



Manejo de la crisis asmática en Urgencias. No solo fármacos..¡ También soporte respiratorio.

Departamento de Emergencia Pediátrica CHPR
Prof. Dr. Javier Prego



ITEM PLANTEADO	CONFLICTO DE INTERESES PARA DECLARAR SI/NO
SCIENTIFIC ADVISORY BOARD	NO
INVESTIGACIÓN PARA LA INDUSTRIA	NO
EMPLEADO/A	NO
ACCIONISTA	NO
CONSULTOR/A	NO
DISERTANTE	NO
HONORARIOS	NO

Centro Hospitalario Pereira Rossell

Montevideo, Uruguay



Hospital Materno Infantil
Centro de Referencia
Sub-sector público
50.000 consultas/año en DEP



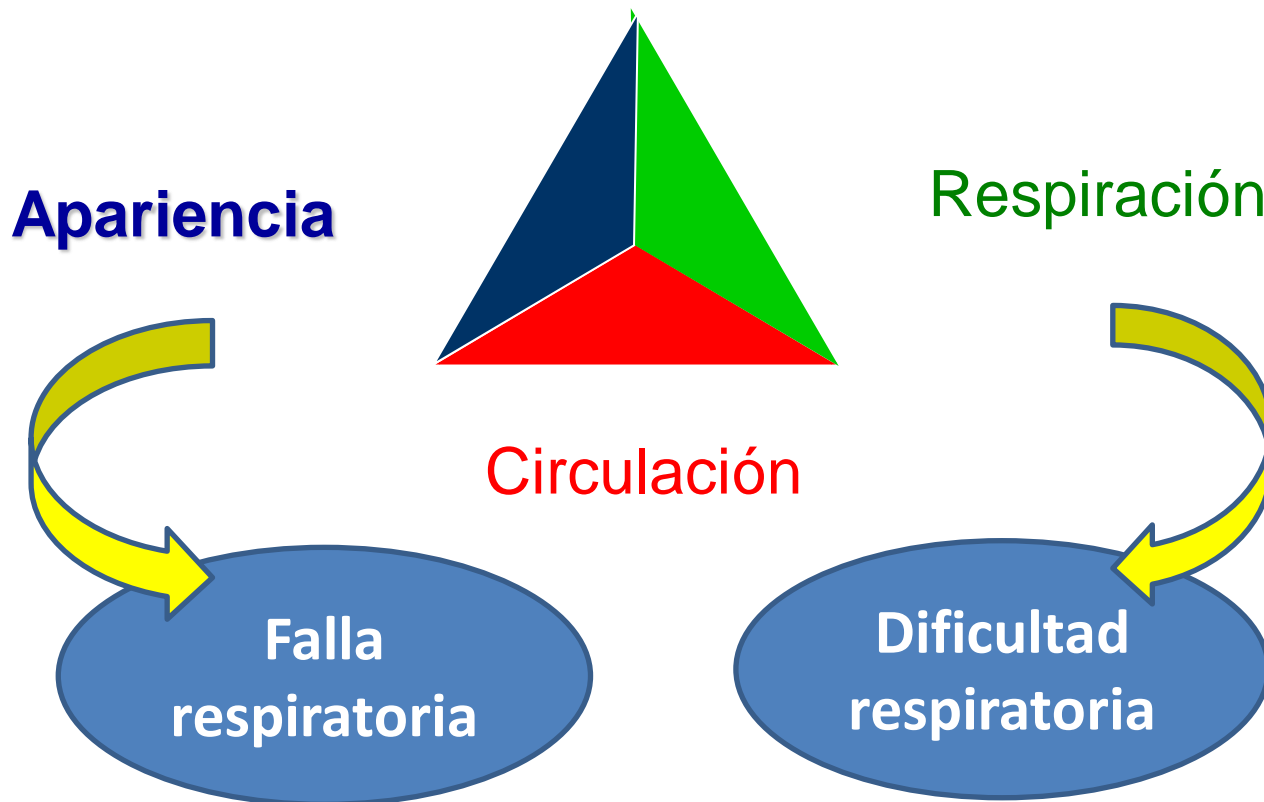
Tratamiento de la crisis asmática

- Debilidades:
 - Dificultad en la clasificación de la crisis
 - Leve
 - Moderada
 - Severa
 - Sub-estimación de crisis severa
 - Desconocer tratamientos correctos en la etapa pre-hospitalaria
 - Menores dosis de fármacos a las recomendadas
 - Prolongación del tiempo de asistencia ante falta de respuesta inicial sin aumentar intensidad del tratamiento
 - Demora en iniciar soporte respiratorio no invasivo





















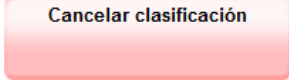
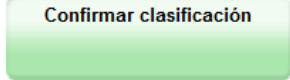




















Evaluación inicial - Severidad

Evaluación inicial - Severidad

Alteración fisiológica Triángulo de Evaluación Pediátrica



MAT – SET web_e-PAT

 Parada respiratoria y/o cardiorrespiratoria	 Choque	 Inconsciente (AVPN = 3)	 Situaciones de agitación y violencia extrema	 Convulsiones generalizadas activas
 Gran quemado	 Obstrucción de la vía aerea/parada respiratoria inminente	 Hemorragia masiva incontrolable	 Trauma grave	 Presentación de partes fetales/Prolapso del cordón umbilical
 Paciente psiquiátrico	 Signos y/o constantes vitales	 Dolor	 Estado emocional	 Nivel de conciencia
 Riesgo epidémico	zona Ayuda  Valoraremos inicialmente la necesidad de reanimación, contención activa o ayuda al parto. Una vez descartado el nivel I, evaluaremos los signos y/o constantes vitales, la presencia de dolor y el estado emocional. Será importante valorar la presencia de factores de riesgo o situaciones específicas que pueden aumentar el nivel de urgencia y/o de complejidad, al igual que evaluar algunas manifestaciones que se miden como escalas de gravedad.		zona Datos personales Datos del paciente Penélope Dieza Catorce Edad 12 (>= 10 años y < 14 años) NHC: 55555555	
 Diabético	Datos del profesional Sant Joan de Deu Médico		 Dificultad respiratoria	
 Inmunodeprimido / Crónico				
 Hipertenso	 Fiebre			
 Embarazada	 Deshidratación			
 Dolor torácico	 Hemorragia			
 Cefalea y/o cervicálgia	 Focalidad neurológica	 Convulsiones	 Inestabilidad, lipotimia / síncope y malestar general	
 Síntomas oculares	 Síntomas otorrinolaringológicos	 Alergia y reacciones cutáneas	 Síntomas digestivos	 Síntomas uro-ginecológicos
 Intoxicación	 Agresión/negligencia	 Abuso sexual	 Alteración del tronco y extremidades no traumática	 Lesiones y traumatismos

Niveles de prioridad

<u>Nivel</u>	<u>Asistencia médica</u>	<u>Clasificación</u>
Nivel I	Inmediato	Resucitación
Nivel II	10min.	EMERGENCIA
Nivel III	30 min.	URGENCIA
Nivel IV	120 min.	SEMI-URGENCIA
Nivel V	180 min.	NO URGENCIA

Evaluación inicial - Severidad

SCORE WOOD DOWNES MODIFICADO*

VARIABLE	0	1	2
Cianosis	No	Al aire	Fi O2 0.4
Sat Hb	93 -100% VEA	<93% VEA	<93 % Fio2 0.4
PaO2 mmhg	70-100VEA	<70 VEA	<70 Fio2 0.4
Ruidos insp	Normal	asimétricos	Dism. Ausen
Uso musc accesorios	NO	MOD	Max
Sibilan esp	NO	MOD	Marcado
Conciencia	Normal	Depr.o agita	Coma
* Score igual o mayor a 5 es igual a I.R			

SCORE ASMA PEDIÁTRICO (PAS)

Puntaje	FR	Sat O2	Tirajes	Sibilancias	Disnea
1	1-4 años <34 5-6 años <30 7-12 años <26	>95% VEA	Sin tiraje o intercostal	Final espiración	Habla fluido
2	1-4 años 34-39 5-6 años 30-34 6-12 años 26-30	90-95% VEA	Intercostal y subesternal	Espiración	Oraciones cortas
3	1-4 años >39 4-6 años >34 6-12 años >30	<90% VEA con O2	Intercostal, subesternal y supraclavicular	Espiración Inspiración	Palabras sueltas

Leve 5-7

Moderado 8-11

Severo 12-15

Pulmonary score index

score	Respiratory rate		wheezing	Accessory muscles involvement (sternocleidomastoid muscle etc)
	<6yrs	>6yrs		
0	<30	<20	no	none
1	31-45	21-35	Terminal expiration	Questionable ,increase
2	46-60	36-50	Throughout expiration	Increase apparently
3	>60	>50	Inspiration expiration	All muscles involved
	0-3-mild 4-6 –moderate >6 (6-9)--severe			

Varios scores de severidad

	Items in Score	Validity Measures	Reliability Measures
Asthma Severity Score (ASS) (3)	Wheeze (0-3), Heart rate (0-3), Accessory Muscle Use (0-3)	1. Physician severity judgment, 2. Oxygen saturation, 3. PEFR	1. Interobserver reliability
Preschool Respiratory Assessment Measure (PRAM) (4)	Wheeze (0-3), Air entry (0-3), Scalene contractions (0-2), Suprasternal retractions (0-2), oxygen saturation (0-2)	1. Resistance to forced oscillation (RFO), 2. Clinician and parent severity judgment, 3. Change in score correlation with change in RFO	1. interobserver reliability, 2. internal consistency
Pulmonary Index (PI) (5)	Wheeze (0-3), Respiratory Rate (0-3), Inspiratory/Expiratory ratio (0-3), Accessory Muscle Use (0-3)	1. Spirometry, 2. ED Disposition, 3. Change in score with treatment during ED course	
Pulmonary Score (PS) (16)	Wheeze (0-3), Respiratory rate (0-3), Sternocleidomastoid use (0-3)	1. PEFR, 2. Change in score with treatment during ED course	
Pediatric Asthma Severity Score (2)	Wheezing, Prolonged Expiration, Work of Breathing	1. PEFR, 2. Oxygen Saturation, 3. Responsiveness to treatment, 4. Hospital admission	1. interobserver reliability good to excellent



Initial Asthma Severity Assessment Tools as Predictors of Hospitalization.

