

XXVI REUNIÓN PAMPLONA | 16 AL 18 DE JUNIO DE 2022
SOCIEDAD ESPAÑOLA DE
URGENCIAS DE PEDIATRÍA

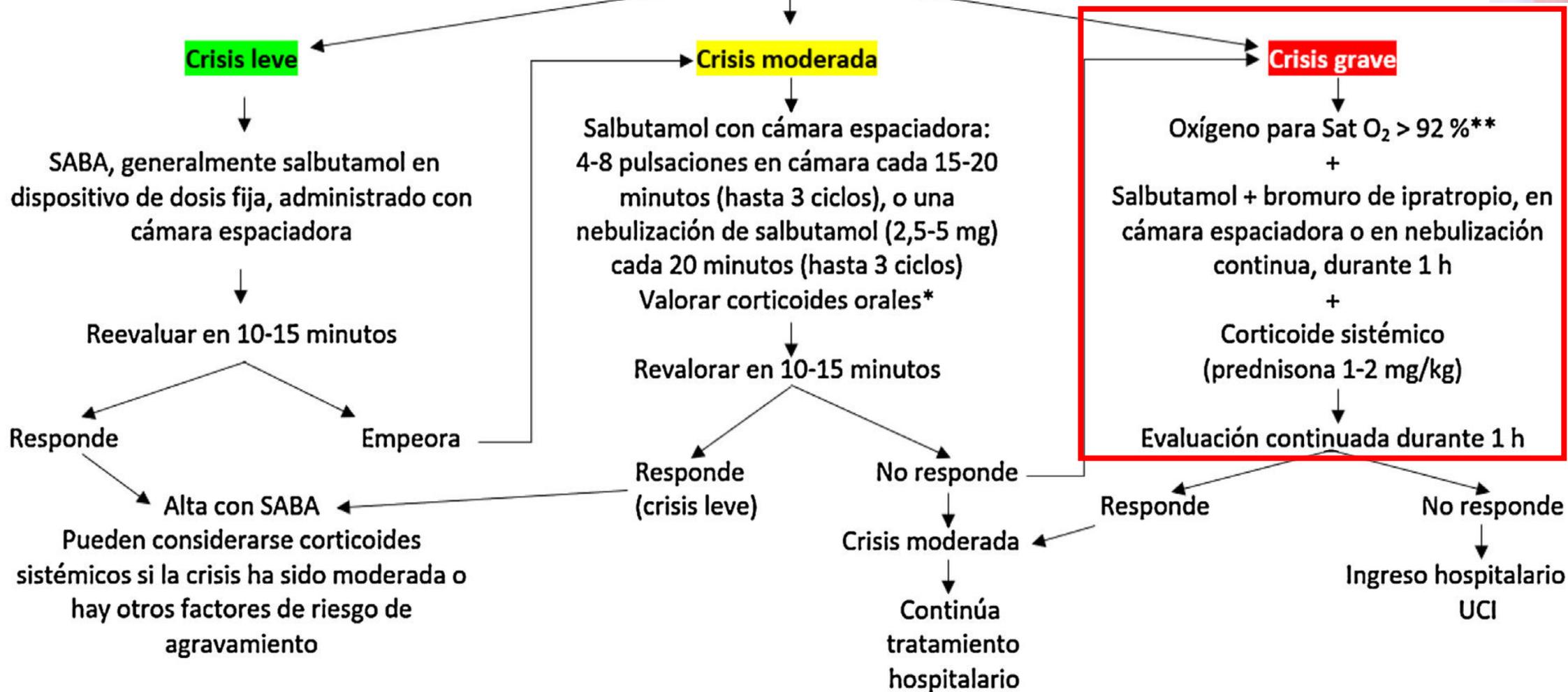


Controversias en Asma...No todo está en la guías ii

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Jefe de Servicio Urgencias
Profesor Agregado Universitat de Barcelona
Hospital Sant Joan de Déu.Barcelona



GRAVEDAD DE LA CRISIS



Beyond the guidelines: Fatal and near-fatal asthma

Paediatric Respiratory Reviews 13 (2012) 106–111

Grades of evidence for interventions in acute severe asthma

Intervention	Level of evidence
Use inhaled β_2 -agonists as primary bronchodilators in acute asthma and administer as early as possible	A1
Use IV or IM β_2 -agonists for those patients in whom inhaled therapy cannot be reliably administered	B1
In asthma that is poorly responsive to an intermittent aerosol of β_2 -agonist, use continuous nebulization	A2
For severe asthma, add nebulized ipratropium bromide. Doses every 30 min should be used early. The dose frequency should be reduced as clinical improvement occurs	B1
Give steroids in all cases of acute asthma. Oral are as effective as IV or IM if patient is able to swallow. Use prednisone 2 mg/kg once daily to a maximum does of 80 mg.	A1
A single dose of IV magnesium sulfate can be given to patients with acute severe asthma. (suggest dose to be used in children)	C1
A single dose of intravenous monteleukast should be considered if given very early	D1
Mucoactive medications should not be used.	D2
Heliox does not provide benefits when used to treat severe asthma	B2
Oxygen should be administered in sufficient amount to maintain peripheral oxygen saturation (SpO ₂) between 0.89 and 0.95	A1
Mechanical ventilation (noninvasive or after endotracheal intubation) should considered for patients with hypoventilation (PaCO ₂ > 60 torr) and respiratory distress	A1
While on mechanical ventilation use a low tidal volume (VT) of 4-6 mL/kg and long exhalation times to minimize barotraumas and dynamic hyperinflation	B1

Evaluación inicial del nivel de gravedad (ESTÁTICA)

Anamnesis, exploración física, FEV₁ o PEF, SaO₂ y otros según indicación

Crisis leve

PEF o FEV₁ ≥ 70 %

- **Salbutamol:** pMDI + cámara 2-4 inhalaciones c/20 min durante la 1ª hora

Crisis moderada-grave

PEF o FEV₁ < 70 %

- **Oxígeno** (FiO₂ < 40 %) si SatO₂ < 92 %
- **Salbutamol + ipratropio:**
 - pMDI + cámara: 4-8 inhalaciones c/10-15 min durante la 1ª hora
 - NEB intermitente: 2,5 mg salbutamol + 0,5 mg ipratropio c/20 min durante la 1ª hora
- **GCS:** prednisona 50 mg VO o hidrocortisona 250 mg EV
- **GCI:** **propionato de fluticasona:** pMDI + cámara: 4 inhalaciones (250 µg c/puls) c/10-15 min o **budesónida:** pMDI + cámara: 4 inhalaciones (200 µg c/puls) c/10-15 min o NEB: 0,5 mg c/20 min durante la 1ª hora
- **Considerar** en las crisis graves: Mg EV, salbutamol EV en perfusión lenta, VMNI

