

# The DELUX study: development of lung volumes during extubation of preterm infants

**Leonie Plastina<sup>1</sup>, Vincent D. Gaertner<sup>1</sup>, Andreas D. Waldmann<sup>2</sup>, Janine Thomann<sup>1</sup>, Dirk Bassler<sup>1</sup> and Christoph M. Rüegger<sup>1</sup>**

<sup>1</sup> Newborn Research, Department of Neonatology, University Hospital and University of Zurich, Zurich, Switzerland

<sup>2</sup> Department of Anesthesiology and Intensive Care Medicine, Rostock University Medical Center, Rostock, Germany

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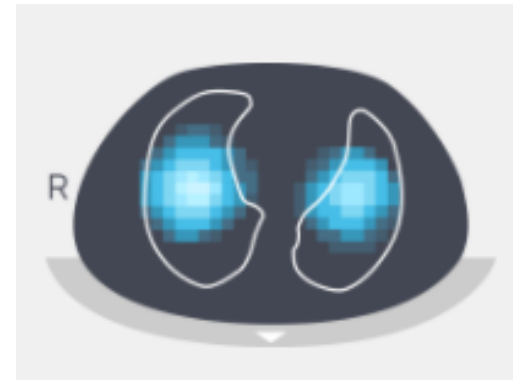
# Introduction



*Dargaville, P. et al., 2016; Photo source: swiss society of neonatology, 2010*

60%  
intubation

40%  
re-intubation



# Objectives

Measure changes in EELI ( $\triangleq$  FRC) during the extubation procedure

- 1) Specific events and their influence
- 2) Association with cardiorespiratory parameters
- 3) Development of FRC after initiation of NIV

EELI: end-expiratory lung impedance

FRC: functional residual capacity

NIV: non-invasive ventilation

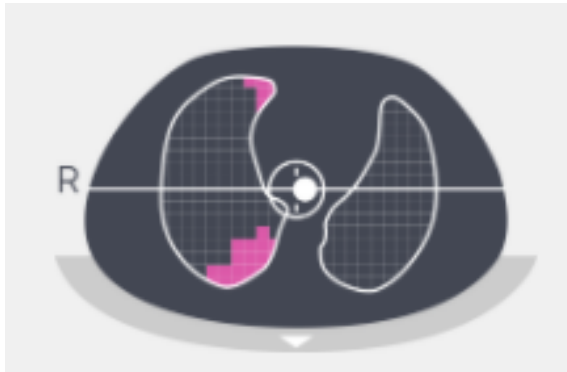
# Methods

## Population

Infants 26<sup>0/7</sup> and 31<sup>6/7</sup> weeks gestational age

## Intervention

continuous monitoring of lung volumes with electrical impedance tomography (EIT) during the standard extubation procedure