Paniagua N, Elosegí A, Duo I, Fmartinez-Indart L, Mintegi S, Benito J.

Conclusiones:

- El TEP, nivel de Triage, Pulmonary Score y SatO₂ inicial, fueron buenos predictores de hospitalización en exacerbaciones de asma agudo pediátrico.

Evaluación inicial - Severidad

- **Anamnesis:**

- SAMPLE
- Desencadenantes
- Factores de riesgo de muerte

- **Clínica:** Scores, hidratación

- **SatO₂ Hb / PEF** en niños mayores

- **Gasometría**

- Severa: paO₂ <60, pCO₂ >40

- **Rx Tx** no siempre

(complicaciones mecánicas o infecciosas, no respuesta al tto)

- **Factores de riesgo de muerte por asma:**

- necesidad de AVM
- internación en el último año por asma
- uso actual o reciente de corticoides orales
- uso de más de un canister de B₂ agonistas por mes
- enfermedad psiquiátrica
- mal medio socioeconómico
- no adherencia al tratamiento

ASMA – Tratamiento de la CRISIS

- Oxigenoterapia:
 - Dispositivo de acuerdo a requerimientos y tolerancia
 - Si SatO₂ menor a 95% o trabajo respiratorio aumentado
- Soporte respiratorio: OAF - VNI o VI de acuerdo a severidad
- Fármacos broncodilatadores
 - Inhalatorios
 - Intravenosos
 - Sub-cutáneos
- Corticoides

Oxigenoterapia

Reducir consumo de O₂

- Posición semisentado, a 30-45°
- Mantener termoneutralidad
- Suspender si corresponde la v/o
- Evitar estimulación excesiva
- Asegurar adecuado aporte hidro – electrolítico

Aporte de O₂



Crisis Asmática - Tratamiento

- **BRONCODILATADORES**

- **β 2 AGONISTAS** de acción rápida

- Efecto β adrenérgico en receptores músculo liso bronquial
- Efectos adversos: taquicardia, temblor, cefalea, irritabilidad. HipoK en altas dosis
- Vía **inhalatoria** continua o discontinua
- **IDM ½ puff/kg peso (50 ug/k) cada 20 min (máx 10 a 20 puff = 1-2 mg) con INHALOCAMARA - Se puede oxigenar con catéter nasal**
- Nebulizaciones 2.5 a 5 mg (0.15 – 0.2 mg/kg) en **5 cc SF** durante **5 min** en pacientes con altos requerimientos de O₂

Tratamiento con broncodilatadores en urgencias de pediatría: nebulización versus inhalación con cámara espaciadora

DR. JAVIER BENITO FERNÁNDEZ¹

Inhalación Vs. Nebulización

- Inhalación IDM

- Práctico
- Rápido inicio
- Fácil
- Efectiva
- Mejor penetración pulmonar

- Nebulización

- 90% se deposita en la boca y orofaringe
- Lenta
- Permite aportar O₂ con mayor concentración

Relación nebulización/inhalación = 3 a 1

Bromuro de ipratroio



Cochrane Database of Systematic Reviews

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

Griffiths B, Ducharme EM

AUTHORS' CONCLUSIONS

Implications for practice

The findings of this Cochrane review support the use of anticholinergics in addition to SABAs over SABAs alone in the management of acute asthma in children, with an anticipated 27% reduction in the risk of hospital admission.

Corticoides

Journal of
ASTHMA

<http://tandfonline.com/ijas>
ISSN: 0277-0903 (print), 1532-4303 (electronic)

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PEDIATRIC ASTHMA

Pediatric acute asthma exacerbations: Evaluation and management from emergency department to intensive care unit

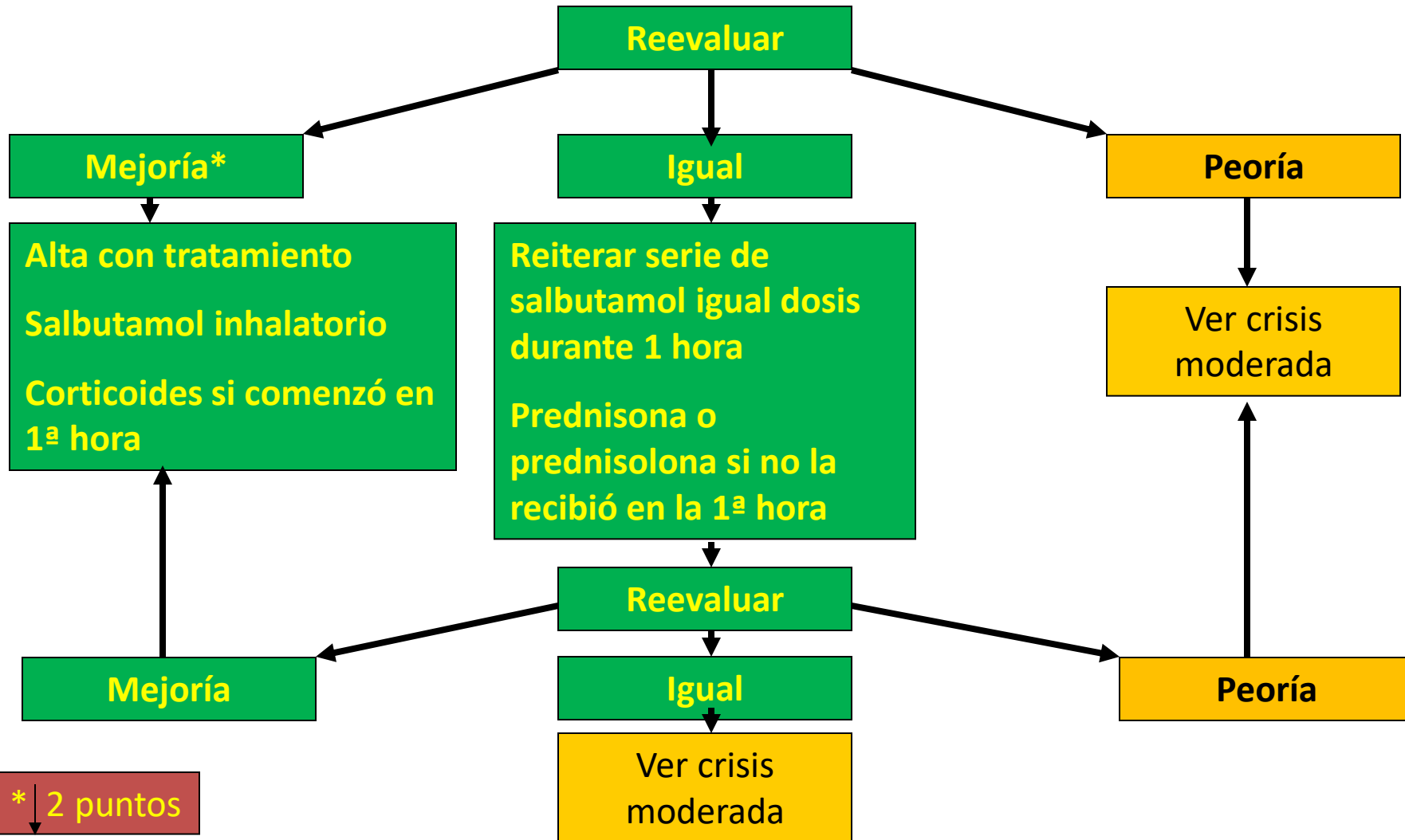
Brittany Pardue Jones, MD^{1,*}, Geoffrey M. Fleming, MD^{2,*}, Jaime Kaye Otilio, MD^{1,*}, Ishan Asokan, MSc, BA³,
and Donald H. Arnold, MD, MPH^{1,4}

Current guidelines recommend treatment of moderate to severe asthma exacerbations with oral prednisone or dexamethasone. Oral prednisone or prednisolone (1–2 mg/kg/day) is taken for a 3–5 day course and dexamethasone (0.3–0.6 mg/kg) is given in either a one or two-dose regimen.

Tratamiento de la crisis asmática leve

B2 agonistas inhalatorio por IDM por 1 hora

Corticoides: prednisona o prednisolona v/o (pacientes que reciben corticoides inhalados o los que abandonaron recientemente corticoterapia)



Tratamiento de la crisis asmática moderada

Oxigenación

B2 agonistas inhalatorios: IDM/Nebulizado/Nebulización continua

Bromuro de ipratropio inhalatorio: IDM/Nebulizado

Corticoides: prednisona o prednisolona vo.

MEJORÍA

Evaluar oxigenación
B2 agonistas inhalatorio igual dosis, cada 2-4 hs
Ipratropio inhalatorio cada 2-4 hs

REEVALUAR .

MEJORÍA

ALTA

β 2 inh cada 4 hs
Prednisona 2 mg/k/día

ADMISION

O₂
 β 2 inh c/2-4 hs
Ipratropio inh c/ 4-6 hs
Prednisona

NO RESPUESTA o PEORÍA

Sulfato de Mg i.v.