Crisis vital

- Oxígeno
- **Salbutamol + ipratropio** NEB
- **Hidrocortisona**
- Considerar Mg EV; salbutamol EV en perfusión lenta; VMI

Ingreso en UCI

Evaluación I

Tratamiento

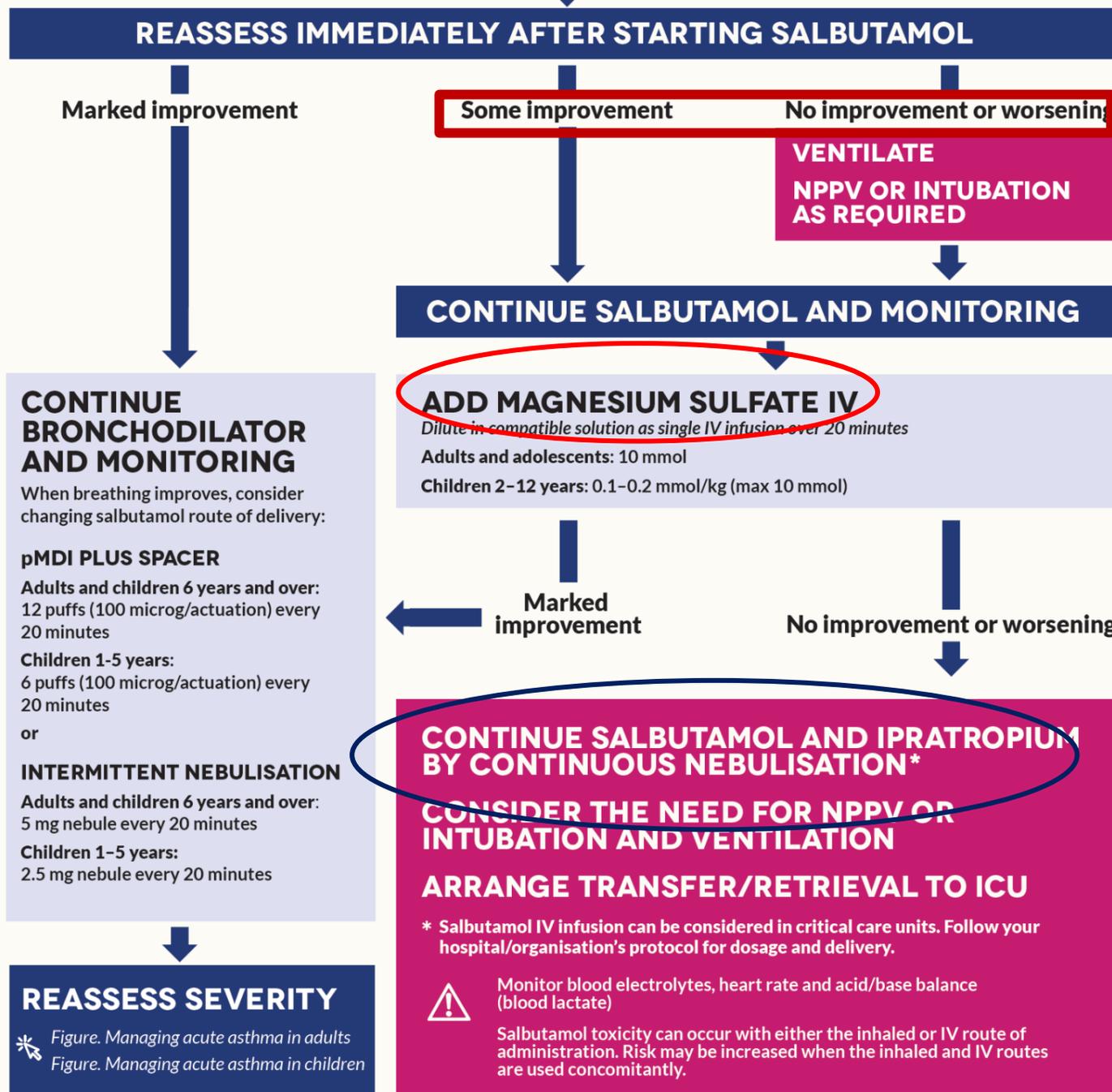


Figure. Managing acute asthma in adults
Figure. Managing acute asthma in children

<p>NO HOSPITAL ADMISSION</p> <p>Continue:</p> <p>SALBUTAMOL every 4-6 h , then tapering doses for 7 days.</p> <p>In children receiving inhaled steroid (ICS) , keep on same therapy</p>	<p>Repeat</p> <p>SALBUTAMOL (Q 20 min. up to 3 doses)</p> <p>and OCS</p> <p><u>Good response</u> <u>Poor response</u></p> <p> </p> <p>SALBUTAMOL</p> <p>OCS</p>	<p>Progressively reduce the frequency of</p> <p>SALBUTAMOL and IPRATROPIUM BROMIDE</p> <p>Then continue only with SALBUTAMOL and OCS.</p>	<p>HOSPITAL ADMISSION</p> <p>Repeat</p> <p>SALBUTAMOL with IPRATROPIUM BROMIDE (Q 20 min up to 3 doses)</p> <p>Continue</p> <p>OCS</p> <p>O2 therapy to achieve SpO2 ≥ 95%</p> <p><u>Good response</u> <u>Poor response</u></p> <p></p>	<p>Tapering doses of</p> <p>SALBUTAMOL and IPRATROPIUM BROMIDE (initially Q hour for 3 times)</p> <p>Continue</p> <p>OCS or systemic</p> <p>O2 to achieve SpO2 ≥ 95%</p>	<p>Repeat</p> <p>SALBUTAMOL and IPRATROPIUM BROMIDE (Q 20 min up to 3 doses)</p> <p>Continue</p> <p>OCS or systemic</p> <p>O2 to achieve SpO2 ≥ 95%</p> <p><u>Poor response</u></p> <p>Consider</p>
	<p>TREAT AS A MODERATE ASTHMA ATTACK</p>		<p>Tapering doses according to clinical response</p> <p>TREAT AS A SEVERE ASTHMA ATTACK</p>		<p>Intravenous magnesium sulphate,</p> <p>intravenous salbutamol ,</p> <p>intravenous aminophylline,</p> <p>admission to PICU</p>

British guideline on the management of asthma

▶ Consider early addition of a **single bolus dose of intravenous salbutamol** (15 micrograms/kg over 10 minutes) in a severe asthma attack where the child has not responded to initial inhaled therapy.



