

XXVII REUNIÓN DE LA SOCIEDAD ESPAÑOLA DE URGENCIAS DE PEDIATRÍA



SEUP
SOCIEDAD ESPAÑOLA DE
URGENCIAS DE PEDIATRÍA

CUIDÁNDONOS | CUIDÁNDOLOS

Desde Lancet 1978: “Water with sugar and salt” al 2023... ¿cómo lo hacemos?

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H. Universitario Príncipe de
Asturias. Alcalá de Henares.

Rosario López López.
H. Infantil Universitario La Paz. Madrid.

Grupo de trabajo de Hidratación y Trastornos Electrolíticos SEUP

Declaración de conflicto de intereses



Este Symposium está patrocinado por Humana

Humana no ha influido en de ningún modo en el desarrollo de la ponencia ni en las afirmaciones que se realizan.

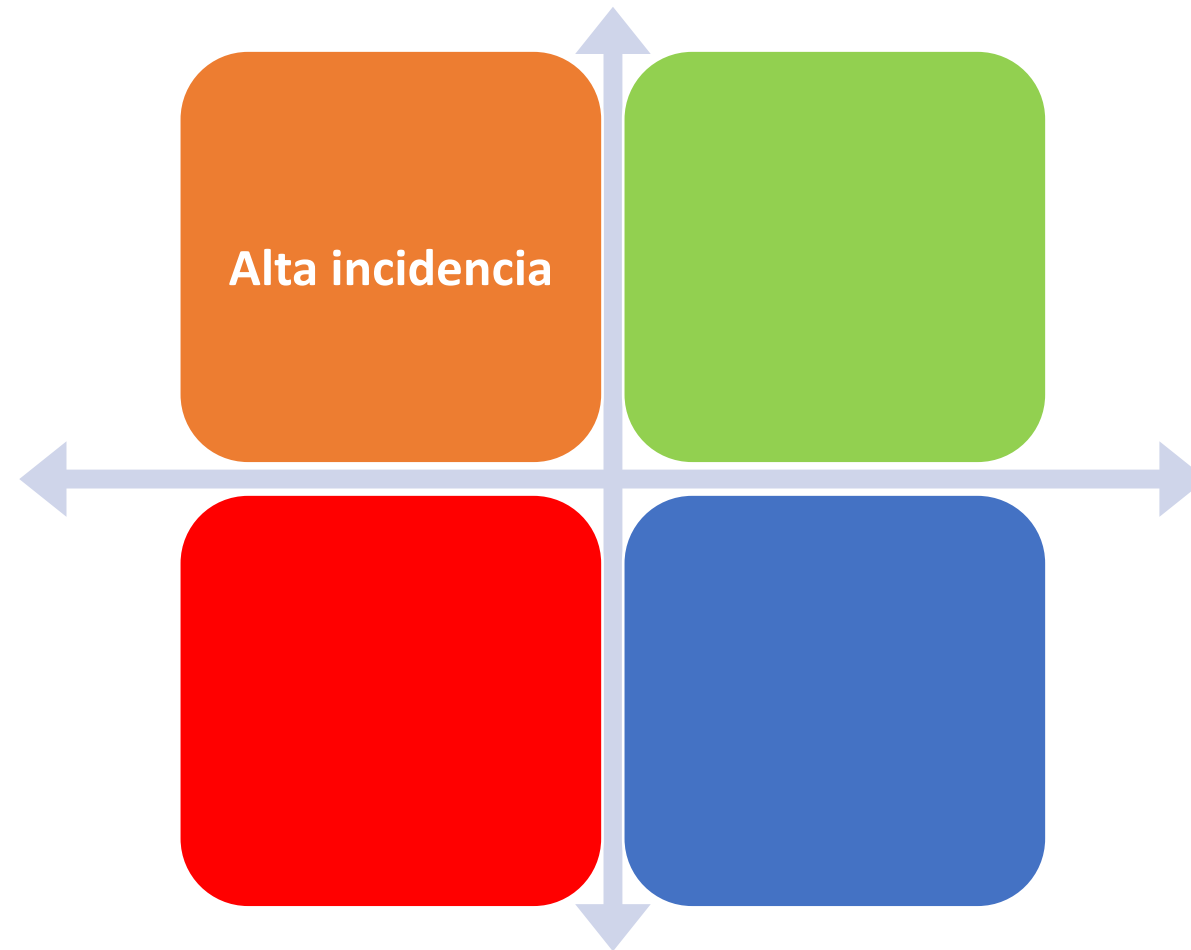


Water with Sugar and Salt

THE discovery that sodium transport and glucose transport are coupled in the small intestine, so that glucose accelerates absorption of solute and water, was potentially the most important medical advance this century.¹ It opened the way to oral hydration treatment for severe diarrhoea—the main cause of infant death in the developing world.

The Lancet, 5 de Agosto 1978

¿Por qué estamos aquí?



XXVII REUNIÓN



4. EPIDEMIOLOGY

The incidence of diarrhea ranges from 0.5 to 2 episodes per child per year in children <3 years in Europe.

Gastroenteritis is a major reason for hospitalization in this range of age.

Rotavirus is the most frequent agent of AGE; however, norovirus is becoming the leading cause of medically attended AGE in countries with high rotavirus vaccine coverage.

The most common bacterial agent is either *Campylobacter* or *Salmonella* depending on country.

Intestinal infections are a major cause of nosocomial infection.

The incidence of diarrhea ranges from 0.5 to 2 episodes per child per year in children <3 years in Europe.

Guarino A, et al. ESPGHAN. Evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. JPGN. 2014.

Los motivos de consulta fueron fundamentalmente por fiebre (27%), dificultad respiratoria (10%) y diarrea (10%). Los **diagnósticos al alta más frecuentes fueron gastroenteritis aguda (15%),** infección de vías aéreas altas (12%), faringoamigdalitis (10%) y síndrome febril (10%).

Ortega Benítez AM et al. Estudio epidemiológico de las urgencias pediátricas en el Hospital Universitario Nuestra Señora de la Candelaria. *Ene.* [online]. 2019.

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XXVII REUNIÓN



Acute gastroenteritis (AGE), the most common cause of dehydration in infants and children, accounts for **1.5 million annual outpatient visits** and **10% of all pediatric hospital admissions**

Baker AH, Eisenberg M. Gastroenteritis Care in the US and Canada: Can Comparative Analysis Improve Resource Use? Pediatrics. 2021 Jun;147(6):e2021050436.

¿Por qué estamos aquí?



XXVII REUNIÓN



Estudio prospectivo observacional de pacientes de 1 mes a 14 años de edad que ingresaron hospital Palamós, Girona

La GEA fue la causa de ingreso en el 16,5 % de nuestros pacientes

El 74 % de los pacientes tenían deshidratación leve, el 89,2 % RHIV

La estancia total fue de 206 días (media 3,1 días).

El coste médico mediana 710,46 euros/paciente, IC 95 %: 616,37-804,56 euros)

Parada Ricart E, et al. Gastroenteritis aguda: coste de una causa de ingreso potencialmente evitable [Acute gastroenteritis: the cost of an ambulatory care sensitive condition]. An Pediatr (Barc). 2007 Oct;67(4):368-73.

Original breve

Epidemiología de la gastroenteritis por rotavirus adquirida en la comunidad en el área de Fuenlabrada (Madrid)

M. José Rivero^a, Enriqueta Román^b, M. Isabel García^c, Miguel Zafra^a, Ángel Gil^d
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El coste para cada UCH se incrementó de 1.464 € en 2005 a 1997,89 € en 2008. El coste global para el proceso gastroenteritis aguda en menores de 5 años, a lo largo de los 4 años de estudio, fue de 544.993,86 €.

¿Por qué estamos aquí?



XXVII REUNIÓN





Organización
Mundial de la Salud

¿Por qué estamos aquí?

En todo el mundo, las enfermedades infecciosas, entre ellas la **neumonía, la diarrea y el paludismo**, junto con el parto prematuro, la asfixia y los traumatismos perinatales y las malformaciones congénitas siguen siendo las principales causas de defunción de niños menores de cinco años.

