



## Cambodia Obstetrics Forum

ការអប់រំអំឡុងពេលមានផ្ទៃពោះ

[Home](#) > [Training modules ម៉ូឌុលបណ្តុះបណ្តាល](#) > [Neonatology ភាគវិទ្យាទារកទើបនឹងកើត](#) > *Spontaneous respiratory activity*

Spontaneous respiratory activity



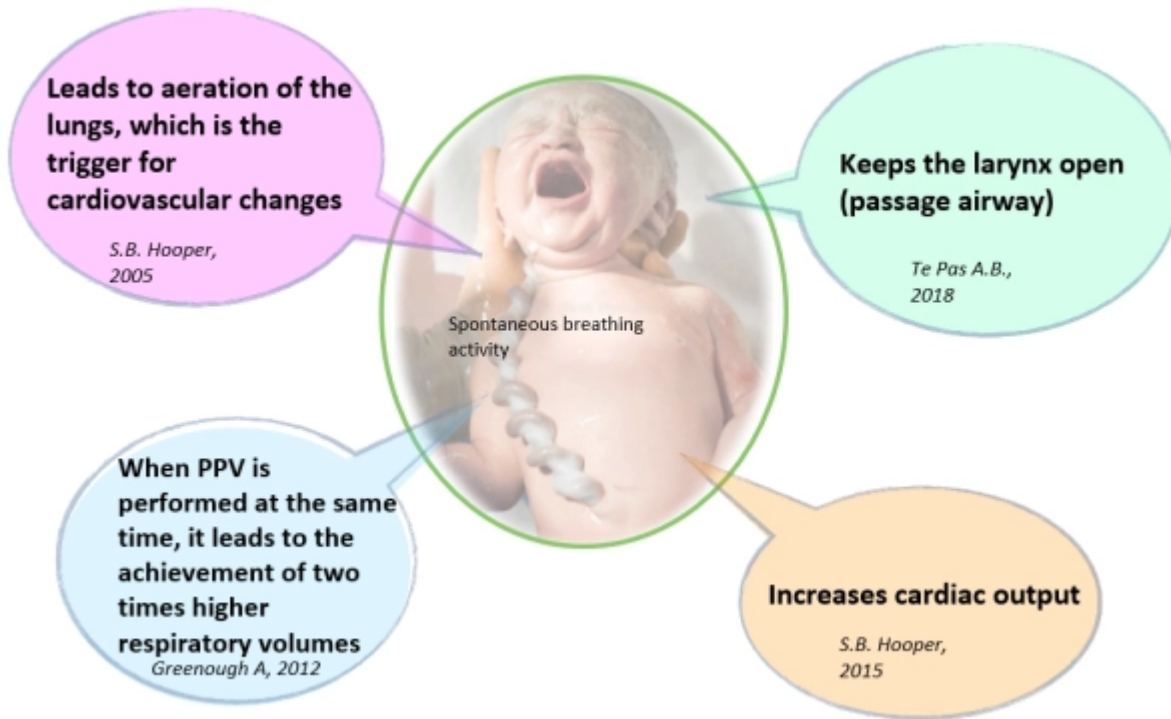
# Spontaneous respiratory activity

Richard Plavka, MD., Professor

