jeudi 22 novembre 2016 de 9h30 à 10h00

Détresse respiratoires
Spécificités pédiatriques

Christophe Milési
Réanimation Pédiatrique MONTPELLIER

c-milesi@chu-montpellier.fr

Conflit d’interet

- Orateur pour Fisher et Paekel

Plan

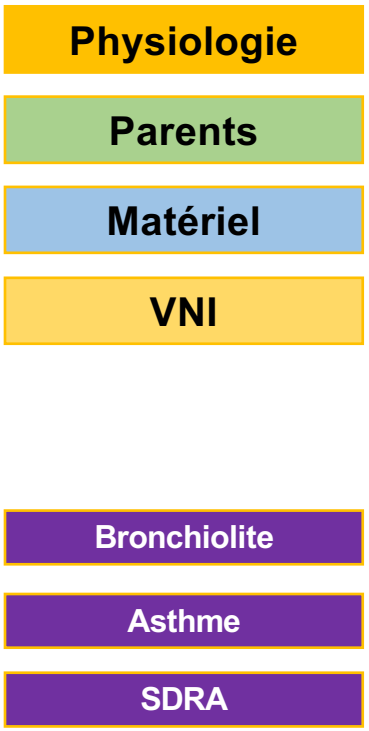
- Physiologie
- Importance des parents
- Importance du materiel
- Interet de la VNI

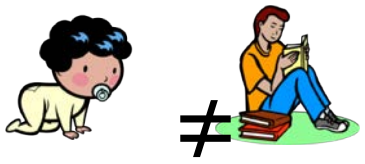
QQ pathologies:

-Bronchiolite

-Asthme et VNI

-SDRA

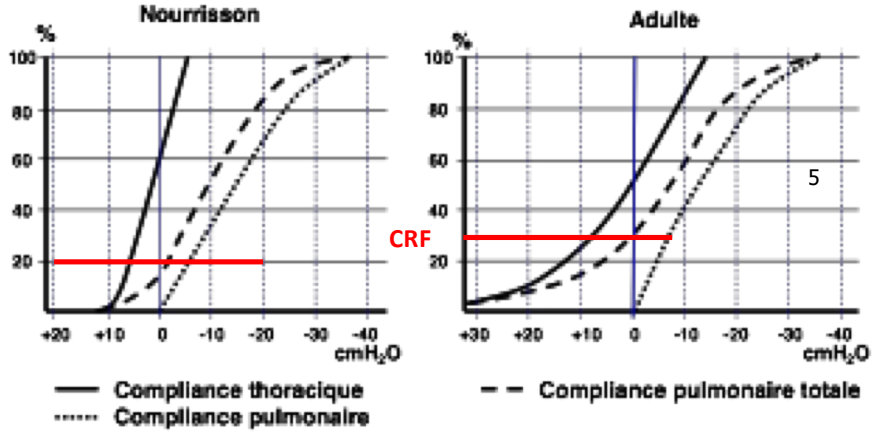




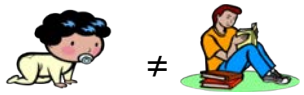
. Mecanique

Basse compliance pulmonaire / grande compliance thoracique

Propriétés statiques et dynamique thoraco-pulmonaires	3 mois	Adulte	Facteur de variation
Compliance pulmonaire (mL/cm H_2O)	5-6	200	40
Compliance thoracique (mL/cm H_2O/kg)	1	2,5-3	2,5-3
Compliance spécifique (compliance/CRF)	0,04-0,06	0,04-0,07	1
Résistance pulmonaire (cm H_2O/L/sec)	25-30	1,6	0,05



Physiologie

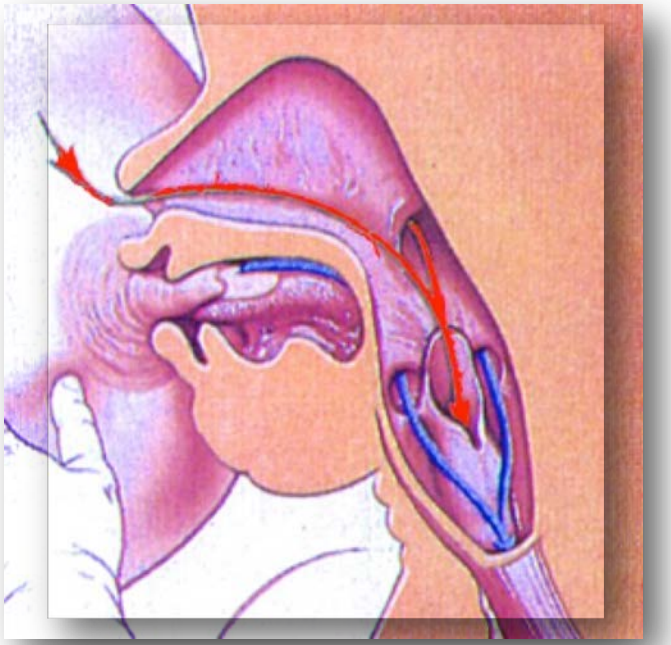


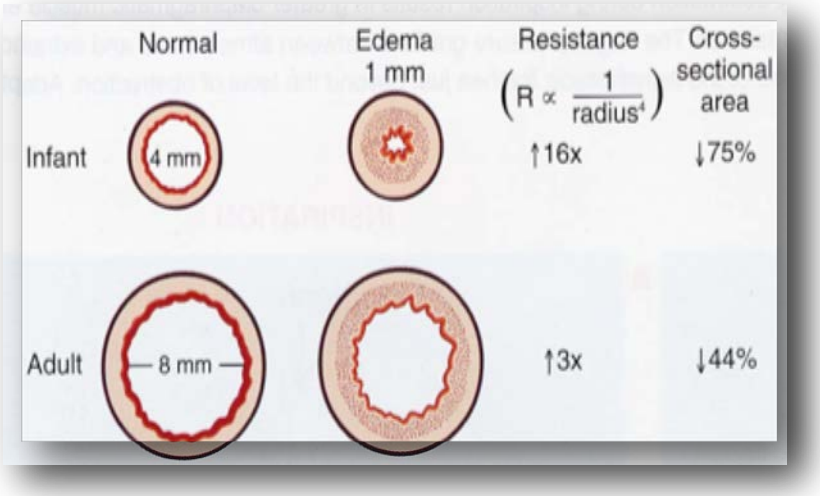
•Anatomie

•Hypertrophie des amigdales.

•Résistance au débit des narines (≈ 50% of R_{aw}) et des petites bronches.

•Espace mort physiologique: 3ml/kg.