XXVII REUNIÓN



CASO CLÍNICO 1



No trabajo respiratorio

Buen color

Aspecto alterado

Motivo consulta:

Lactante 8 meses

Vómitos y diarrea

EVALUACIÓN

Lactante 8 meses

TRIAJE

3



Constantes:

Tª 36°C

TA 99/62, FC 130 pm

Sat 95%, FR 22rpm

Glucemia 80 mg/dl

CASO CLÍNICO 1

SAMPLE

Acude por cuadro de vómitos (2-3 al día) y deposiciones líquidas (12 en las últimas 24 horas). Asocia fiebre hasta 38,5°C.

Ha tomado paracetamol hace 30 minutos. Último vómito hace 2 horas, no ha tomado nada después. Sin antecedentes de interés.

EXPLORACIÓN

Peso en urgencias 9 kg (referido previo 9,6 kg; -6,2%).

AEG, mucosa pastosa, labios secos, RC 2 seg, pulsos periféricos presentes, abdomen blando y depresible, no impresiona doloroso. **Decaído**, FANT. Reacciona bien a estímulos.



¿Está deshidratado?

- Estimar el grado de deshidratación



¿Por dónde lo rehidrato?

- Oral
- Intravenoso



¿Con qué lo rehidrato?

- Solución RO hipoosmolar
- Líquidos isotónicos IV

SI

DH moderada 6%

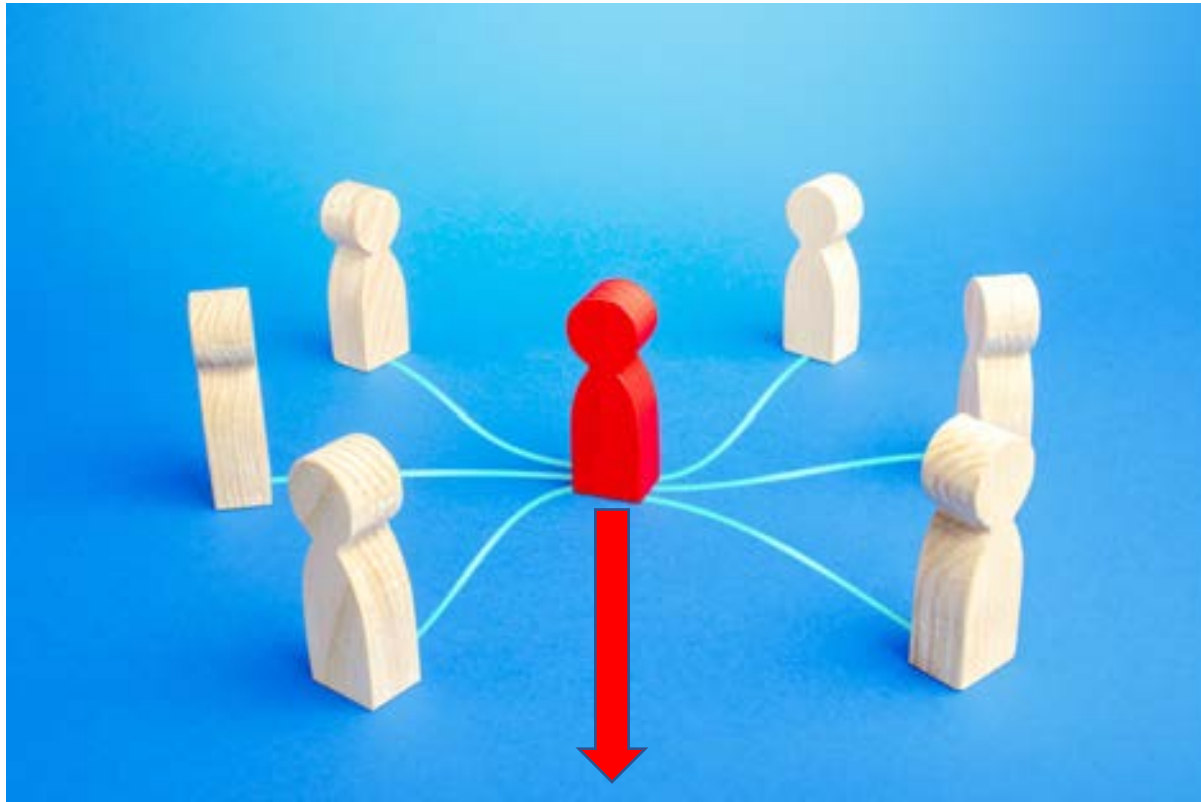
¿Por dónde lo rehidrato?



Table 4

Relevant guidelines regarding oral rehydration therapy

Professional Society and Practice Parameter	Year of Publication	Patient Population
American Academy of Pediatrics Practice parameter: the management of acute gastroenteritis in young children	1996	Previously healthy children aged 1 mo–5 y living in developed countries with acute gastroenteritis
Centers for Disease Control and Prevention Managing acute gastroenteritis among children: oral rehydration, maintenance, and nutritional therapy	2003	Infants and children with acute diarrhea
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	2014	Previously healthy children aged 5 and under living in Europe with acute gastroenteritis
Canadian Paediatric Society Oral rehydration therapy and early refeeding in the management of children with gastroenteritis	2006 Reaffirmed 2016	Children with gastroenteritis
Canadian Paediatric Society Emergency department use of oral ondansetron for acute gastroenteritis-related vomiting in young children	2011 Reaffirmed 2016	Children 6 mo–12 y with vomiting due to gastroenteritis
World Health Organization Department of Child and Adolescent Health and Development Clinical management of acute diarrhea: WHO/UNICEF joint statement	2004	Children in developing nations with diarrheal diseases



Las soluciones de rehidratación oral hipoosmolares (Na 50-60 mmol/L) deberían ser usadas como primera línea de tratamiento para el manejo de los niños con GEA.

Recomendación fuerte, calidad evidencia moderada

Guarino A, et al. ESPGHAN. Evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. JPGN. 2014.



XXVII REUNIÓN



Utilización de la rehidratación oral en urgencias. Encuesta nacional

Sociedad Española de Urgencias de Pediatría

TABLA 2. Diferencias entre la utilización real y teórica de la rehidratación oral en urgencias en diferentes supuestos clínicos planteados (n = 290)

	Deshidratación leve (sin vómitos, diarrea leve)	Deshidratación leve (vómitos moderados, diarrea leve)	Deshidratación moderada (vómitos leves, diarrea leve)	Deshidratación moderada (vómitos moderados, diarrea moderada)
Uso teórico de la solución de rehidratación oral	290 (100 %)	223 (78,6 %)	221 (76,2 %)	94 (32,4 %)
Uso real de la solución de rehidratación oral	289 (99,7 %)	230 (79,3 %)	204 (70,3 %)	66 (22,8 %)

Inconvenientes para su uso en urgencias:

- Tiempo/presión asistencial
- Falta de espacio
- Desconfianza de los padres
- Mal sabor

The Treatment of Pediatric Gastroenteritis: A Comparative Analysis of Pediatric Emergency Physicians' Practice Patterns

Stephen B. Freedman, MDCM, MSc, Vithika Sivabalasundaram, BHSc, Vanessa Bohn, Elizabeth C. Powell, MD, MPH, David W. Johnson, MD, and Kathy Boutis, MD, MSc

"You evaluate a 15-month-old with a history and physical examination consistent with moderate dehydration. The child has had seven episodes of nonbloody diarrhea today and five episodes of vomiting, with the last occurring 45 minutes ago. The presumed etiology is infectious gastroenteritis." How often do you:

	PERC (<i>n</i> = 136)			PEM-CRC (<i>n</i> = 94)			p-value*
	≤25%	25%–75%	>75%	≤25%	25%–75%	>75%	
Initiate rehydration ORALLY as first-line therapy?	13 (10)	20 (15)	103 (76)	17 (18)	33 (35)	44 (47)	<0.001

Grupo pediatras Canadá: 76% RHO primera opción

Grupo pediatras EEUU: 47% RHO primera opción



¿Tiempo de estancia mayor en Rehidratación Oral?