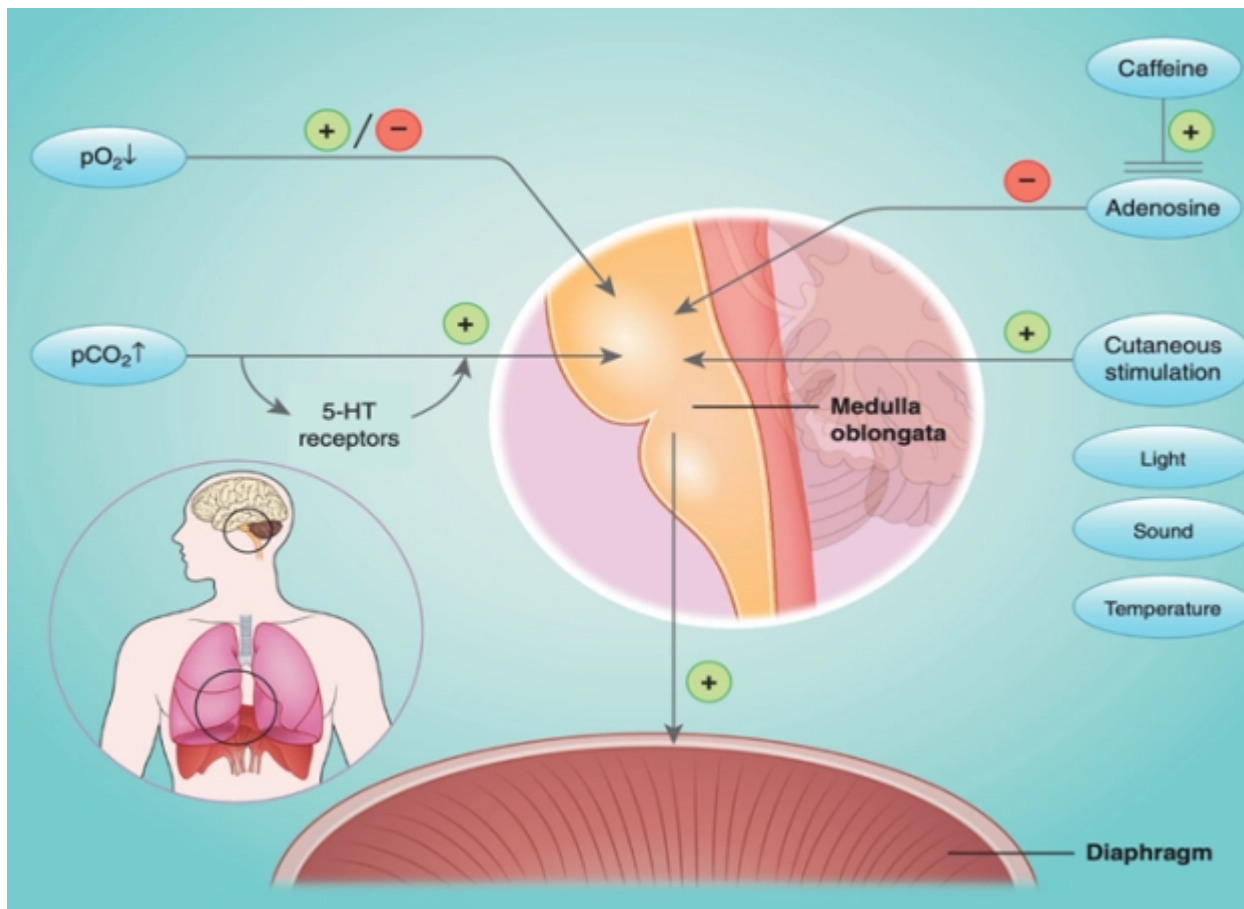


**Spontaneous respiratory activity is the key to successful stabilization of premature newborns**

**Importance of spontaneous breathing activity for the adaptation of premature newborns**

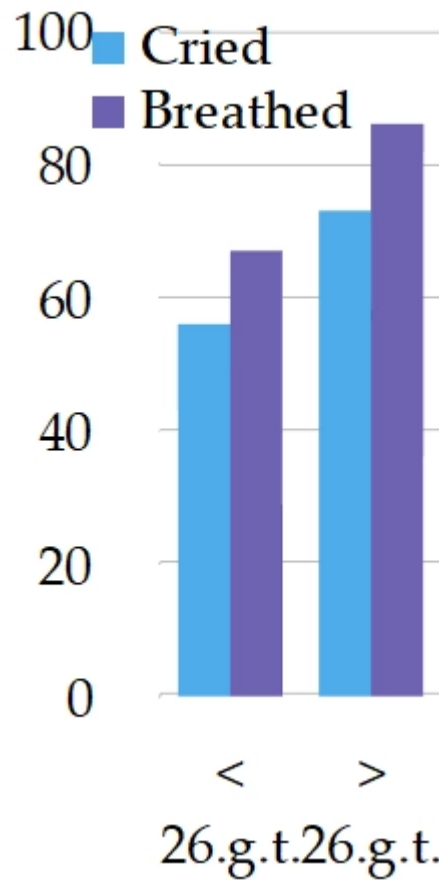


**Initiation of spontaneous respiratory activity**

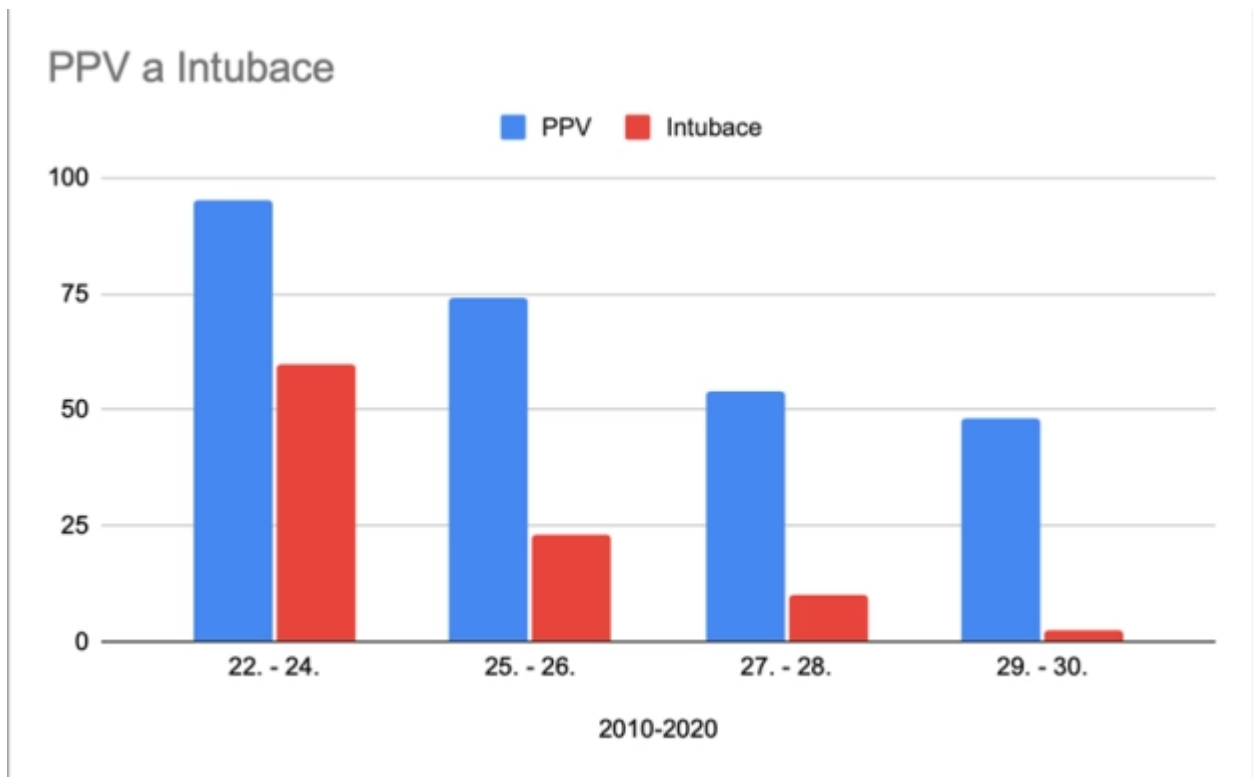