(puede repetirse-infusión 4 hs)

MEJORÍA

**NO RESPUESTA
o PEORÍA**

Ver crisis severa

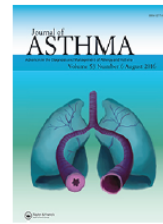
**O₂
CNAF**

**VNI
CPAP
BiPAP**

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Cuando usar vía iv?



Journal of Asthma

ISSN: 0277-0903 (Print) 1532-4303 (Online) Journal homepage: <http://www.tandfonline.com/loi/ijas20>

Pediatric acute asthma exacerbations: Evaluation and management from emergency department to intensive care unit

Brittany Pardue Jones MD, Geoffrey M. Fleming MD, Jaime Kaye Otilio MD, Ishan Asokan MSc, BA & Donald H. Arnold MD, MPH

For patients with more than minimal ventilation, IV or SQ β -agonists have no therapeutic advantage over inhaled delivery and are associated with greater systemic side effects [63]. However, for the patient with a severe exacerbation who has minimal air entry that does not respond to initial treatment with inhaled albuterol and IV $MgSO_4$, this mode of delivery should be considered.



0021-7557/01/77-04/279

Jornal de Pediatria

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ORIGINAL ARTICLE

Controlled study on intravenous magnesium sulfate or salbutamol in early treatment of severe acute asthma attack in children

João Carlos Santana,¹ Sérgio Saldanha Menna Barreto,²
Jefferson Pedro Piva,³ Pedro Celiny Ramos Garcia⁴

Conclusions: the early intravenous administration of magnesium sulfate, especially salbutamol, achieved a rapid clinical response with excellent prognosis and no significant side effects.



ELSEVIER

Contents lists available at [ScienceDirect](#)

Paediatric Respiratory Reviews



Clinical Usefulness

Magnesium should be given to all children presenting to hospital with acute severe asthma

Mon Ohn MBBS¹, Stephen Jacobe BMed, MHL, FACLM, FRACP, FCICM^{2,*}

- Cuando la severidad de la crisis determina el uso de la vía iv, deben recibir sulfato de magnesio iv asociado al tratamiento broncodilatador estándar.

**Eficacia del sulfato de magnesio como
tratamiento inicial del asma aguda grave
pediátrica. Estudio aleatorizado y controlado**

*Effectiveness of magnesium sulfate as initial treatment
of acute severe asthma in children. A randomized,
controlled trial*

*Dr. Silvio Torres^a, Dr. Nicolás Sticco^a, Dr. Juan José Bosch^a, Dr. Tomás Iolster^a,
Dr. Alejandro Siaba^a, Dr. Manuel Rocca Rivarola^a y Dr. Eduardo Schnitzler^a*

Nuestros resultados mostraron que la administración de sulfato de magnesio endovenoso dentro de la primera hora de ingreso al hospital, en niños con asma aguda grave redujo significativamente la necesidad de asistencia ventilatoria mecánica.

High-Dose Magnesium Sulfate Infusion for Severe Asthma in the Emergency Department: Efficacy Study

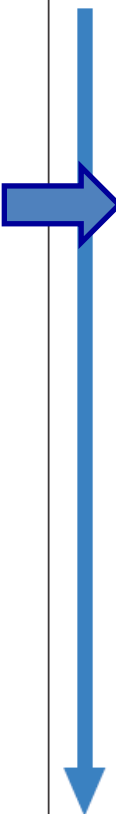
Jose E. Irazuzta, MD, FCCM¹; Fatima Paredes, MD²; Viviana Pavlicich MD²; Sara L. Domínguez MD²

- Conclusiones: La utilización temprana de infusión de sulfato de magnesio a altas dosis prolongadas (50 mg/kg/hr/4 hr), para asma no vinculado a infección, favorece el alta desde el departamento de emergencia y disminuye significativamente los costos de salud.

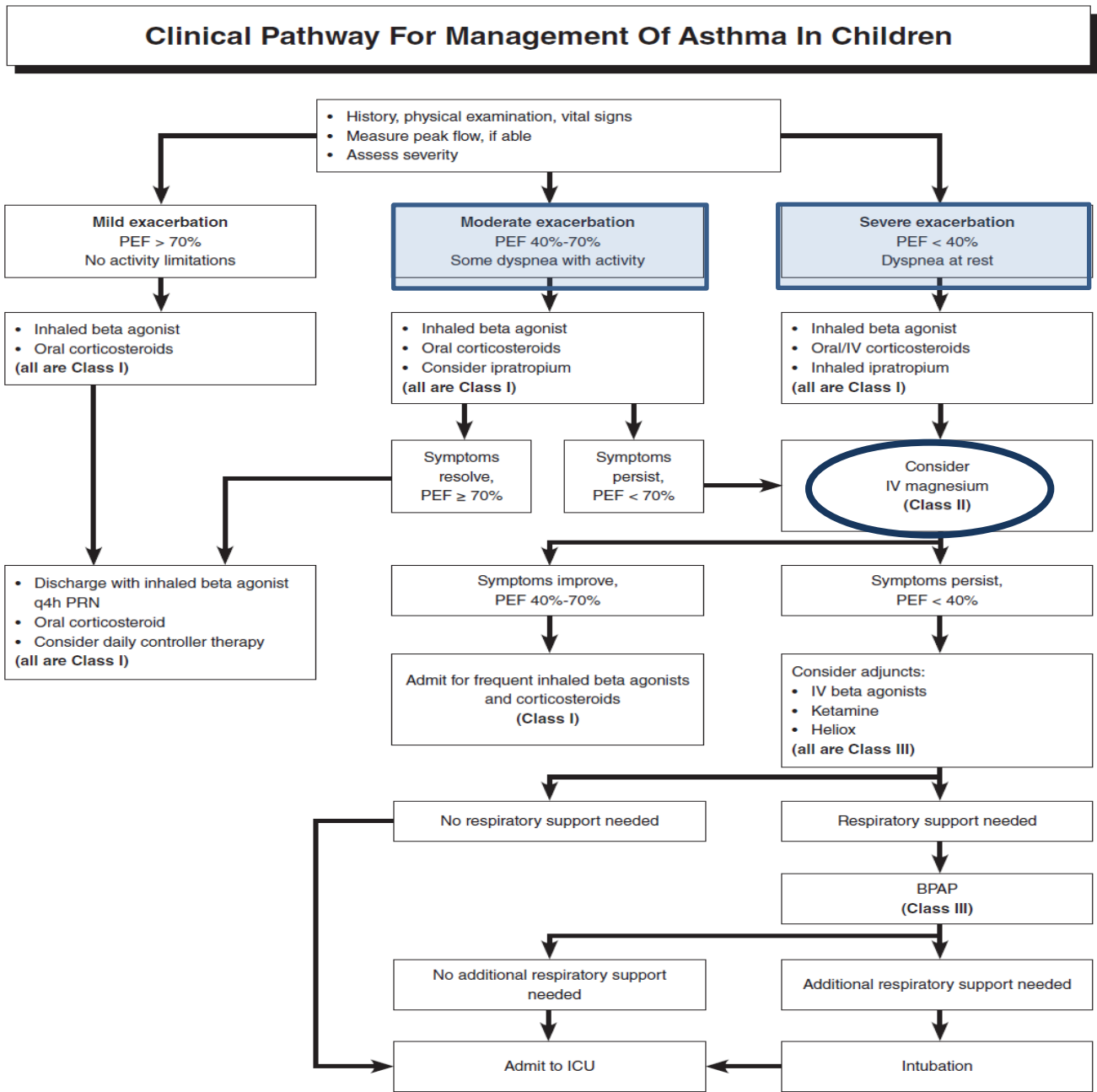
Severe Acute Asthma Exacerbation in Children: A Stepwise Approach for Escalating Therapy in a Pediatric Intensive Care Unit

I. Federico Fernandez Nievas, MD and Kanwaljeet J. S. Anand, MBBS, DPhil, FRCPCH

Departments of Pediatrics, Anesthesiology, Anatomy & Neurobiology, Division of Critical Care Medicine, University of Tennessee Health Science Center. and Le Bonheur Children's Hospital. Memphis. Tennessee



Step	Therapy	Comments
1	Albuterol, Ipratropium, Steroids	These medications should be ordered for all patients admitted to the PICU.
2	Continuous Albuterol	0.5-1 mg/kg/hr. If < 20 kg give 10-20 mg/hr; 20-30 kg give 10-30 mg/hr, > 30 kg give 15 -45 mg/hr
3	IV Magnesium	25 to 50 mg/kg/dose (max 2 g) infused over 20 to 30 min. Follow by continuous infusion of 15-25 mg/kg/hr. Mg level ≈ 4 mg/dL. Monitor for hypotension.
4	Heliox	Provide O ₂ using non-rebreathing mask. May combine O ₂ by nasal cannula if necessary to keep SaO ₂ > 92%.
5	IV Terbutaline	Loading dose of 10 mcg/kg over 10 min followed by 0.4 mcg/kg/min. Increase by 0.4 mcg/kg/min every 15 min. Range 0.1 to 10 mcg/kg/min (average dose is 4 mcg/kg/min)
6	IV Theophylline	Loading dose of 5 mg/kg over 20 min followed by continuous infusion of 0.5-1 mg/kg/hr. Check serum theophylline concentration 30 min after the end of the loading dose. Target theophylline concentration is 10-20 mg/L
7	Non-Invasive Ventilation	Consider BiPAP to unload WOB. IPAP:10 EPAP:5
8	IV Ketamine	1 mg/kg/hr for sedation. Bronchodilatory properties. Increase airway secretions.
9	Intubation	Ketamine + Midazolam + Rocuronium
10	Ventilation	Try to avoid neuromuscular blockade. Permissive hypercapnia. PC/PRVC/PSV. Monitor peak to plateau pressure difference.