NO

A Randomized Trial of Oral vs Intravenous Rehydration in a Pediatric Emergency Department

Yvonne C. Atherly-John, MD; Sandra J. Cunningham, MD; Ellen F. Crain, MD, PhD

Arch Pediatr Adolesc Med. 2002;156:1240-1243

Table 2. Outcomes by Treatment Group*

Outcome	Treatment Group		P Value
	ORT (n = 18)	IVT (n = 16)	
LOS, min	224.7 (77.8)	358.0 (160.0)	<.01
PED staff time, min	35.8 (32.0)	65.0 (44.0)	.03
LOS-PED staff time, min	188.9 (86)	293.0 (174)	.03
Patients who are highly satisfied with the visit, % (95% CI)	77.7 (52.4-93.6)	37.5 (15.2-64.6)	.01
Patients who were hospitalized, % (95% CI)	11.1 (1.4-34.7)	25.0 (4.5-36.1)	0.2
Patients who relapsed, %	0	0	



¿Tiempo de estancia mayor en Rehidratación Oral?

NO

Overview of Reviews

Treatment of acute gastroenteritis in children: an overview of systematic reviews of interventions commonly used in developed countries

Stephen B. Freedman,^{1*} Samina Ali,² Marta Oleszczuk,^{3,4} Serge Gouin⁵ and Lisa Hartling^{3,4}

Main results: Children who received oral rehydration therapy had a shorter length of stay in hospital compared with children who received IV therapy [mean difference, MD = -1.20 days (-2.38, -0.02)]; however, the result was no longer significant when an outlying study was removed. Children who received IV therapy were

Evid.-Based Child Health 8: 1123–1137 (2013)

DOI: 10.1002/ebch.1932

XXVII REUNIÓN





¿Reconsultan más los pacientes con RHO?

NO

RESEARCH ARTICLE

Gastroenteritis Therapies in Developed Countries: Systematic Review and Meta-Analysis

Stephen B. Freedman^{1*}, Dion Pasichnyk², Karen J. L. Black³, Eleanor Fitzpatrick⁴, Serge Gouin⁵, Andrea Milne², Lisa Hartling², Pediatric Emergency Research Canada Gastroenteritis Study Group^{1†}

Results

31 trials (4,444 patients) were included. *ORT*: Compared with intravenous rehydration, hospitalization (RR 0.80, 95%CI 0.24, 2.71) and emergency department return visits (RR 0.86, 95%CI 0.39, 1.89) were similar. *Antiemetics*: Fewer children administered an antiemetic re-

PLOS ONE | DOI:10.1371/journal.pone.0128754 June 15, 2015

XXVII REUNIÓN





¿Es mejor la Rehidratación Intravenosa?

NO

Oral Versus Intravenous Rehydration of Moderately Dehydrated Children: A Randomized, Controlled Trial

Philip R. Spandorfer, MD, MSCE; Evaline A. Alessandrini, MD, MSCE; Mark D. Joffe, MD; Russell Localio, MS; and Kathy N. Shaw, MD, MSCE

TABLE 3. Secondary Outcome Measures

Variable	ORT (<i>n</i> = 36)	IVF (<i>n</i> = 37)	Difference (95% CI)*
Mean time to initiate therapy, min†	19.9 + 13.4 (<i>n</i> = 35)	41.2 + 29.4 (<i>n</i> = 35)	21.2 (10.3 to 32.1)
Improved dehydration score at 2 h	78.8% (26/33)	80% (28/35)	−1.2% (−20.5% to 18%)
Hospitalization rate (24-h observation unit)	30.6% (11/36)	48.7% (18/37)	−18.1% (−40.1% to 4.0%)
Parental preference for same therapy next time	61.3% (19/31)	51.4% (18/35)	9.9% (−14 to 33.7)
72-h ED revisits‡	9.1% (3/33)	8.3% (3/36)	0.8% (−12.6% to 14.1%)

PEDIATRICS Vol. 115 No. 2 February 2005

XXVII REUNIÓN





¿Tiene muchos fracasos?

NO



Cochrane Database of Systematic Reviews

Oral versus intravenous rehydration for treating dehydration due to gastroenteritis in children (Review)

Hartling L, Bellemare S, Wiebe N, Russell KF, Klassen TP, Craig WR

Cochrane Database Syst Rev. 2006

AUTHORS' CONCLUSIONS

Implications for practice

There were no important clinical differences between ORT and IVT for rehydration secondary to acute gastroenteritis in children. It seems reasonable that children presenting for medical care with mild to moderate dehydration secondary to acute gastroenteritis should initially be treated with ORT. Should treatment fail, then IVT may be used. In children who have persistent vomiting, ORT may be used, but the child must be closely observed for proof of successful treatment.

For every 25 children treated with ORT, one would fail and require IVT. Clinicians and families need to apply this evidence to individual situations in order to decide whether they are willing to accept this minimal risk.

Implications for research

Further research comparing ORT and IVT for children with dehydration secondary to gastroenteritis is not warranted and may be unethical. If undertaken, further research should focus on evaluating the efficacy of nasogastric rehydration in children who have persistent vomiting.

XXVII REUNIÓN





Research Article

Parents' Attitudes toward Oral Rehydration Therapy in Children with Mild-to-Moderate Dehydration

- 75 % esperaban que sus hijos recibieran fluidoterapia IV
- 49% rechazaban el tratamiento de rehidratación oral
- 75% rechazaban la colocación de una SNG
- Los padres cuyo hijo había recibido previamente fluidoterapia IV eran menos propensos a estar de acuerdo con el tratamiento oral

Nir V, Nadir E, Schechter Y, Kline-Kremer A. ScientificWorldJournal. 2013



¿Está deshidratado?

- Estimar el grado de deshidratación

SI

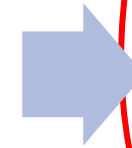
DH moderada 6%



¿Por dónde lo rehidrato?

- Oral
- Intravenoso

Vía oral



¿Con qué lo rehidrato?

- Solución RO hipoosmolar
- Líquidos isotónicos IV

Un poco de historia...

1975: OMS desarrolla una solución hidroelectrolítica para ser empleada por vía oral, independientemente de la etiología de la diarrea y del desequilibrio hidroelectrolítico.

Recomendación composición solución rehidratación oral

	OMS 1975
Na (mEq/L)	90
K (mEq/L)	20
Cl (mEq/L)	80
Base (mEq/L)	30 Bicarbonato
Glucosa (mmol/L)	111
Osmolaridad (mOsm/L)	330

	OMS 2002	Coca cola	Bebidas deportivas	Zumo de manzana
Na (mEq/L)	75	2	20	3
K (mEq/L)	20	0		32
Cl (mEq/L)	65			
Base (mEq/L)	10	13		0
	Citrato			
Glucosa (mmol/L)	75	620		666
Osmolaridad (mOsm/L)	245	750		730

Modificaciones a las SRO



- Soluciones a base de polímeros de glucosa
- L-isoleucina, miel
- Zinc
- Prebióticos (fructooligosacáridos y xilooligosacáridos)

Guarino A, et al. ESPGHAN. Evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. JPGN. 2014.

Oral zinc for treating diarrhoea in children (Review)

Lazzerini M, Wanzira H

- Niños mayores a 6 meses los suplementos de Zinc pueden acortar la duración de la diarrea $\frac{1}{2}$ día y probablemente reduce el número de niños con diarrea persistente al 7 día.
- En niños con malnutrición el efecto es mayor, reduciendo la duración de la diarrea 1 día.

