

**3<sup>rd</sup> INTERNATIONAL PEDIATRIC**

**NONINVASIVE VENTILATION  
CONFERENCE**

**Necker university hospital**

Paris - France

November 7<sup>th</sup> & 8<sup>th</sup> 2019

# Interfaces for NIV and CPAP in children

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# Interfaces for NIV in children

- The different types of interfaces
- Advantages and side effects
- How choose the optimal interface ?
- In practice...



# Nasal masks



MiniMe  
vented  
nasal mask



## Evaluation of a New Pediatric Positive Airway Pressure Mask

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Valerie Assalone, R.N.<sup>3</sup>; Chia-Yu Cardell, RPSGT<sup>1</sup>; Stephanie Huston, B.S.<sup>2</sup>; Leslee Willes, M.S.<sup>4</sup>; Alison J. Wimms, M.Sc.<sup>5</sup>;  
June Mendoza, B.S.<sup>5</sup>

# Pixi nasal vented mask





# Nasobuccal mask



# Nasobuccal masks

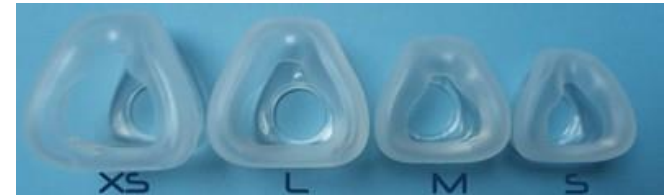


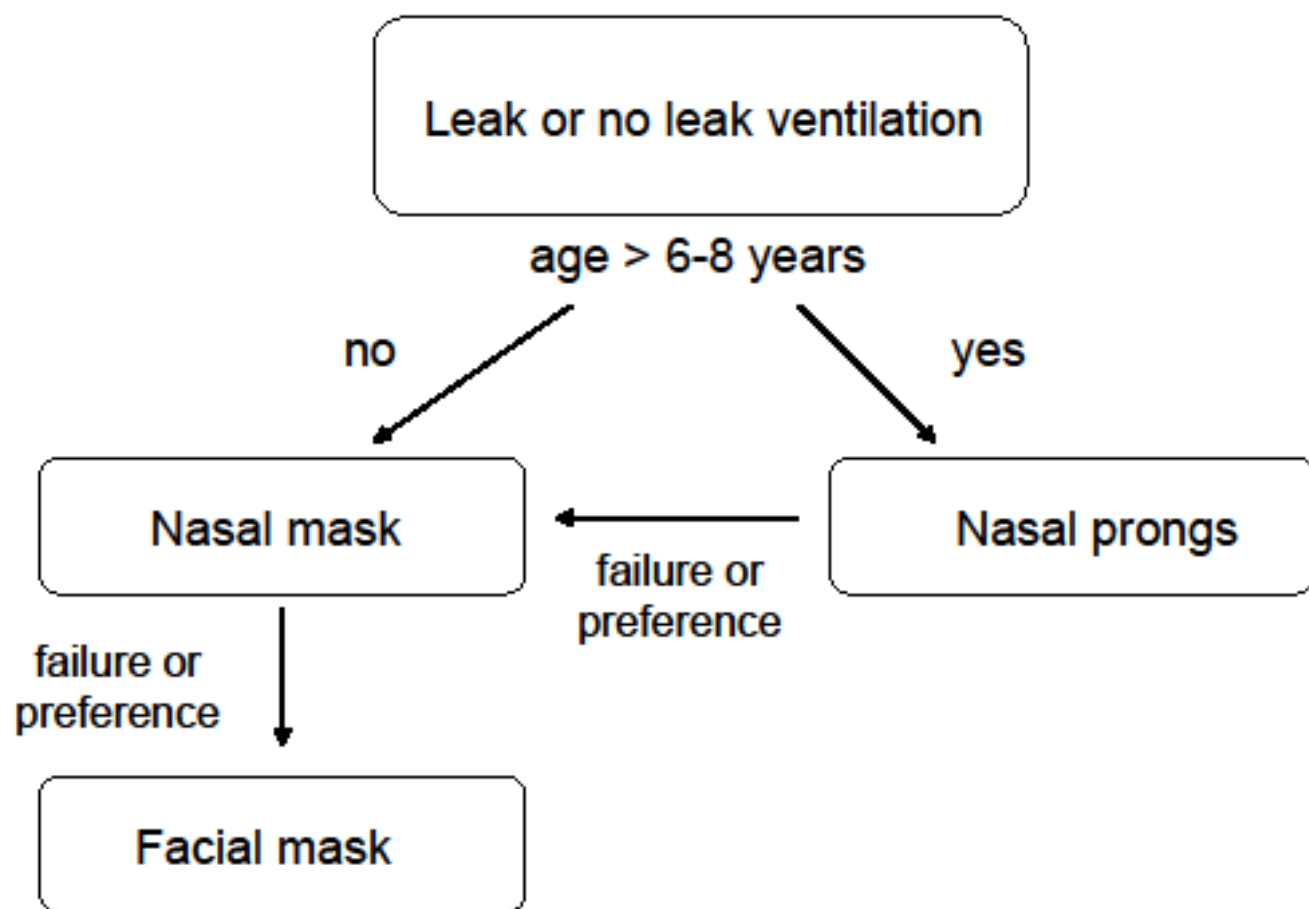
# Nasal prongs





# Nasal interfaces for infants





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# Long-term non-invasive ventilation in children



Alessandro Amaddeo, Annick Frapin, Brigitte Fauroux

	Advantages	Disadvantages	Side-effects
Nasal mask	Small internal volume; large choice of different industrial models	Not usable in case of mouth leaks	Pressure sores, eye irritation if leaks, facial deformity