## Initiation of spontaneous respiratory activity

- 80% of extremely premature newborns breathe spontaneously after birth (O`Donnell, 2010)
- 86% of premature newborns (under 32th ) breathe during PPV in the delivery room (Shilleman, 2013)



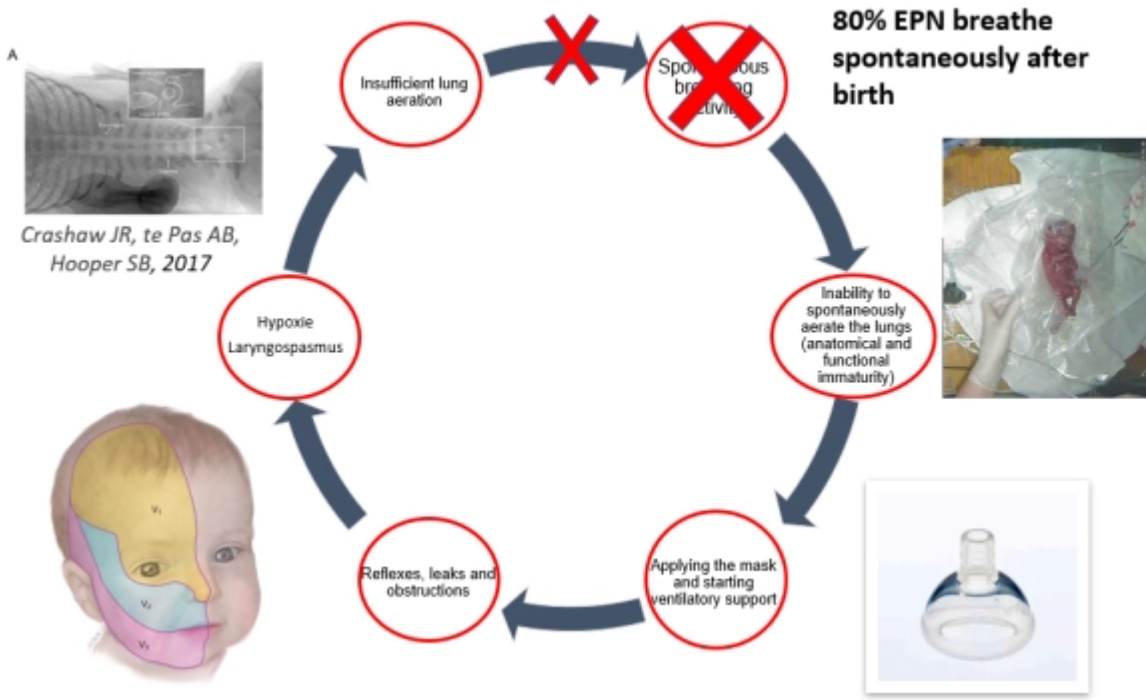
**Paradox: Most premature newborns require PPV during delivery room stabilization**



