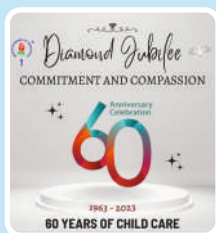


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Newer Research and recommendations In Child Health

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Fluid Volume and Mortality in Pediatric Septic Shock

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BASED ON ARTICLE

Matthew A. Eisenberg MD, MPH et al Association Between the First-Hour Intravenous Fluid Volume and Mortality in Pediatric Septic Shock. *Annals of Emergency Medicine*, Volume 80 Issue 3, September 2022, Pages 213-224. doi.org/10.1016/j.annemergmed.2022.04.008

SUMMARY

Background: International guidelines suggest administering fluid boluses to children with septic shock in settings with available intensive care. Timely fluid resuscitation is a cornerstone of early sepsis therapy, however the optimal resuscitative fluid volume in sepsis is controversial and the association between the volume of fluid resuscitation and outcomes is unknown. This study aims to (1) determine the association between the volume of bolus fluid delivered in the first hour after arrival at the emergency department (ED) and sepsis attributable mortality in children with hypotensive septic shock. (2) to evaluate the association between the volume of bolus fluid given in the first hour and mortality in all children with suspected sepsis regardless of hypotension.

Methods: This is a multicenter retrospective cohort study between January 2017 and December 2020 using propensity score analysis on children who met the IPSO (Improving Pediatric Sepsis Outcomes - a multicenter quality improvement collaborative) sepsis definition. Children who had hypotension within the first 60 minutes after arrival at the ED and children with sepsis treatment or in whom sepsis recognition occurred within 60 minutes of arrival at the ED, regardless of the presence of hypotension were included. All deaths among IPSO sepsis patients were reviewed and classified by the sepsis improvement team at the participating hospitals.

Main Results: Propensity matched analysis was applied between groups for comparison. 26 (4.3%) of 602 subjects with hypotension who received more than or equal to 30 mL/kg of fluid in the first hour experienced 30-day sepsis-attributable mortality compared to 25 (4.2%) of 602 patients who received less than 30 mL/kg (OR 1.04; 95% CI 0.59 to 1.83). There was no difference in 3-day sepsis attributable mortality or the need for mechanical ventilation. Patients who received more than or equal to 30 mL/kg of fluid had a longer length of stay at the hospital and were more likely to be admitted to an ICU and receive a vasoactive infusion than those who received less than 30 mL/kg.

In the secondary analysis, subjects were included with suspected sepsis regardless of blood pressure within 1 hour of arrival at the ED. In the propensity-matched cohorts, 45(3%) of 1,494 subjects who received more than or equal to 30 mL/kg experienced 30-day sepsis-attributable mortality compared with 30 (2%) patients who received less than 30 mL/kg (OR 1.52, 95% CI 0.95 to 2.44)

As with the hypotensive cohort, there was no difference in 3-day sepsis-attributable mortality; however, patients who received more than or equal to 30 mL/kg of fluid were more likely to be admitted to an ICU, undergo mechanical ventilation, and receive a vasoactive medication during their hospital stay.

Post hoc analyses were performed for patients with hypotensive septic shock using 40 mL/kg and 60 mL/kg as a cut off. Among the 413 matched patients who received more than or equal to 40 mL/kg, 21 (5.1%) experienced 30-day sepsis attributable mortality compared with 18 (4.4%) patients who received less than 40 mL/kg (OR 1.18, 95% CI 0.62 to 2.26); 6 (7.8%) of 77 matched patients who received more than or equal to 60 mL/kg experienced 30-day sepsis attributable mortality compared with 5 (6.5%) of 77 patients who received less than 60 mL/kg (OR 1.22, 95% CI 0.35 to 4.39)

Conclusion : In children who receive timely early sepsis care, the delivery of a specific volume of fluid resuscitation in the first hour is not associated with mortality

COMMENTARY

Recommendation of various guidelines regarding volume of fluid boluses in the initial resuscitation in septic shock is variable. International guidelines suggest administering fluid boluses to children with septic shock in settings with available intensive care. Studies have demonstrated that providing fluid boluses as part of a bundle of timely resuscitation reduces mortality, hospital and ICU length of stay in children with sepsis. This study included children with hypotensive septic shock and another group with a diagnosis of sepsis. Mortality was not influenced by initial resuscitating volume probably due to timely resuscitation, appropriate and continuous monitoring of volume status and antibiotic administration in the first hour rather than the volume of fluid administered. This observation is contrary to previous studies in pediatric sepsis resuscitation. Early volume effects seen in other studies may be attributed to the differences in time to initiation of care or clinical monitoring. Larger fluid volume used or increased severity of illness could have resulted in ICU admission, longer duration of hospital stay, and more frequent use of vasoactive medication in children receiving equal to or more than 30 mL/kg. Additional analysis using 40 mL/kg and 60 mL/kg as cutpoints demonstrated similar results thereby suggesting that the outcome cannot be attributed to the choice of 30 mL/kg as the cut off point between lower-volume and higher-volume groups.

Strengths of study: Statistical methods to reduce potential confounding factors and adjust for differences in characteristics between patients who received more than or equal to 30 mL/kg of bolus fluid in the first hour and those who received less than 30 mL/kg was performed using propensity score matching. Based on IPSO sepsis definitions, children were included on the basis of clinician's decision to treat for sepsis, even if an alternate cause of disease was identified later. This definition of sepsis is useful in a study of treatment decisions made in the first hour because the initial resuscitation will include all children believed to have sepsis regardless of the ultimate diagnosis.

Limitations: Retrospective nature and the possibility of unmeasured confounders. Variability among individual institutions on determining which deaths were sepsis-attributable is possible. Clinical signs such as physical examination findings and the response to fluid boluses were not included in the data set. The rate of administration, type of fluid, and total fluid volume received after the initial phase may be associated with sepsis-attributable mortality but were not analyzed in this study. Observational analyses of larger databases of septic children will provide valuable information regarding the first hour fluid bolus.

Implications for practitioners: In a child with suspected sepsis or septic shock timely resuscitation, appropriate and continuous monitoring of volume status and antibiotic administration in the first hour rather than the volume of fluid administered is important for an optimal outcome