Keeping Your Patients Alive—for Better or Worse—Until They Reach the Emergency Department

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Guest Contributors

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Editor's Note: *You are reading the 66th installment of Annals of Emergency Medicine Journal Club. As the Journal Club enters its second decade of publication, we are making a number of changes to the format. Dr. David Schriger, the originator of the Annals of Emergency Medicine Journal Club and its first editor, has retired from his Journal Club editorial role. The journal and his fellow editor are indebted to Dr. Schriger for his outstanding contributions and the success of this educational section. The Journal Club section welcomes Dr. Ryan Radecki and Dr. Rory Spiegel to the editorial staff. The Journal Club format has been revised and will focus on a monthly succinct review of high-impact articles from this journal and other premier medical journals relevant to emergency medicine. The reviews are followed by questions demonstrating principles by which readers–be they clinicians, academics, residents, or medical students–may critically appraise the literature. We are interested in receiving feedback about this feature. Please e-mail journalclub@acep.org with your comments.*

ARTICLE IN REVIEW

Wang HE, Schmicker RH, Daya MR, et al. Effect of a strategy of initial laryngeal tube insertion vs endotracheal intubation on 72-hour survival in adults with out-of-hospital cardiac arrest: a randomized clinical trial. *JAMA*. 2018;320:769-778.

What Question Did This Investigation Aim to Answer?

In adult patients with out-of-hospital cardiac arrest and in need of an advanced airway, how does use of a supraglottic airway device compare with intubation for 72-hour survival?

What Study Design Did the Authors Choose?

Design: Prospective, pragmatic, cluster-crossover clinical trial. Pragmatic Airway Resuscitation Trial (PART). ClinicalTrials.gov Identifier: NCT02419573.

Setting: Twenty-seven emergency medical services (EMS) agencies randomized to 13 clusters in 5 cities associated with US sites of the Resuscitation Outcomes Consortium.

Population: A total of 3,004 adults with nontraumatic out-of-hospital cardiac arrest requiring anticipated ventilatory support or advanced airway management.

Intervention: Initial advanced airway management was provided by EMS agencies with either laryngeal tube supraglottic airway device or intubation per cluster randomization. At intervals throughout the study period, agencies switched to the alternative method for initial management.

Primary and Secondary Outcomes: The primary outcome was 72-hour survival. Secondary outcomes included return of spontaneous circulation, survival to hospital discharge, and favorable neurologic status at discharge, as characterized by a modified Rankin Scale score less than or equal to 3.

Sponsors: National Heart, Lung, and Blood Institute.

How Did the Authors Interpret the Results?

In the intention-to-treat analysis, 72-hour survival was 18.3% when patients were randomized to laryngeal tube as an initial airway strategy compared with 15.4% when randomized to intubation (2.9% difference; 95% confidence interval [CI] 0.2% to 5.6%).[1] Secondary outcomes also showed small absolute effects favoring the laryngeal tube airway strategy, including 3.6% difference (95% CI 0.3% to 6.8%) in return of spontaneous circulation, 2.7% difference (95% CI 0.6% to 4.8%) in survival to hospital discharge, and 2.1% difference (95% CI 0.3% to 3.8%) in favorable neurologic status at discharge. Adjusted analyses accounting for age, sex, rhythm, response time, witnessed status, and bystander chest compressions minimally attenuated these differences. Out-of-hospital adverse events favored the laryngeal tube strategy, with 44.1% of patients randomized to intubation failing initial airway technique compared with 11.8% randomized to laryngeal tube.

Conclusion

An initial strategy of supraglottic airway, such as a laryngeal tube rather than intubation, increased survival among adults with out-of-hospital cardiac arrest.

How Might This Study Affect Your Clinical Practice in the Emergency Department?

In this large, out-of-hospital trial comparing 2 strategies for an advanced airway, small advantages were observed with laryngeal tube as an initial strategy.[1] These results are grossly consistent with those of another recently published clinical trial.[2] There are several features of this trial affecting the reliability of the observed findings, but evidence supporting an initial strategy using intubation continues to diminish. Considerations for training time and maintenance of airway skills may influence EMS medical director decisions in regard to the preferred approach to advanced airway.

DISCUSSION POINTS

1. *The authors chose 72-hour survival as their primary outcome. Examples of other primary outcomes from out-of-hospital resuscitation trials include return of spontaneous circulation, 30-day survival, and Cerebral Performance Score at hospital discharge. What are some of the implications of the choices of primary outcome?*

In this trial, the authors chose 72-hour survival in an effort to balance several considerations. First, they were sensitive to the overall resource needs of the trial in an effort to reduce sample size. As with many study follow-up periods, outcomes in both arms converge as time elapses from the index event because of simple actuarial effects. As the expected absolute magnitude of the effect size diminishes, larger sample sizes are necessary to make inferences about the probabilistic nature of the observed outcomes. Second, the authors stated that their choice of 72-hour survival was made to accommodate key elements of standard postarrest care. This consideration incorporates the durability of the resuscitation, a feature rather important to trials of epinephrine in out-of-hospital cardiac arrest, in which physiologic status in the epinephrine cohort deteriorates rapidly after admission to the hospital.

Other issues to consider in regard to measurement timeframe include increasing likelihood of patients lost to follow-up. The difficulty of determining longer-term outcomes depends on the outcome definition and available methods, but tends to become a more salient issue as follow-up periods lengthen.

Finally, overall survival is a simple dichotomous measurement with little variation between outcomes assessors. Measures of neurologic performance such as Cerebral Performance Score and modified Rankin Scale score have well-studied interrater reliability issues, with deleterious effects on precision.

2. *This trial grouped 27 EMS agencies into 13 randomization clusters with crossover. Another recent trial created randomization clusters at the individual paramedic level,[2] resulting in 1,523 clusters without crossover. What are the strengths and limitations of the choices made by strategy?*

Cluster randomization is a popular strategy for large-scale pragmatic trials, with advantages in administrative efficiency, avoidance of treatment group contamination, and natural fit for interventions applied at the cluster level. In cluster randomization, patients are divided into small pragmatic cohorts and their treatments are randomized at this level instead of at the individual patient level. For this study, each study site was divided into multiple clusters defined at the EMS agency or unit level. Traditional statistical methods assume the outcome for each patient is completely independent of the outcome for all other patients. This is not reliably true for cluster randomization. Treatments and outcomes may be more similar among patients treated by one EMS agency than another, either better or worse, because of factors related to the EMS agency. The influence of these factors needs to be accounted for in the statistical methods.

The amount of similarity within clusters, in this case the EMS agencies, is called the intracluster correlation. In this instance, it may be induced by protocols, skill level, training, limited variation in postarrest care, or population-specific factors. When the number of clusters is small, the dependence between outcomes within clusters may have an important influence on results. In general, the more clusters there are, and the smaller the clusters, the less influence intracluster correlation has on the results. In this study, there were 13 clusters (for 27 EMS agencies), so the potential effects of intracluster correlation are likely to be important and should be accounted for in the analysis. In contrast, the other recent study with 1,523 clusters created a median cluster size of 5 or 6 patients. Diminishing cluster sizes mitigates the effect of intracluster correlation.

These authors also added an interesting wrinkle to their clusters by introduction of crossover. In this study, the authors started the study with one initial airway approach and then changed to the other initial airway approach every 3 to 5 months during the course of the trial. This design allows "cluster period units," which may be compared with statistical methods to further evaluate and control for the presence of intracluster correlation.

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