Efficacy of a New Hypotonic Oral Rehydration Solution Containing Zinc and Prebiotics in the Treatment of Childhood Acute Diarrhea: A Randomized Controlled Trial

Annalisa Passariello, MD, PhD, Gianluca Terrin, MD, PhD, Giulio De Marco, MD, PhD, Gaetano Cecere, MD, Serena Ruotolo, MD, Antonio Marino, MD, Linda Cosenza, MD, Maria Tardi, MD, Rita Nocerino, NR, and Roberto Berni Canani, MD, PhD

Objective To evaluate the efficacy of a hypotonic oral rehydration solution (ORS) containing zinc and prebiotics for treatment of acute diarrhea in children.

Study design We conducted a single-blind, prospective, controlled trial including children (age range, 3-36 months) with acute diarrhea randomly assigned to standard hypotonic ORS (group 1) or to new hypotonic ORS containing zinc and prebiotics (group 2). The main outcome was the rate of resolution of diarrhea at 72 hours.

Results A total of 60 children in group 1 (34 male; mean age, 18.58 months; 95% CI, 15.5-21.6) and 59 in group 2 (36 male; mean age, 19.26 months; 95% CI, 15.9-22.6) completed the study protocol. The rate of diarrhea resolution at 72 hours was higher in group 2 (50% versus 72.9%, $P = .010$). Total ORS intake in the first 24 hours was higher in group 2 (50 mL/kg; 95% CI, 41-59 versus 22 mL/kg; 95% CI, 17-29; $P < .001$). The mean number of missed working days by the parents of children in group 2 was lower (0.39; 95% CI, 0.08-0.70 versus 1.45; 95% CI 1.02-1.88; $P < .001$). Fewer patients in group 2 needed adjunctive drugs for the treatment of diarrhea 6/59 versus 19/60, $P = .004$. No adverse events were observed in either of the two groups.

THE JOURNAL OF PEDIATRICS 2011

XXVII REUNIÓN



Modificaciones a las SRO

El zinc se recomienda como complemento de la rehidratación oral en niños mayores de 6 meses que viven en países de bajos ingresos o en entornos con medio o alto riesgo de deficiencia de zinc. Su eficacia no está respaldada por pruebas sólidas en niños bien alimentados que viven en países de altos ingresos.

En lactantes menores de 6 meses el zinc no es efectivo independientemente del estado nutricional.

Recomendación fuerte, calidad evidencia moderada

Guarino A, et al. ESPGHAN. Evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. JPGN. 2014.

¿Fórmulas caseras?

Search... cómo

Ingredientes

- 2 limones ecológicos
- 800 g de agua
- 50 g de azúcar
- ½ cucharadita (tamaño postre) de sal
- ½ cucharadita (tamaño postre) de bicarbonato

4

INGREDIENTES

- un litro de agua
- una pizca de sal (1,8 gramos)
- una cucharadita de bicarbonato de sodio
- dos cucharadas soperas de azúcar (50 gramos)
- zumo de un limón

5

EXPERIENCE AND REASON—Briefly Recorded

“In Medicine one must pay attention not to plausible theorizing but to experience and reason together. . . . I agree that theorizing is to be approved, provided that it is based on facts, and systematically makes its deductions from what is observed. . . . But conclusions drawn from unaided reason can hardly be serviceable; only those drawn from observed fact.” Hippocrates: *Precepts*. (*Short communications of factual material are published here. Comments and criticisms appear as letters to the Editor.*)

Two Wrongs Don’t Make a Right: Harm Aggravated by Inaccurate Information on the Internet

ABSTRACT. There has been much concern expressed in the literature about the use of medical information on the Internet by patients and families. Although much work has been done to quantify the misinformation available on the Internet, there have not been reports of actual harm to children resulting from this misinformation. We present the case of a 1-year-old boy whose clinical course of diarrhea was complicated not only by inaccurate advice given by the emergency room physician, but also by the same advice received from the Internet. *Pediatrics* 2002;109:522–523; *Internet, child, case report, medical errors, harm.*

XXVII REUNIÓN



¿Cuánto suero le doy?

- Depende del grado de deshidratación y pérdidas mantenidas
- 10 ml/kg equivale a 1% de deshidratación
- Lactante 8 meses → 9 kg
- DH 6% → 60 ml por 9 kg = 540 ml

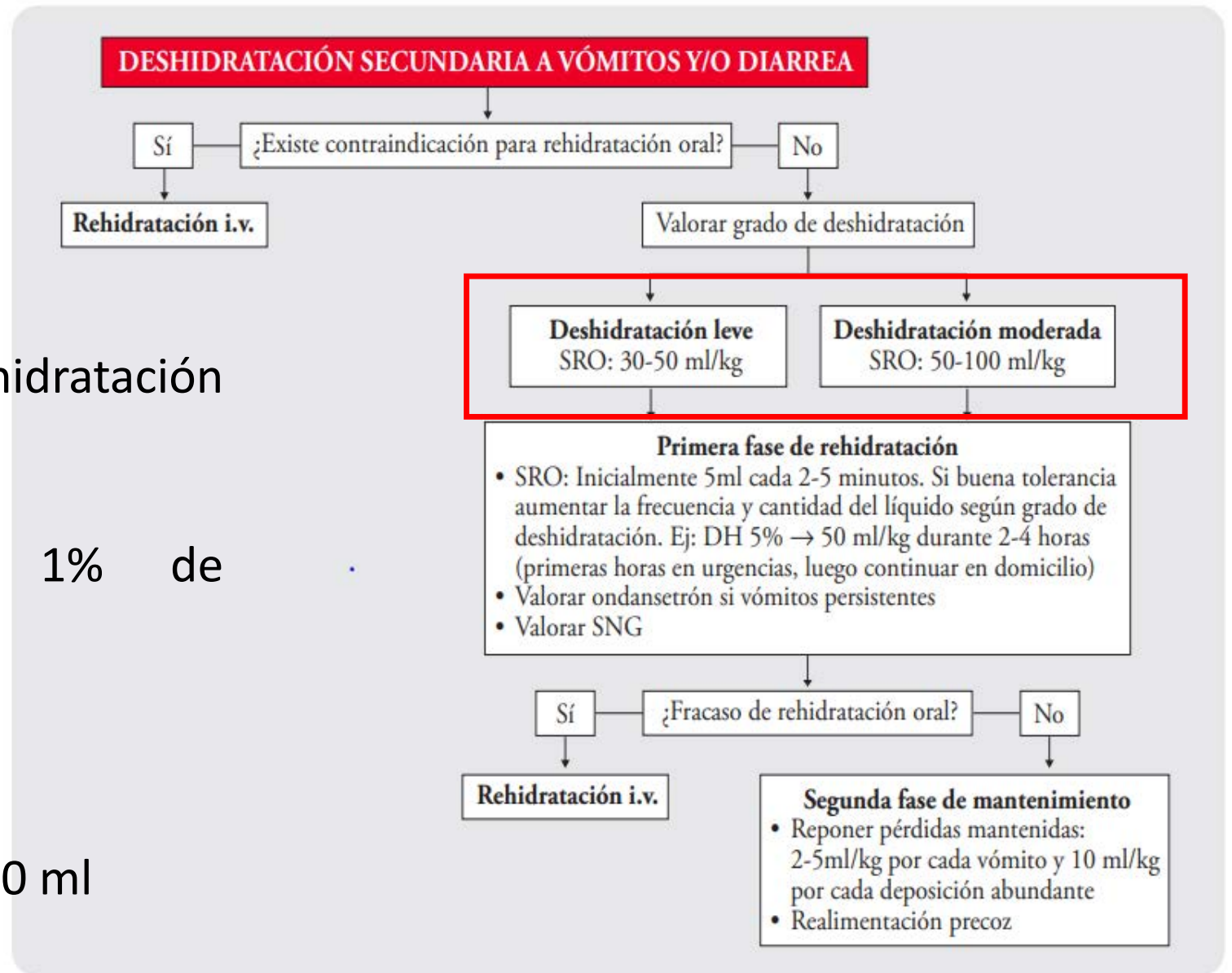


Figura 1. Algoritmo rehidratación oral.

y....¿si vomita?