### Why?

- Clinical monitoring of spontaneous respiratory activity (chest movements) in the delivery room is complex and imprecise (Poulton 2011; Shilleman, 2013)
- Anatomical and functional prematurity – extremely premature newborns are able to take their first breath but cannot spontaneously clear and aerate the lungs
- Our efforts tend to be counterproductive – irritation of reflex zones leads to iatrogenic inhibition of spontaneous breathing activity
- Secondary hypoxia

**Spontaneous breathing activity is supported by gradual aeration of lungs**

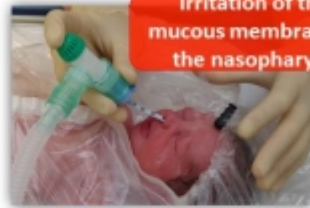


## Reflexes negatively affecting spontaneous breathing



**Applying of the mask**

**Trigemino - cardiac reflex (TCR)**  
→ apnea, bradycardia



**Irritation of the mucous membrane of the nasopharynx**

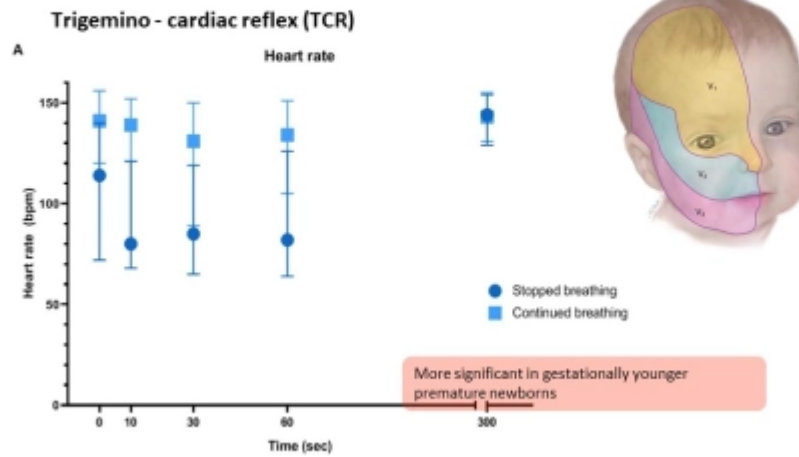
**Laryngeal - chemo reflex (LCR)**  
→ laryngospasmus, apnea



**Pressure support**

**Activation of pressure-sensitive laryngeal receptors**  
→ laryngospasm, apnea  
**Hering-Breuer reflex**  
→ reduction in respiratory rate, decrease in vTE  
*Kuypers K, Lamberska T, te Pas AB, 2020*

## Apnea and reflex bradycardia during mask ventilation



*Kuyperus K, Lamberska T, te Pas AB et al; 2019*

## Delayed ligation of the umbilical cord until the initiation of spontaneous respiratory activity





Upper heating

Moveable platform for newborns with a cutout for the umbilical cord

Resuscitator with humidifier and a gas heater

Gas mixer

Camera

NewLifeBox monitor



Custom-made resuscitation bed, manufacturer: Alfamedic, s.r.o.