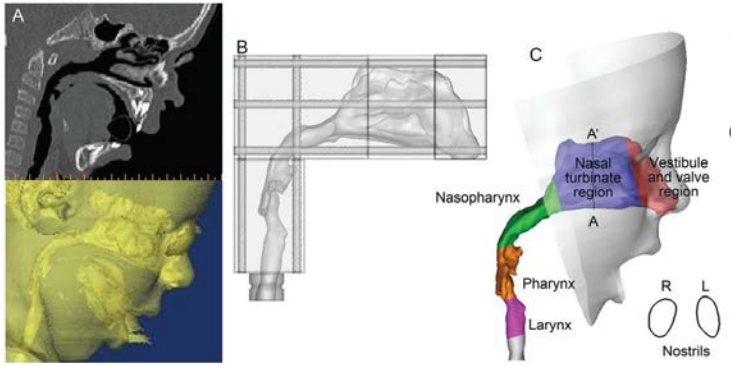


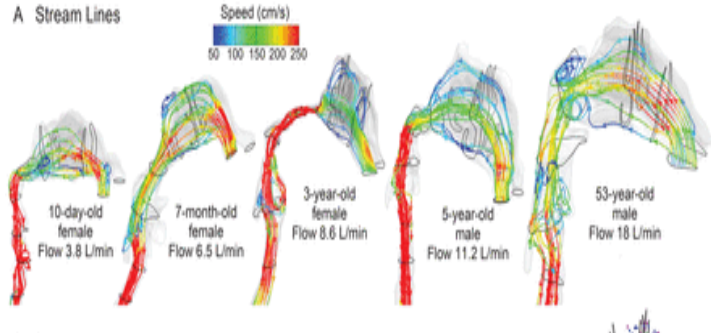


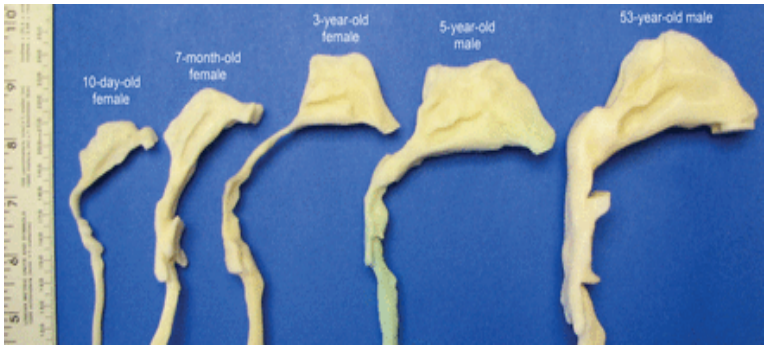
Physiologie

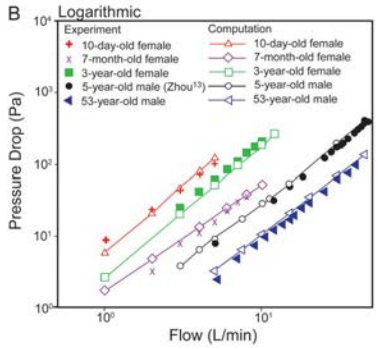
Growth of Nasal and Laryngeal Airways in Children: Implications in Breathing and Inhaled Aerosol Dynamics

Jinxiang Xi PhD, Xiuhua Si PhD, Yue Zhou PhD, JongWon Kim PhD, and Ariel Berlinski MD









Metabolique

Paramètres respiratoires	Infant	Adult	Facteur de croissance
Fréquence respiratoire	40-60/min	12-16/min	0,3
Ventilation minute (mL/min)	650	7000	11
Ventilation alvéolaire			
- en mL/min	400	4200	10
- en mL/kg/min	100-150	60	0,5
- $mL/m^2/min$	2,3	2,3	1
Consommation d'O_2			
- en mL/min	18	250	14
- en mL/kg/min	6,8	3,3	0,5
Travail respiratoire (g/cm/L)	2000-4000	2000-7000	1-2
Élimination de CO_2 (mL/kg/min)	6	3	0,5
Capacité de diffusion (mL CO/kPa/min)	6-22,5	112-188	10-20
Shunt physiologique	6-10%	1-3%	0,15-0,4

 ≠ 

Synthese

① Augmentation rapide de la charge imposée aux muscles inspiratoires.

② Faible capacité et résistance musculaire

③ Des besoins en O2 plus importants

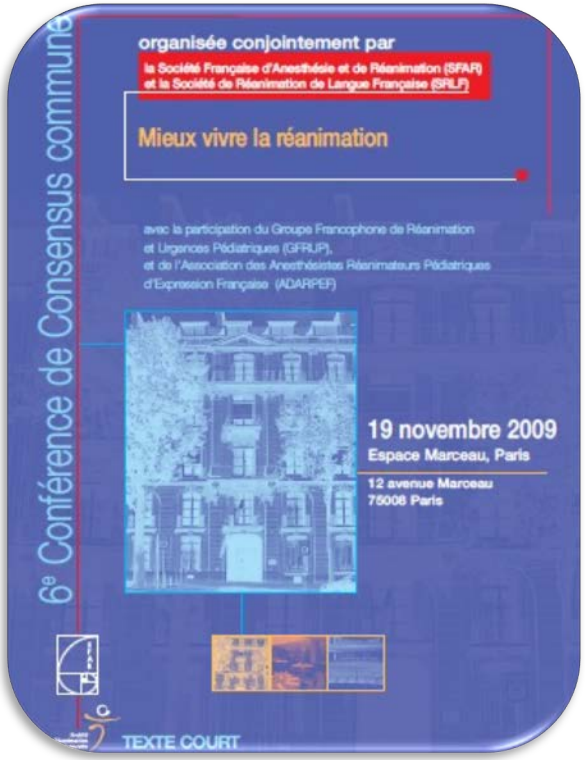
➥Sensibilité à la détresse respi

Parents

Parents

Parents

Conférence de consensus GFRUP SRLF SFAR 2009



« Un enfant hospitalisé a **le droit** d'avoir ses parents ou leur substituts auprès de lui jour et nuit quel que soit son age ou son état. »

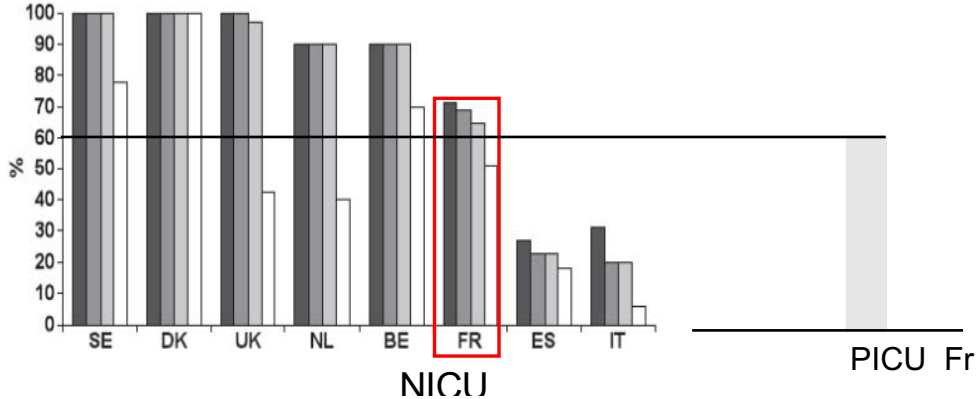
« Les parents deviennent des **partenaires de soins »**

« Une **politique de service définissant le champ d'action des familles** est utile afin de garantir la sécurité du patient et de limiter les risque de tension avec l'équipe soignante. »

Parents

Réalité de l'entrée des familles NICU vs PICU

Entrée 24/24



Greisen 2009

	Ouverture 24/24	Grands parents admis	Fratrie admise	Lits dans la chambre pour parents	Douche pour parents	Salle de repos
PICU F n=33(%)	57	67	81	40	40	73
NICU F n=45 (%)	70	85	87	15	23	55
p	0.3	0.11	1	**0.005**	0.36	0.16