- La presencia de vómitos crea discomfort en familia / paciente/ cuidadores... llevando al incremento del uso de terapia intravenosa, incluso en la ausencia de deshidratación significativa.
- Ondansetrón ha mostrado ser eficaz y seguro en niños.
- En las guías aspectos concernientes a posibles efectos secundarios, falta clara efectividad han llevado a variación en las recomendaciones...

Antiemetics in Children With Acute Gastroenteritis: A Meta-analysis

Laura E. Niño-Serna, MD, MSc,^{1,2} Jorge Acosta-Reyes, MD, MSc,¹ Areti-Angeliki Veroniki, PhD,^{3,4,5} Ivan D. Florez, MD, MSc^{1,4}

abstract

CONTEXT: Several antiemetics have been used in children with acute gastroenteritis. However, there is still controversy over their use.

OBJECTIVE: To determine the effectiveness and safety of antiemetics for controlling vomiting in children with acute gastroenteritis.

DATA SOURCES: Medline, Embase, Cochrane Central Register of Controlled Trials, Cumulative Index to Nursing and Allied Health Literature, Latin America and the Caribbean Literature on Health Sciences, and gray literature, until December 2018.

STUDY SELECTION: We selected randomized clinical trials comparing metoclopramide, ondansetron, domperidone, dexamethasone, dimenhydrinate, and granisetron.

DATA EXTRACTION: Two reviewers independently screened abstracts and full texts, extracted the data, and assessed the risk of bias. We performed pairwise and network meta-analysis using the random-effects model.

RESULTS: Twenty-four studies were included (3482 children). Ondansetron revealed the largest effect in comparison to placebo for cessation of vomiting (odds ratio = 0.28 [95% credible interval = 0.16 to 0.46]; quality of evidence: high) and for hospitalization (odds ratio = 2.93 [95% credible interval = 1.69 to 6.18]; quality of evidence: moderate). Ondansetron was the only intervention that reduced the need for intravenous rehydration and the number of vomiting episodes. When considering side effects, dimenhydrinate was the only intervention that was worse than placebo.

LIMITATIONS: Most treatment comparisons had low- or very low-quality evidence, because of risk of biases and imprecise estimates.

CONCLUSIONS: Ondansetron is the only intervention that revealed an effect on the cessation of vomiting, on preventing hospitalizations, and in reducing the need for intravenous rehydration. Ondansetron was also considered a safe intervention.

Pediatrics. 2020.

Ondansetron and Oral Rehydration Therapy in Pediatric Patients with Dehydration: A Review of Clinical Effectiveness

MacDonald E, McCormack S. ondansetrón and Oral Rehydration Therapy in Pediatric Patients with Dehydration: A Review of Clinical Effectiveness Canadian Agency for Drugs and Technologies in Health; 2020 Feb 14.

In summary, in pediatric patients with mild to moderate dehydration secondary to gastroenteritis, ondansetron is likely effective for decreasing risk of requiring intravenous rehydration and reducing vomiting as compared to placebo, both in combination with oral rehydration solution. The evidence does not support the effectiveness of ondansetron in children at risk of dehydration. Interpretation of these findings is limited by inconsistent outcome definitions, inconsistent methods of assessment of the presence and severity of dehydration, and applicability to the Canadian context.

y....¿si vomita más?



Cuando la rehidratación oral no es posible, rehidratación enteral mediante SNG es preferible a la vía IV y debería proponerse.

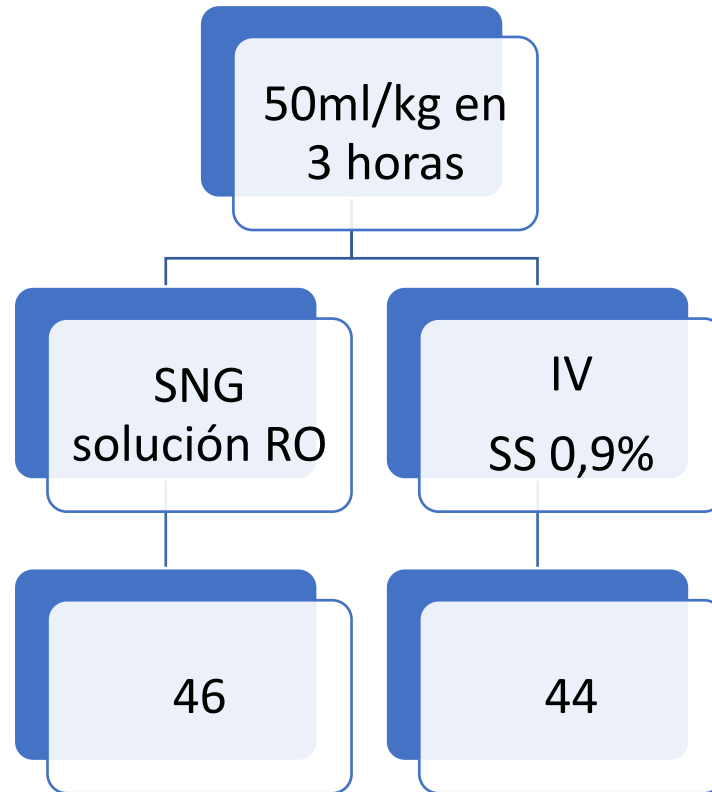
Recomendación fuerte, moderada calidad de la evidencia.

La mayoría de regímenes propuestos usan volúmenes de 40-50ml/kg en 3-6h.

Guarino A, et al. ESPGHAN. Evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. JPGN. 2014.

Comparison of Nasogastric and Intravenous Methods of Rehydration in Pediatric Patients With Acute Dehydration

Alan L. Nager, MD, FAAP, and Vincent J. Wang, MD



CONCLUSION

RNG hydration may be safely and effectively used in children suffering from moderate dehydration caused by acute symptoms of vomiting and/or diarrhea, presumed to be from acute gastroenteritis. RNG is as efficacious as RIV, is no more labor intensive than RIV, and is associated with fewer complications. In addition, we found that most routine laboratory testing is of little value in these patients and should be avoided, except when clearly clinically indicated. The utilization of RNG also results in significant cost savings as compared with RIV and standard IV therapy. RNG may be used in place of RIV in the ED or possibly in an alternative "well-equipped" outpatient setting.

Nasogastric vs. Intravenous Rehydration with Gastroenteritis and Refusal to Drink: A Randomized Controlled Trial

Nasogastrale vs. intravenöse Rehydratation bei Kindern mit Gastroenteritis und Nahrungsverweigerung: Eine randomisierte kontrollierte Studie

Authors J. Marquard¹, C. Lerch², A. Rosen¹, H. Wiecezorek¹, E. Mayatepek¹

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² Department of General Practice, Cochrane Metabolic and Endocrine, University Hospital Düsseldorf, Germany

Weight was measured to the nearest 0.1 kg using a SECA chair scale [SECA, Hamburg, Germany]. Patients were rehydrated during a 6-h rehydration phase: in the IVRT group they received 50 ml/kg of a 2.5% glucose in 0.45% sodium chloride solution over 6 h via an infusion pump. In the NGRT group they received the same amount of oral rehydration solution containing 60 mmol/L sodium, 20 mmol/L potassium, 60 mmol/L chloride, 10 mmol/L citrate and 90 mmol/L glucose over 6 h at a constant rate through a nasogastric tube. In our hospital, the use of oral ondansetron is uncommon in children with gastroenteritis and was not used in the study. The local Ethics Committee recommended the use of racecadotril in all study patients because it was a standard treat-

Marquard J et al. Nasogastric vs. Intravenous Rehydration... Klin Padiatr 2014; 226: 19–23

Abstract

Background: Nasogastric rehydration therapy (NGRT) is the recommended therapy in moderately dehydrated children with gastroenteritis and refusal to drink, since it is supposed to be as effective if not better than intravenous rehydration therapy (IVRT). However, in clinical practice IVRT is often favored. We conducted a clinical trial to determine whether IVRT is not inferior to NGRT.