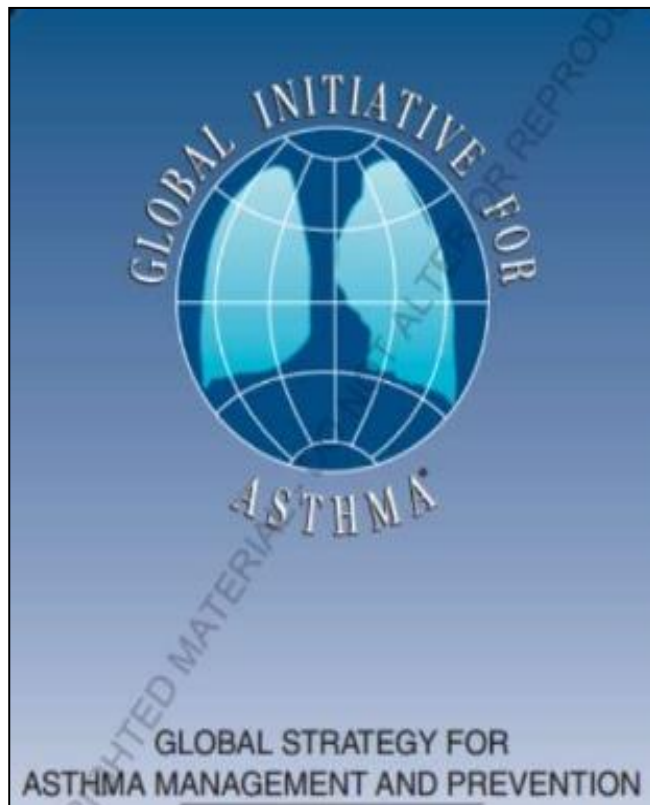
Abbreviations: BPAP, bilevel positive airway pressure; ICU, intensive care unit; IV, intravenous; PEF, peak expiratory flow.

CLINICAL INVESTIGATION

Feasibility of Short-Term Infusion of Magnesium Sulfate in Pediatric Patients With Status Asthmaticus

Jose Irazuzta, MD,^{1,2} Tosha Egehund, PharmD,¹ Sarah K. Wassil, PharmD,¹ and Christian Hampp, PhD³

¹ Wolfson Children's Hospital/Baptist Health, Jacksonville, Florida, ² University of Florida College of Medicine, Jacksonville, Florida, ³ Division of Epidemiology, Office of Surveillance and Epidemiology, Center for Drug Evaluation and Research, US Food and Drug Administration, Bethesda, Maryland



British Thoracic Society
Scottish Intercollegiate Guidelines Network

British guideline on the management of asthma
A national clinical guideline

Revised 2014



SAP

SOCIEDAD ARGENTINA DE PEDIATRÍA



Semana de
Congresos y
Jornadas Nacionales

8° Congreso Argentino de Emergencias y Cuidados Críticos en Pediatría

SULFATO DE MAGNESIO INTRAVENOSO EN LA CRISIS ASMÁTICA

1er año de experiencia en el Departamento de Emergencia Pediátrica

Tórtora S, Morosini F, Alonso B, Dall'Orso P, Prego J.

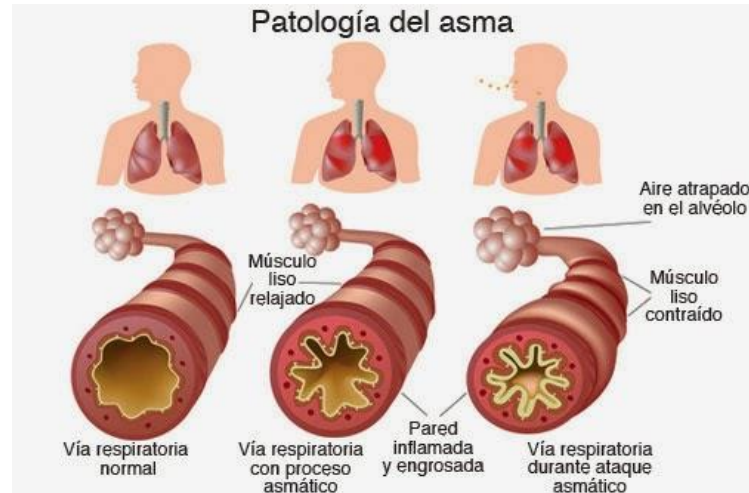
Departamento de Emergencia Pediátrica Hospital Pereira Rossell



CONCLUSIONES



- Beneficioso, sencillo y sin efectos adversos en la crisis asmática que no responde a la primera línea de tratamiento.
- Solo o asociado a soporte respiratorio no invasivo permitió, en pacientes respondedores, reducir la necesidad de otros fármacos iv y el ingreso a UCI.
- Propuesta:
 - Infusión de Sulfato Mg vs Sulfato Mg dosis única reiteradas



Tratamiento de las crisis asmática severa

Si el paciente llega al DEP sin tratamiento o tratamiento incompleto

Oxigenación / Soporte respiratorio precoz

Salbutamol inhalatorio:

nebulizado/nebulización continua

Bromuro de ipratropio inhalatorio:

nebulizado

VVP – laboratorio:

Gasometría, ionograma, glicemia, hemograma

Sulfato de Mg iv 1 dosis

Hidrocloruro 10 mg/kg iv max 500 mg

Evaluar indicación y oportunidad de Rx Tx

MEJORÍA

NO RESPUESTA o
AGRAVAMIENTO

Ver Crisis
moderada

ADMISIÓN
UCI-Cuidados
Moderados

Salbutamol iv: dosis carga, seguido de infusión a dosis creciente.
Si respuesta, mantener infusión 4 hs. y luego descenso de 0,5 mcg/kg/min cada hora.
Retomar β 2 vía inhalatoria.
Teofilina iv – Ketamina iv

Si el paciente llega al DEP con tratamiento correcto prehospitalario o **no respondió a terapia inhalatoria**

Adrenalina s.c.: considerar en pacientes graves, “pre-agotamiento. Subcutánea 0.01 cc/kg dosis (máximo 0.4 cc) de solución 1:1000, puede repetirse hasta 3 veces cada 10-15 minutos.

VVP - exámenes laboratorio:

Gasometría, ionograma, glicemia, hemograma

Sulfato de Mg i.v. 1 dosis-infusión 4 hs

**Hidrocloruro 10 mg/kg iv
máx 500 mg**

MEJORÍA

NO
RESPUESTA

CNAF

VNI

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Articles

Randomised trial of intravenous salbutamol in early management of acute severe asthma in children

Gary J Browne, Antonio S Penna, Xan Phung, Michael Soo

Summary

Background The mainstay of treatment for acute asthma in children is nebulised β_2 -adrenergic agents such as salbutamol, given with corticosteroids. However, penetration of the drug to the small airways is impeded by obstruction so intravenous salbutamol may be more effective. We assessed the use of intravenous salbutamol in the management of children with acute severe asthma in a double-blind randomised study.

Interpretation Addition of a 10 min infusion of salbutamol in the early treatment of children with acute severe asthma has the potential to curtail the clinical progression of asthma, reduce demand placed on hospital resources, and improve the quality of health care provided to the acutely sick child with asthma.

Lancet 1997; **349**: 301–05

Introduction



Contents lists available at SciVerse ScienceDirect

Paediatric Respiratory Reviews



Mini-Symposium: Respiratory Emergencies in Children

Management of status asthmaticus in children

Muriel Koninckx^{1,*}, Corinne Buysse², Matthijs de Hoog²

¹ Paediatric Intensive Care, Middelheim Ziekenhuis, Lindendreef 1, Antwerp, Belgium

² Paediatric Intensive Care, Sophia Children's Hospital, Dr Molewaterplein 60 Rotterdam, The Netherlands

If nebulisation fails, salbutamol can also be given intravenously, on the assumption that with little air entry only a small amount of the drug reaches the target airway receptors. In children, well conducted studies concerning pharmacokinetics and pharmacodynamics of intravenous salbutamol are lacking. An early study found that 69% of the patients responded satisfactorily after a loading dose of 10 µg/kg, followed by a continuous infusion of 0.2 µg/kg/min, which was increased by 0.1 µg/kg every 15 minutes.³⁴ This study included only 14 children and the outcome parameter was a decrease of the pCO₂, which gives only scarce information about the clinical condition. Another double blind randomized study in 29 children with severe acute asthma compared a loading dose of 15 µg/kg intravenous salbutamol to nebulised ipratropium bromide or a combination of both. Bolus salbutamol was more effective, leading to earlier cessation of nebulisation, less oxygen need and earlier discharge from hospital.³⁵ Dosing of intravenous salbutamol in children varies between 0.1 and 15 µg/kg/min and there is no consensus if a loading dose is needed.^{36,37}

Management Of Acute Asthma In The Pediatric Patient: An Evidence-Based Review

Abstract

May 2013
Volume 10, Number 5

Authors

Brittany Pardue Jones, MD

Clinical Fellow, Pediatric Emergency Medicine, Icahn School of Medicine at Mount Sinai, New York, NY

Audrey Paul, MD, PhD

Assistant Professor of Pediatric Emergency Medicine, Icahn School of Medicine at Mount Sinai, New York, NY

