

TC monitoring in the NICU: The value of $TcpO_2$



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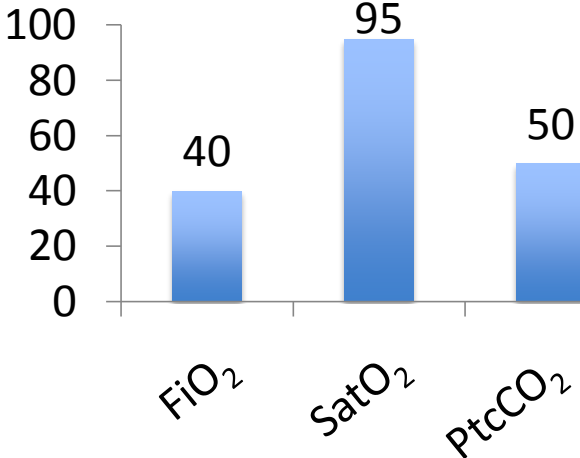
ESPNIC Respiratory Section Deputy Chair
ESPR/ESN Scientific Content Manager and Officer for Accreditation



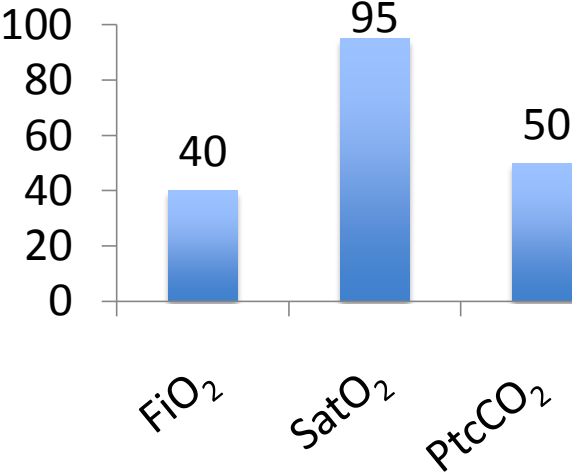
UNIVERSITÀ
CATTOLICA
del Sacro Cuore



Are they different ?



FiO_2 (%)
Air = 21%





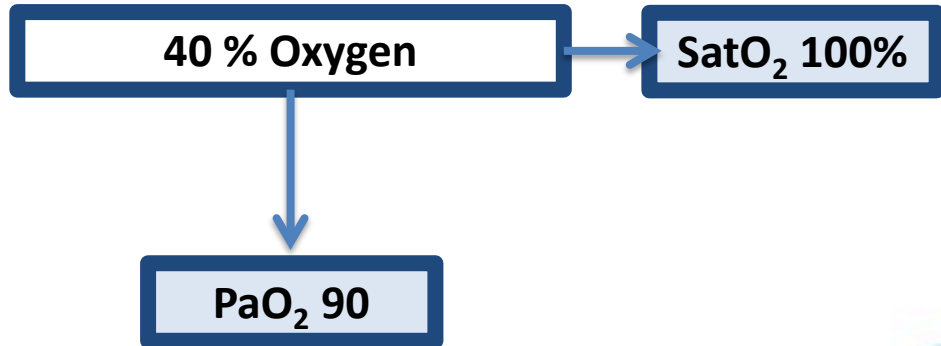
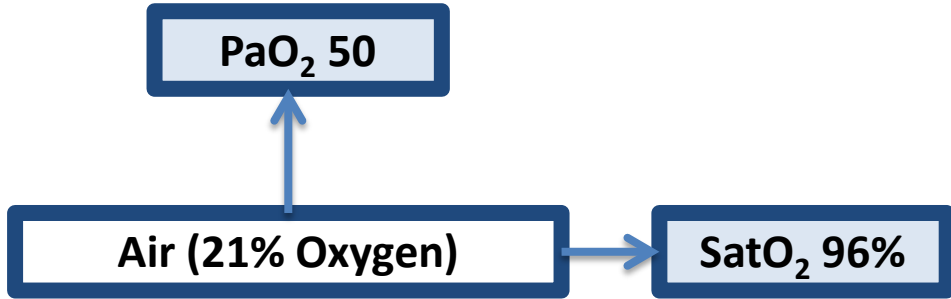
Temperature 37.5°C