Patients and Methods: Children 3 months to 6 years of age with moderate dehydration and refusal to drink secondary to gastroenteritis were recruited. After clinical assessment of the degree of dehydration, patients were assigned randomly to receive either IVRT or NGRT over 6 h on the hospital ward.

Results: Recruitment did not yield the estimated number of patients. Mainly, non-enrollment was due to failure to obtain parental consent because IVRT was expected. 97 patients were enrolled in the study, 46 were randomized to NGRT and 51 to IVRT. There was no difference between IVRT and NGRT groups concerning length of hospital stay (2.2 ± 1.1 days vs. 2.4 ± 1.1 days), success of rehydration (78 vs. 76%) and adverse events.

Discussion: Since we had to terminate the study ahead of schedule due to a low recruiting rate, our results are not reliable. However, data from the literature shows that the widespread described superiority of NGRT over IVRT is seriously influenced by studies from developing countries questioning the applicability of the results to a setting available in high-income countries nowadays.

Conclusion: Our study demonstrates the difficulties performing such a study in a high-income country to come to an objective and clearly evident final conclusion.





Todas las guías recomiendan que la lactancia materna continúe durante la rehidratación y dieta apropiada a la edad que debe ser empezada durante o después de la fase inicial de rehidratación (4-6 horas).

Reanudación temprana de la alimentación después de la terapia de rehidratación.

CASO CLÍNICO 2

9:00. El primero de la mañana



- No trabajo respiratorio
- Buen color
- Consciente

Motivo de consulta:

Paciente de 9 años

Diarrea y vómitos

EVALUACIÓN

Algo nauseoso



NIVEL 2 EN TRIAJE

Paciente de 9 años

Constantes:

- Tª 37 °C
- TA 110/60
- FC 100 lpm

CASO CLÍNICO 2

9:00. El primero de la mañana

Paciente de 9 años . SAMPLE

- Deposiciones diarreicas de 48 horas de evolución. Ayer 6 deposiciones. Ha realizado 1 deposición líquida y ha vomitado en 2 ocasiones tras el desayuno, motivo por el que acude a urgencias.
- Tª máxima axilar ayer 38°C, hoy afebril.
- Hermana de 10 años con cuadro similar.

CASO CLÍNICO 2

Paciente de 9 años

Diabetes Mellitus Tipo 1, diagnosticado hace 2 años. Portador de bomba de infusión desde hace 1 año.



Fotografía tomada de
<https://www.fundaciondiabetes.org/infantil/185/bomba-de-insulina-ninos>



Tomada de <https://www.midiabetes.cl>

Glucemia al levantarse (8:00): 102 mgr/dl.
Se ha administrado 3UI insulina acción rápida de antes del desayuno a las 8:00h (3 raciones).

Ha vomitado hace 30 min....

¿Qué más quiero saber?

1. Nada. Oxígeno, monitor, vía y suero....está fatal
2. Hay un montón de GEAs. A casa con antitérmico y SRO
3. Le peso. Necesito el peso en todo niño con gastroenteritis por eso de calcular el déficit y decidir
4. Además del peso, vamos ha hacer una glucemia
5. Pues ya puestos, además del peso y la glucemia, quiero una cetonemia

¿Qué más quiero saber?

- Peso: 33.6 kg (35 kg hace 3 días en consulta): ↓4 %
- Cetonemia 0,6 mmol/L



Glucemia capilar: 88 mg/dl

Tomada de <https://freestyleserver.com/>

¿Y ahora qué?

1. Oxígeno, monitor, vía y suero rápido....está fatal
2. Hay un montón de GEAs y no está casi deshidratado (4%).

Alta

3. Le rehidrato por vía intravenosa
4. Le doy ondansetrón y solución de rehidratación oral

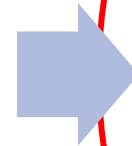
¿Está
deshidratado?

Deshidratación del
4 %



¿Por dónde lo
rehidrato?

Oral



¿Con qué lo
rehidrato?

Solución
rehidratación oral
hipoosmolar

CONTRAINDICACIONES

- Hipersensibilidad al fármaco o alguno de sus componentes.
- Prematuros y niños menores de 1 mes.
- Si el paciente presenta alteración del nivel de conciencia.
- Pacientes con incapacidad para la deglución.
- Pacientes con vómitos incoercibles que no toleran vía oral.
- Pacientes con obstrucción intestinal/íleo paralítico.
- Perforación intestinal.
- Paciente con malabsorción de hidratos de carbono (por ejemplo, glucosa).
- • Diabetes.
- Insuficiencia renal.
- Insuficiencia cardíaca.
- Si hay deshidratación grave, situación de *shock* hipovolémico o pérdidas fecales importantes y

¿Es la diabetes contraindicación para la RHO?

- Shock
- Severe dehydration ($>9\%$ of body weight)
- Neurological abnormalities (lethargy, seizures, etc)
- Intractable or bilious vomiting
- Failure of oral rehydration
- Suspected surgical condition
- Conditions for a safe follow-up and home management are not met

Guarino A, et al. ESPGHAN. Evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. JPGN. 2014.

Gracia M.ª Lou

Actuación ante enfermedades
intercurrentes y descompensaciones
en el niño diabético

Protoc diagn ter pediatr. 2019;1:63-76.

8.1.1. Si hay tolerancia oral

- Si la glucemia es <150 mg/dl: preparar 200 cc de zumo de fruta frío, no ácido, con una cucharada de azúcar (5-10 gramos), y ofrecerlo poco a poco a lo largo de 1-2 horas.
- Si la glucemia es >150 mg/dl: preparar 200 cc de zumo de fruta, no ácido, sin azúcar y ofrecerlo poco a poco a lo largo de una a dos horas.

También pueden utilizarse, si se asocia diarrea,
las soluciones orales habituales

Management of type 1 diabetes mellitus in children during illness, procedures, school, or travel

Topic

Graphics (2)



AUTHORS: Lynne L Levitsky, MD, Madhusmita Misra, MD, MPH

SECTION EDITOR: Joseph I Wolfsdorf, MD, BCh

DEPUTY EDITOR: Alison G Hoppin, MD

[Contributor Disclosures](#)

All topics are updated as new evidence becomes available and our [peer review process](#) is complete.

Literature review current through: **Apr 2023**.

This topic last updated: **Mar 08, 2023**.

Maintain hydration — For all patients, maintain hydration by encouraging regular oral fluids. If BG is <250 mg/dL (13.9 mmol/L), the fluids should include [carbohydrates and electrolytes](#). If hypoglycemia develops, higher concentrations of carbohydrates may be required. If BG is >250 mg/dL (14 mmol/L), carbohydrate-free fluids should be used. (See '[Insulin and carbohydrate dosing](#)' below.)

For all patients with suspected or confirmed ketosis, rigorous oral hydration is essential, in addition to insulin and carbohydrate therapy. To hydrate, administer oral fluids every one to two hours at the rate of 4 to 6 mL/kg/hour or 100 mL/hour.

If adequate oral hydration cannot be maintained, particularly if ketosis is present, the patient should be evaluated and treated at an appropriate medical facility. These patients may require intravenous fluids and additional insulin. (See "[Diabetic ketoacidosis in children: Treatment and complications](#)".)

ISPAD Clinical Practice Consensus Guidelines 2018: Sick day management in children and adolescents with diabetes

Lori M. Laffel¹  | Catarina Limbert² | Helen Phelan³  | Anju Virmani⁴ | Jamie Wood⁵ |
Sabine E. Hofer⁶ 

3.4 | Monitor and maintain hydration with salt and water

- Hyperglycemia, fever, excessive glycosuria, and ketonuria all contribute to increased fluid losses.
- Sick day cabinets should contain supplies as above to prevent dehydration.
- Liquids for hydration should contain salt and water and not just plain water, especially if there are ongoing losses associated with vomiting or diarrhea.

¿Qué hacemos?

- Ondansetrón
- Rehidratación oral con Solución de Rehidratación

¿y algo más?

