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### Is tracheal intubation safe after in-hospital cardiac arrest?

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**English key words:** child, preschool; heart arrest; intubation, intratracheal; survival analysis.

**Spanish key words:** análisis de supervivencia; infancia; intubación intratraqueal; parada cardíaca.

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# Is tracheal intubation safe after in-hospital cardiac arrest?

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## Abstract

**Authors' conclusions:** the association between decreased survival and tracheal intubation in cardiac arrest attendance in hospitalized children questions current recommendations for early intubation during CPR.

**Reviewers' commentary:** this study, of good methodological quality, seems to question the practice of immediate tracheal intubation during resuscitation maneuvers in children admitted to hospitals in a clinical situation of cardiac arrest. However, they could have existed unadjusted biases in the analysis that could have influenced the results. For this reason, with the information available, we cannot encourage intubation, nor can we advise against it.

**Key words:** child, preschool; heart arrest; intubation, intratracheal; survival analysis.

## ¿Es segura la intubación traqueal en la parada cardiaca hospitalaria?

### Resumen

**Conclusiones de los autores del estudio:** la asociación entre una disminución de la supervivencia y la intubación traqueal en la asistencia a la parada cardiaca en niños hospitalizados cuestiona las recomendaciones actuales de intubación precoz en la atención a estos niños.

**Comentario de los revisores:** este estudio, de buena calidad metodológica, parece cuestionar la práctica de la intubación traqueal inmediata entre las maniobras de resucitación en niños ingresados en hospitales en situación clínica de parada cardiaca. No obstante, podrían existir sesgos no ajustados en el análisis, que hayan influido en los resultados. Por ello con la información disponible no podemos fomentar la intubación, pero tampoco desaconsejarla.

**Palabras clave:** análisis de supervivencia; infancia; intubación intratraqueal; parada cardiaca.

## STRUCTURED ABSTRACT

**Objective:** to determine whether tracheal intubation of paediatric patients after in-hospital cardiac arrest is associated with better outcomes.

**Design:** prospective observational cohort study.

**Setting:** data from United States hospitals included in the Get With The Guidelines-Resuscitation Registry.

**Population under study:** the registry collected data for paediatric patients aged less than 18 years with a history of in-hospital cardiac arrest between January 2000 and December 2014. Cardiac arrest was defined as a minute or more of chest compressions. Of 15 811 potential cases of arrest identified, 2294 were finally included (1555 intubated and 739 not intubated). Another 537 patients were excluded from the main analysis due to missing or inconsistent data but were included in a subsequent sensitivity analysis. In addition to these patients, patients who were receiving assisted ventilation and/or had an invasive airway in place at the time chest

compressions were initiated were excluded. Furthermore, cardiac arrests in the delivery room or Neonatal Intensive Care Unit were also excluded.

**Assessment of prognostic factor:** index intubation (insertion of a tracheal tube during the cardiac arrest event) and time to intubation (in whole minutes) from the start of chest compressions to when the tracheal tube was correctly inserted.

**Outcome measurement:** the primary outcome was percent survival at the time of hospital discharge. Secondary outcomes included return of spontaneous circulation (ROSC) and favourable neurologic outcome at discharge (assessed by means of the Pediatric Cerebral Performance Category [PCPC] score). The authors performed unadjusted and adjusted analyses. The adjusted association between intubation and the primary and secondary outcomes was assessed by means of the propensity score, calculated using a multivariable Cox proportional hazards model. The adjusted analysis included various variables with a potential association with the event based on the findings of similar studies conducted in the past. Matching was performed 1:1. Three different sensitivity analyses and two subgroup analyses were performed.

**Main results:** the patients were young children (median age, 7 months; interquartile range, 21 days to 4 years of age). The main adjusted analysis showed that survival was lower in the intubated group (36%) than in the not-intubated group (41%), with an intubation-attributable proportion of decreased survival of 6.2% (95% confidence interval [95 CI], 2.8 to 9.4). There were no differences between groups in the two secondary outcomes. The sensitivity and subgroup analyses confirmed the trends observed in the results except in one subgroup of patients documented as pulseless at any time, with a survival of 30% in those intubated versus 34% in those not intubated (intubation-attributable proportion: 2.9%; 95 CI, -0.4 to 6.1).

**Conclusion:** among paediatric patients with in-hospital cardiac arrest, tracheal intubation during cardiopulmonary resuscitation was associated with decreased survival. Although the study design did not eliminate all potential for confounding, these findings do not support the current emphasis on early tracheal intubation during resuscitation in these patients.

**Conflicts of interest:** one of the authors reported serving as a paid consultant for the American Heart Association. No other authors reported disclosures.

**Funding source:** not noted.

## COMMENTARY

**Justification:** intubation in paediatric patients is usually a difficult and risky procedure. It is no surprise that outcomes in out-of-hospital settings are no better.<sup>1</sup> The outcomes ought to be more favourable when intubation is performed in intensive care units or emergency departments.<sup>2</sup> This study aimed to determine whether intubation improved survival in hospital settings.

**Validity/scientific rigour:** the study was clearly defined as to its sample, exposure variable and outcome measures. The exclusion criteria were strict. The event of intubation during arrest is not a predetermined decision that could lead to a conscious selection bias (intubation of the most serious cases), but there could be unconscious bias. Patients in whom intubation was attempted but unsuccessful were considered not intubated, which may have biased the results toward more serious cases. Data collection was not blinded to the results, but the authors made a considerable effort to control the confounding variables characteristic of cohort studies during the statistical analysis (propensity score). However, since the study analysed an intervention that was not randomised, the inference of causality is significantly restricted. While the outcome of survival at discharge leaves no room for bias, the study may seriously underestimate other outcomes such as sequelae due to the short duration of followup.

**Clinical relevance:** survival was lower in the intubated group (36%) compared to the not-intubated group (41%), with an intubation-attributable proportion of deaths of 6.2% (95 CI, 2.8 to 9.4). The effect size was considerable, as it referred to mortality. While there are few studies on this subject in the paediatric population, Gupta and Gausche<sup>1,3</sup> did not find any differences in survival or neurologic outcomes between intubated and not-intubated patients. Based on the findings of this study,<sup>4</sup> the emphasis placed on intubation may not be warranted.

**Applicability to clinical practice:** this study, of good methodological quality, seems to question the practice of including immediate tracheal intubation in the resuscitation efforts of paediatric patients with in-hospital cardiac arrest. However, since it was a cohort study, there may have been uncontrolled confounding variables affecting the results. Thus, the information that is currently available does not support recommending intubation, but it also does not support recommending against it.

**Conflicts of interest:** the authors of the commentary have no conflicts of interest to declare.

\* Calculated using the data of the study.

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