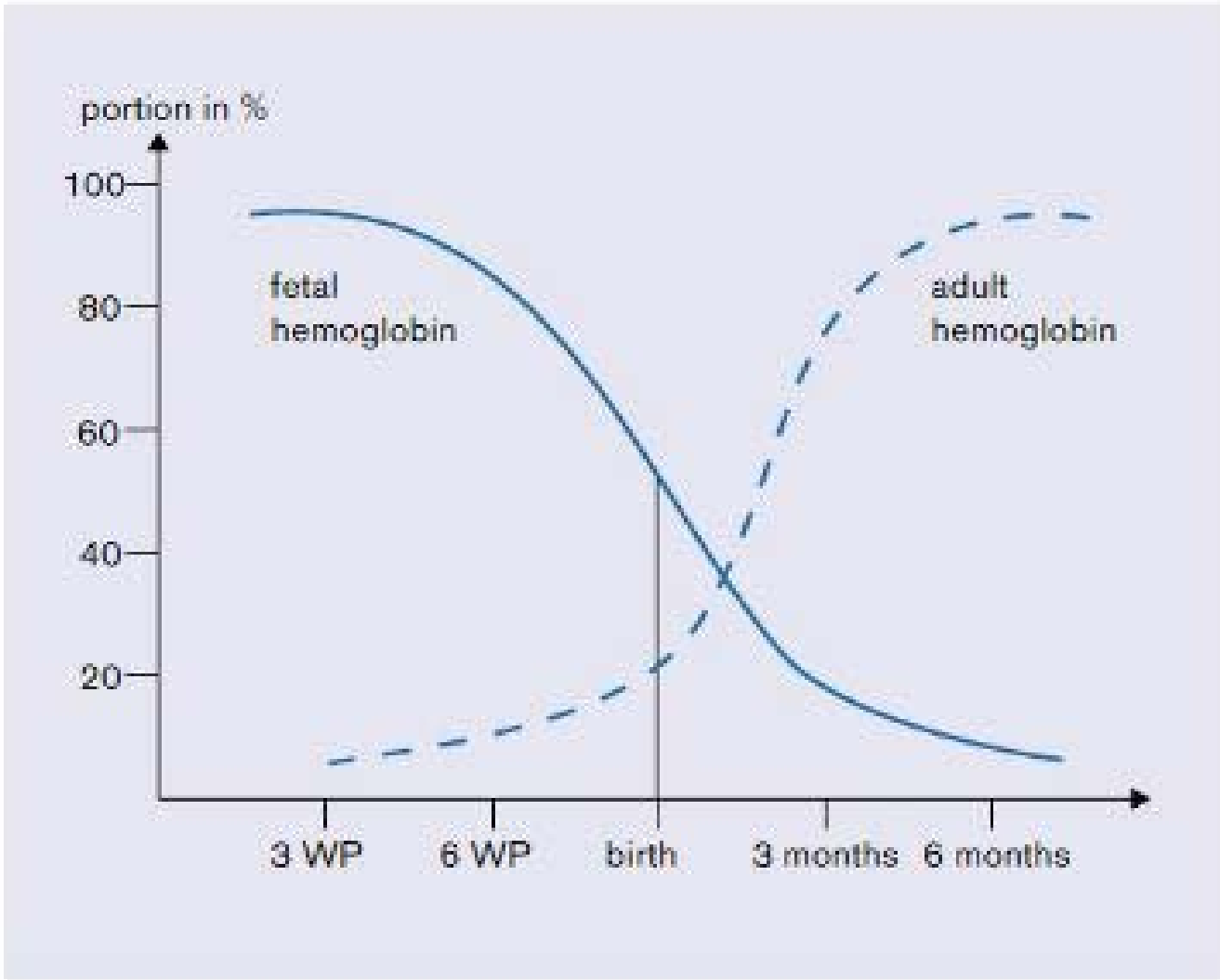
PARACETAMOL 250 mg

Temperature 39.5°C

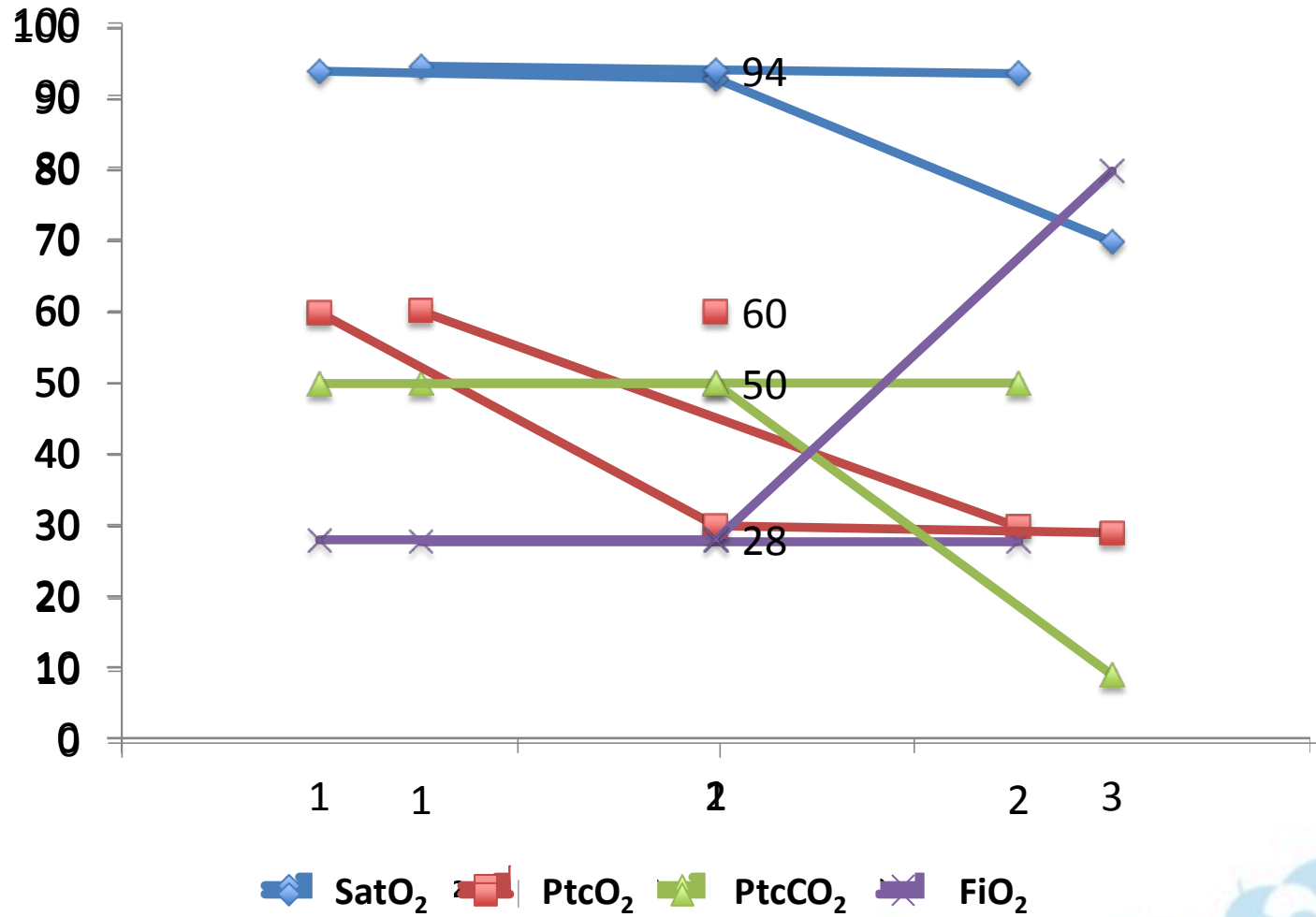
ZERO PARACETAMOL



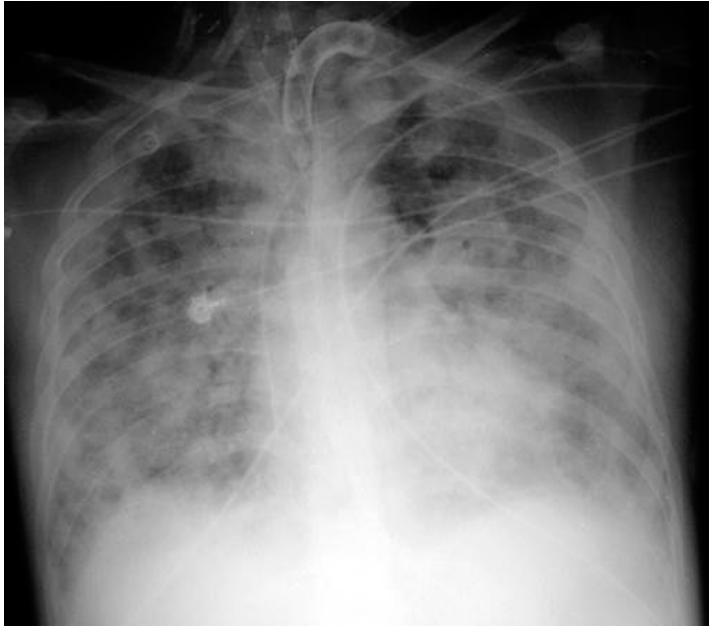




Kinetic