Matériel

Respirateurs

Respi spécifiques VNI **Respi lourd avec soft VNI**

Pas de mélangeur air/O2

Mélangeur air / O2

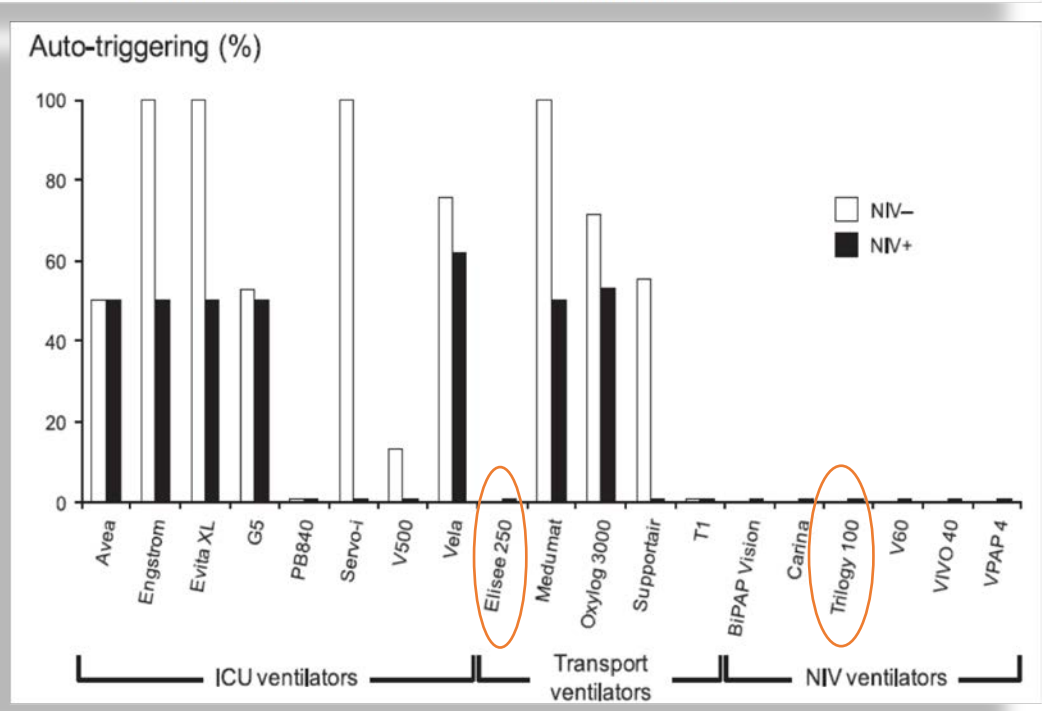
Matériel

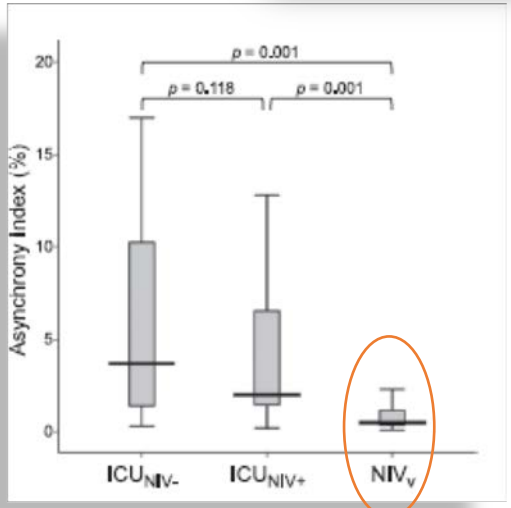
CHEST Original Research
CRITICAL CARE

Patient-Ventilator Asynchrony During Noninvasive Ventilation

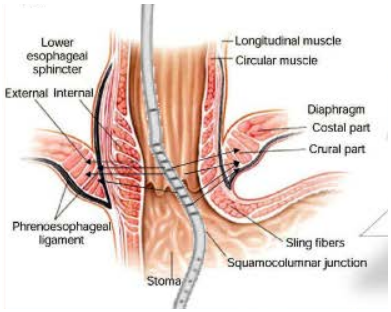
A Bench and Clinical Study

Guillaume Carteaux, MD; Aissam Lyazidi, PhD; Ana Cordoba-Izquierdo, MD; Laurence Vignaux; Philippe Jolliet, MD; Arnaud W. Thille, MD, PhD; Jean-Christophe M. Richard, MD, PhD; and Laurent Brochard, MD





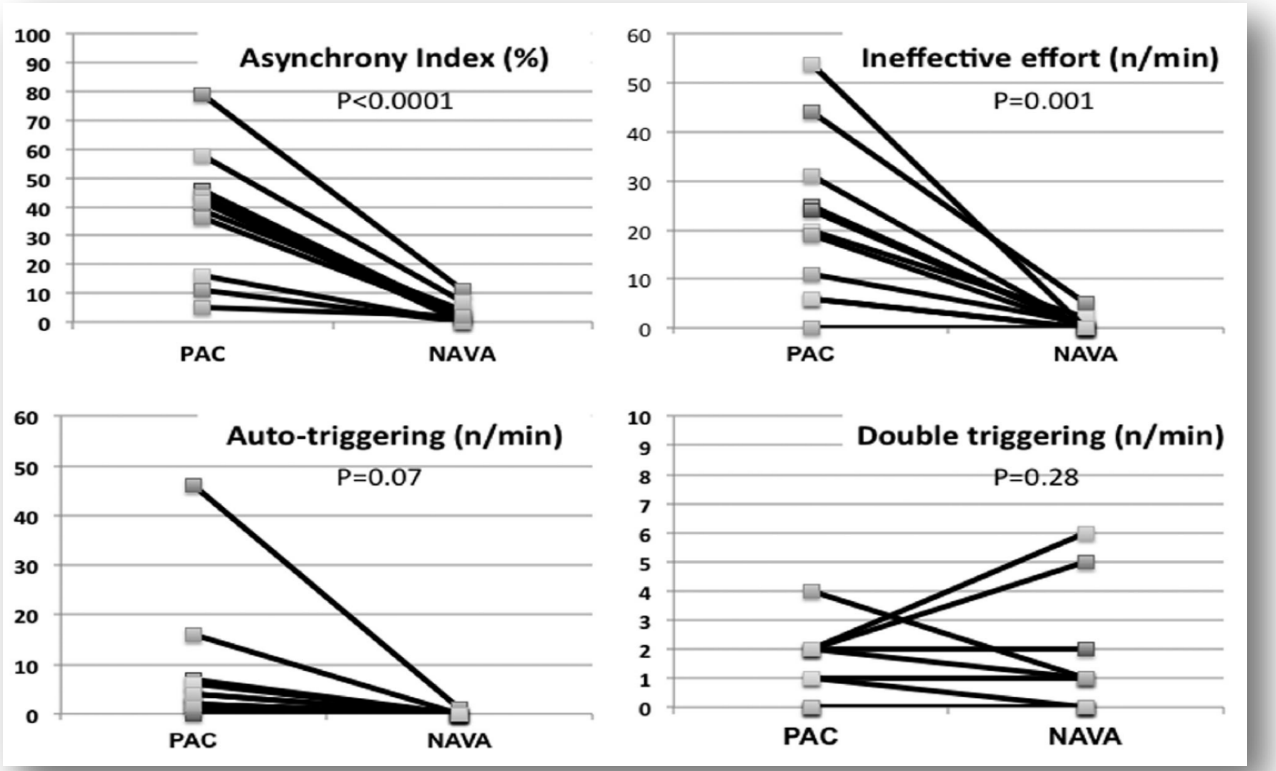
Matériel



Pediatric Pulmonology

Neurally Adjusted Ventilator Assist (NAVA) Reduces Asynchrony During Non-Invasive Ventilation for Severe Bronchiolitis

Florent Baudin, MD,[1] Robin Pouyau, MD,[1] Fleur Cour-Andlauer, MD,[1,2] Julien Berthiller, MSc,[2,3] Dominique Robert, MD, PhD,[4] and Etienne Javouhey, MD, PhD[1,4]*