¿le paro la perfusión de insulina?

¿Está hipoglucémico? 88 mgr/dl **NO**

NIVEL	CRITERIO GLUCÉMICO	DESCRIPCIÓN
Hipoglucemia leve (1) Valor de alerta	70-55 mg/dl	Nivel suficientemente bajo para tratamiento, aún sin síntomas
Hipoglucemia moderada (2) Clínicamente significativa	≤ 54 md/dl	Nivel suficientemente bajo con posibles implicaciones médicas
Hipoglucemia grave (3) Complicación aguda	Sin especificar umbral	Hipoglucemia asociada a alteración neurológica grave*

¿Le paro la bomba de insulina?

Hypoglycemia with hyperketonemia, which may occur in the setting of GI illness or starvation, requires administration of insulin along with carbohydrate intake.

Maintaining hydration is essential in every child with diabetes during an acute illness; oral fluids with or without sugar should be consumed depending on the glucose level; consider timely initiation of IV fluids if the child is unable to drink.

Laffel LM, Limbert C, Phelan H, Virmani A, Wood J, Hofer SE. ISPAD Clinical Practice Consensus Guidelines 2018: Sick day management in children and adolescents with diabetes. *Pediatr Diabetes*. 2018 Oct;19

¿Le paro la bomba de insulina?

Phelan H, Hanas R, Hofer SE, James S, Landry A, Lee W, Wood JR, Codner E. Sick day management in children and adolescents with diabetes. *Pediatr Diabetes*. 2022 Nov;23(7):912-925.

Management when vomiting and/or gastrointestinal illness is present

Hypoglycemia with hyperketonemia..., requires administration of insulin along with carbohydrate intake



The “Suspend before low” The low limit was set for the entire study duration at 3.4 mmol/L (61 mg/dL), and the pump would therefore suspend insulin infusion when sensor glucose (SG) was ≤ 7.3 mmol/L or 131 mg/dL (70 mg/dL above the low limit) and mediated to be ≤ 4.5

Predictive Low-Glucose Management System reduced hypoglycemia exposure without compromising glycemic control or quality of life in children and adolescents with type 1 diabetes

Abraham MB, et al. Study Group. Reduction in Hypoglycemia With the Predictive Low-Glucose Management System: A Long-term Randomized Controlled Trial in Adolescents With Type 1 Diabetes. Diabetes Care. 2018 Feb;41(2):303-310.

¿Está hipoglucémico?

NO

¿Tiene riesgo de hipoglucemia?

SI

¿Le paro la bomba de insulina?

**SI, en
predicción de
hipoglucemia**

ESPGHAN 74-111 MMOL/L = 1333 – 2000 mg/dl= 13-20 mgr/ml

500 ml $\simeq$ 1 ración

XXVII REUNIÓN



10:00 Lleva tolerando ya 30 min

Tolera adecuadamente 100 ml de SRO

Nos avisa la madre de que el
sensor capilar marca 60 mg/dl

Asintomático

Cetonemia 0,8 mmol/L

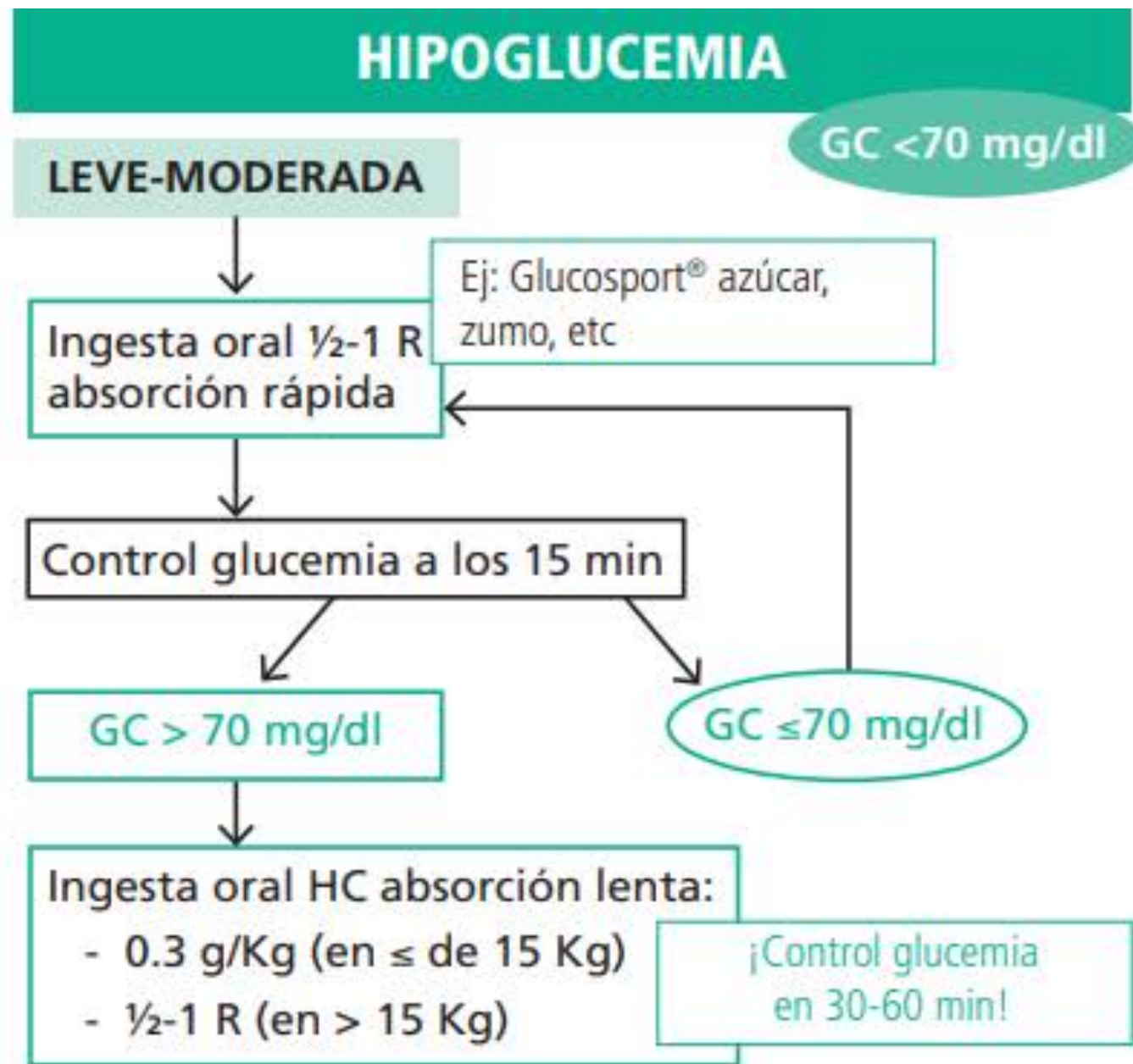


¿Qué hacemos?

¿Y ahora qué?

1. Oxígeno, monitor, vía y suero rápido....está fatal
2. Le doy hidratos de carbono
3. Valoro poner “minidosis de glucagon”
4. Le doy más solución de rehidratación oral
5. Ahora si, rehidratación intravenosa

https://www.seep.es/images/site/gruposTrabajo/enlaces/protocolo_insulin_ISCI_13.pdf



Hipoglucemia sin alteración de conciencia: la mayoría de los casos



- Dar por boca hidratos de carbono de absorción rápida en una cantidad personalizada y acordada con el equipo sanitario (5-15 gramos). Ante la duda, siempre dar más que menos hasta ganar experiencia.

Ejemplos de hidratos carbono absorción rápida:



Geles de glucosa
(suelen contener 5-15 gramos de azúcar, según marcas)



Azúcar blanco
(2 terrones=10 gramos de azúcar)



1 vaso de zumo naranja natural sin pulpa (100 ml =10 gramos de azúcar)



Tetrabrik de zumo
(ver composición de azúcares en la etiqueta)

Hay que elegir los alimentos que le gusten al niño para que los tome rápido. Una vez ingerido:

- Esperar 10-15 minutos en reposo
- Hacer nuevo control de glucemia capilar para confirmar recuperación de la glucemia. Si no se ha normalizado la glucemia (<70 mg/dl): se volverá a repetir la ingesta de hidratos de carbono de absorción rápida. Se esperará de nuevo 15 minutos, estando el niño en reposo, y se repetirá el control.