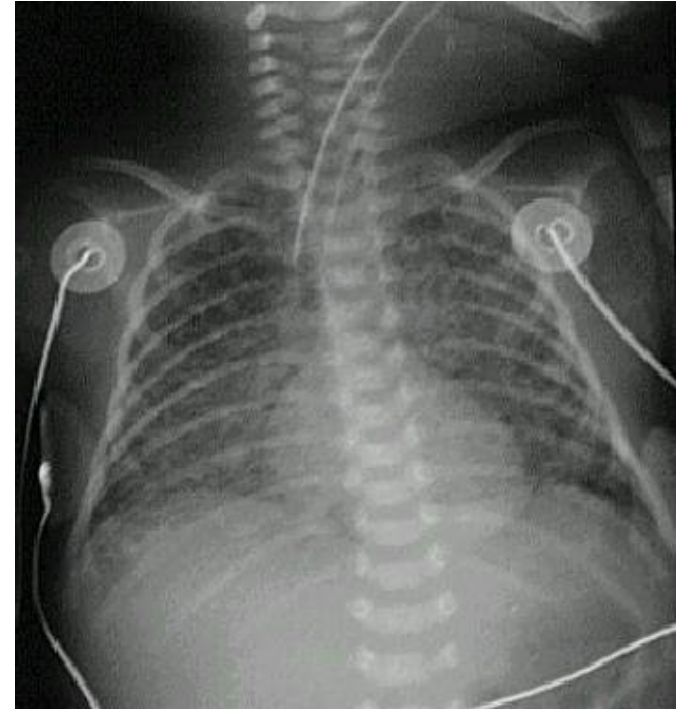
Adults with A-RDS



$\text{PaO}_2/\text{FiO}_2 = 150$

Arterial catheters or
Transcutaneous PaO_2

Babies with RDS



$\text{FiO}_2 = 40\%$

$\text{PaO}_2 = ???$