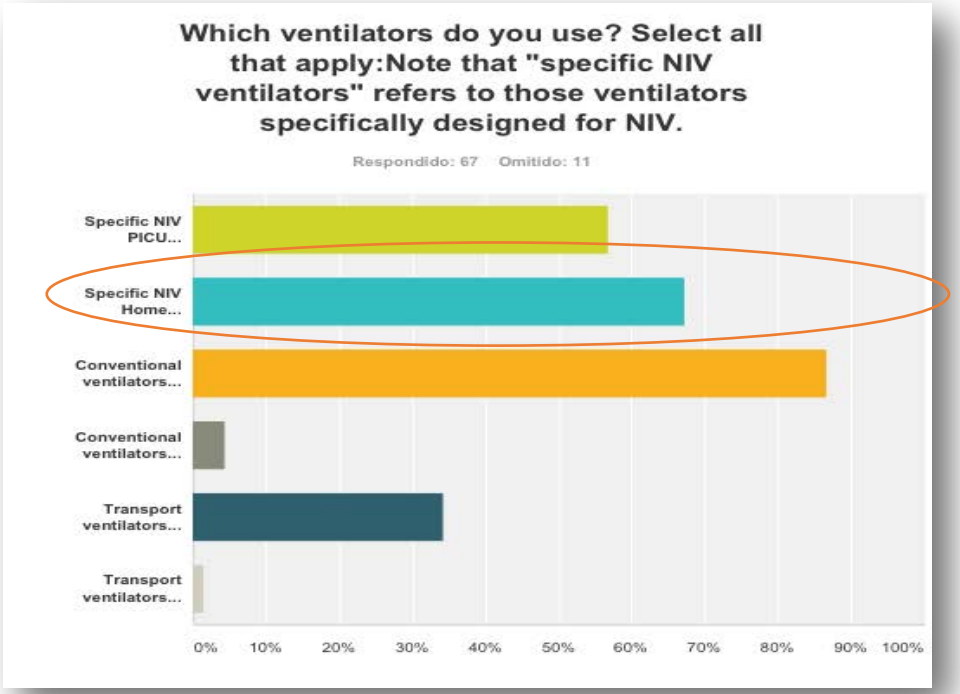


Matériel

Non-invasive ventilation practices in children across Europe

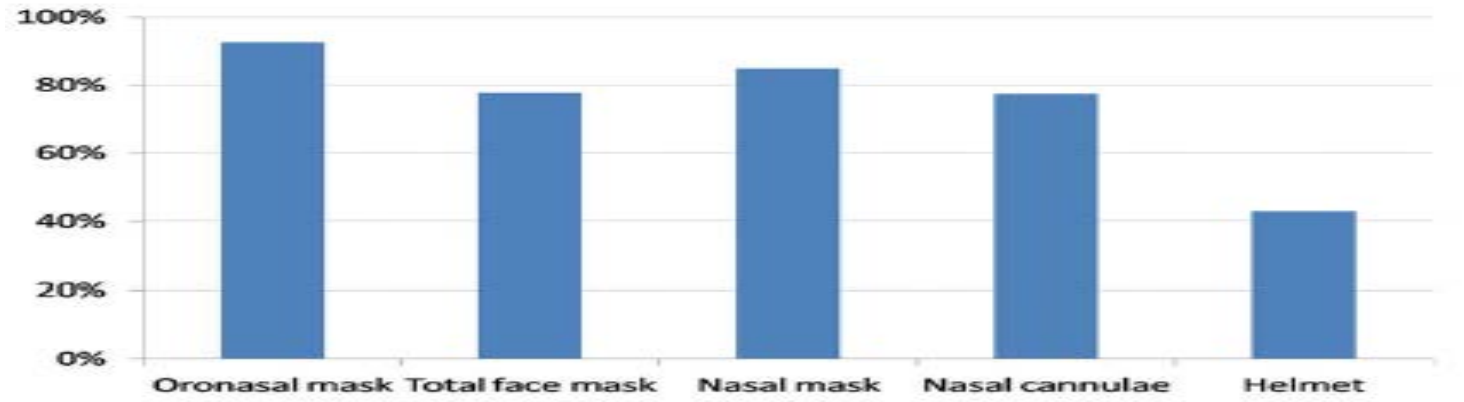
Juan Mayordomo-Colunga MD,PhD[1] | Martí Pons-Òdena MD,PhD[2] |
Alberto Medina MD,PhD[1] | Corsino Rey MD,PhD[1] | Christophe Milesi MD,PhD[3] |
Merja Kallio MD,PhD[4] | Andrea Wolfler MD,PhD[5] | Mireia García-Cuscó MD[6] |
Demet Demirkol MD[7] | Milagros García-López MD[8] | Peter Rimensberger MD,PhD[9]

Pediatric Pulmonology. 2018;1–8.



Matériel

Interfaces

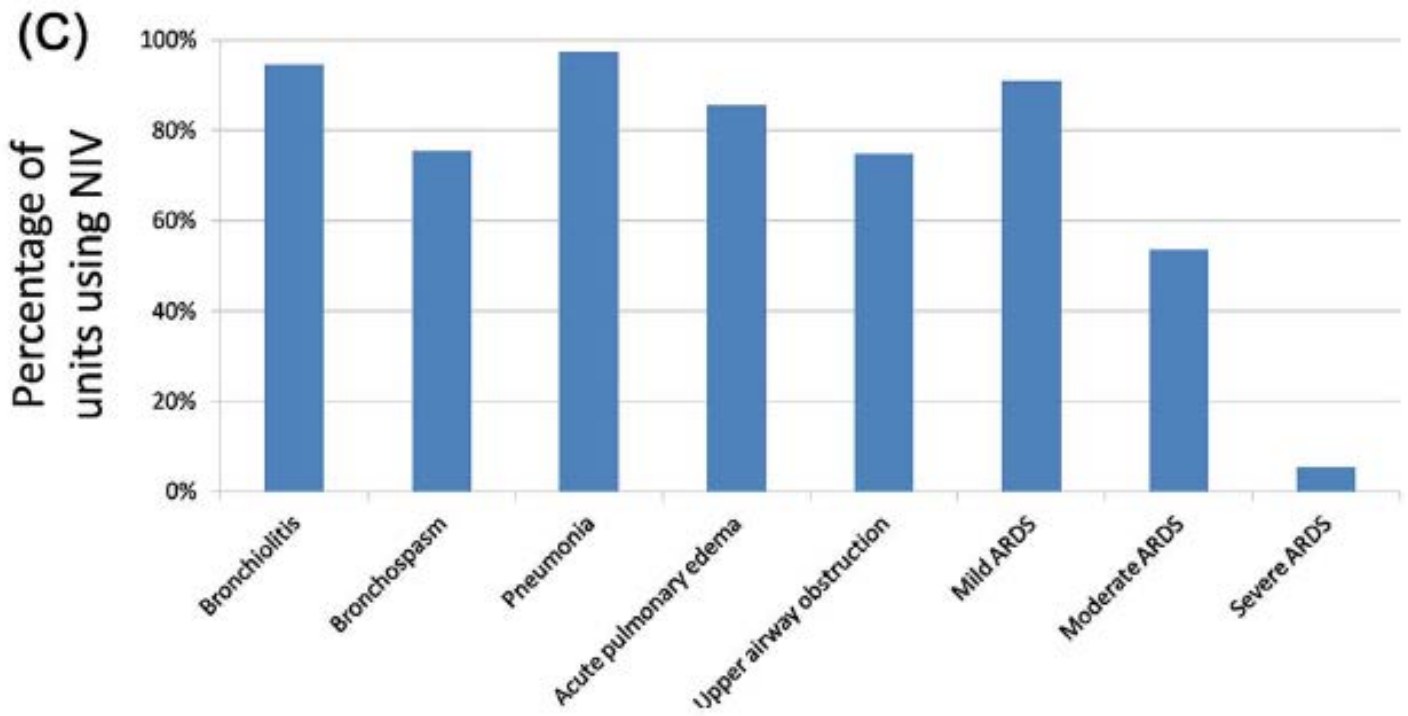


VNI

Non-invasive ventilation practices in children across Europe

Juan Mayordomo-Colunga MD,PhD[1] | Martí Pons-Òdena MD,PhD[2] |
Alberto Medina MD,PhD[1] | Corsino Rey MD,PhD[1] | Christophe Milesi MD,PhD[3] |
Merja Kallio MD,PhD[4] | Andrea Wolfler MD,PhD[5] | Mireia García-Cuscó MD[6] |
Demet Demirkol MD[7] | Milagros García-López MD[8] | Peter Rimensberger MD,PhD[9]

Pediatric Pulmonology. 2018;1–8.