Nasobuccal mask	Prevents mouth leaks	Large volume; risk of inhalation of gastric content in case of gastro-oesophageal reflux; impairs communication and vocalisation; increased aerophagia	Pressure sores, eye irritation if leaks, facial deformity
Total face mask	Prevents mouth leaks	Larger volume than nasobuccal mask; risk of inhalation of gastric content in case of gastro-oesophageal reflux; impairs communication and vocalisation; increased aerophagia	Pressure sores, facial deformity
Nasal pillows	Small and light; no pressure sores	Not usable in case of mouth leaks	Nasal irritation
Mouthpiece	Small and light; no pressure sores; can be used intermittantly	Not useable during sleep	None

*Lancet Respir Med* 2016

Published Online

July 13, 2016



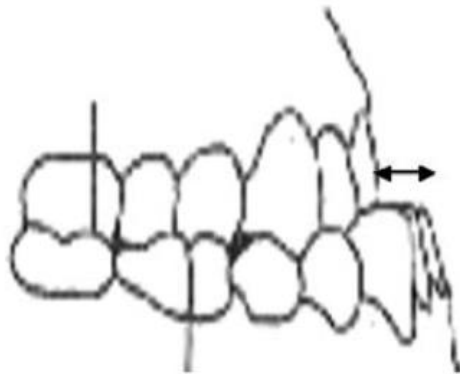
Brigitte Fauroux  
Jean-François Lavis  
Frédéric Nicot  
Arnaud Picard  
Pierre-Yves Boelle  
Annick Clément  
Marie-Paule Vazquez

## Facial side effects during noninvasive positive pressure ventilation in children

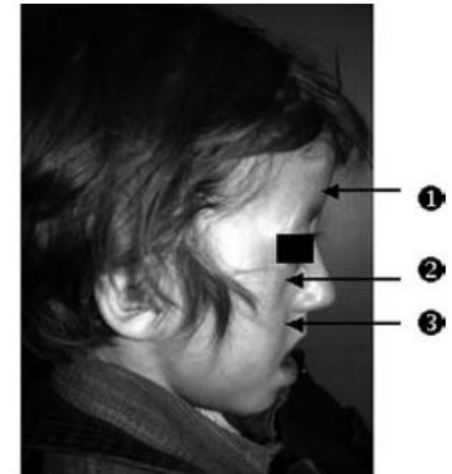


Brigitte Fauroux  
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Frédéric Nicot  
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Pierre-Yves Boelle  
Annick Clément  
Marie-Paule Vazquez

## Facial side effects during noninvasive positive pressure ventilation in children



Rétromaxillie



Aplatissement facial

# Limits of interfaces

- No nasobuccal masks for young children & infants
- Skull and facial deformity: inadequation between mask and headgear
- Pressure of the headgear: ex. posterior distraction