▶ Aminophylline is not recommended in children with mild to moderate acute asthma.

▶ Consider aminophylline for children with severe or life-threatening asthma unresponsive to maximal doses of bronchodilators and steroids.

▶ In children who ~~respond poorly to first line treatments~~, consider the addition of **intravenous magnesium sulphate as first-line** intravenous treatment (40 mg/kg/day).



Heliox

▶ There is no evidence to support the use of heliox for the treatment of acute asthma in childhood.

Pediatric Severe Asthma Algorithm

For children age ≥ 12 months

Recognition of Severe Asthma (age ≥ 12 months)

Severe Respiratory Difficulty

- Pediatric Resp Assessment Measure (PRAM) Score ≥ 8
- Increased work of breathing (WOB), wheeze or silent chest, cough

Impending Respiratory Failure

- Lethargy, cyanosis, decreasing respiratory effort and/or rising PCO₂

May not have asthma diagnosis or previous wheeze

PRAM Scoring Table

SIGNS	0	1	2	3
Suprasternal indrawing	Absent		Present	
Scalene retractions	Absent		Present	
Wheezing	Absent	Expiratory only	Inspiratory +/- expiratory	Audible wheeze / silent chest / minimal air entry
Air entry	Normal	Decreased at bases	Widespread decrease	Absent / minimal
O ₂ Saturation (R/A)	>94%	92 – 94%	<92%	

Initial Management

- Continuous cardiopulmonary monitoring
- Administer oxygen to maintain SpO₂ >92%
- Administer salbutamol + ipratropium **q20 min x 3** consecutive treatments, via nebulizer or metered dose inhaler (MDI) as per table below:

Weight	Salbutamol	Ipratropium
Less than 20 kg	MDI: 5 puffs OR Nebule: 2.5 mg	MDI: 4 puffs OR Nebule: 250 mcg
Greater than or equal to 20 kg	MDI: 10 puffs OR Nebule: 5 mg	MDI: 4 puffs OR Nebule: 250 mcg

- Administer oral steroid as soon as possible
- **Dexamethasone** 0.6 mg/kg (MAX 12 mg)
- Assess perfusion, consider IV access and fluids
- If impending respiratory failure administer:

Magnesium sulfate 50 mg/kg IV (MAX 2 g) over 20 min, check BP q5 min during infusion, then q30 min



Reassess vitals and SpO₂, WOB, perfusion and PRAM score

PRAM Score 4 – 7 (Improved)

- Continue salbutamol q30-60 min PRN
- Monitor closely for any clinical deterioration
- Assess need for admission/transfer at 4 hours post steroid administration and discuss with Pediatric Referral Site
- Ensure adequate hydration via PO/IV fluids

CAUTION!

- **Avoid intubation**
- Magnesium sulfate may cause severe hypotension
 - Decrease infusion rate and treat with bolus fluids
- Consider other diagnoses if clinical status deteriorates with fluid administration (myocarditis/cardiogenic shock)
- Consider pneumothorax in patients who deteriorate/fail to improve

Discuss with Pediatric Referral Centre

PRAM ≥8 or IMPENDING RESPIRATORY FAILURE

- Continuous nebulized salbutamol at above doses
- IV access x 2; IO access if 2 failed IV attempts
 - IV NS bolus 20 mL/kg over 15 min
- Administer (if not already given):
 - IV steroid: **Hydrocortisone** 8 mg/kg IV (MAX 400 mg)
 - **Magnesium sulfate** 50 mg/kg IV (MAX 2 g) over 20 min; check BP q5 min during infusion, then q30 min
- Consider IM epinephrine if allergy suspected
 - Dose: 0.01 mg/kg (1 mg/mL), MAX 0.5 mg
- Consider CXR

Alert Pediatric Referral Centre

Management of Respiratory Failure

STEPWISE STRATEGY:

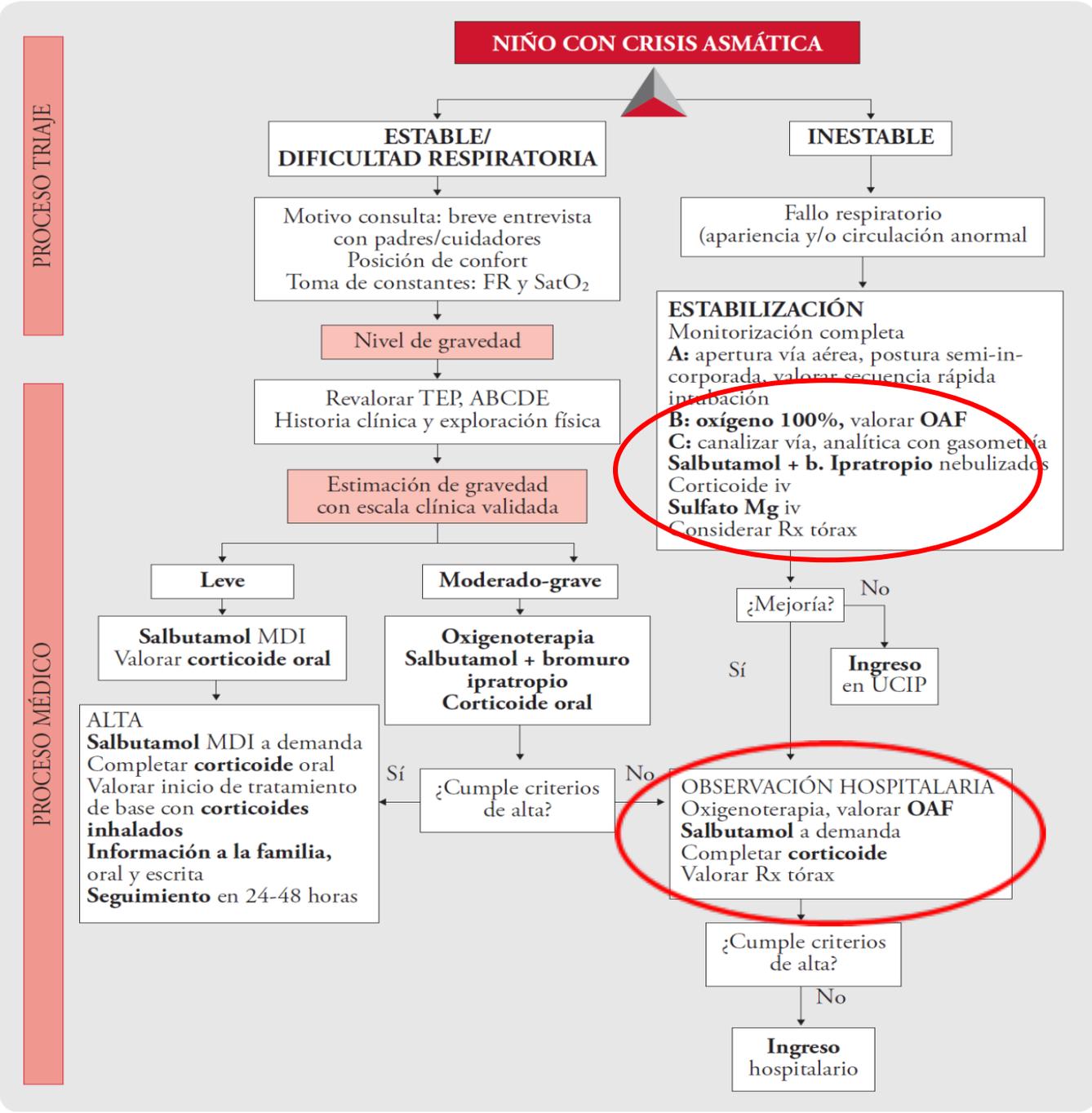
1. Administer high flow O₂ if available
 2. CPAP MIN 5 cm H₂O (MAX 10 cm H₂O)
 3. Transition to BiPAP if needed, PEEP min 5 cm H₂O, keeping a minimum delta P of 5
- Assess for pneumothorax/barotrauma
 - Intubation is a *high-risk procedure* and is rarely required

Pediatric Referral Centre Discussion

CONSIDERATION OF:

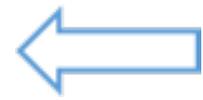
- Airway management
- Difficult vascular access
- Persistent/severe resp distress/impending resp failure
- Concern for underlying cardiac problem
- Pneumothorax or other barotrauma





PROCESO TRIAJE

PROCESO MÉDICO



Current practices in children with severe acute asthma across Europe

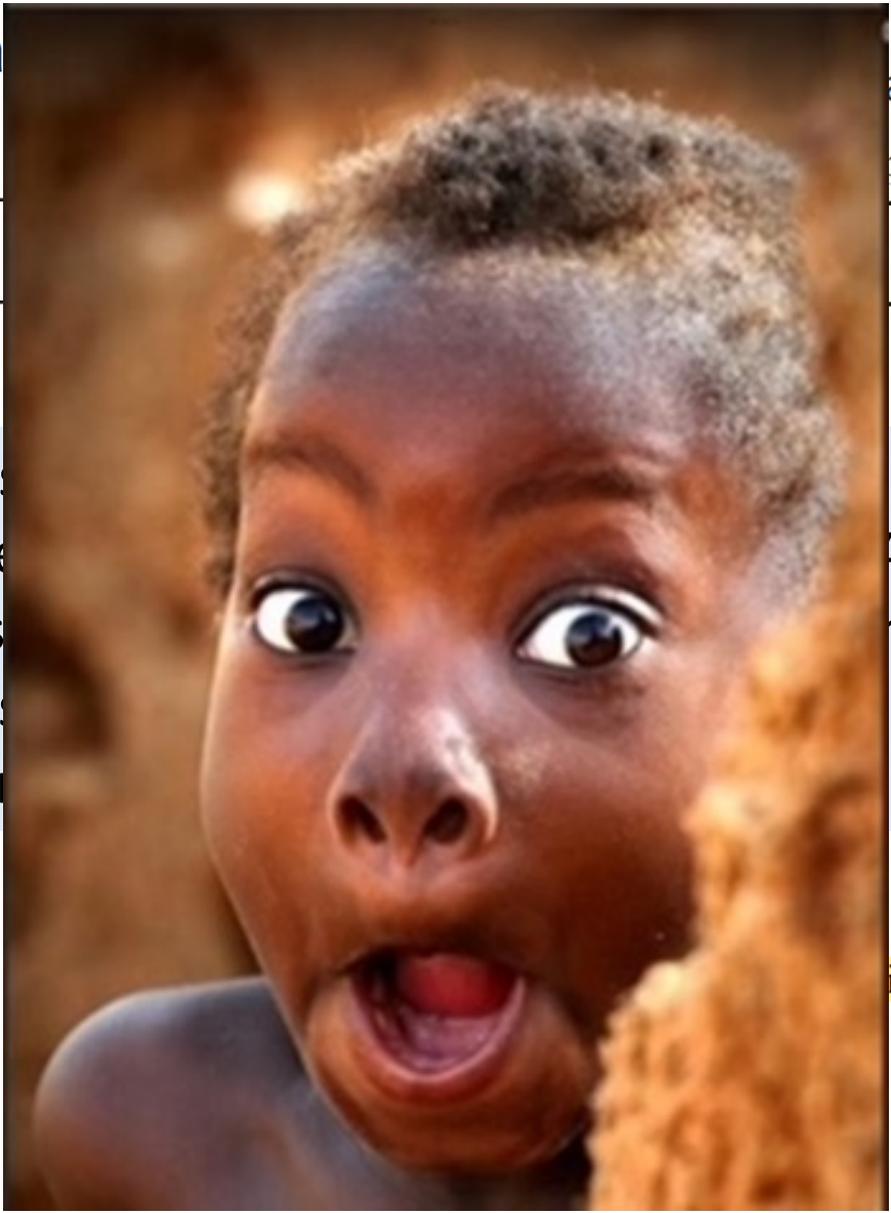
European Journal of Pediatrics (2020) 179:455–461