Very rare arterial catheters - rare
Transcutaneous PaO_2

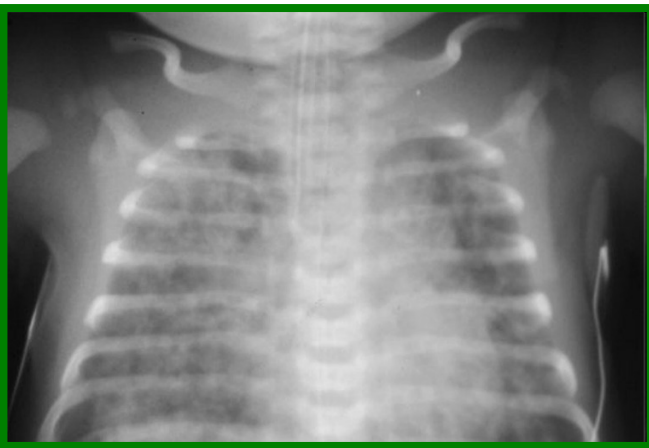
Does neonatal ARDS exists???

YES!

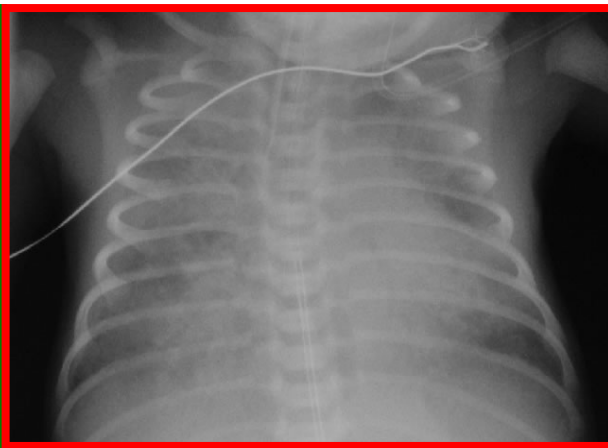
(Why not?)