# Methods

Populat

Interven

## Local standards

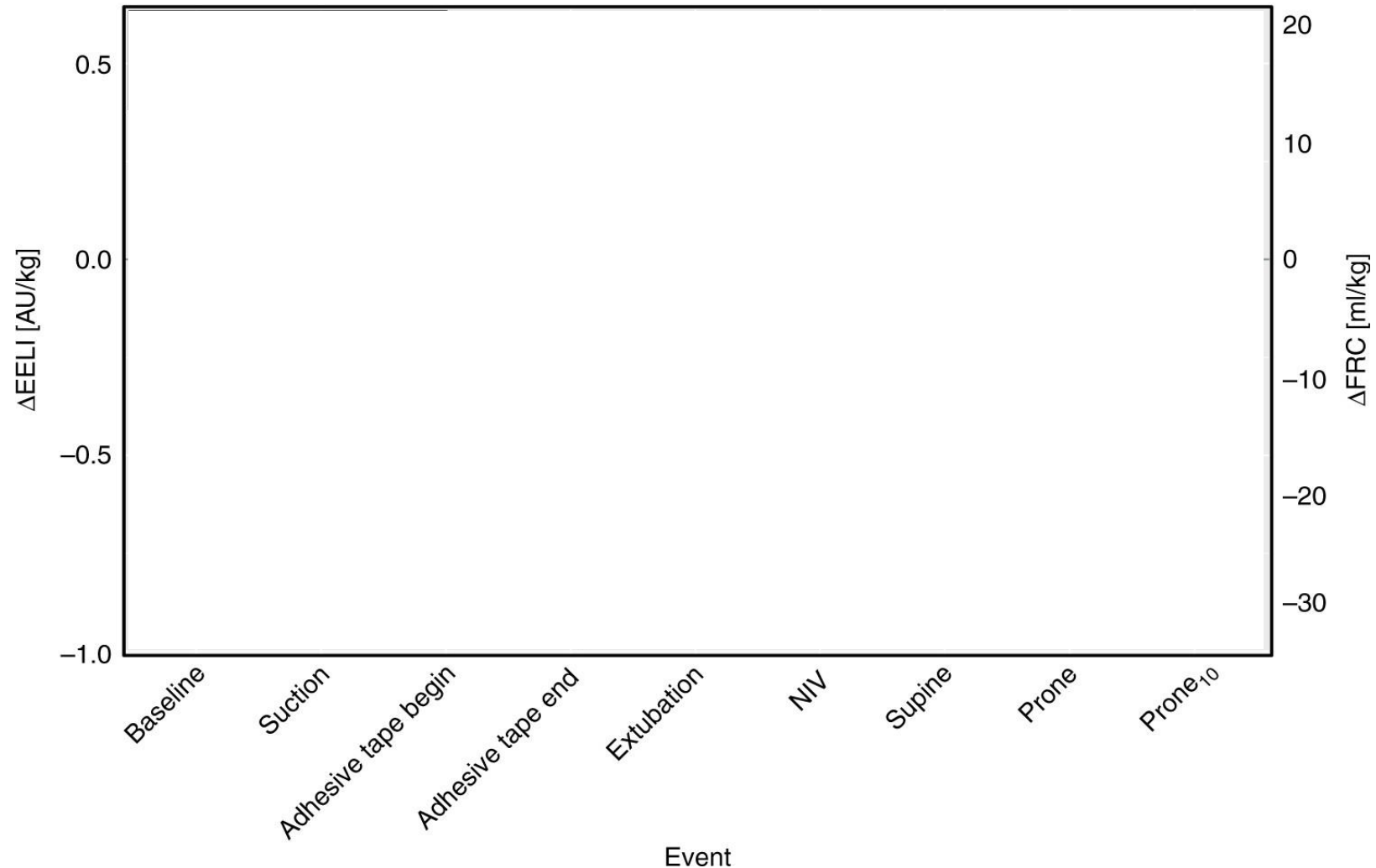
- Intubated nasally
- In supine position
- Endotracheal tube fixated with adhesive tape
- Extubated in supine position
- Extubated to non synchronized NIPPV (< 28 weeks) or CPAP (> 28 weeks)



NIPPV: nonsynchronized nasal intermittent positive pressure ventilation

CPAP: continuous positive airway pressure

# Extubation procedure and data analysis



## At each timepoint:

- 30 seconds of artefact free tidal ventilation
- normalized for body weight
- changes compared to baseline (=  $\Delta\text{EELV}$ )
- calculation of tidal volume (= ml/kg)

# Patient characteristics

Patient characteristics	Median (IQR)
<b>Perinatal characteristics</b>	
Gestational age (completed weeks)	27 (27–28)
Birth weight (g)	1140 (951–1152)
Male, <i>n</i> (%)	4 (33%)
Complete course of antenatal steroids, <i>n</i> (%)	7 (58%)
APGAR score at 5 min	8 (6–8)
<b>At extubation</b>	
Postmenstrual age (completed weeks)	28 (27–30)
Age at extubation (days)	3 (2–5)
Weight at extubation (g) <sup>a</sup>	1145 (1068–1250)
Received exogenous surfactant, <i>n</i> (%)	12 (100%)
Days of endotracheal ventilation	1 (1–3)

