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Prehospital Airway Management

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The prehospital emergency airway management is a key moderating factor for patient survival and mortality rates. There has been much debate around the optimum method of prehospital emergency airway management. This commentary critically appraises a recent systematic review which assesses the harms and benefits of three different airway management strategies for a range of emergency clinical scenarios.

keywords: Airway Management, systematic review, Prehospital, Paramedic

Conflict of interest disclosure; No authors have any conflicts of interest

Commentary on: Carney N, Totten AM, Cheney T, Jungbauer R, Neth MR, Weeks C, Davis-O'Reilly C, Fu R, Yu Y, Chou R, Daya M. Prehospital Airway Management: A Systematic Review. *Prehosp Emerg Care.* 2021 Jul 20:1-12. doi: 10.1080/10903127.2021.1940400. Epub ahead of print. PMID: 34115570.

Key Points

- The current evidence base does not indicate benefits of any single airway intervention based upon outcomes for survival, neurological function, return of spontaneous circulation or airway intervention success.
- Published evidence for pre-hospital airway management is of variable quality; this review relies heavily upon observational evidence impacting the confidence of the findings
- High-quality multi-arm random controlled trials are required for SGA Vs ETI Vs BVM.

Introduction

The optimal emergency management of a patient's airway is one of the most important aspects of prehospital emergency care and one that has, and continues to be, much debated by prehospital clinical speciality groups & professional bodies (Gowens et al. 2018). It is critical to the successful management of a patient's airway that appropriately trained clinicians use the correct skills, equipment and strategies to meet the patient's airway needs and failure to do so is likely to impact negatively on patient morbidity and mortality (Cook et al. 2021). Endotracheal intubation has long been considered the 'gold standard' for airway management, but there has been controversy in recent years about which approach to airway management is optimal in the pre-hospital setting given the variable success rates and high complications associated with pre-hospital endotracheal intubation and recent advances in supraglottic airway devices (van Schuppen et al. 2021). The systematic review by Carney et al (2021) aims to provide an evidence base to inform recommendations and practice for prehospital airway management; it was also intended to inform the development of guidelines within the United States.

Aim of commentary

This commentary aims to critically appraise the methods used within the review by Carney et al (2021) and expand upon the findings in the context of clinical practice.

Methods

A comprehensive multi-database search was carried out on the Cochrane Central Register of Controlled Trials, MEDLINE, Cochrane Database of Systematic Reviews, Scopus and CINAHL (January 1990 to September 2020). Any comparative study which included adult and / or paediatric patients requiring ventilatory support or airway protection provided by prehospital emergency medical services comparing airway management approaches of bag valve mask [BVM], endotracheal intubation [ETI] and supraglottic airway [SGA] where included. Abstract and title, full paper screening and assessment of bias (Cochrane Risk of Bias) was undertaken by two reviewers independently. Data extraction was carried out by a single reviewer and verified by a second reviewer. Certainty in the evidence was assessed using Grading of Recommendations, Assessment, Development and Evaluations [GRADE] by a single reviewer and verified by at least one or more reviewers. A random effects meta-analysis was undertaken on any comparison where there were at least two or more studies.

Results

The search strategy identified 9,284 papers. After full screening, 99 studies were included (22 Randomised Controlled Trials (RCTs), 20 prospective and 50 retrospective observational studies). The meta-analysis revealed no evidence of a difference in survival between the use of BVM, SGA and ETI for adults/mixed ages and paediatric patients with cardiac arrest (GRADE: low - moderate) and adults/mixed ages trauma patients (GRADE: Low).