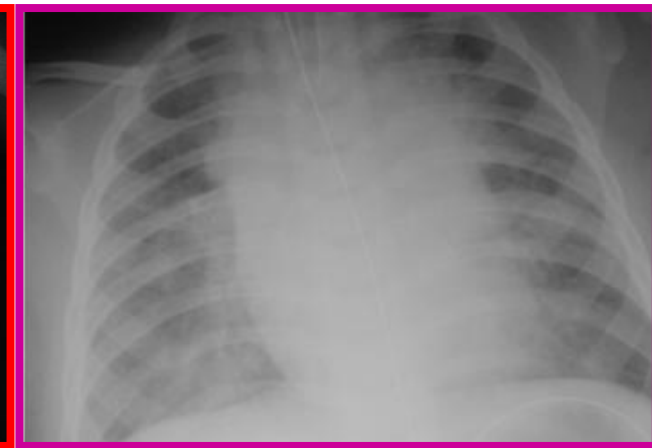
Same ???



**Meconium
aspiration**

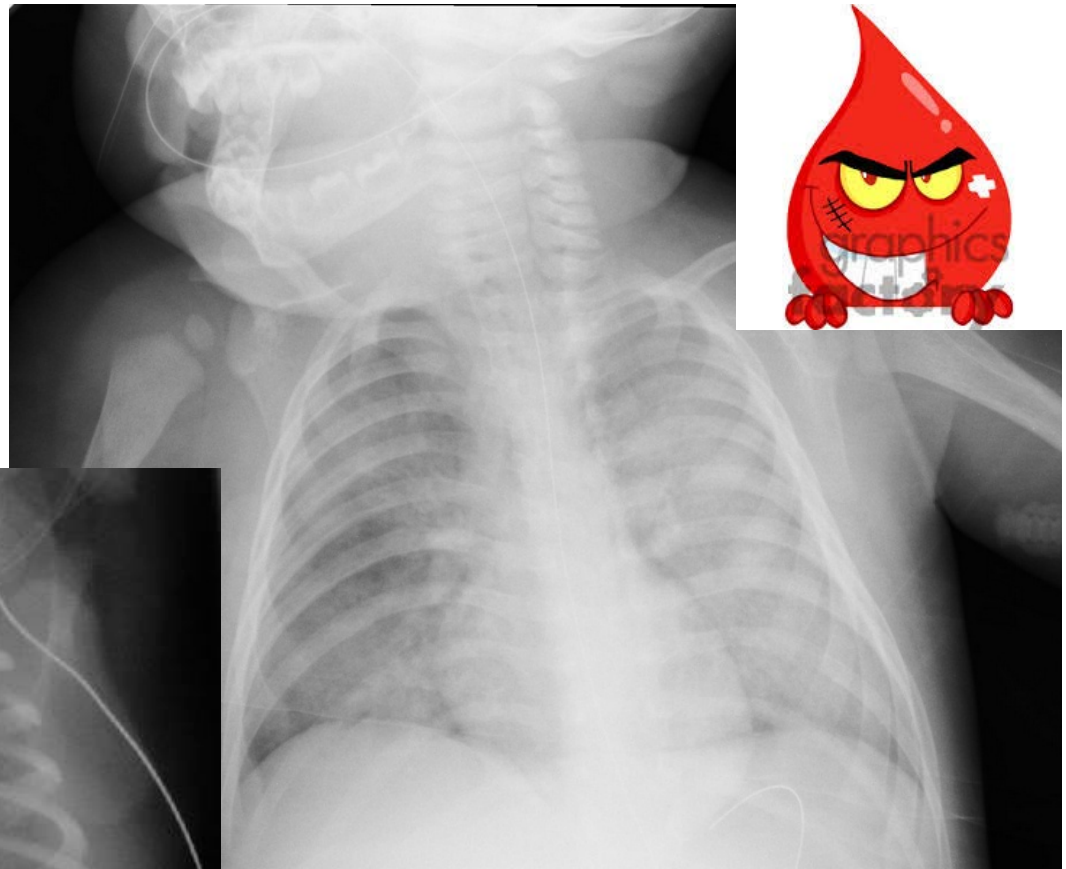


Sepsis



ARDS





Nguyen S, Pediatrics 2002



MONTREUX DEFINITION: An expert consensus for neonatal ARDS

ALL THE 5 CRITERIA MUST BE FULFILLED	
1. Timeframe	Acute onset from a known or suspected clinical insult (such as infection [sepsis, pneumonia, bronchiolitis..], milk or meconium aspiration, NEC etc..)
2. Exclusion criteria	Hyaline membrane disease or transient tachypnoea of the neonate as primary current acute respiratory condition, as defined by the appendix
3. Lung imaging	Bilateral, irregular opacities/infiltrates or complete opacification of the lungs (at chest x-rays), not fully explained by local effusions or atelectasis or congenital malformations or hyaline membrane disease or TTN
4. Origin of oedema	Absence of congenital heart disease explaining the oedema (this includes PDA without acute pulmonary haemorrhage). Echocardiography is needed to verify this criterion.
5. Oxygenation deficit expressed as oxygenation index* (it may be calculated using transcutaneous blood gas values)	Mild ARDS: OI 4 - <8
	Moderate ARDS: OI >8 - 16
	Severe ARDS: OI > 16

OI cut-offs according to the PALICC definition of Pediatric ARDS



How to evaluate oxygenation ?

Many scores – combinaisons of FiO_2 & PaO_2

- $\text{PaO}_2/\text{FiO}_2$ ratio
- a/A ratio
- A-a gradient
- Oxygenation index (OI)
- Others...



Who's the sickest?



TOMMY
30% Oxygen – CPAP 7 cmH₂O

MAXIME
45% Oxygen – CPAP 4 cmH₂O





European Consensus Guidelines on the Management of Neonatal Respiratory Distress Syndrome in Preterm Infants – 2013 Update

David G. Sweet^a Virgilio Carnielli^c Gorm Greisen^d Mikko Hallman^e
Eren Ozek^f Richard Plavka^g Ola D. Saugstad^h Umberto Simeoniⁱ
Christian P. Speer^j Maximo Vento^k Henry L. Halliday^b

- (3) In spontaneously breathing babies stabilize with CPAP of at least 5–6 cm H₂O via mask or nasal prongs (A).
- (4) Intubation should be reserved for babies who have not responded to positive pressure ventilation via face mask (A). Babies who require intubation for stabilization should be given surfactant (A).

CLINICAL REPORT

Surfactant Replacement Therapy for Preterm and Term Neonates With Respiratory Distress



Richard A. Polin, MD, FAAP, Waldemar A. Carlo, MD, FAAP,
and COMMITTEE ON FETUS AND NEWBORN

4. Early initiation of CPAP with subsequent selective surfactant administration in extremely preterm infants results in lower rates of BPD/death when compared with treatment with prophylactic surfactant therapy (LOE 1).

To pay

What could increase oxygenation

$$OI = \text{FiO}_2 (\%) \times \text{Mean airway pressure (cmH}_2\text{O)}$$

PaO_2 (mmHg)

What you obtain

To buy



Who's the sickest?



TOMMY
30% Oxygen – CPAP 7 cmH₂O
PaO₂ = 48 mmHg

OI = 4.4

MAXIME
45% Oxygen – CPAP 4 cmH₂O
PaO₂ = 65 mmHg

OI = 2.8



What could increase oxygenation

$$OI = FiO_2 (\%) \times \text{Mean airway pressure (cmH}_2\text{O)}$$

PaO_2 (mmHg)