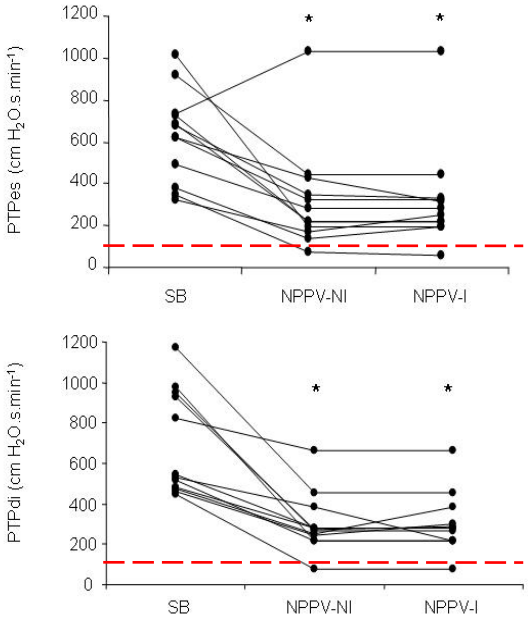
VNI

Intensive Care Med (2008) 34:2248–2255
DOI 10.1007/s00134-008-1202-9

PEDIATRIC ORIGINAL

Sandrine Essouri
Philippe Durand
Laurent Chevret
Vincent Haas
Claire Perot
Annick Clement
Denis Devictor
Brigitte Fauroux

Physiological effects of noninvasive positive ventilation during acute moderate hypercapnic respiratory insufficiency in children

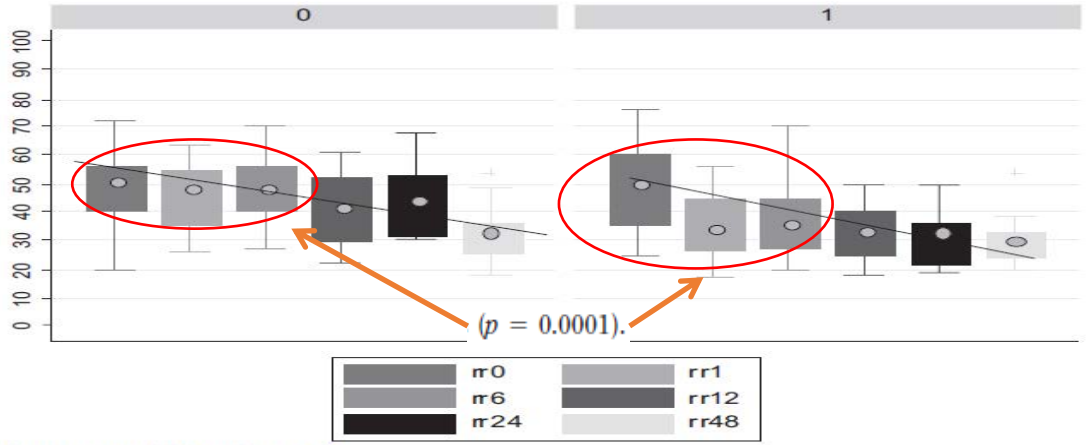


VNI

RR

A prospective, randomized, controlled trial of noninvasive ventilation in pediatric acute respiratory failure*

Leticia J. Yañez, MD; Mauricio Yunge, MD; Marcos Emilfork, MD; Michelangelo Lapadula, MD; Alex Alcántara, MD; Carlos Fernández, MD; Jaime Lozano, MD; Mariana Contreras, MD; Luis Conto, MD; Carlos Arevalo, MD; Alejandro Gayan, MD; Flora Hernández, RN; Mariela Pedraza, MD; Marion Feddersen, MD; Marcela Bejares, MD; Marta Morales, MD; Fernando Mallea, MD; Maritza Glasinovic, MD; Gabriel Cavada, PhD



Graphs by 0: CONTROL 1: NIV

	Control Group (n = 25)	NIV Group (n = 25)	p
Intubation, n (%)	15 (60%)	7 (28%)	0.045
Days of invasive ventilation (mean days)	3.1	2.6	—
ICU length of stay (mean days)	5.5 ± 2.7	6.7 ± 5.9	0.19
Hospital length of stay (mean days)	10.6 ± 4.8	10.4 ± 7.9	0.51

Table 2. Specific diagnoses in each group

Control Group	No.	NIV Group	No.
Moderate asthma	1	Moderate asthma	4
Viral pneumonia—bronchiolitis	9	Viral pneumonia and/or bronchiolitis	6
Bacterial pneumonia	1	Bacterial pneumonia	2
RSV pneumonia and/or bronchiolitis	12	RSV pneumonia—bronchiolitis	12
Influenza A pneumonia	2	Parainfluenza 1 pneumonia	1

VNI

Pediatric Critical Care

(*Crit Care Med* 2017; 45:1045–1053)

OPEN

Outcomes for Children Receiving Noninvasive Ventilation as the First-Line Mode of Mechanical Ventilation at Intensive Care Admission: A Propensity Score-Matched Cohort Study*

Jenny V. Morris, MSc[1]; Padmanabhan Ramnarayan, FFICM[2]; Roger C. Parslow, PhD[1]; Sarah J. Fleming, PhD[1]

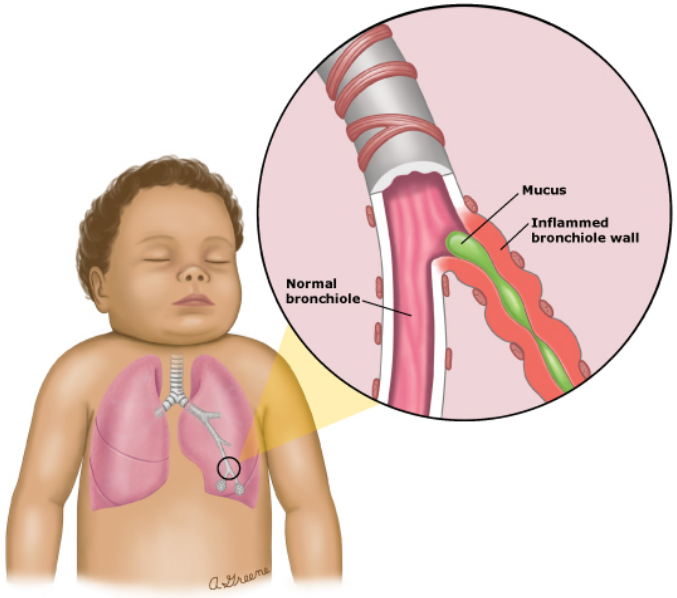
TABLE 2. Crude Outcomes for Patients Included in the Whole Cohort (*n* = 15,025) and Propensity Score-Matched Cohort (*n* = 6,002)

	Whole Cohort (*n* = 15,025)			Propensity Score Matching Cohort (*n* = 6,002)		
Outcome	Invasive Ventilation (*n* = 10,221)	NIV (*n* = 4,804)	*p*	Invasive Ventilation (*n* = 3,001)	NIV (*n* = 3,001)	*p*
PICU mortality (%)	9.6	4.4	< 0.001	8.5	5.9	< 0.001
Length of ventilation (d), median (IQR)	4 (2–7)	4 (2–7)	< 0.001	5 (3–9)	4 (2–7)	< 0.001
Length of stay (d), median (IQR)	5 (2–9)	5 (3–8)	< 0.001	6 (4–11)	5 (3–9)	< 0.001
VFD-28—all patients, median (IQR)	8 (0–24)	12 (0–22)	0.016	0 (0–16)	8 (0–22)	< 0.001
VFD-28—survivors only, median (IQR)	12 (0–24)	12 (0–22)	0.269	0 (0–16)	12 (0–22)	< 0.001
NIV failure rate, *n* (%)	NA	1,237 (25.7)	NA	NA	948 (33.3)	NA

IQR = interquartile range, NA = not applicable, NIV = noninvasive ventilation, VFD-28 = ventilation-free days at day 28.

