteriorate and arrest in the department and b) OHCA patients who can presumed to have had a long duration of low-flow / no-flow given that CPR is still being performed by the time they reach the ED. Compared to out of hospital cardiac arrests, there remains a distinct lack of high quality data from in-hospital studies. However, the best available evidence cannot be said to support the use of ETT in the initial management of cardiac arrest patients.

The recent publication of several high profile trials in airway management in out-of-hospital cardiac arrests have brought the continual debate of airway management firmly back into the spotlight [8, 9]. Regardless of the choice of airway management, the aim of in cardiac arrest is adequate oxygenation and ventilation without unnecessary interruptions to ongoing resuscitation. This requires a highly experienced operator who can determine the most appropriate strategy based on the scenario and the condition of the patient and who also has the technical ability to deliver this chosen strategy in a timely manner and manage any potential complications. All in all this is a complex skill that need to be delivered in most difficult circumstances. Even the most competent and seamless airway management can act as a distraction for other important tasks during cardiac arrests [10].

Conflict of interest:

The authors declare no conflict of interest.

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