What you obtain



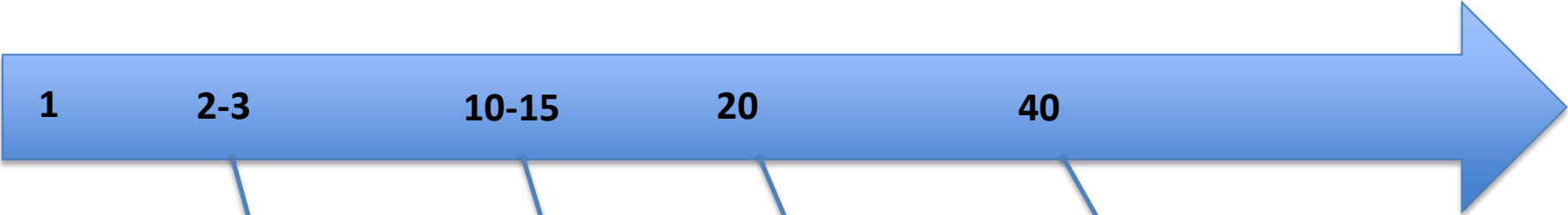
- Not influenced by hemoglobine

(anemia, high Ht, hemoglobin anomalies...)

- Not influenced by age
- Can be used with all ventilation
- **VERY KNOWN** – used for many years