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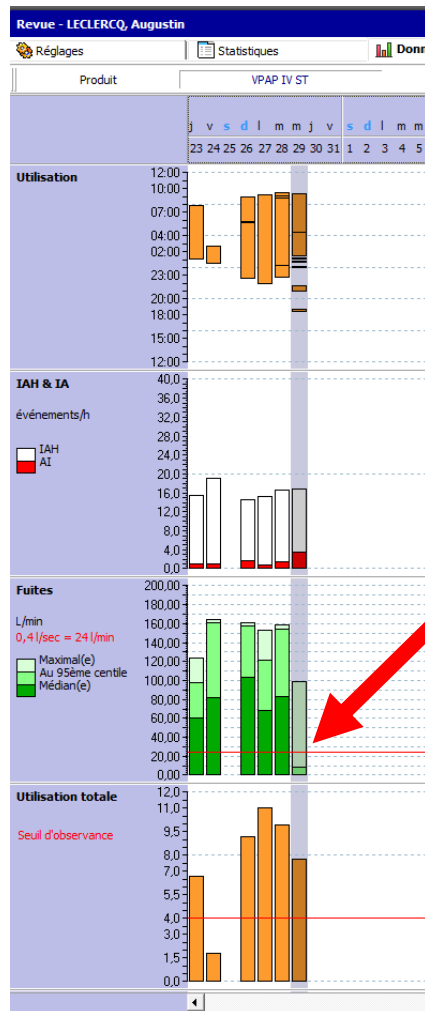




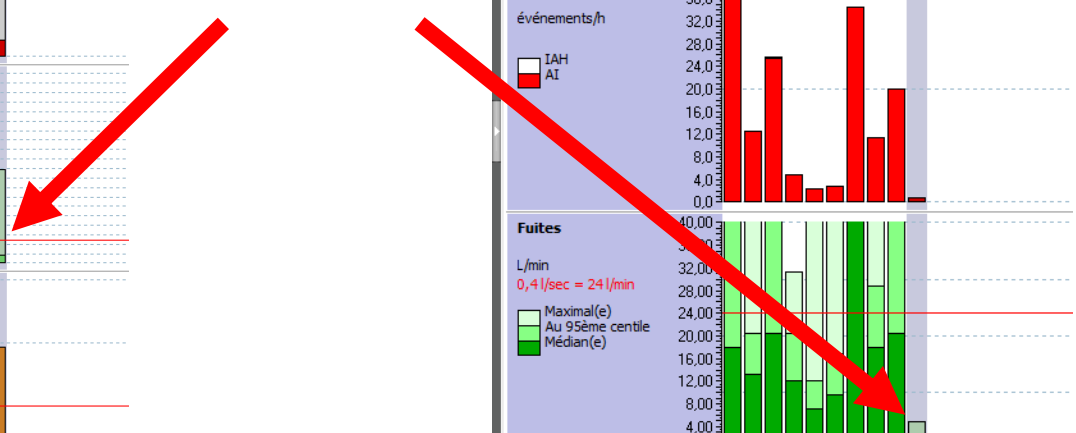
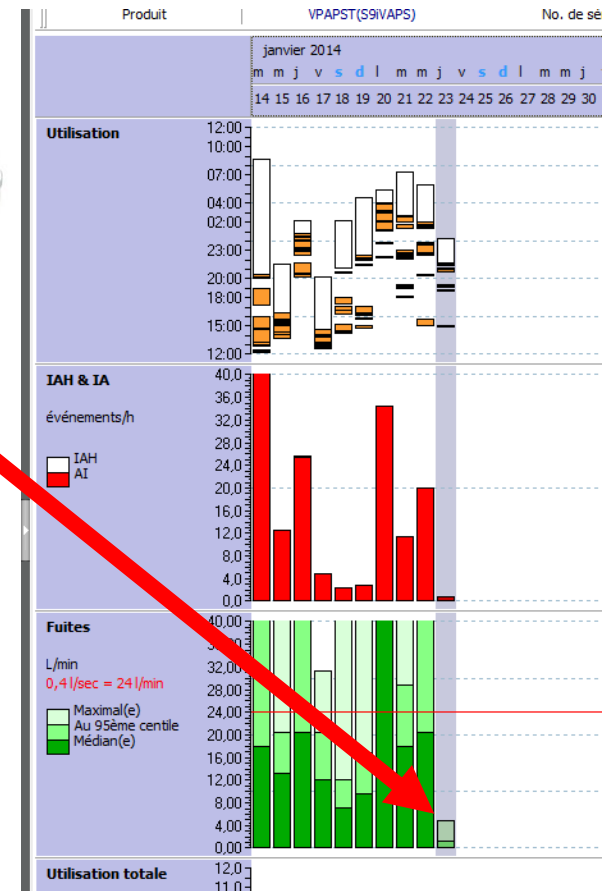
# How choose the optimal interface ?