## Tactile stimulation (TS)

- Very little data



- Meta-analysis of 6 studies:
  - Wide variability among sites and patient groups
  - **In premature newborns, TS is performed less often**
  - TS is rarely performed within the first minute of life
  - **TS during the first 4 minutes of life improves oxygenation, especially in premature newborns**
  - Repetitive stimulation is more effective
  - TS during mask PPV can improve the development of spontaneous respiratory activity and does not increase the risk of leaks and obstructions

**Pressurized ventilation support: stratification according to the maturity of the newborn**



1. A periviable newborn initially requires a higher pressure and longer inspiratory duration to achieve optimal lung inflation
2. Gentle pressure support **synchronized with spontaneous breathing activity** (NAVA; Neurally Adjusted Ventilatory Assist, Graseby capsule)
3. Use of HFNC in the delivery room for gestationally older premature newborns



## Interface

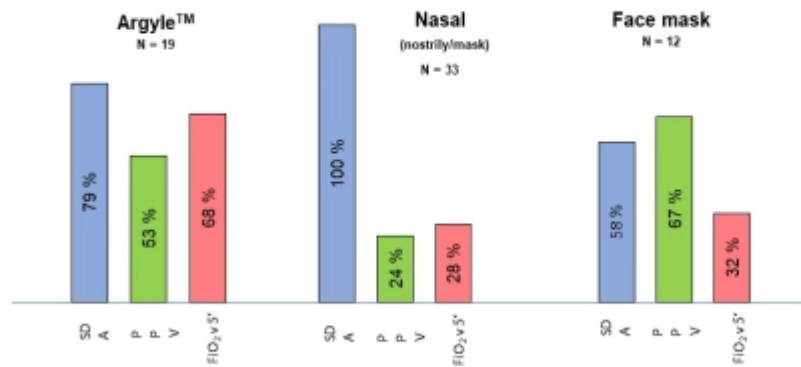
Author/year	Technique	Number	Primary outcome	Outcomes
Cappaso 2005		314/303	Intubation and indirect heart massage at the delivery room	Significant reduction in intubations and CPR in the group
Kamlin 2013		185/178	Intubation in first 24 hours of life	NS
O'Donnell 2013		72/72	PPV and intubation at the delivery room	NS

ILCOR 2021: mask or nasal cannula

- Data on periviable newborns are missing
- The use of a nostril/nasal mask remains a question



## The effect of interface on the respiratory status and adaptation of premature newborns in the delivery room

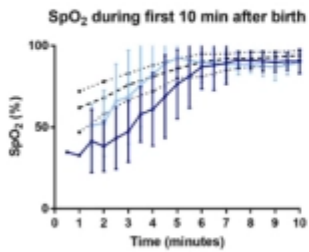


Period 2019–2020, GT 27<sup>0</sup> – 29<sup>6</sup>, N=66

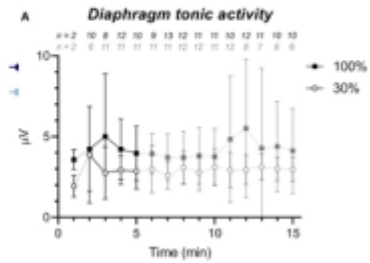
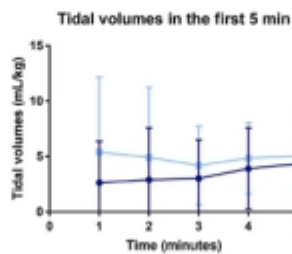
K. Dunajová, 2021

## Oxygen therapy

## ILCOR 2021: FiO<sub>2</sub> 0,3 pro ENN < 28 t.t.



Dekker J, 2019



van Leuteren RW, 2021

- Initial stabilization of premature newborns with 100% O<sub>2</sub> resulted in higher respiratory effort, better oxygenation, and shorter duration of PPV mask, without increased risk of oxidative stress.
- Diaphragm activity measured by electromyogram was significantly higher in premature newborns stabilized with 100% oxygen.

### Caffeine in the delivery room

- Caffeine increases diaphragm activity and respiratory volume

*Kraaijenga G. J. H. J. V. et al, The Effect of Caffeine on Diaphragmatic Activity and Tidal Volume in Preterm Infants. The Journal of Pediatrics (2015)*

- A small randomized clinical trial showed a trend towards reduced number of intubations by 12 hours of life, significant increase in mean blood pressure and higher SVC

*Katheria, A. C. et al. A pilot randomized controlled trial of early versus routine caffeine in extremely premature infants. Am. J. Perinatol. 32, 879–885 (2015)*

- Administration of a caffeine bolus (10 mg/kg) immediately after birth was associated with improved respiratory function in premature newborns at < 30 weeks.

*Dekker, J. et al. Caffeine to improve breathing effort of preterm infants at birth: a randomized controlled trial. Pediatr. Res. 82, 290–296 (2017).*

### Summary: support of spontaneous breathing activity and aeration of the lungs

- Delayed ligation of the umbilical cord
- Tactile stimulation

- Gentle pressure support ideally synchronized with spontaneous breaths
- Appropriate interface
- Oxygen therapy
- Caffeine application?