Support in children with SAA

Table 4 Medication used in the treatment of

Medication	N of PICU (% , N = 37)
Inhalation with salbutamol	
Systemic corticosteroid ^a	17 (46)
IV	
Oral or IV	
Inhalation with	
IV MgSO ₄ ^b	
25 mg/kg	
40 mg/kg	
50 mg/kg	
> 50 mg/kg	
SABA IV loading dose ^c	
Salbutamol	
Reproterol ^d	
< 10 mcg/kg	
10–15 mcg/kg	

- 37 UCI de 11 paí
- 8 no disponen de
- Beta 2 inhalados
- 18 utilizan score
- 17 reportan un i



3 (43) 31–50%

Asma
n corticoides y MgSO₄ ev
rave

ilation

7 (19)
5 (14)
4 (11)
24 (65)
7 (19)
2 (5)

Interventions for escalation of therapy for acute exacerbations of asthma in children: an overview of Cochrane Reviews (Review)

Table 1
Summary of included reviews.

Treatment modality	Comparison	Number of studies involving children	Total of children included in review
Inhaled treatment	Continuous vs. intermittent SABAs	1	70
	Addition of anticholinergic therapy to SABAs for initial treatment	20	2632
	Anticholinergic therapy added to SABAs in hospitalised patients	4	472
	Inhaled magnesium sulfate	8	1247
Parenteral treatment	IV aminophylline added to inhaled bronchodilators	7	380
	IV SABA added to inhaled SABA	2	73
	IV SABA vs. IV aminophylline	4	168
	IV magnesium sulfate	5	182
	IV ketamine	1	68
Interventions to reduce the work of breathing	Heliox	3	82
	Non-invasive positive-pressure ventilation	2	40
Other interventions	Antibiotics	3	133
	Leukotriene-receptor antagonists	4	470

SABA: short-acting beta agonist; IV: intravenous.

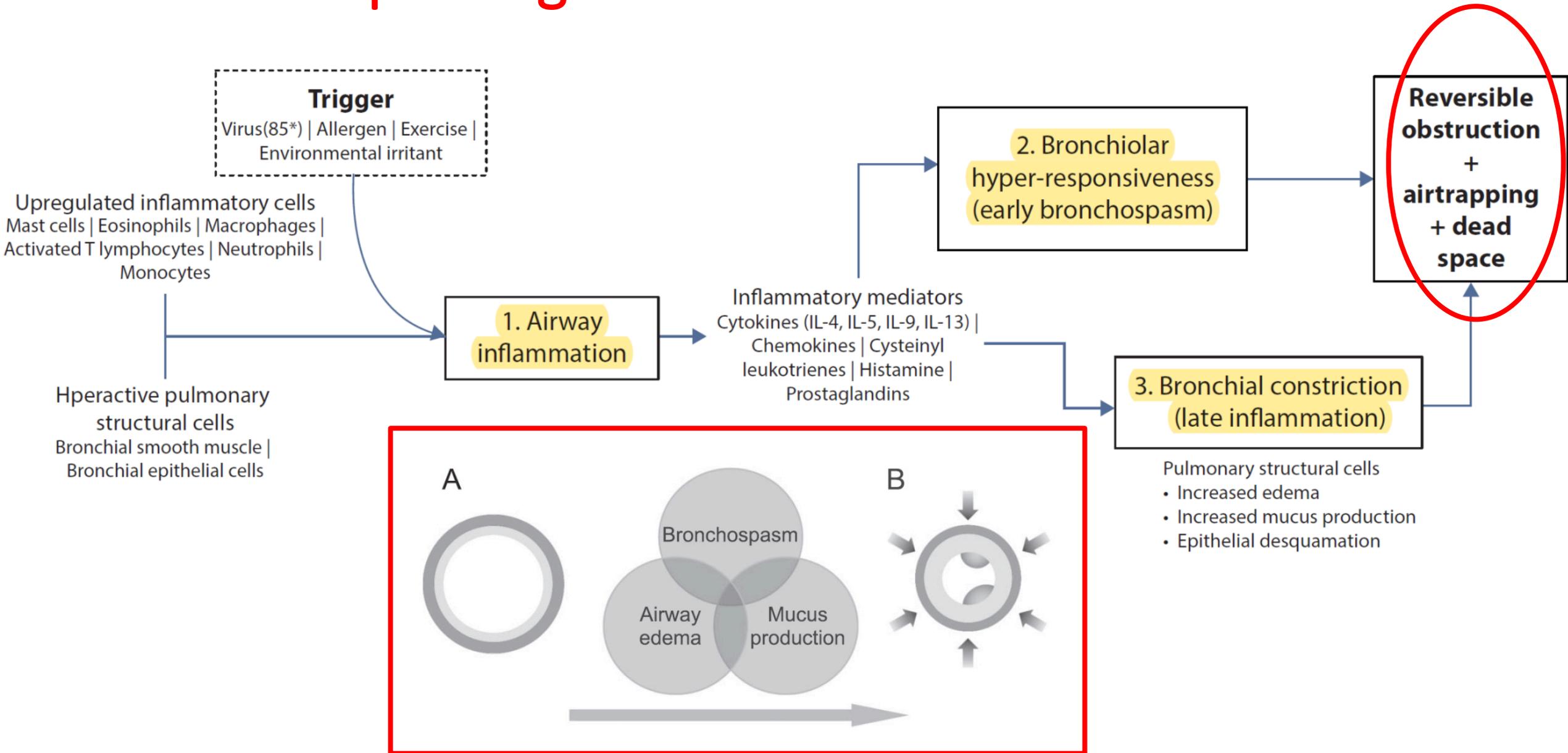
Interventions for escalation of therapy for acute exacerbations of asthma in children: an overview of Cochrane Reviews (Review)

Cochrane Database of Systematic Reviews 2020, Issue 8. Art. No.: CD012977.