A Wilcoxon rank-sum test was used to compare all continuous variables presented as mean (interquartile range), a two sample *t* test was used to compare continuous variables presented as mean (SD), and chi-square test of independence compared all categorical variables presented as *n* (%).

Bronchiolite



-Inflammation aigue virale (VRS +++)
-Œdème + nécrose des cel épithéliales.
-Production de mucus.

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

Guidance for the Clinician in Rendering Pediatric Care

CLINICAL PRACTICE GUIDELINE

Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis

PEDIATRICS Volume 134, Number 5, November 2014

	HAS 2000	AAP 2006	AAP 2014
Bronchodilatateur	NON	NON/ ou adré avec évaluation	NON

Intensive Care Med (2008) 34:1608–1614
DOI 10.1007/s00134-008-1150-4

ORIGINAL

Etienne Javouhey
Audrey Barats
Nathalie Richard
Didier Stamm
Daniel Floret

Non-invasive ventilation as primary ventilatory support for infants with severe bronchiolitis

	IV period (n=53)	NIV period (n=27)	P value
Intubation : n (%)	47 (89)	14 (52)	<0.001
Duration of ventilation support : median(1st-3rd Q)	100 (60-176)	87 (24-144)	0.45
Ventilation associated pneumonia: n (%)	9 (17)	0	<0.05

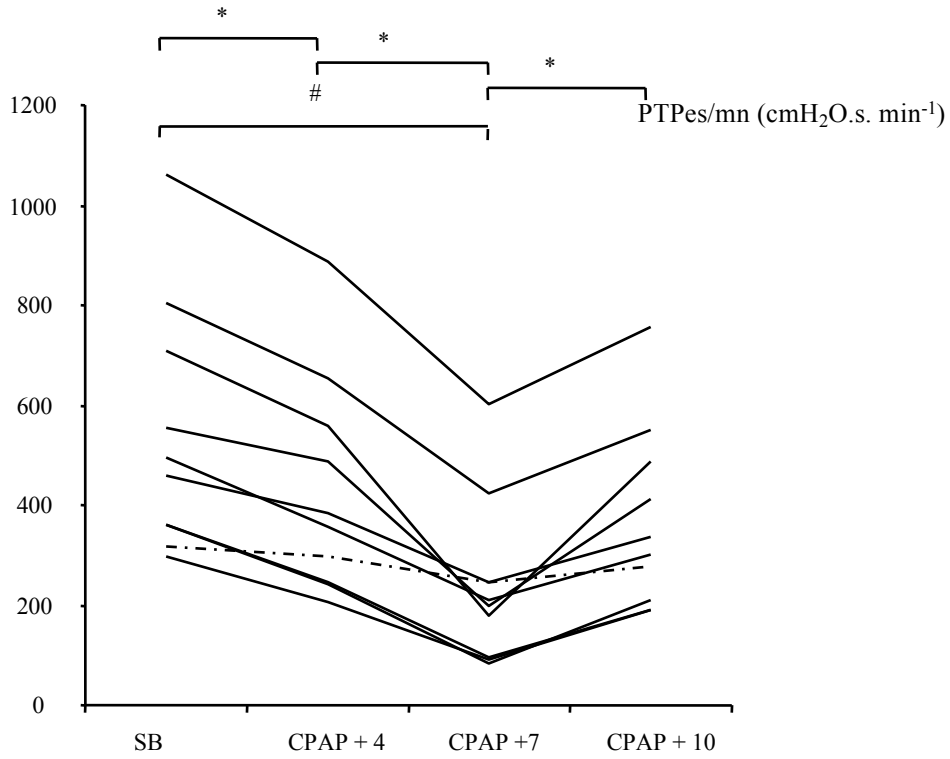
Bronchiolite

Intensive Care Med (2011) 37:2002–2007
DOI 10.1007/s00134-011-2372-4

PEDIATRIC ORIGINAL

Sandrine Essouri
Philippe Durand
Laurent Chevret
Laurent Balu
Denis Devictor
Brigitte Fauroux
Pierre Tissières

Optimal level of nasal continuous positive airway pressure in severe viral bronchiolitis



Bronchiolite

Continuous positive airway pressure (CPAP) for acute bronchiolitis in children (Review)

Jat KR, Mathew JL

Cochrane Library

Cochrane Database of Systematic Reviews

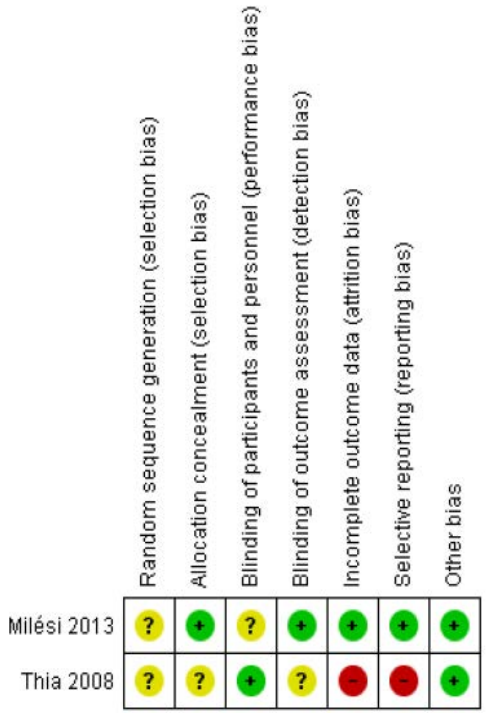


Figure 4. Forest plot of comparison: 1 Outcome measures between CPAP group and control group, outcome: 1.1 Proportion of patients requiring mechanical ventilation.

Figure 5. Forest plot of comparison: 2 Secondary outcomes, outcome: 2.3 Change in partial pressure of carbon dioxide from start to end of intervention (mmHg).

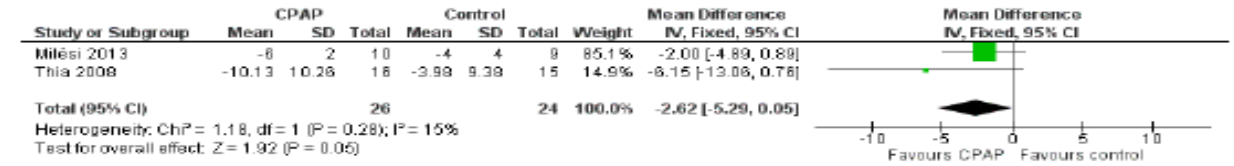
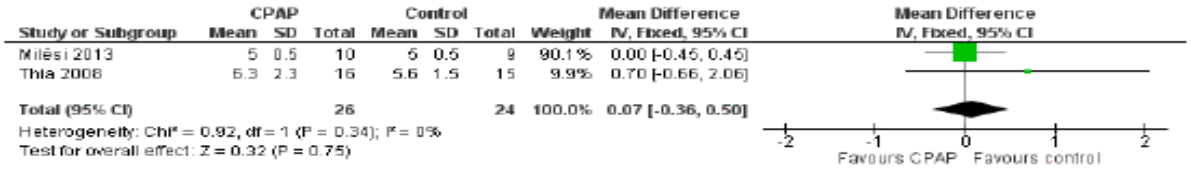


Figure 6. Forest plot of comparison: 2 Secondary outcomes, outcome: 2.4 Duration of hospital stay (days).