OXYGENATION INDEX



Surfactant



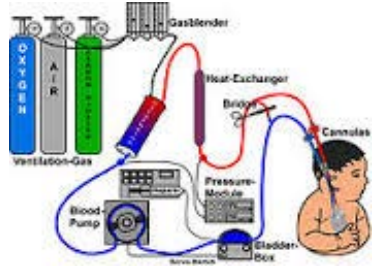
HFOV



iNO

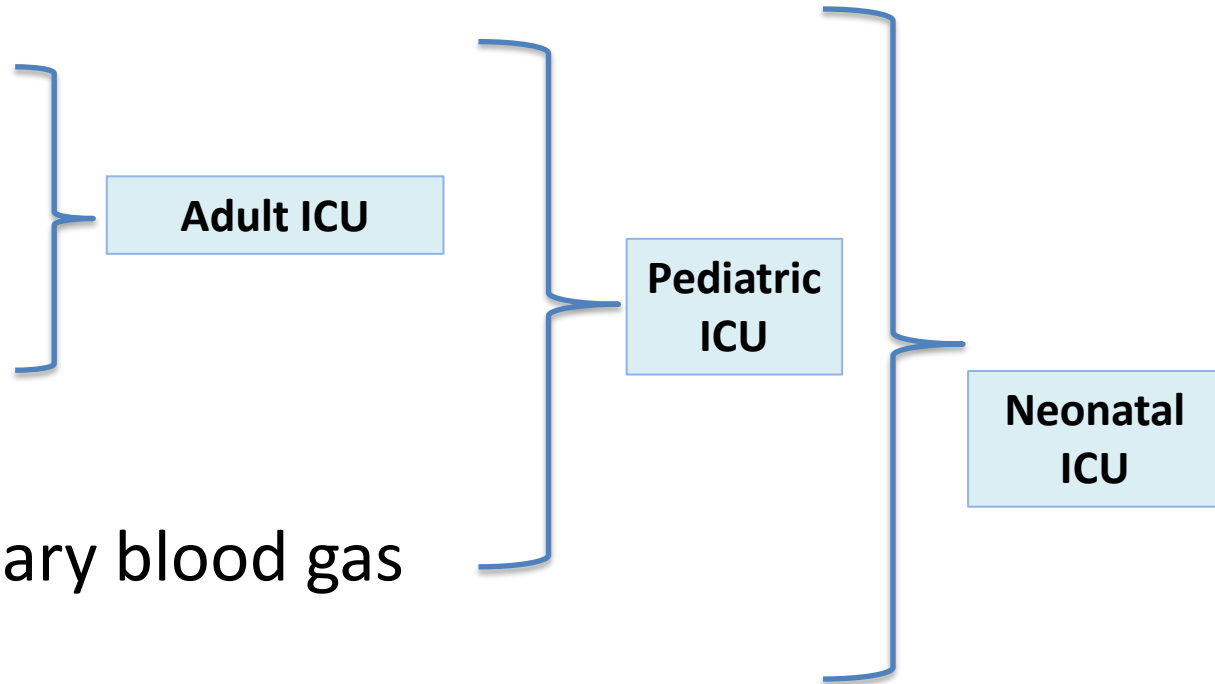


ECMO



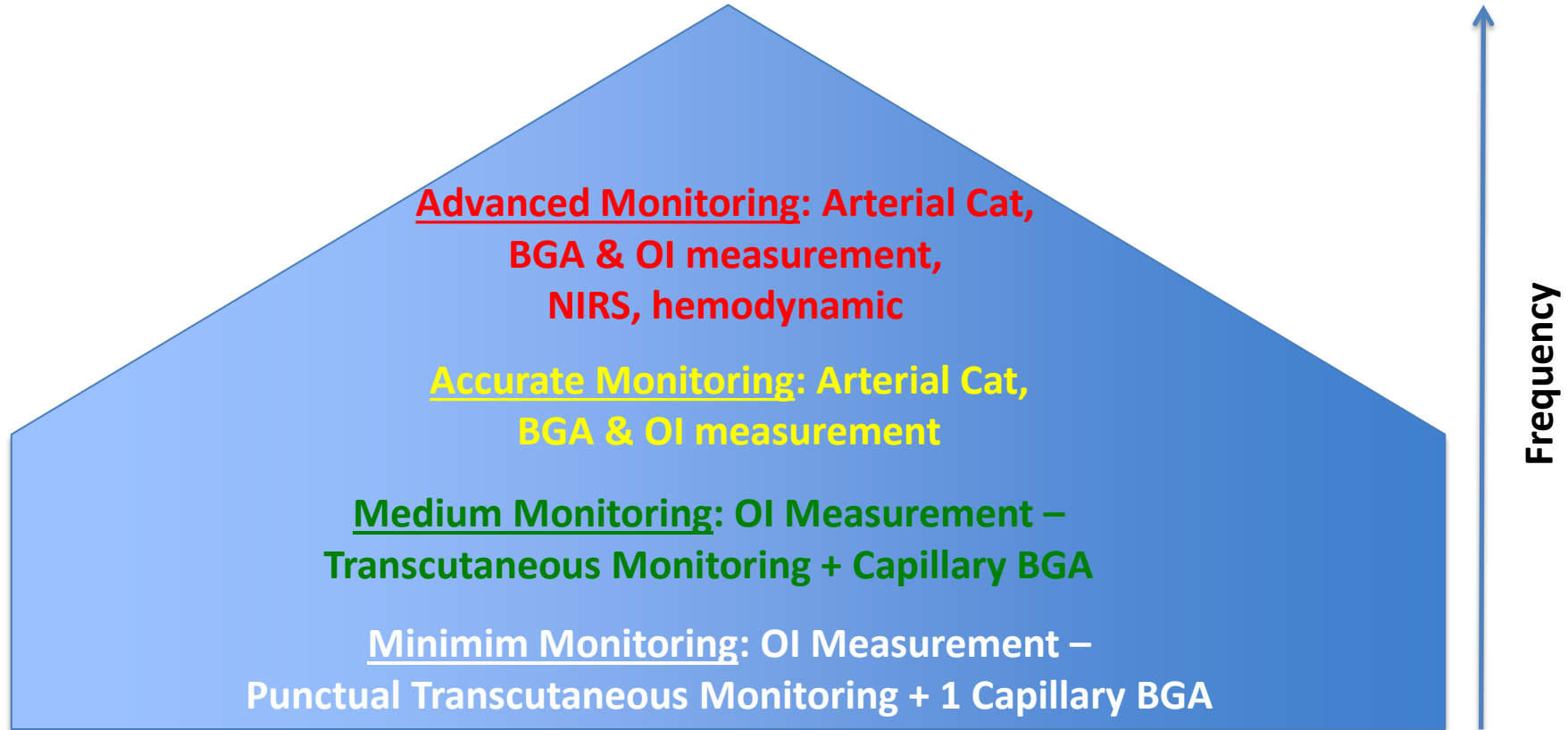
No excuses!!!!

- UAC (art umb cat)
- PAC (periph art cat)
- TC Monitoring
- Arterialised capillary blood gas



ESPECIALLY PRETERM BABIES NEED IT!!!!

Care Customization (Clamart-Paris experience)



Strategies

1. PaO₂ measurement is essential to take care of premature babies with severe respiratory disease ... or we don't have visibility
2. Physiology is the same for adults and babies
3. PaO₂ measurement is possible with premature babies in a non-invasive way... so there is no reason not doing it



Why not?

No reason not doing it

If we can get more accurate information and do not stay at global level... why not?

Is anyone would do hemodynamic interventions without echo or other assessments ?

Would you give paracetamol without measuring temperature?



Thank You for Your attention!