- Sulfato Mg ev reduce la **estancia hospitalaria**
- Ninguna intervención **reduce significativamente el ingreso en UCI**
- La combinación con Bromuro de Ipratropio, el Sulfato Mg y el Heliox nebulizado **reducen la necesidad de ingreso hospitalario**
- La combinación de Sulfato Mg inhalado con broncodilatadores **reduce los efectos adversos** en pacientes hospitalizados
- La aminofilina ev produce un **mayor número de casos de vómitos y nauseas** comparada con los beta 2
- La combinación de anticolinérgicos con beta 2 **reduce el temblor y los vómitos pero no las nauseas**

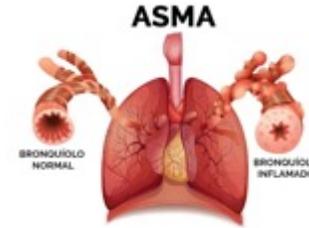


Fisiopatología del Asma



Tipos de Intervención

- Antiinflamatorios



- Disminución del trabajo respiratorio



Antiinflamatorio

Early use of inhaled corticosteroids in the emergency department treatment of acute asthma (Review)

Cochrane Database of Systematic Reviews 2012, Issue 12. Art. No.: CD002308.

Effectiveness of inhaled corticosteroids in the treatment of acute asthma in children in the emergency department: A meta-analysis

Annals of Medicine, 46:1, 24-30, (2014)

Budesonide Reduces Hospital Admission Rates in Preschool Children with Acute Wheezing

Pediatric Pulmonology 52:720–728 (2017)

Role of Inhaled Corticosteroids for Asthma Exacerbation in Children: An Updated Meta-Analysis

Journal of Emergencies, Trauma, and Shock | Volume 13 | Issue 2 | April-June 2020

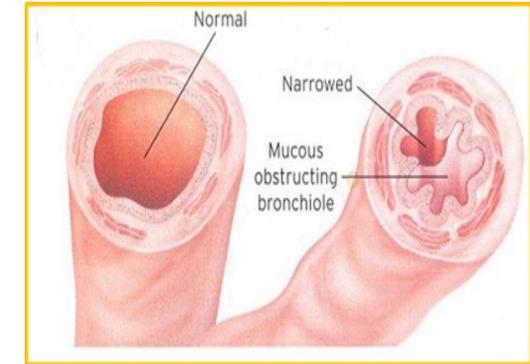


Table 4. Recommended corticosteroids for acute asthma medications in children.^{7,11,15,16}

Name	AAE severity indication	Route	Dosage ^a	Frequency/course	Comments
Prednisone/ prednisolone	Moderate/severe (consider in mild)	Oral	1 mg/kg/dose (max 60 mg/ dose)	Once or twice daily x 3–5 days	Adrenal suppression may occur with repeat doses
Dexamethasone	Moderate/severe (consider in mild)	Oral	0.15–0.3 mg/ kg/dose (max 10–16mg)	One dose or two doses spaced 24 hours apart	i.v. administration possible but less preferred Decreased vomiting compared to prednisone/prednisolone
Methylprednisolone	Severe/critical	i.v.	1–2 mg/kg/day (max 60 mg/ day)	Every 6 or 12 hours x 3–5 days	Less mineralocorticoid effects than hydrocortisone
Hydrocortisone	Severe/critical	i.v.	5–7 mg/kg dose (max 400 mg/dose)	Every 6 hours	

Fluticasona / Budesonida Moderada inh 500 mcg / 800 mcg cada 10-15 m coadyuvante con vía oral



Continuous Albuterol in Pediatric Acute Care: Study Demonstrates Safety Outside the Intensive Care Unit

Amanda F. Messer, MD*; Esther M. Sampayo, MD, MPH†; Brent Mothner, MD‡; Elizabeth A. Camp, PhD‡; Jennifer Jones, MS‡; Terri Brown, MSN, RN, CPN§; Joyee Vachani, MD, Med‡

(Pediatr Qual Saf 2019;4:e225;

Prevalence and risk factors of lactic acidosis in children with acute moderate and severe asthma, a prospective observational study

European Journal of Pediatrics (2021) 180:1125–1131

Combined inhaled anticholinergics and short-acting beta₂-agonists for initial treatment of acute asthma in children

Benedict Griffiths¹, Francine M Ducharme^{2,3}

Pediatr Crit Care Med 2013



SJD So Bo **Table 5. Recommended primary bronchodilators for acute asthma exacerbations in children**

Name	AAE severity indication	Route	Dosage ^a	Frequency/course	Comments
Salbutamol (albuterol)	Home/mild/moderate	MDI with spacer	(100 µg/puff) Home: 2–6 puffs Mild/moderate: 4 puffs (<20 kg) or 8 puffs (>20 kg)	Home: every 20 minutes (max: 2 sets) Mild/moderate: every 20 min for the first hour, then every 30–60 min as needed	Repeat doses optional for mild AAE
Salbutamol (albuterol)	Severe/critical	Nebulizer	2.5 mg (<20 kg) or 5 mg (>20 kg)	Every 20 minutes for the first hour OR continuous for 60–180 min, then every 30–60 min as needed	– If available, continuous is preferred ←
		Continuo	0,25-0,5 mg/Kg/h (máx. 15mg/h)	4 horas.Bomba:12.5 cc / h	– Monitor potassium

Table 6. Recommended adjunct bronchodilators for acute asthma exacerbations in children.^{7,11,15,16}

Name	AAE severity indication	Route	Dosage ^a	Frequency/course	Comments
Ipratropium bromide	Moderate/severe	MDI with spacer	(17 µg/puff) 3–4 puffs (<20 kg) 6–8 puffs (>20 kg)	Every 20 minutes for first hour	
Ipratropium bromide	Severe/critical	Nebulizer	250 µg (<20 kg) or 500 µg (>20 kg)	Every 20 minutes for first hour	Can mix with salbutamol nebulization

Broncodilatadores nebulizados

Asthma Frequently Asked Questions

Question 5: Magnesium Sulphate for Acute Asthma in children

[Paediatric Respiratory Reviews 36 \(2020\) 112–117](#)

JAMA | **Original Investigation**

Effect of Nebulized Magnesium vs Placebo Added to Albuterol on Hospitalization Among Children With Refractory Acute Asthma Treated in the Emergency Department

A Randomized Clinical Trial

[JAMA. 2020;324\(20\):2038-2047.](#)

Therapeutics effects of inhaled magnesium sulfate combined with adrenergic beta-2 agonist on children with acute asthma: Systematic review and meta-analysis

[Journal of Pediatric Nursing xxx \(xxxx\) xxx 2022](#)



Inhalación versus Nebulización



Cochrane Database of Systematic Reviews

Cochrane Database of Systematic Reviews 2013, Issue 9. Art. No.: CD000052.

