Resuscitation and Maintenance Fluids

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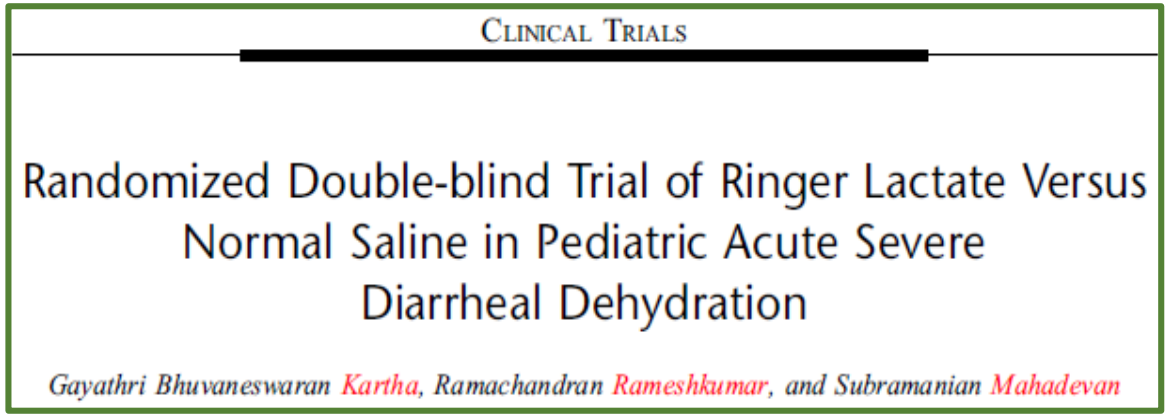
Resuscitation fluid changes made to updated STGs and EML

- Modified Ringers Lactate ADDED as an alternative to Sodium Chloride, 0.9%

Resuscitation fluids: Saline versus Ringers Lactate (1)

- The previous edition of the Paediatric STGs and EML only recommended 0.9% Sodium Chloride.
- The consideration of Modified Ringers Lactate was evaluated during the current review cycle.



CLINICAL TRIALS

Randomized Double-blind Trial of Ringer Lactate Versus Normal Saline in Pediatric Acute Severe Diarrheal Dehydration

Gayathri Bhuvaneswaran Kartha, Ramachandran Rameshkumar, and Subramanian Mahadevan

A randomized trial comparing the effectiveness of Ringer lactate and normal saline for correction of paediatric acute severe diarrhoeal dehydration found that 38% of patients on Ringers lactate and 23% of patient on normal saline had improvement in clinical status and pH ≥ 7.35 after 6 hours, RR =1.63, 95% CI 0.8 to 3.4).
No significant differences were seen secondary outcomes regarding electrolyte, renal and blood gas parameters, or hospital stay duration.

Kartha GB, Rameshkumar R, Mahadevan S. Randomized Double-Blind Trial of Ringers Lactate versus Normal Saline in Pediatric Acute Severe Diarrheal Dehydration. JPGN, 2017, 65 (6):1.

Resuscitation Fluids: Saline versus Ringers Lactate (2)

- In addition to these agents being comparable in efficacy, the current costs of sodium chloride 0.9% and ringers lactate are equivalent:

Item	Price*
Sodium Chloride; 0.9%; Infusion (parenteral); 1 L	R10.59
Ringer Lactate; Infusion (parenteral); 1 L	R10.75

**August 2023*

Note: Much large volume on National Contract for NaCl compared to Ringers Lactate. As volumes of Ringers increase, it would be expected this price to go down

Modified Ringers Lactate was thus added as an alternative resuscitation fluid to sodium chloride, 0.9% in a shock, anaphylaxis, cardiac arrest and burns.

Maintenance fluid changes made to updated STGs and EML

- ½ Darrows/Dextrose 5% REMOVED
  - ✓ Replaced with Sodium Chloride 0.9%/Dextrose 5%