- Factors guiding the interface choice:
  - patient's age (weight)
  - facial (and skull) anatomy (headgear +++)
  - mouth breathing, nasal permeability
  - ventilatory mode ( $\pm$  vented interface)
  - patient's autonomy (neuromuscular patients)
  - patient's comfort (unintentional leaks)
  - patient's tolerance (skin injury, facial deformity)

# Reduction of non intentional leaks with an appropriate nasal mask



Decrease of non intentional leaks



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Contents lists available at ScienceDirect

## Sleep Medicine

journal homepage: [www.elsevier.com/locate/sleep](http://www.elsevier.com/locate/sleep)

Original Article

## Continuous positive airway pressure and noninvasive ventilation adherence in children



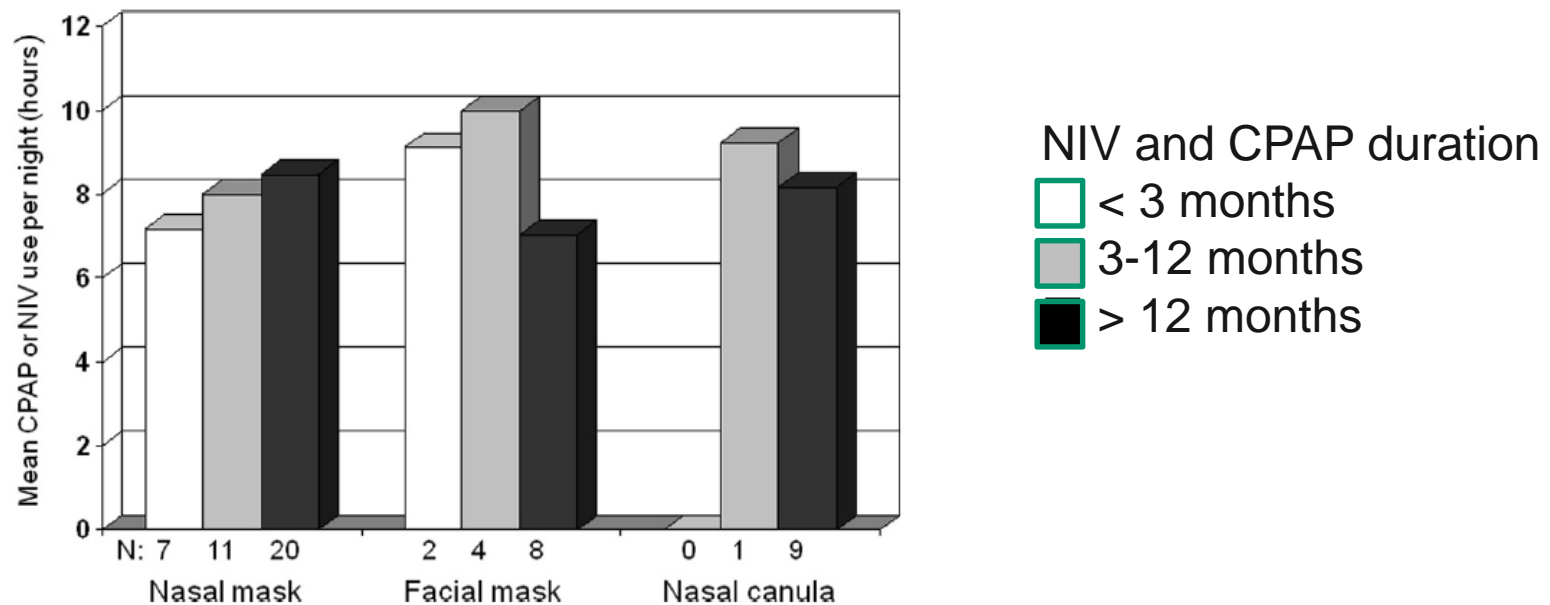
Adriana Ramirez<sup>a,b</sup>, Sonia Khirani<sup>b,c</sup>, Sabrina Aloui<sup>b</sup>, Vincent Delord<sup>d</sup>, Jean-Christian Borel<sup>e,f</sup>, Jean-Louis Pépin<sup>f,g</sup>, Brigitte Fauroux<sup>b,h,i,\*</sup>

