

Intravenous fluids in dehydrated children with acute gastroenteritis: evidence is needed

Líquidos intravenosos en niños deshidratados con diarrea aguda: la necesidad de evidencias

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Hydration is essential for managing acute diarrhea. Fluid requirements can be estimated clinically based on hydration status. Intravenous hydration becomes necessary when oral hydration fails or in severely dehydrated patients. The World Health Organization (WHO) recommends treating severe dehydration by administering 100 mL/kg of crystalloid solution over 6 h for infants under 1 year of age and over 3 h for those over 1 year (referred to as “Plan C”)¹. Plan C suggests a minimum of 100 mL/kg, equivalent to volume replacement for 10% dehydration. The initial 30 mL/kg should be administered rapidly (within 30-60 min), followed by the remaining 70 mL/kg over 5 h for infants under 1 year and 2.5 h for older children.

However, this recommendation challenges the management practices that general practitioners have followed for decades. To support or refute it, we conducted a search for scientific evidence. Below, we present the most relevant findings of our research.

In 2014, the European Society of Pediatric Gastroenterology and the European Society of Infectious Diseases² recommended infusing 0.9% saline, 40-80 mL/kg, over 2-4 h for dehydrated patients. European guidelines emphasize clinical assessment every 30 min, allowing adjustments based on the

patient’s condition. This approach contrasts with the rigid WHO protocol. In Europe, severe dehydration due to acute gastroenteritis is uncommon, accounting for < 5% of cases². Overestimating dehydration is more common than underestimating it, which exposes patients to the risks of rapid infusion overload. In addition, the WHO’s two-stage expansion phase introduces operational challenges without clear benefits.

In 2018, Iro et al. conducted a systematic review and meta-analysis of randomized controlled trials to compare different rates of intravenous fluid therapy in children with acute diarrhea and moderate or severe dehydration³. Out of the 806 selected studies, only three were considered appropriate. The authors concluded that no high-quality trials were conducted in low-income countries. Data to support the current WHO guidelines for intravenous rehydration are missing. The WHO recommendation is based on expert opinion. It is intended for patients in regions with high levels of socioeconomic poverty and specific diarrhea etiologies, conditions that may not always be applicable to all settings.

In 2022, the Working Group on Hydration and Electrolyte Disorders of the Spanish Society of Pediatric Emergencies proposed additional measures to enhance

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safety in treating dehydrated patients⁴. These actions include:

- Patients in shock or experiencing hemodynamic instability should receive treatment in intensive care units.
- Patients with dysnatremia, with serum sodium below 130 or above 150 mEq/L, should be excluded from the WHO protocol.
- Laboratory tests should be performed to rule out electrolyte, glycemic, and acid–base balance disorders.
- Infusion of 20 mL/kg/h of saline solution, Ringer’s lactate, or Plasma-Lyte over 1-4 h (equivalent to 20-80 mL/kg) is recommended to replace the extracellular volume deficit. Clinical assessment and estimation of losses should be performed regularly.

Another relevant aspect to consider is the type of solution recommended for the maintenance phase. This topic has been more frequently studied in the literature, and based on randomized controlled trials and meta-analyses, influential institutions such as NICE (2015) and the American Academy of Pediatrics (2016) recommended the use of isotonic solutions (such as 0.9% saline and Ringer’s lactate) as the ideal choice for fluid therapy maintenance, minimizing the risk of hyponatremia.

Otherwise, in a 2022 systematic review supported by robust scientific methodology, authors concluded that isotonic fluids should be used for acutely ill children admitted to wards and for critically ill children

admitted to intensive care units (level A evidence, > 95% agreement)⁵.

While awaiting a randomized controlled study with a representative sample, we concluded that the best evidence suggests the following:

- During the intravenous hydration expansion phase, a plan involving the infusion of 0.9% saline solution for 1-4 h should be implemented. Regular clinical evaluations should be conducted, and the infusion rate should be increased from 10 to 20 mL/kg/h if necessary.
- Isotonic solutions should be used when intravenous rehydration is indicated for the maintenance phase.

References

1. World Health Organization. Diarrhoea. In: Pocket Book of Hospital Care for Children: Guidelines for the Management of Common Childhood Illnesses. 2nd ed., Ch. 5. Geneva: World Health Organization; 2013. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK154434>
2. Guarino A, Ashkenazi S, Gendrel D, Lo Vecchio A, Shamir R, Szajewska H, et al. European Society for Pediatric Gastroenterology, Hepatology, and Nutrition/European Society for Pediatric Infectious Diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. *J Pediatr Gastroenterol Nutr.* 2014;59:132-52.
3. Iro MA, Sell T, Brown N, Maitland K. Rapid intravenous rehydration of children with acute gastroenteritis and dehydration: a systematic review and meta-analysis. *BMC Pediatr.* 2018;18:44.
4. Mora-Capín A, López-López R, Guibert-Zafra B, de Ceano-Vivas La Calle M, Porto-Abad R, Molina-Cabañero JC, et al. Recommendation document on rapid intravenous rehydration in acute gastroenteritis. *An Pediatr (Engl Ed).* 2022;96:523-35.
5. Brossier DW, Tume LN, Briant AR, Jotterand Chaparro C, Moullet C, Rooze S, et al. ESPNIC clinical practice guidelines: intravenous maintenance fluid therapy in acute and critically ill children- a systematic review and meta-analysis. *Intensive Care Med.* 2022;48:1691-708.