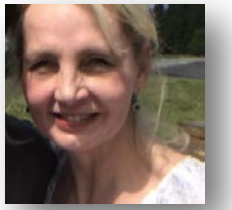
Bronchiolite

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of High-Flow Oxygen Therapy in Infants with Bronchiolitis

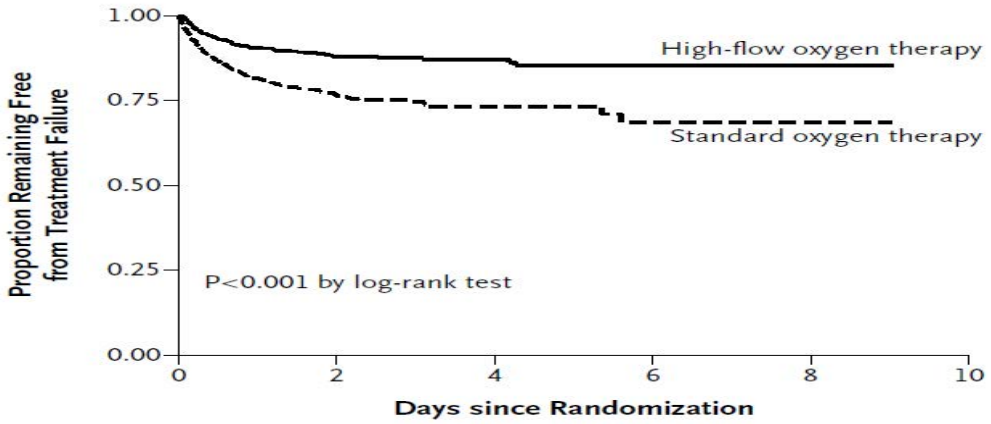
Donna Franklin, B.N., M.B.A., N ENGL J MED 378;12 NEJM.ORG MARCH 22, 2018



Population: 17 ER
-Age < 12 month
-O2 requirement (Sat 92-98%)
-No Pressure support.

Failure (≥3 signs)

-**HR**: idem
-**HR**: increase
-**RR**: idem
-**RR**: increase
-**FiO2**> 0,4



No. at Risk

High-flow oxygen	739	382	115	25	14	6
Standard oxygen	733	264	74	21	7	4

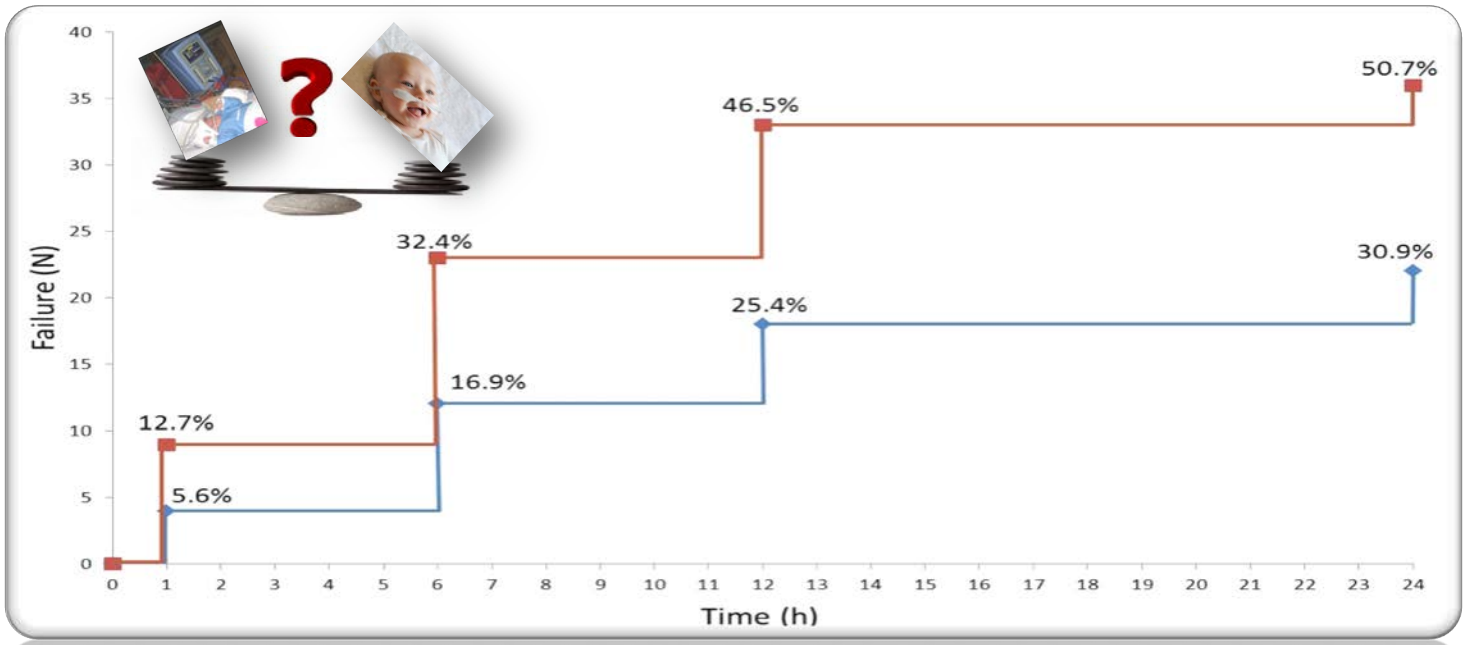
Bronchiolite

Intensive Care Med
DOI 10.1007/s00134-016-4617-8

ORIGINAL

High flow nasal cannula (HFNC) versus nasal continuous positive airway pressure (nCPAP) for the initial respiratory management of acute viral bronchiolitis in young infants: a multicenter randomized controlled trial (TRAMONTANE study)

Christophe Milési[1], Sandrine Essouri[2], Robin Pouyau[3], Jean-Michel Liet[4], Mickael Afanetti[5], Aurélie Portefaix[3,6], Julien Baleine[1], Sabine Durand[1], Clémentine Combes[1], Aymeric Douillard[7], Gilles Cambonie[1*] and Groupe Francophone de Réanimation et d'Urgences Pédiatriques (GFRUP)



Asthme

- Adulte

Auteur / année	n	étude	mode	résultats
Méduri 1996	17	Observ prosp	CPAP	CO2 amélioré
Fernandez 2001	33	Observ retros	CPAP +/- AI	CO2 amélioré
Soroksky 2003	30	**RCT**	Nasal AI 3+8	FEV1
De miranda 2004	42	**RCT**	Facial CPAP	0
Soma 2008	44	**RCT**	AI	FEV1
Filho 2009	21	**RCT**	AI 5+12	FEV1; FR
Gupta 2010	28	**RCT**	Facial AI 4+8	O2; LOS

FEV: capacité vitale forcée

- Pédiatrique

Auteur / année	n	étude	mode	résultats
Thill 2004	20	**RCT**	Nasal AI 5+10	FR; score de détresse
Carol 2006	5	Observ	AI	FR; score de détresse
Mayordomo 2011	72	Observ	Nasal AI 5+7	FR; score de détresse
Basnet 2012	20	**RCT**	AI	FR, score de détresse; O2