	Total population (N = 62)	Nasal mask (n = 38)	Facial mask (n = 14)	Nasal cannula (n = 10)	P value
<i>Underlying disease (n, %)</i>					
OSA	51 (82%)	33	14	4	
Lung disease	5 (8%)	4	0	1	
Neuromuscular disease	6 (10%)	1	0	5	
Gender (female/male)	26/36	12/26	9/5	5/5	
Age (y)	10.0 ± 4.7	7.6 ± 4.0 <sup>§</sup>	11.8 ± 4.6	15.0 ± 3.0	<.001
Weight (kg)	31.0 ± 21.0	25.6 ± 20.5 <sup>§</sup>	41.9 ± 16.5	47.0 ± 13.4	<.001
<i>CPAP and NIV adherence over the last month</i>					
Average use per night (h:min)	8:17 ± 2:30	8:17 ± 2:16	8:12 ± 3:17	8:23 ± 2:44	.858
Number of patients using treatment >8 h/night (n, %)	45 (72%)	25 (65%)	12 (86%)	8 (80%)	.183
Average nights use (n)	26 ± 5	27 ± 4	23 ± 8	28 ± 7	.122
<i>Nocturnal gas exchange with CPAP or NIV</i>					
Mean SpO <sub>2</sub> (%)	97 ± 2	97 ± 2	97 ± 3	97 ± 2	.985
Minimal SpO <sub>2</sub> (%)	91 ± 2	91 ± 4	92 ± 2	90 ± 4	.328
% of night time with a SpO <sub>2</sub> <90% (%)	0.3 ± 1.3	0.5 ± 1.7	0.0 ± 0.0	0.0 ± 0.0	.233
4% Desaturation index (events/h)	4 ± 5	5 ± 7	3 ± 3	4 ± 3	.936
Mean PtcCO <sub>2</sub> (mmHg)	39 ± 5	39 ± 5	38 ± 3	41 ± 7	.270
Maximal PtcCO <sub>2</sub> (mmHg)	45 ± 5	45 ± 5	42 ± 4	48 ± 5*	.020
Percent of night time with a PtcCO <sub>2</sub> >50 mmHg (%)	1.4 ± 6.3	0.4 ± 2.0	0.0 ± 0.0	8.1 ± 15.2 <sup>#</sup>	.016



# NIV and CPAP adherence according to the interface

	Age < 10 y			Age > 10 y		
	Nasal mask (n = 30)	Facial mask (n = 5)	Nasal cannula (n = 0)	Nasal mask (n = 8)	Facial mask (n = 9)	Nasal cannula (n = 10)
Average use per night (h:min/night)	8:14 ± 2:17	07:50 ± 3:43	-	08:27 ± 2:23	8:25 ± 3:01	08:23 ± 2:38
Number of patients using CPAP or NIV >8 h/night (n, %)	20 (66%)	4 (80%)	-	6 (75%)	8 (88%)	8 (80%)
Average number of nights use over the last month (n)	27 ± 4	22 ± 9	-	28 ± 4	24 ± 7	28 ± 4
Number of patients using CPAP or NIV <3 h/night (n, %)	1 (3%)	1 (20%)	-	0	1 (11%)	1 (10%)



# Conclusion

- The choice of the **interface (+ headgear)** is of **paramount importance** for the **success** of **NIV** in children
- Important improvements have been made:
  - nasal interfaces for infants
  - minimal contact interfaces (nasal prongs)
- Improvements can be made
  - headgears
  - nasal prongs and nasobuccal masks for young children

**A well tolerated interface + ventilator is the key of success**