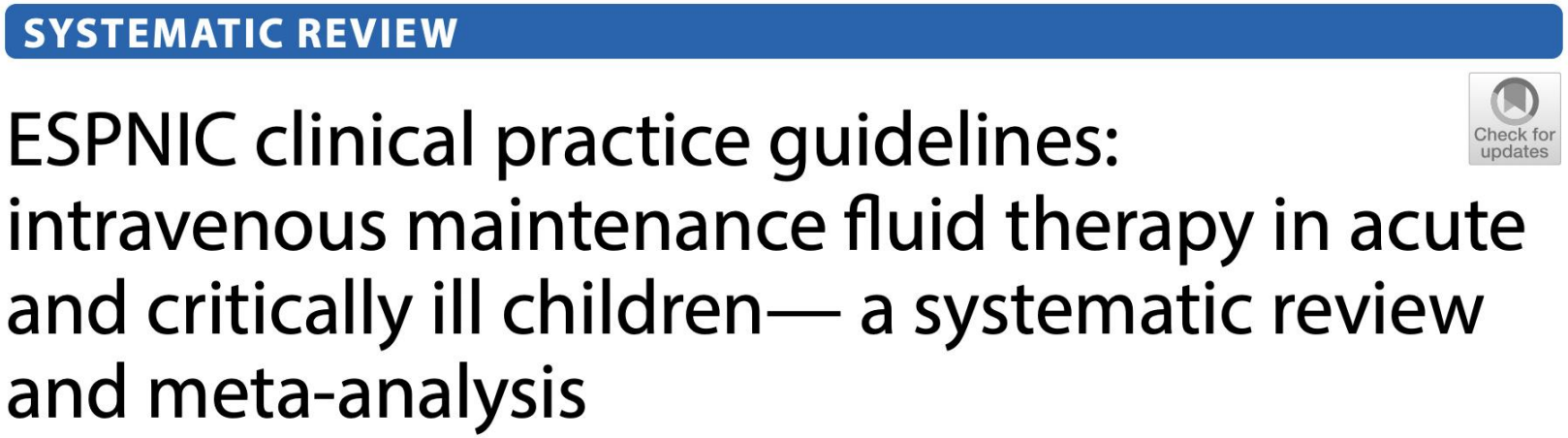
Fluid composition

	Resuscitation		Maintenance			
	Modified Ringer's lactate	**Sodium chloride, 0.9%**	**½ Darrows Dextrose, 5%**	**Sodium chloride, 0.9%/Dextrose, 5%**	**Paediatric Maintenance Solution**	**Balanced solution**
Na	130	154	61	154	35	130
K	4		18	154	12	4
Cl	109	154	51		47	110
Bicarb			27			27
Lactate	28					
Dextrose			50	50	50	
Osmolality	272	308	434	560	372	273
Tonicity	Isotonic	Isotonic	Hypotonic	Hypertonic	Hypotonic	Isotonic
pH	6,5		5			7,4