SDRA

SDRA

PALISI definition 'pediatrique 2014

Age	Exclude patients with peri-natal related lung disease			
Timing	Within 7 days of known clinical insult			
Origin of Edema	Respiratory failure not fully explained by cardiac failure or fluid overload			
Chest Imaging	Chest imaging findings of new infiltrate(s) consistent with acute pulmonary parenchymal disease			
Oxygenation	Non Invasive mechanical ventilation	Invasive mechanical ventilation		
	PARDS (No severity stratification)	Mild	Moderate	Severe
	Full face-mask bi-level ventilation or CPAP ≥5 cm H_2O [2] PF ratio ≤ 300 SF ratio ≤ 264 [1]	4 ≤ OI < 8 5 ≤ OSI < 7.5[1]	8 ≤ OI < 16 7.5 ≤ OSI < 12.3[1]	OI ≥ 16 OSI ≥ 12.3[1]

Figure 1: PALICC Definition of PARDS

OI = oxygenation index = (FiO_2* mean airway pressure*100)/ PaO_2

OSI = oxygen saturation index = (FiO_2* mean airway pressure*100) /SpO_2

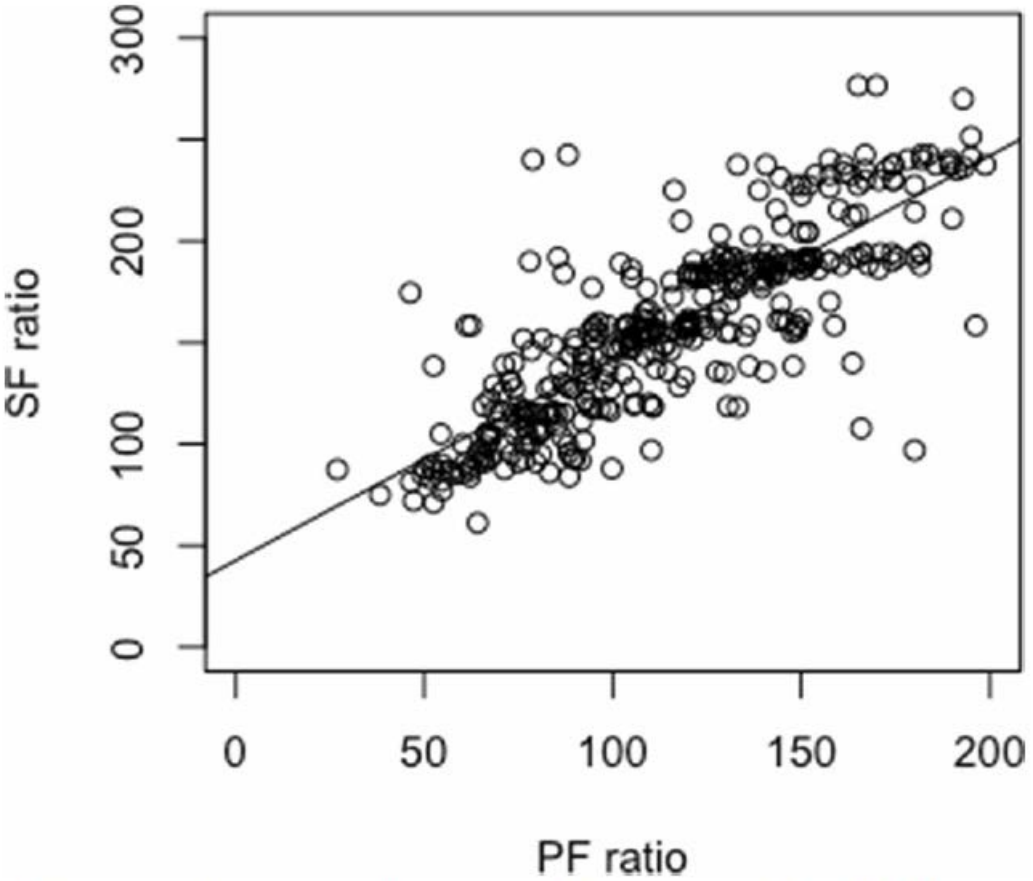


Fig. 2 Scatterplot of SPO_2/FiO_2 versus PaO_2/FiO_2 at initial ARDS diagnosis. The line represents the best-fit linear relationship: $SpO_2/FiO_2 = 42.6 + 1.0 * PaO_2/FiO_2$ [$P < 0.001$, $R^2 = 0.676$] at initial ARDS diagnosis

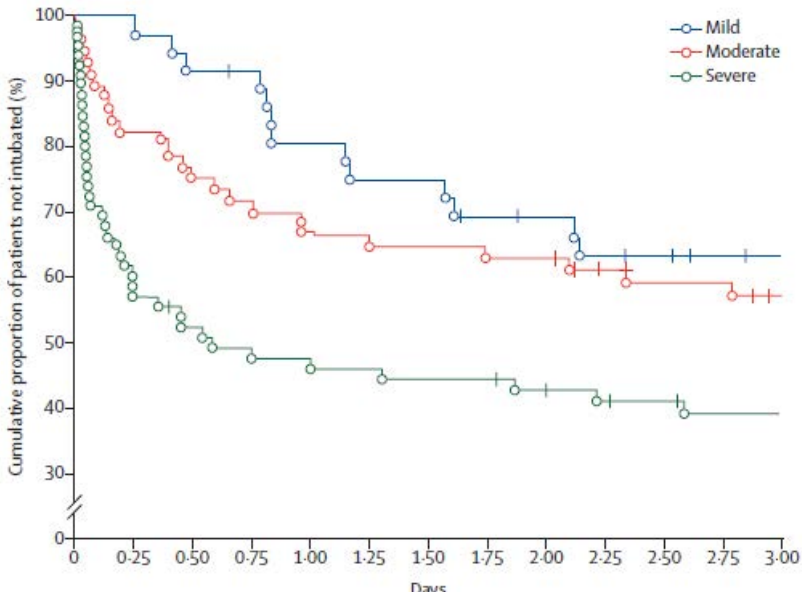
Pisani ICM 2017

SDRA

Paediatric acute respiratory distress syndrome incidence and epidemiology (PARDIE): an international, observational study

Robinder G Khemani, Lincoln Smith, Yolanda M Lopez-Fernandez, Jeni Kwok, Rica Morzov, Margaret J Klein, Nadir Yehya, Douglas Willson, Martin C J Kneyber, Jon Lillie, Analia Fernandez, Christopher J L Newth, Philippe Jouvet, Neal J Thomas, on behalf of the Pediatric Acute Respiratory Distress syndrome Incidence and Epidemiology (PARDIE) Investigators and the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI) Network*

	Non-invasive ventilation subgroups			
	Non-invasively ventilated (n=160)	Non-invasively ventilated with subsequent intubation‡ (n=80)	Non-invasively ventilated and not intubated‡ (n=80)	p value†
PICU mortality	24 (15·0%; 9·9–21·5)	20 (25·0%; 16·0–35·9)	4 (5·0%; 1·4–12·3)	0·0004
90 day mortality§	27/158 (17·1%; 11·4–23·6)	21/79 (26·6%; 17·0–37·6)	6/79 (7·6%; 2·8–15·6)	0·0015



SDRA: **3% des admissions** en réaped et **6% des intubés**
PALISI def plus sensible et précoce (32% des Berlin def).

Mortalité si Berlin def: 27%
Mortalité si PALISI def: 17%

Si VNI: Echec dans 50% et mortalité si echec de 25%

Conclusion

- **Physio:** Enfant non petit adulte
- **Parents:** Acteurs de soins.
- **Matériel:** le plus récent!
- **Réglage:** Ti, VT, Trigger
- **Evidence…. Faible niveau!**