Parenteral Administration

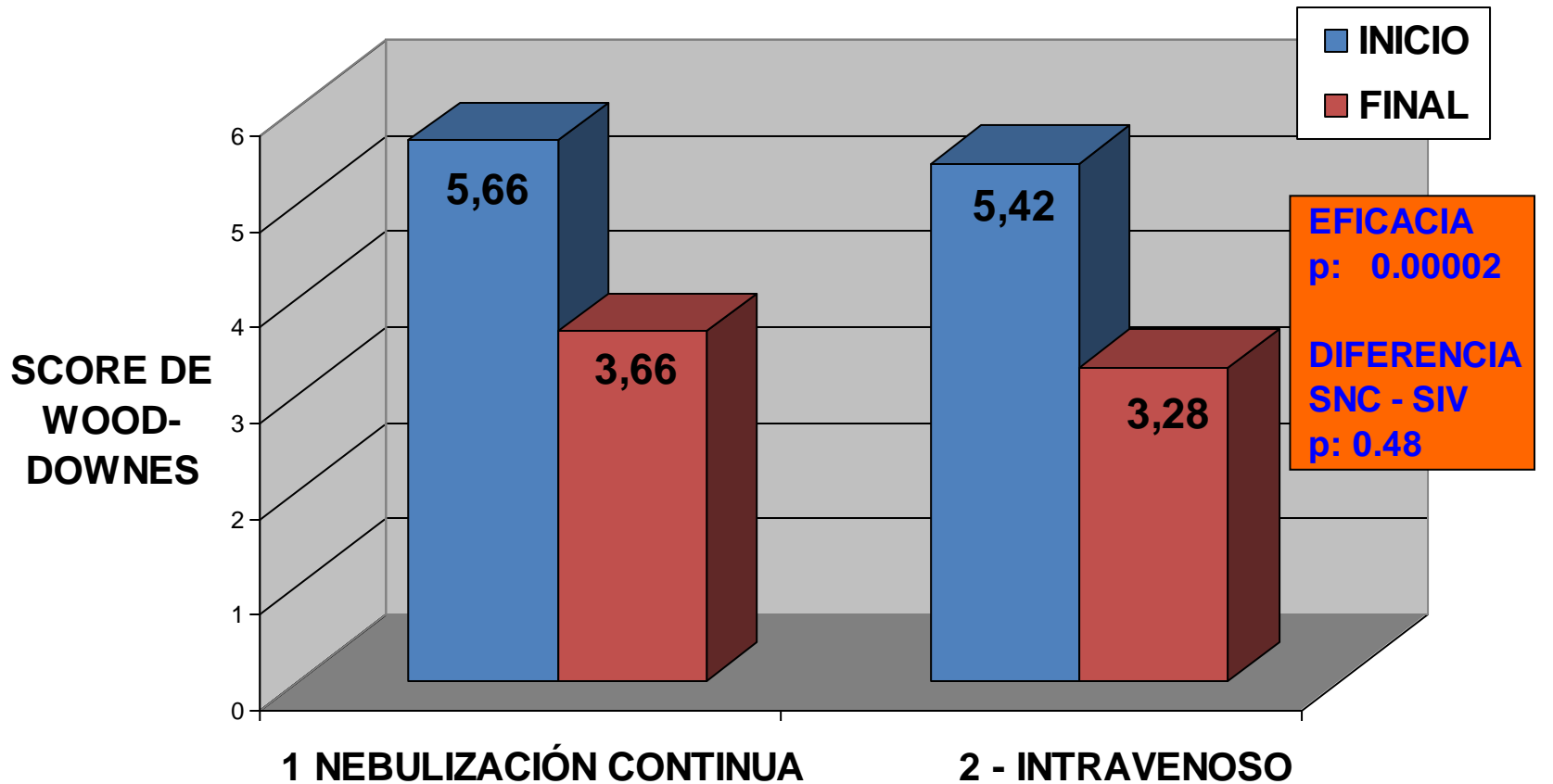
Parenteral administration of beta agonists may be required for children with severe exacerbations in whom inhaled therapy is ineffective or infeasible.^{105,106} In severe exacerbations, inspiratory flow may be too poor to allow for adequate drug delivery to the small airways,⁷⁹ and IV administration may be necessary to effectively provide beta-agonist thera-

Tratamiento de la crisis asmática con salbutamol intravenoso y en nebulización continua en emergencia

DRES. JAVIER PREGO¹, GRACIELA SEHABIAGUE², DANIEL DE LEONARDIS³, MÓNICA PUJADAS⁴

RESULTADOS

VARIACIÓN DEL SCORE de WOOD-DOWNES





Variation in treatment of acute childhood wheeze in emergency departments of the United Kingdom and Ireland: an international survey of clinician practice

Mark D Lyttle, Ronan O'Sullivan, Iolo Doull, et al.

Arch Dis Child published online August 25, 2014

doi: [10.1136/archdischild-2014-306591](https://doi.org/10.1136/archdischild-2014-306591)

Escalating to intravenous therapy

In all, 170 (92.9%) escalate for deteriorating severe wheeze, 166 (90.7%) for life-threatening wheeze and 141 (77%) if there is no response to inhaled bronchodilators; 167 (91.8%) require more than one criterion and 172 (93.9%) use these on a case-by-case basis. Low numbers use set criteria such as time since starting or total accrued dose of inhaled therapy. In all, 99 (54.1%) use salbutamol as first-line intravenous therapy, 52 (28.4%) magnesium sulfate and 27 (14.8%) aminophylline; 87 (47.5%) give these sequentially depending on response and 30 (16.4%) give them concurrently. Overall, 146 (79.8%) continue inhaled bronchodilators while on intravenous therapy.

Intravenous bronchodilators

A total of 170 (92.9%) use intravenous salbutamol, though in a range of strategies and doses. For the purposes of this study, a continuous infusion was defined as a 'weight based *rate* (micrograms/kg/min) with no fixed endpoint'; a loading dose as a 'weight based *rate* (micrograms/kg/min) given for a set period of time' and a bolus as a 'weight based *dose* (micrograms/kg)'. Five general strategies are employed, the most common being 'bolus and continuous infusion'. For boluses, four doses and seven durations were described. There were 10 different continuous infusion rates with over 10-fold variation between the lowest and highest (table 4).

Overall, 142 (77.6%) use aminophylline, with 127 (89.4%) giving 'bolus and infusion'; 132 (93%) give a bolus, of which 120 (91%) give 5 mg/kg, 5 (3.8%) give each of 6 or 7.5 mg/kg and one 10 mg/kg. In all, 120 (91%) give the bolus over 20–30 min. Nine continuous infusion rates were described, all at 1 mg/kg/h or less, with 1 mg/kg/h being the most common (68.6%).

In all, 173 (94.5%) use magnesium sulfate; all used a bolus with no subsequent infusion and 141 (81.5%) give 40–50 mg/kg over 20–30 min.

British guideline on the management of asthma
A national clinical guideline



Revised 2014

IV SALBUTAMOL

The role of intravenous β_2 agonists in addition to nebulised treatment remains unclear.⁵³⁹ One study has shown that an IV bolus of salbutamol given in addition to near-maximal doses of nebulised salbutamol results in clinically significant benefits for those with moderate to severe asthma.⁵³⁹

1+

B

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

British guideline on the management of asthma
A national clinical guideline



Revised 2014

8.9.2 IV AMINOPHYLLINE

There is no evidence that aminophylline is of benefit for mild to moderate asthma and side effects are common and troublesome.^{563, 614} One well conducted study has shown evidence of benefit in children with acute severe asthma unresponsive to multiple doses of β_2 agonists and steroids, although the loading dose used was double that currently recommended in the UK and a third of patients were withdrawn from active medication because of vomiting.⁶¹⁵

1+
2+

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

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



REVISTA CHILENA DE PEDIATRÍA

www.elsevier.es/RCHP



EDITORIAL

El lado B del uso de beta-agonistas en niños con falla respiratoria aguda



- CV = taquicardia, arritmias supraventriculares
- Vasodilatación pulmonar = alteración V/Q, aumento espacio muerto
- Glicogenólisis = acidosis láctica

Pablo Cruces R.
Unidad de Paciente Crítico Pediátrico.
Hospital El Carmen de Maipú.
Centro de Investigación de Medicina Veterinaria,
Escuela de Medicina Veterinaria,
Facultad de Ecología y Recursos Naturales,
Universidad Andrés Bello.
Correo electrónico: pcrucesr@gmail.com

Eur J Pediatr (2006) 165: 323–325
DOI 10.1007/s00431-005-0049-0

ORIGINAL PAPER

Jeremy R. Parr · Amanda Salama · Peter Sebire

A survey of consultant practice: intravenous salbutamol or aminophylline for acute severe childhood asthma and awareness of potential hypokalaemia

EXPERT
REVIEWS

A review of the use of adjunctive therapies in severe acute asthma exacerbation in critically ill children

Expert Rev. Respir. Med. 8(4), 423–441 (2014)

Judith JM Wong¹,
Jan Hau Lee^{*2,3},
David A Turner⁴ and
Kyle J Rehder⁴

Asthma is a common and potentially life threatening childhood condition. Asthma involves not only chronic airway remodeling, but may also include frequent exacerbations resulting from bronchospasm, edema, and mucus production. In children with severe exacerbations, standard therapy with β_2 -agonists, anti-cholinergic agents, oxygen, and systemic steroids may fail to reverse the severe airflow obstruction and necessitate use of adjunctive therapies.