Values expressed in mmol/L, except osmolality and pH

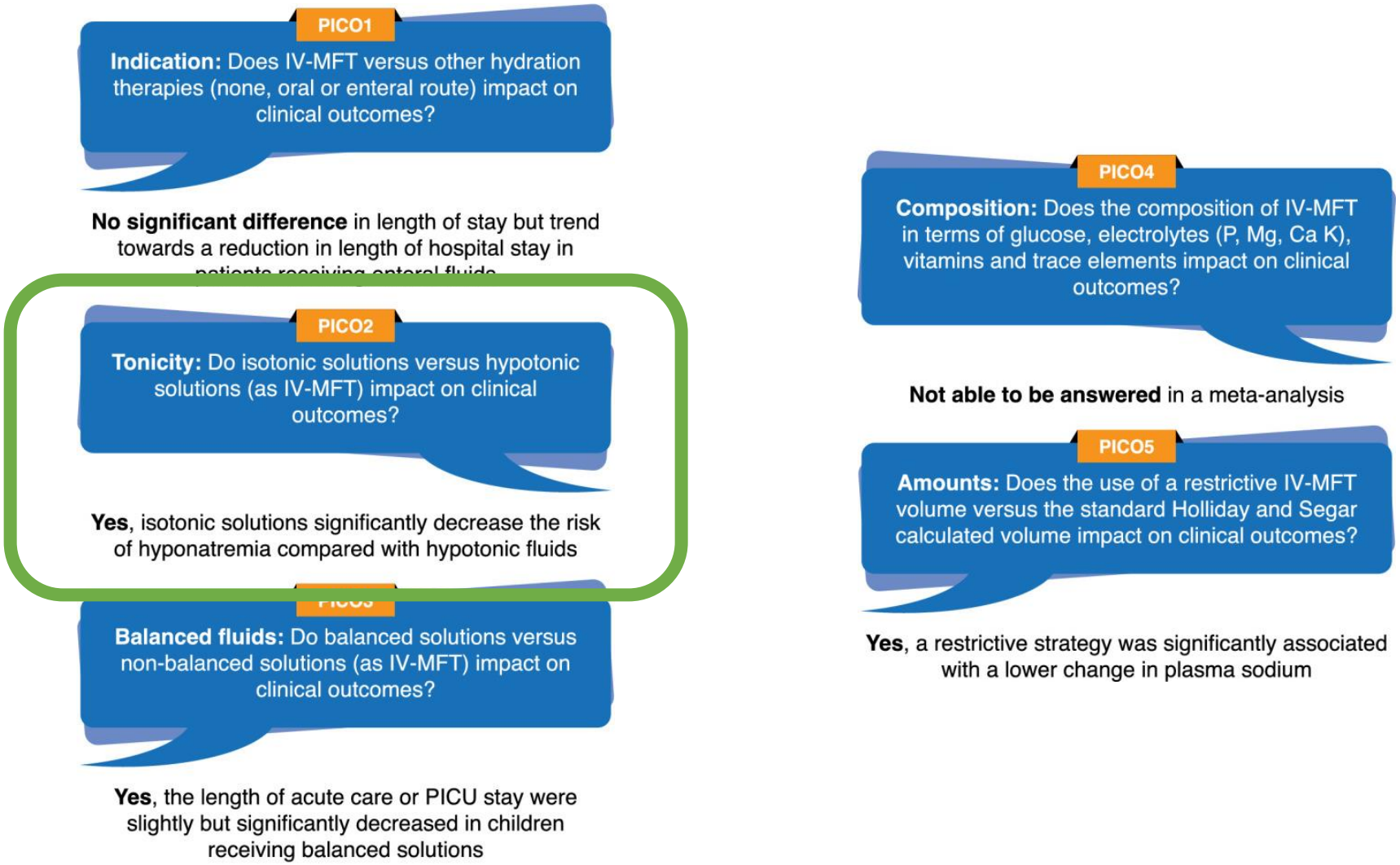
Update in maintenance fluid recommendation for children

- Half-strength Darrow's solution has been used extensively for childhood dehydration in treatment internationally.
- Major adverse effect: **iatrogenic hyponatraemia**.



BROSIER, 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 ♙♙♙♙ DEC; ♙♙(♙♙) : ♙♙♙♙♥♙♙♙♙. DOI: ♙♙ ♙♙♙♙♙/ S♙♙♙♙♙♙♥♙♙♙♥♙♙♙♙♙♥Z EPUB ♙♙♙♙ OCT ♙♙

Update in maintenance fluid recommendation for children



Broster, 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 ♢♢♢♢ dec; ♢♢(♢♢) : ♢♢♢♢♥♢♢♢♢. doi: ♢♢ ♢♢♢♢/ s♢♢♢♢♢♢♥♢♢♢♥♢♢♢♢♥z epub ♢♢♢♢ oct ♢♢

Update in maintenance fluid recommendation for children

Half strength Darrow with glucose 5% is the **more costly** option compared to saline 0.9%/dextrose 5% option

	Half Darrow With Glucose; 5%; Infusion (parenteral); 500 ml	Sodium Chloride, Dextrose; 0.9%, 5%; Infusion (parenteral); 1 L	Sodium Chloride, Dextrose; 0.9%, 5%; Infusion (parenteral); 200 ml
Current contract price*	R12.86	R12.37	R22.28
Price per litre	R25.72	R12.37	R111,40

**August 2023*

Thus removed: replaced with Sodium Chloride 0.9%/Dextrose 5% solution

Important points to note:

Most children should receive maintenance fluids orally or via nasogastric tube

All children receiving IV fluid should be re-assessed frequently (4 hourly)