For neurological functioning outcomes measured by the Cerebral Performance Category (Neurological function at discharge or at 1-month post incident), BVM was more beneficial than SGA in adults/mixed ages with cardiac arrest (GRADE: Low). However, when excluding high risk of bias studies, this difference was notably less. When comparing SGA and ETI for neurological functioning for adults/mixed ages with cardiac arrest, ETI was more beneficial than SGA (GRADE: Low). For Modified Rankin Scale (Good outcome = score 0 to 3), there was no evidence of a difference for adults with cardiac arrest (GRADE: Low). When comparing BVM and ETI for neurological functioning, there was no evidence of a difference for adults with cardiac arrest (GRADE: Moderate). There was no evidence of a difference for neurological functioning (Cerebral Performance Category) between BVM, SGA and ETI for paediatric patients with cardiac arrest (GRADE: Low).

For return of spontaneous circulation (ROSC) [pre-hospital, sustained, or overall] , there was no evidence of a difference between BVM compared to SGA and ETI for adults with cardiac arrest (GRADE: Low). When comparing SGA and ETI for adults with cardiac arrest, ETI was favourable over SGA (13 observational studies); however, the three RCTs favoured SGA over ETI. There was no evidence of a difference for return of spontaneous circulation between BVM, SGA and ETI for paediatric patients with cardiac arrest (GRADE: Low).

For first-pass success, SGA was favourable than ETI for both adult and paediatric patients with a cardiac arrest and adults with mixed emergency types (GRADE: Low). There was no evidence of difference between SGA and ETI for adults with a medical emergency for first-pass success (GRADE: Low). For overall success rates for insertion of advanced airway, there was no difference between SGA and ETI for adults with cardiac arrest, adults with medical emergency and adults with mixed emergency types (GRADE: moderate). For harms, there was no evidence of difference between BVM and SGA. However, this was analysed descriptively and graded at moderate certainty. Similarly, no

evidence of difference was reported descriptively for BVM compared to ETI (GRADE: moderate) and SGA versus ETI (GRADE: moderate – low).

Commentary

This systematic review aimed to identify and synthesise the current evidence base for the undertaking of pre-hospital emergency airway interventions across 3 commonly utilised approaches; bag valve mask, supraglottic airway and endotracheal intubation. Critical appraisal of the methods used within the review utilising the Amstar2 tool (A Measurement Tool to Assess systematic Reviews) reveals this review was undertaken utilising a high-quality methodological approach with minor omissions. These included no justification given for a specific start date of search parameters, although this was not deemed to substantially affect the overall quality. Thus, this review provides a comprehensive summary of the available evidence that addresses the questions of interest and contextualises the current evidence for a range of airway interventions in the pre-hospital environment.

The inclusion of observational studies as well as RCTs is appropriate and justified, but subsequently impacts on the confidence in the overall quality of results and their interpretation. The heterogeneity of the included studies, together with the large number of observational studies means confidence in the results is low for the majority of the comparators when utilising the GRADE framework.

When determining the most appropriate airway intervention for patients requiring pre-hospital care, there is currently limited evidence available for many patient presentations and especially for paediatrics. From the evidence examined in this review, for adults in cardiac arrest SGA is demonstrated to be the airway intervention associated with an increased likelihood of achieving a ROSC. Additionally, for both adults and paediatrics in cardiac arrest, use of SGA achieves greatest success in securing the airway on the first attempt. However, for any patient presentation requiring airway support, ETI or BVM may still be helpful to consider when inadequate ventilation is achieved with SGA.

Due to the large number of observational studies included in this review, which formed in some cases the only evidence for a specific comparison, further high-quality, multi-arm RCTS are required (SGA Vs ETI Vs BVM). Future research should ensure transparent reporting of airway intervention timing and specific methods used (e.g. BVM one or two people). Wherever possible, reliable and valid outcomes for oxygenation and ventilation should be reported alongside the standard outcomes identified in this review. To facilitate with greater consistency and reporting of outcomes, the development of a core outcome set for pre-hospital airway management is recommended.

CPD reflective questions

- What are the main methodological limitations of the evidence used within the systematic review?
- What factors should you consider when selecting a pre-hospital airway management intervention?
- How do the findings of this review impact upon the choice of airway management strategy for pre-hospital clinicians?
- Should pre-hospital clinicians vary their approach to airway management depending upon the patient's presenting condition based on the evidence within this review?

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