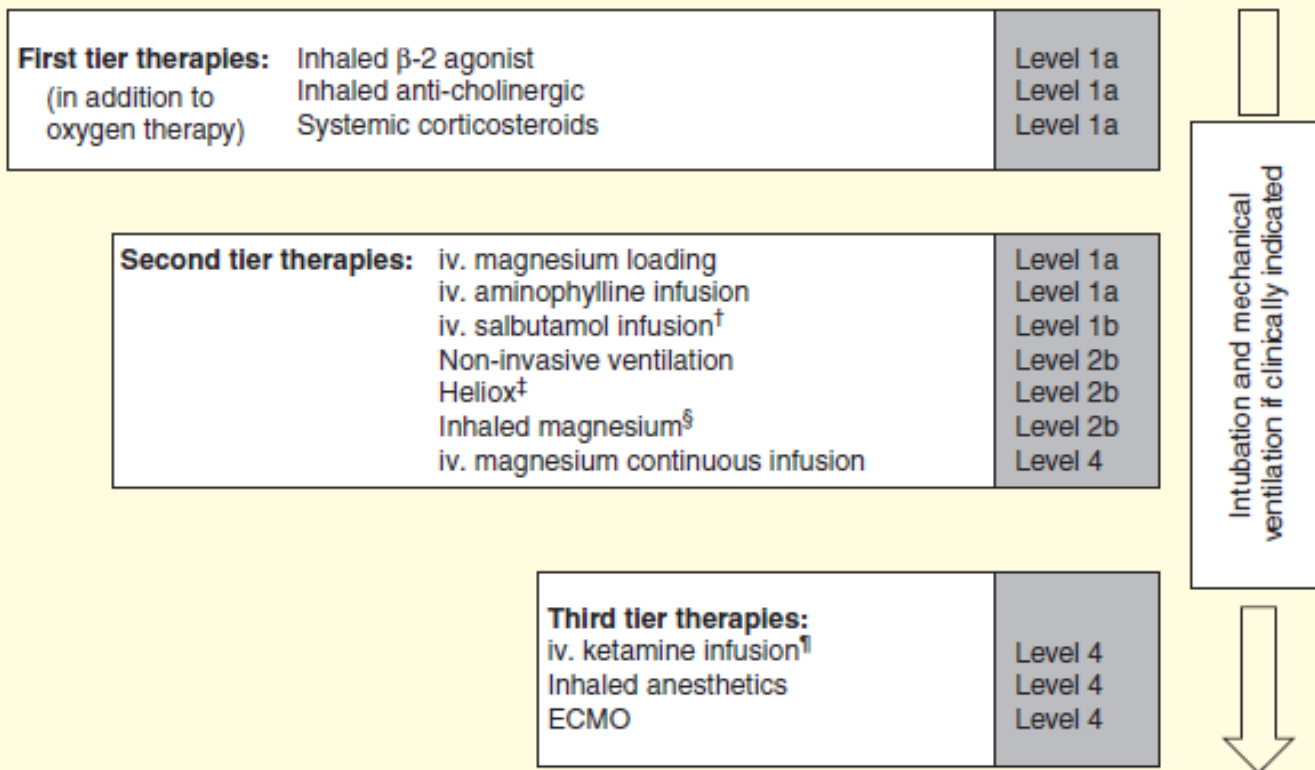


Figure 1. Proposed algorithm for escalation of therapy in acute severe asthma in children. Level of evidence adapted from the Centre for Evidence-Based Medicine, www.cebm.net.

[†]Evidence of benefit comes from two randomized controlled trials with overlapping patient population.

[‡]For those with severe baseline pulmonary function impairment.

[§]The evidence for inhaled magnesium derives from a single randomized controlled trial's subanalysis of patients with SpO₂ <92% and within 6 h of symptom onset.

[¶]iv. ketamine at adequate dose 20–60 μ g/kg/min for infusion.

ECMO: Extracorporeal membrane oxygenation; iv.: Intravenous.

CRISIS ASMÁTICA EN NIÑOS

TEP, constantes vitales
Examen físico
Factores de riesgo de muerte
Evaluación de severidad (PAS)

LEVE
PAS 5 - 7

MODERADA
PAS 8 - 11

SEVERA
PAS 12 - 15

B2 agonistas inh
Corticoides v.o.
Clase I

B2 agonistas inh
Corticoides v.o.
Ipratropio inh
Clase I

B2 agonistas inh
Corticoides v.o.
Ipratropio inh
Clase I

ALTA DOMICILIO
B2 inh c/4-6h
Corticoides v.o.
Considerar corticoides
inhalados diarios

MEJORIA

NO RESPUESTA

Sulfato Mg iv
Clase II

MEJORIA

NO RESPUESTA
O PEORÍA

ADMISIÓN
HOSPITALARIA

B2 agonistas iv
Teofilina-Ketamina iv
Clase III

S
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02

CNAF

VNI

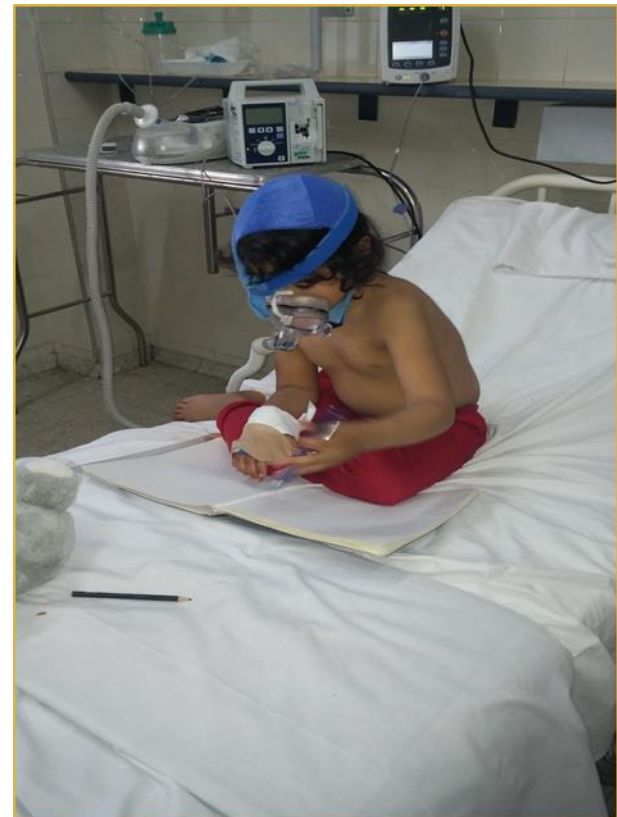
VMI

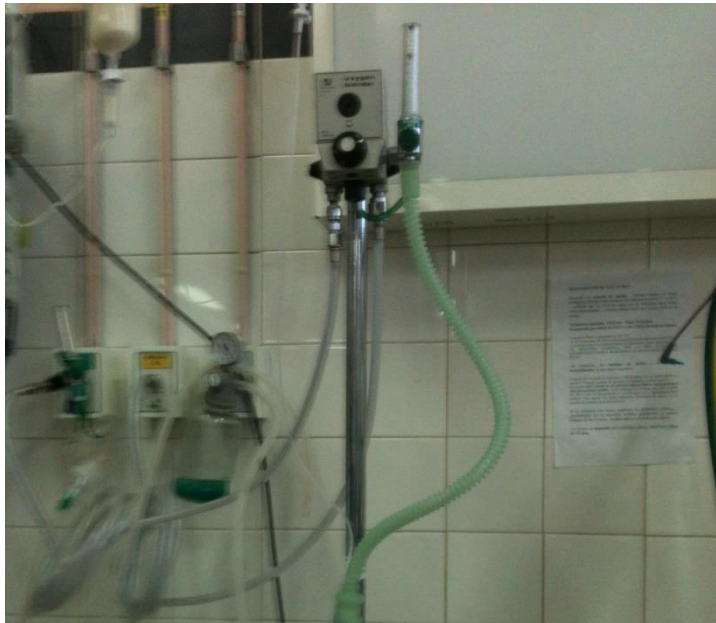
Soporte respiratorio no invasivo

O2 CNAF



VNI





High flow nasal cannula: recommendations for daily practice in pediatrics

Annals of Intensive Care 2014, **4**:29 doi:10.1186/s13613-014-0029-5

Asthma

From a physiological point of view, HFNC for asthmatic patients seems attractive. As in bronchiolitis, CPAP may reduce the burden on the inspiratory muscles related to auto-PEEP. Use of heated and humidified gas also limits the bronchoconstriction induced by cold dry gas. Theoretically, the high gas flow should improve the distribution of inhaled treatments. However, this effect remains a subject of controversy, as the dose of bronchodilator received varies from 0.5% to 25% of the administered dose [48,49]. Distal bronchodilator delivery might be improved by positioning the aerosol upstream of the humidifier, choosing an ultrasonic nebulizer over a pneumatic nebulizer or even using heliox gas as the vector [50,51]. However, the literature is scant on the use of high flow in this indication. Kelly et al. described the largest observational study to date, which included 38 children under 2 years of age presenting with a severe asthmatic attack [29]. Experience with HFNC for this indication is particularly lacking and this must be emphasized. For instance, in our PICU, we limit HFNC use to the mildest asthmatic attacks. Use of another type of NIV becomes mandatory if tachypnea and/or signs of respiratory distress do not improve within 1 h of HFNC initiation.

Use of high-flow nasal cannula support in the emergency department reduces the need for intubation in pediatric acute respiratory insufficiency.

Wing R, James C, Maranda LS, Armbsby CC.

Pediatric Emergency Care. 2012 Nov;28(11):1117-23

- “La terapia con oxígeno de alto flujo usada tempranamente en el desarrollo de la insuficiencia respiratoria aguda en niños, se asocia con una menor necesidad de intubación endotraqueal y ventilación mecánica”

High-Flow Nasal Cannula Use in Children With Respiratory Distress in the Emergency Department: Predicting the Need for Subsequent Intubation

Kelly G, Simon H, Sturm, Jesse J.