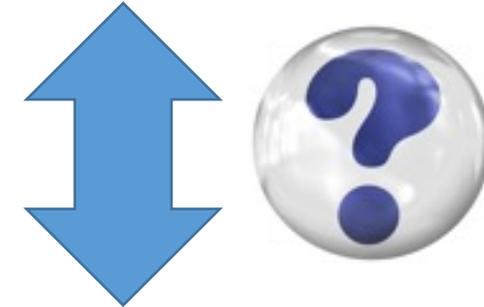
Holding chambers (spacers) versus nebulisers for beta-agonist treatment of acute asthma (Review)

Salbutamol and ipratropium by inhaler is superior to nebulizer in children with severe acute asthma exacerbation: Randomized clinical trial

Pediatric Pulmonology. 2019;54:372–377.

A comparison of the costs of bronchodilator delivery methods in children with asthma exacerbations treated in hospital. The first Polish study in children

Adv Dermatol Allergol 2021; XXXVIII (6): 1011–1016



Broncodilatadores endovenosos

▶ Travers AH, Milan SJ, Jones AP, Camargo CA, Jr., Rowe BH. Addition of intravenous $\beta(2)$ -agonists to inhaled $\beta(2)$ -agonists for acute asthma. Cochrane Database Syst Rev 2012;12:CD010179.

▶ Travers AH, Jones AP, Camargo CA, Jr., Milan SJ, Rowe BH. Intravenous $\beta(2)$ -agonists versus intravenous aminophylline for acute asthma. Cochrane Database Syst Rev 2012;(12):CD010256.

▶ Safety of Terbutaline for Treatment of Acute Severe Pediatric Asthma
Doymaz, Sule MD; Schneider, James MD

Pediatric Emergency Care: [May 2018](#)





Table 7. Recommended secondary bronchodilators and critical care medicines for acute asthma exacerbations in children.^{7,11,15,16}

Name	AAE severity indication	Route	Dosage ^a	Frequency/course
Aminophylline	Critical	i.v.	5 mg/kg loading dose (omit if on baseline oral theophylline) followed by 1 mg/kg/h infusion	Infusion monitored by ICU Narrow therapeutic index
Salbutamol	Critical	i.v.	7.5 µg/kg bolus over 5 min OR 15 µg/kg bolus over 10 min, followed by 1–2 µg/kg/min infusion (max 5 µg/kg/min)	Infusion monitored by ICU
Terbutaline	Critical	s.c./i.v.	s.c.: 0.01 mg/kg (max 0.25 mg/dose) i.v.: 2–10 µg/kg over 10 min, then 0.1–10 µg/kg/min infusion	s.c.: Every 20 min for first hour, then every 2–6 hours as needed
Epinephrine	Critical Anafilaxia	i.m.	1 mg/mL (1:1000) 0.01 mg/kg (max 0.5 mg)	Every 20 min for first hour
Ketamine	Critical	i.v.	Bolus 1–2 mg/kg, followed by 20–60 µg/kg/min infusion	



Broncodilatadores endovenosos

Review

▶ Stating the obvious: intravenous magnesium sulphate should be the first parenteral bronchodilator in paediatric asthma exacerbations unresponsive to first-line therapy *Breathe* | 2021 | Volume 17 | No 4

▶ Continuous Magnesium Sulfate Infusions for Status Asthmaticus in Children: A Systematic Review

Peter N. Johnson¹, Anna Sahlstrom Drury² and Neha Gupta^{3}*

Front. Pediatr. 10:853574.2022.853574

▶ Early versus delayed administration of intravenous magnesium sulfate for pediatric asthma

American Journal of Emergency Medicine 50 (2021) 36–40



Magnesium sulfate	Moderate/severe/critical	i.v.	25–50 mg/kg i.v. bolus over 20–30 min (maximum 2 g)	<ul style="list-style-type: none"> – Watch for hypotension – Consider higher doses (75 mg/kg i.v.) for critical AAE
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Disminución del trabajo respiratorio. Heliox

▶ Helium/oxygen-driven albuterol nebulization in the management of children with status asthmaticus: A randomized, placebo-controlled trial*

Pediatr Crit Care Med 2010 Vol. 11, No. 3

▶ Heliox-driven β_2 -agonists nebulization for children and adults with acute asthma: a systematic review with meta-analysis

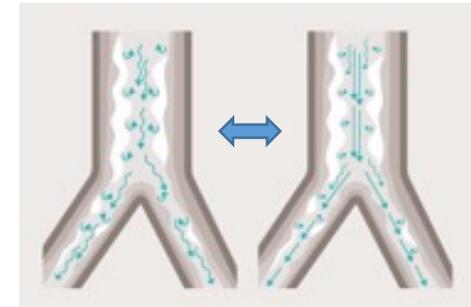
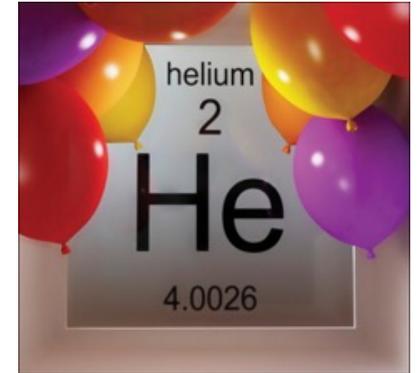
Gustavo J. Rodrigo, MD*; and Jose A. Castro-Rodriguez, MD, PhD†

Ann Allergy Asthma Immunol 112 (2014) 29e34

▶ *Heliox for Pediatric Critical Asthma: A Multicenter, Retrospective, Registry-Based Descriptive Study*

Alicia Lew , John M Morrison , Ernest Amankwah , Anthony A Sochet

J Intensive Care Med . 2021



Disminución del trabajo respiratorio. Alto Flujo

Pilot Clinical Trial of High-Flow Oxygen Therapy in Children with Asthma in the Emergency Service

(*J Pediatr* 2018;194:204-10).