3 MANTENIMIENTO DE GLUCEMIA

Una vez normalizada la glucemia (>70 mg/dl), se tomarán hidratos de carbono de absorción lenta (5-10 gramos) si no es la hora de una de las comidas. Esto se hace para evitar que la hipoglucemia se repita.

En el caso de hipoglucemia con pérdida de conocimiento, la ingesta se realizará cuando la persona recupere el conocimiento.

carbón absorción lenta:

(Ver composición exacta según marca y etiquetado)



Pan
(20 gramos=10 gr.
de hidratos)



Yogur natural
(aproximadamente
5 gr. de hidratos)



Galletas estilo María
(1= aprox. 5 gr. de hidratos,
ver composición exacta
según marca y etiquetado)



XXVII REUNIÓN



Dr. Roque Cardona Hernández Pediatra endocrinólogo. Jefe Unidad de Diabetes Hospital Sant Joan de Déu.
Barcelona **Abordaje de la hipoglucemia, en vida real, en el niño y adolescente con diabetes tipo 1**

En niños con enfermedad gastrointestinal y mala tolerancia asociada a **vómitos y/o diarrea**, la administración de **mini-dosis de glucagón puede ser un recurso muy útil para evitar hipoglucemias y hospitalizaciones.**

Para administrarla es necesario utilizar una jeringa de insulina de 100 unidades/ml y cargarla con glucagón reconstituido. La dosis a administrar de forma subcutánea depende de la edad: 2 unidades (20 microgramos) en niños menores de 2 años; 1 unidad por cada año de vida, para niños de 3-15 años, con un máximo de 15 unidades (150 microgramos).

En caso que tras la administración de la mini-dosis de glucagón, la glucosa no se eleve durante los primeros 30 minutos, se puede volver a repetir la administración.

11:00

Se ha tomado $\frac{1}{2}$ zumo y 2 galletas

No nuevos vómitos



11:00

Es ya la hora de la media mañana

Pero... Quiere comer menos, solo 2 raciones.



Reiniciamos
la bomba
Que coma



Fotografía tomada de
<https://www.fundaciondiabetes.org/infantil/185/bomba-de-insulina-ninos>

¿y al alta qué?

1. Solución de rehidratación oral tras cada deposición líquida

ESPGHAN 74-111 MMOL/L = 1333 – 2000 mg/dl= 13-20 mgr/ml

500 ml $\simeq$ 1 ración

LAS SRO SON SEGURAS PARA REHIDRATAR A LOS PACIENTES CON DIABETES

¿y al alta qué?

- Solución de rehidratación oral tras cada deposición líquida
- Ajustes de insulina si precisa
- Poner bolos durante o después de las comidas
- Mantener glucemias 70-180 mgr/dl

Controles frecuentes de glucemia + cetonemia

CASO CLÍNICO 3



No trabajo respiratorio

Buen color

Intranquilo, grita...

Motivo consulta:

Lactante 8 meses

Vómitos y diarrea

EVALUACIÓN

TRIAJE

3

- Tª 37 °C, TA 110/60, FC 130 lpm, FR 24 rpm
- Peso 8,8 kg (peso previo sano 9,6 kg (-800 grs, 7,3%))
- Irritable, mucosas algo pastosas....



- Glucemia 120 mg/dl
- EAB: pH 7,30, HCO3 17, EB -9, Na 158, K 3,7

Pierde vía...¿y ahora qué?

1. Es necesario recanalizar vía para pautar una rehidratación
iv
2. Ondansetrón
3. Valorar SNG
4. Intentar rehidratación oral

¿La hipernatremia es contraindicación para la RHO?

- Deshidratación > 10%
- Alteración del nivel de conciencia
- Alteración grave del estado general
- Pérdidas superiores a 10 ml/kg/h
- Ileo paralítico
- Sospecha de patología quirúrgica
- Vómitos incoercibles

8.5.3 Treatment of Hyponatremia

Oral or NG rehydration with hypoosmolar ORS is an effective and safe treatment and has fewer adverse effects than IV rehydration (III, C) (weak recommendation, very low-quality evidence).

If the child is hyponatremic and needs IV rehydration:

- Use an isotonic solution (0.9% saline) for fluid deficit replacement and maintenance (III, C) (strong recommendation, very low-quality evidence).
- Replace the fluid deficit slowly, typically for 48 hours, with the aim of reducing it to $<0.5 \text{ mmol} \cdot \text{L}^{-1} \cdot \text{h}^{-1}$ (III, C) (weak recommendation, very low-quality evidence).
- Monitor plasma sodium frequently (Vb, D) (weak recommendation, very low-quality evidence).

Safe Oral Rehydration of Hypertonic Dehydration

D. Blum, D. Brasseur, A. Kahn, and *E. Brachet

*Departments of Pediatrics and *Physiopathology, U.L.B., Brussels, Belgium*

18 niños con DH hipernatrémica secundaria a GEA (Na 160,06 +/- 2,19)

Rehidratación con SRO hipoosmolar 120 ml/kg/24 horas

No convulsiones

Descenso medio de 0,32 mmol/L/h



50 years of oral rehydration therapy: the solution is still simple

50 years ago, the first study showing that an oral solution of glucose and electrolytes was effective for replacing water and electrolyte losses in cholera was published in *The Lancet*.¹ The 4.6 million annual deaths from diarrhoea in children younger than 5 years estimated in 1980² has fallen to under 500 000 in 2018,³ despite a 70% increase in the world's population. Although several factors contributed to this reduction, as of 2007 it was estimated that oral rehydration therapy (ORT) alone had prevented 54 million diarrhoeal deaths.⁴ In addition, ORT helped reduce the nutritional impact of diarrhoea. In the past, patients with acute watery diarrhoeal diseases often received only sips of water without food, euphemistically called "resting the stomach", which contributed to iatrogenic marasmus.⁵ The resumption of nutritional intake immediately after rehydration, which became standard practice at the Cholera Research Laboratory in Dhaka (now the International Centre for Diarrhoeal Disease Research, Bangladesh—icddr,b) during the

1960s, and a component of the ORT approach, greatly reduced this problem in countries with ORT programmes. A 1978 *Lancet* Editorial noted that the recognition that glucose enhanced sodium and water absorption, which led to the development of ORT, "was potentially the most important medical advance this century".⁶ Since the developmental history of ORT is well documented,⁷ we focus here on five lessons from 50 years of ORT use (panel).

The first lesson is that high-quality scientific evidence is crucial for the development, acceptance, and use of clinical or preventive innovations. Physiological and pathophysiological studies formed the basis for ORT's development. The solution formula, however, had to be coupled to a validated, effective clinical method based on either intake and output measurements or clinical signs. The latter were later simplified for use by mothers of affected infants.

The second lesson is the importance of doing research in the affected areas. Having investigators in

[David R Nalin](#) y [Richard A Cash](#)

Lancet, The, 2018-08-18, Volumen 392, Número 10147, Páginas 536-538

XXVII REUNIÓN





/ [Richard A Cash](#) Lancet, The, 2018-08-18, Volumen 392,
7, Páginas 536-538

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Nalin DR, Cash RA. 50 years of oral rehydration therapy: the solution is still simple. Lancet. 2018 Aug 18;392(10147):536-538



- The ORS formula was based on physiological and pathophysiological studies coupled with sound clinical methodology providing the foundation for its effective clinical use.
- ORT remains underused in some critically affected countries, and programmes to promote its use should be funded to halt deaths from cholera and other acute watery diarrhoeal diseases. **ORT is also underused in high-income countries, and should be promoted to reduce costs and involve family members to improve patient care.**