Pediatric Emergency Care. 2013;29 (8):888–92

- n: 498
 - BQ 231 (46%)
 - Neumonía 138 (28%)
 - Asma 38 (8%)
 - AVM 42 (8%)

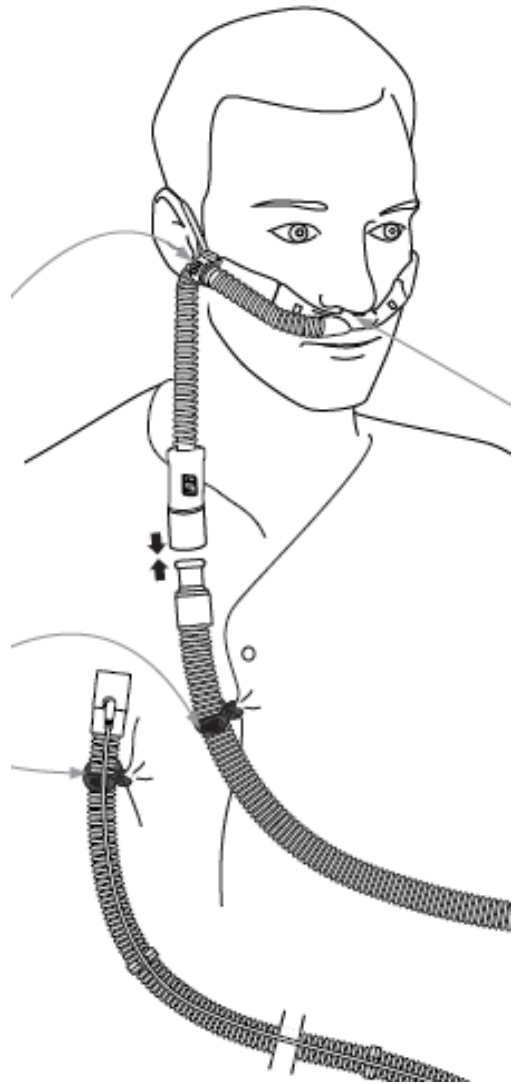
- Útil en todas las causas de insuficiencia respiratoria

Cánula nasal de alto flujo en niños con crisis asmática en un servicio de urgencias pediátrico

High-flow nasal cannula therapy in children with severe asthma exacerbations in a pediatric emergency department

Fabiana Morosini¹, Soledad Tórtora², Paloma Amarillo², Bernardo Alonso³, Mariana Más¹, Patricia Dall'Orso⁴, Javier Prego⁵

Conclusiones: *la CNAF resultó un recurso terapéutico sencillo y accesible para el tratamiento inicial de niños mayores de 2 años con fallo respiratorio. Se utilizaron flujos de 2 L/kg/min, con buena tolerancia. Constituyó el único soporte respiratorio en la mitad de este grupo. Su indicación temprana en el tratamiento escalonado de la crisis asmática en la emergencia ha aumentado; deberá considerarse en los protocolos de atención de la crisis asmática.*



Optiflow™+

HASTA 60 L/min





Imagen cedida por Dr.
Francisco Prado

VNI

CPAP

- EPAP = PEEP = CPAP.
- Contrarrestar la PEEP intrínseca.
- Homogeniza y recluta:
Mejorar V/Q.
- Iniciar CPAP e/4-6.
- Patologías: bronquiolitis, EAP, apneas.

BiPAP

- **PS** = IPAP- EPAP
- **IPAP**. Pr I positiva (9-12 cmH₂O, máximo 20).
- **EPAP**: Pr E positiva (4-6 cmH₂O, máximo 10).
- **FR respaldo**: 10-15 menos que el paciente.
- **Ti**. Duración de IPAP.

EQUIPOS

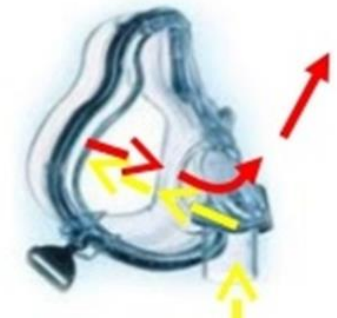


Ventilador-circuito e interfase

- ▶ Ventiladores no invasivos



Interface debe tener válvula exhalatoria



VNI CPAP - BiPAP



PUERTO DE
EXHALACIÓN

SUJECIÓN

EQUIPO



FILTRO



TUBULADURA



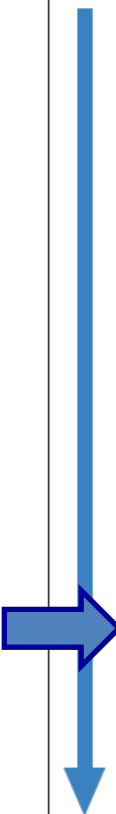
INTERFASE



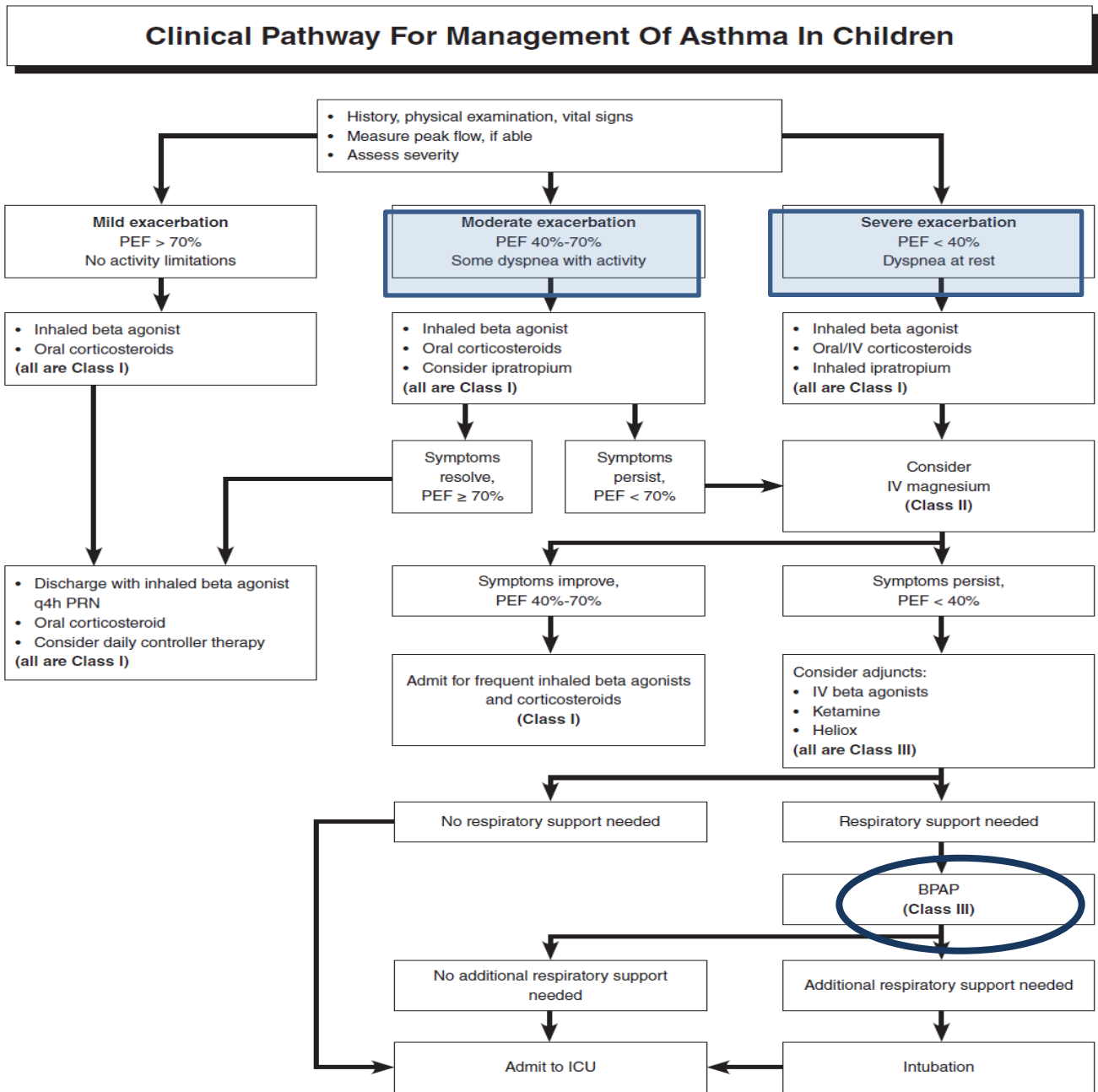
Severe Acute Asthma Exacerbation in Children: A Stepwise Approach for Escalating Therapy in a Pediatric Intensive Care Unit

I. Federico Fernandez Nievas, MD and Kanwaljeet J. S. Anand, MBBS, DPhil, FRCPCH

Departments of Pediatrics, Anesthesiology, Anatomy & Neurobiology, Division of Critical Care Medicine, University of Tennessee Health Science Center. and Le Bonheur Children's Hospital. Memphis. Tennessee



Step	Therapy	Comments
1	Albuterol, Ipratropium, Steroids	These medications should be ordered for all patients admitted to the PICU.
2	Continuous Albuterol	0.5-1 mg/kg/hr. If < 20 kg give 10-20 mg/hr; 20-30 kg give 10-30 mg/hr, > 30 kg give 15 -45 mg/hr
3	IV Magnesium	25 to 50 mg/kg/dose (max 2 g) infused over 20 to 30 min. Follow by continuous infusion of 15-25 mg/kg/hr. Mg level ≈ 4 mg/dL. Monitor for hypotension.
4	Heliox	Provide O ₂ using non-rebreathing mask. May combine O ₂ by nasal cannula if necessary to keep SaO ₂ > 92%.
5	IV Terbutaline	Loading dose of 10 mcg/kg over 10 min followed by 0.4 mcg/kg/min. Increase by 0.4 mcg/kg/min every 15 min. Range 0.1 to 10 mcg/kg/min (average dose is 4 mcg/kg/min)
6	IV Theophylline	Loading dose of 5 mg/kg over 20 min followed by continuous infusion of 0.5-1 mg/kg/hr. Check serum theophylline concentration 30 min after the end of the loading dose. Target theophylline concentration is 10-20 mg/L
7	Non-Invasive Ventilation	Consider BiPAP to unload WOB. IPAP:10 EPAP:5
8	IV Ketamine	1 mg/kg/hr for sedation. Bronchodilatory properties. Increase airway secretions.
9	Intubation	Ketamine + Midazolam + Rocuronium
10	Ventilation	Try to avoid neuromuscular blockade. Permissive hypercapnia. PC/PRVC/PSV. Monitor peak to plateau pressure difference.