Review

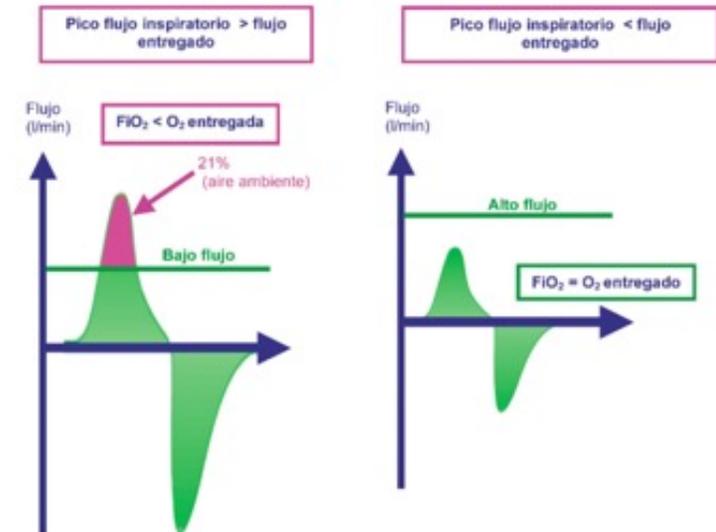
High-flow nasal cannula in children with asthma exacerbation: A review of current evidence

Ke-Yun Chao ^{a,b}, Yu-Hsuan Chien ^c, Shu-Chi Mu ^{c,d,*}

Paediatric Respiratory Reviews 40 (2021) 52–57

Nasal High-flow Oxygen Versus Conventional Oxygen Therapy for Acute Severe Asthma Patients: A Pilot Randomized Controlled Trial

ACADEMIC EMERGENCY MEDICINE 2021;28:530–541



High-Flow Nasal Cannula in Pediatric Critical Asthma

Rachel M Gates, Kaitlyn E Haynes, Kyle J Rehder, Kanecia O Zimmerman, Alexandre T Rotta,
and Andrew G Miller

RESPIRATORY CARE • AUGUST 2021



High flow nasal cannula oxygen therapy in patients with asthmatic crisis in the pediatric emergency department

Oxigenoterapia por cánula nasal de alto flujo en pacientes con crisis asmática en un departamento de emergencia pediátrica

Rodolfo Gauto Benitez*, Laura Patricia Morilla Sanabria*,
Viviana Pavlicich*, Mirta Mesquita*



Cánulas de Alto Flujo vs Ventilación NO invasiva



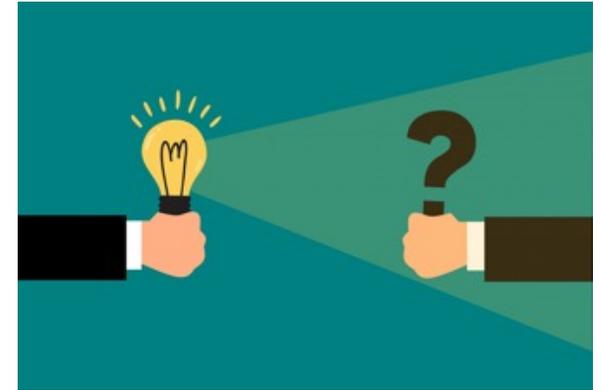
High-flow nasal cannula therapy versus non-invasive ventilation in children with severe acute asthma exacerbation: An observational cohort study

Med Intensiva. 2017;41(7):418–424



High-flow nasal cannula and bilevel positive airway pressure for pediatric status asthmaticus: a single center, retrospective descriptive and comparative cohort study

JOURNAL OF ASTHMA
2022, VOL. 59, NO. 4, 757–764



Ventilación NO invasiva. CPAP / BiPAP

Management of severe asthma exacerbation: guidelines from the Société Française de Médecine d'Urgence, the Société de Réanimation de Langue Française and the French Group for Pediatric Intensive Care and Emergencies

Check for updates



Ann. Intensive Care (2019) 9:115

Noninvasive Ventilation Use in Critically Ill Patients with Acute Asthma Exacerbations

Am J Respir Crit Care Med Vol 202, Iss 11, pp 1520–1530, Dec 1, 2020

CPAP: 5 cmH₂O

BIPAP: IPAP 8 cmH₂O; EPAP 5 cmH₂O

Nebulización en pacientes con VNI

Base of Use

Quick and easy to set up using plug and play technology with the Aerogen ACDC adaptor.



2 modes of operation

- 30 minute mode
- 6 hour mode

Multi-functional

Can be used with the Aerogen Solo and the Aerogen Ultra.



ORIGINAL

Safety of aerosol therapy in children during noninvasive ventilation with helmet and total face mask [Med Intensiva. 2019;43\(8\):474-479](#)

Otros Tratamientos

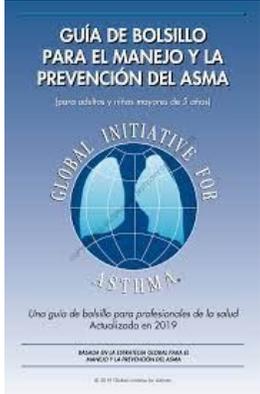
- **Antibióticos**
 - Macrólidos
- **Agentes anestésicos**
 - Isoflurane
 - Sevoflurane
- **Enoximona**
 - Inhibidor selectivo de fosfodiesterasa III
- **Moduladores de Leucotrienos**
 - Monteleukast, Zafirlukast
- **Ketamina, Adrenalina IM / SC (Anafilaxia)**



**Interventions for
asthma in children**



**Cochrane
Library**





Progresión Terapéutica

➤ Antiinflamatorios + broncodilatadores

- Combinación de salbutamol y anticolinérgicos (inhal / nebul)
- Corticoides de forma precoz (oral ± inhalado???)
- Salbutamol en nebulización continua
- Corticoides altas dosis ev
- Sulfato Mg ev (bolus vs continuo)

➤ Disminución trabajo respiratorio

- Cánulas de alto flujo (?)
- Ventilación No Invasiva (CPAP / BiPAP)
Nebulización Salbutamol (*Heliox como adyuvante ???*)
- Ventilación Invasiva
Salbutamol ev / Terbutalina ev / Aminofilina ev





Este aplauso es para agradecer vuestra atención

“Hice algo útil con mi vida,
hice Medicina de
Emergencias”

Muchas gracias

Peter Rosen, MD
(1935-2019)

en, MD
or, DEM