For rehydration, the oral or nasogastric route is preferred

Rapid rehydration over 4 hours (vs slow rehydration) is preferred

Zinc dosing in children

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Zinc dosing

Zinc (mineral and micronutrient supplementation) for diarrhoea in children

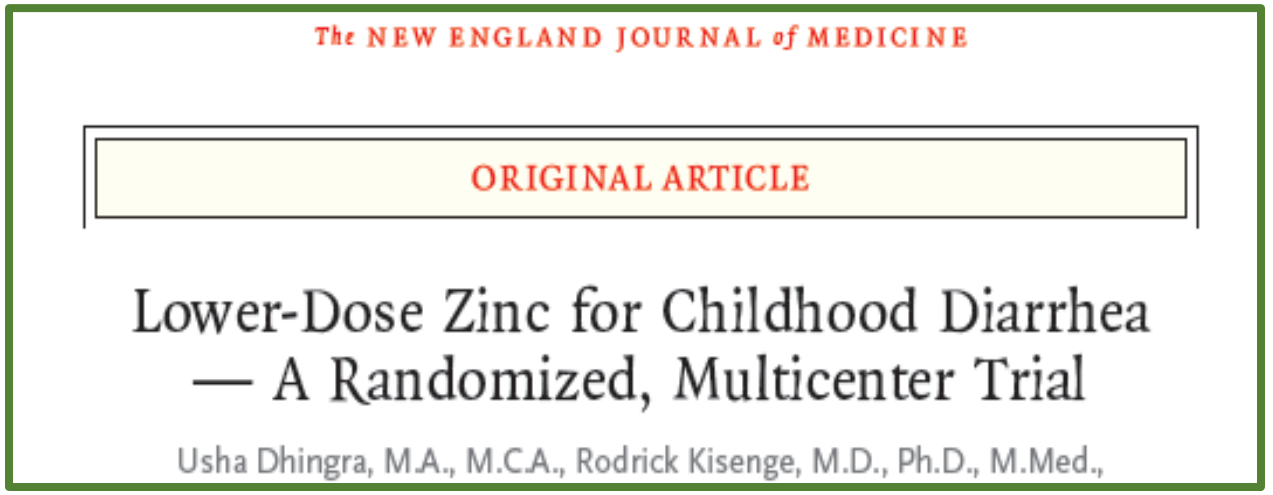
- Zinc supplementation for diarrhoea:
  - shorter durations of diarrhea,
  - reduced number of stools and stool output,
  - reduced risk of persistent diarrhea and
  - may reduce the risk of subsequent illness and increase weight gain.
- Oral zinc: **vomiting** due to strong metallic taste and tendency to cause **gastric irritation**

The previous zinc dosing recommendations in acute diarrhoea were:

- Zinc (elemental), oral, for 14 days:
  - If < 10kg: 10 mg/day
  - If > 10kg: 20 mg/day

Evidence: Zinc dosing in diarrhoea

- Randomised, double-blind, controlled trial.
- Included 4500 children (6-59 months of age) with acute diarrhoea.
- Assigned to receive either 5, 10 or 20 mg zinc daily for 14 days.
- Primary outcomes:
  - diarrhoea duration more than 5 days;
  - number of stools, and;
  - occurrence of vomiting within 30 minutes of zinc administration.



Dhingra U et al. Lower-dose zinc for childhood diarrhea – A randomized, multicenter trial. NEJM. 2020, 383:1231-1241.

Findings

OUTCOME	20mg	10mg	5mg	Difference
Diarrhoea for more than 5 days	6.5%	7.7%	7.2%	• Difference between the 20 mg and 10 mg groups was 1.2 percentage points (upper boundary of the 98.75% confidence interval [CI], 3.3). • Difference between the 20-mg and 5-mg groups was 0.7 percentage points (upper boundary of the 98.75% CI, 2.8). • Both of which were below the non-inferiority margin set of 4 percentage points.
The mean number of diarrheal stools	10.7	10.9	10.8	Difference between the 20-mg and 10-mg groups was 0.3 stools (upper boundary of the 98.75% CI, 1.0). • Difference between the 20-mg and 5-mg groups was 0.1 stools (upper boundary of the 98.75% CI, 0.8). • Both of which were below the non-inferiority margin (2 stools).
Vomiting within 30 minutes after administration occurred	19.3%	15.6%	13.7%	• Risk was significantly lower in the 10-mg group than in the 20-mg group (relative risk, 0.81; 97.5% CI, 0.67 to 0.96). • Risk was also significantly lower in the 5-mg group than in the 20-mg group (relative risk, 0.71; 97.5% CI, 0.59 to 0.86). • Lower doses were also associated with less vomiting beyond 30 minutes after administration.

Zinc in Diarrhoea: Recommendation Updated

- Lower doses had non-inferior efficacy compared to standard 20 mg daily dose.
- Recommendation in STGs and EML updated to recommend 10mg/day for all children with diarrhea:

Mineral and micronutrient supplementation

All children with diarrhoea.

- Zinc (elemental), oral, 10 mg/day for 14 days.

Benefits:

- Improves safety: less vomiting
- No compromise of efficacy
- Deceased cost

Thank you