Abbreviations: BPAP, bilevel positive airway pressure; ICU, intensive care unit; IV, intravenous; PEF, peak expiratory flow.

BMJ Open Paediatric ED BiPAP continuous quality improvement programme with patient analysis: 2005–2013

BMJ Open 2017;7:e011845. doi:10.1136/bmjopen-2016-011845

Thomas Abramo,^{1,2} Abby Williams,^{3,4} Samaiya Mushtaq,^{3,5} Mark Meredith,^{1,6} Rawle Sepaule,⁷ Kristen Crossman,¹ Cheryl Burney Jones,⁸ Suzanne Godbold,⁹ Zhuopei Hu,⁸ Todd Nick⁸

Table 5 PED BiPAP patient placement: 2005–2013

N=1157																					
PICU	325																				
Ward	832																				
Discharge home	52																				
PED BiPAP patients per years	<table border="1"> <thead> <tr> <th>PICU admitted</th> <th>Total PED BiPAP patients</th> </tr> </thead> <tbody> <tr> <td>2005</td> <td>54</td> </tr> <tr> <td>2006</td> <td>73</td> </tr> <tr> <td>2007</td> <td>84</td> </tr> <tr> <td>2008</td> <td>90</td> </tr> <tr> <td>2009</td> <td>109</td> </tr> <tr> <td>2010</td> <td>144</td> </tr> <tr> <td>2011</td> <td>187</td> </tr> <tr> <td>2012</td> <td>214</td> </tr> <tr> <td>2013</td> <td>200</td> </tr> </tbody> </table>	PICU admitted	Total PED BiPAP patients	2005	54	2006	73	2007	84	2008	90	2009	109	2010	144	2011	187	2012	214	2013	200
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BiPAP, bilevel positive airway pressure; PED, paediatric emergency department; PICU, paediatric intensive care unit.

CONCLUSION

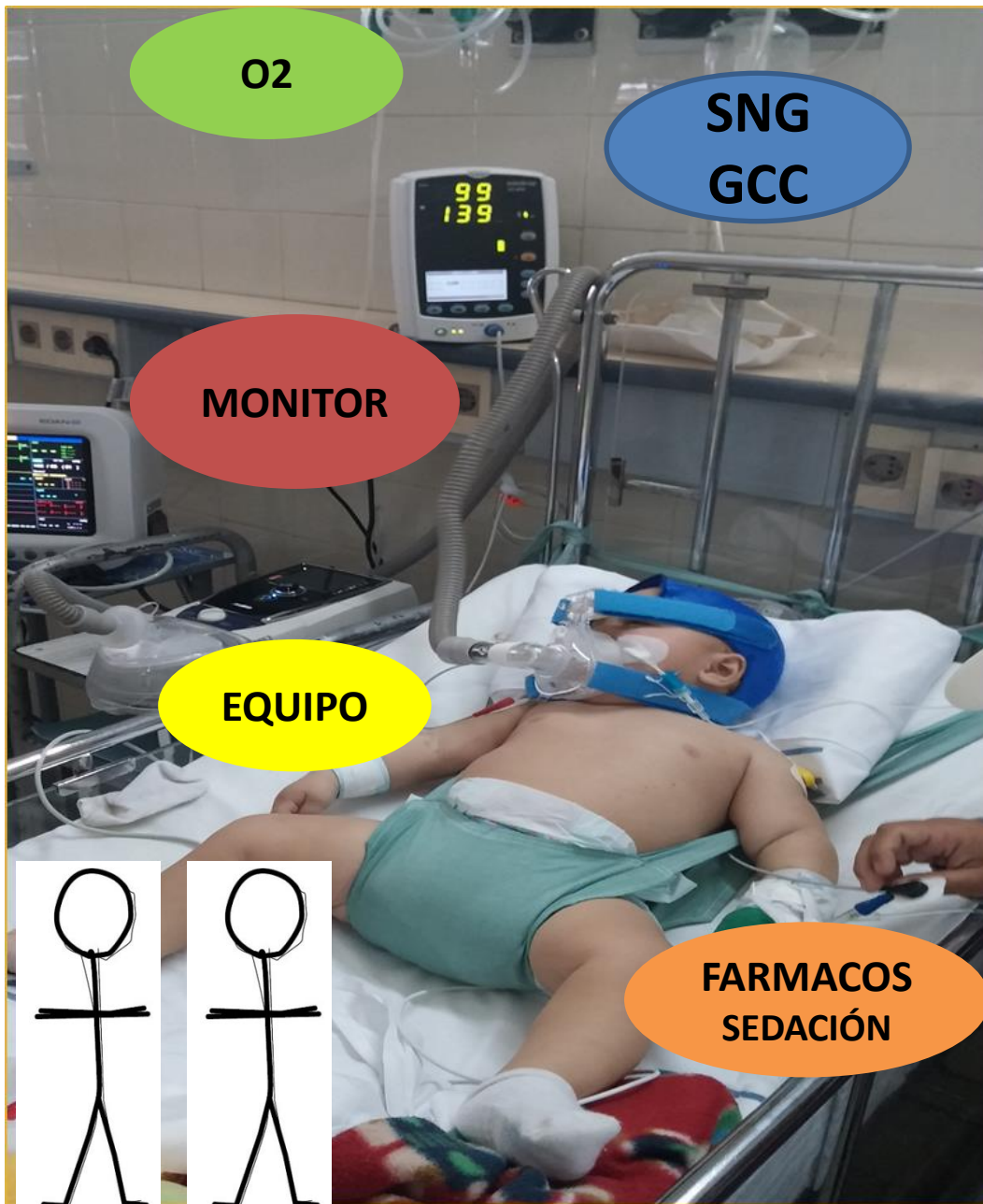
This 8-year PED BiPAP asthmatic CQIP analysis showed overwhelming patient compliance, no complications, improved pulmonary ventilation and therapeutic response time. PED BiPAP in asthmatics did not increase intubation occurrence. This BiPAP CQIP demonstrated clinically that by using higher IPAP, lower EPAP and longer I:E of 1:75, there was a significant reduction in RR and asthma scores, increased Tv, and positively affected patient dispositions. This aspect warrants further investigation. BiPAP should be considered early in the patient with severe asthma and is safe and effective. In the PED moderate asthmatics, who need further therapy or potential PICU criteria, a BiPAP trial has shown significant PICU admission reduction and no complications.

VNI en DEP



VNI en DEP





O2

SNG
GCC

MONITOR

EQUIPO

FARMACOS
SEDACIÓN





Arch Pediatr Urug 2012; 83(4): 250-255

ARTÍCULO ORIGINAL

Ventilación no invasiva en menores de dos años internados en sala con infección respiratoria aguda baja. Posibles factores predictivos de éxito y de fracaso

Dres. Bernardo Alonso¹, Marie Boulay², Patricia Dall Orso¹, Miguel Allegretti³,
Rosario Berterretche³, Laura Solá³, Alicia Alemán⁴, Amanda Menchaca⁵, Gustavo Giachetto⁶

Escolar con AVNI e interfase nasal (Optiflow)



Imagen cedida por Dr.
Francisco Prado



XIII Jornadas Integradas de
Emergencia Pediátrica

II Encuentro Iberoamericano de
Emergencia Pediátrica

28 al 30 de Noviembre de 2016
Centro de Convenciones - Radisson Montevideo Victoria
Plaza Hotel



Organiza: SIEPU
Sociedad Integrada de
Emergencia Pediátrica del Uruguay

Presentación propuestas asma agudo

B. Alonso, J. Benito, L. Cáceres, ME. Gordillo, S. Mintegi, F. Morosini, V. Pavlicich, J. Piva, J. Prego, F. Prado, P. Rino.





Recomendaciones

- Dirigidas al tratamiento del asma agudo moderado y severo
- Tratamiento de crisis asmática
 - Precoz
 - Intenso
- Evitar demoras en Servicios de Urgencias
- Valorar respuestas y adecuar tratamientos
- Todo paciente con crisis asmática debe ser tratado de igual forma/según recomendaciones generales independientemente del lugar y hora de la consulta
- Escalonar tratamientos si no responde, en forma progresiva y rápida

Recomendaciones

- Evitar la progresividad de la crisis
- Evitar la hipoxia
- Evitar IOT/AVM
- Adecuar plantas físicas, nuevos equipamientos
- Entrenamiento / Simulación (OAF / VNI)

Tratamiento escalonado de la crisis asmática

IOT – AVM

Soporte respiratorio
O2 CNAF - VNI

Sulfato de Mg iv - Salbutamol iv
Aminofilina iv - Ketamina iv

Corticoides

Broncodilatadores inhalados
Beta2 agonistas - Anticolinérgicos

Oxigenoterapia - Monitorización

1er. Congreso de la Sociedad Latinoamericana de Emergencia Pediátrica (SLEPE)

XIV Jornadas Integradas de Emergencia Pediátrica (SIEPU)



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Noviembre de 2018**

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Radisson Montevideo
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Uruguay**

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