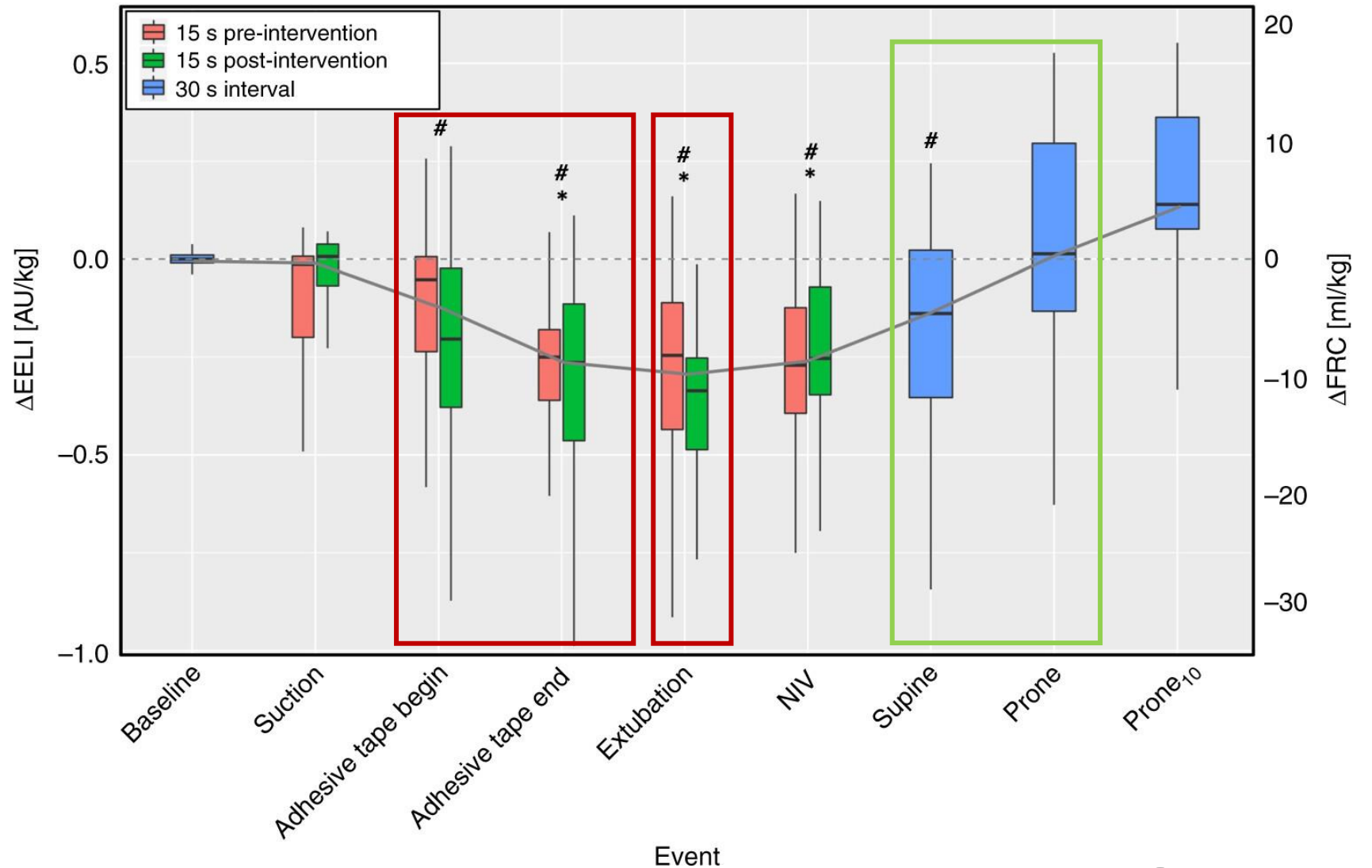
12 extubations  
≈ 3'000 breaths analysed

# Development of $\Delta EELI$ ( $\triangleq \Delta FRC$ )

**FRC: - 10.2 ml/kg**

\* significant compared to baseline

# significant compared to prone10

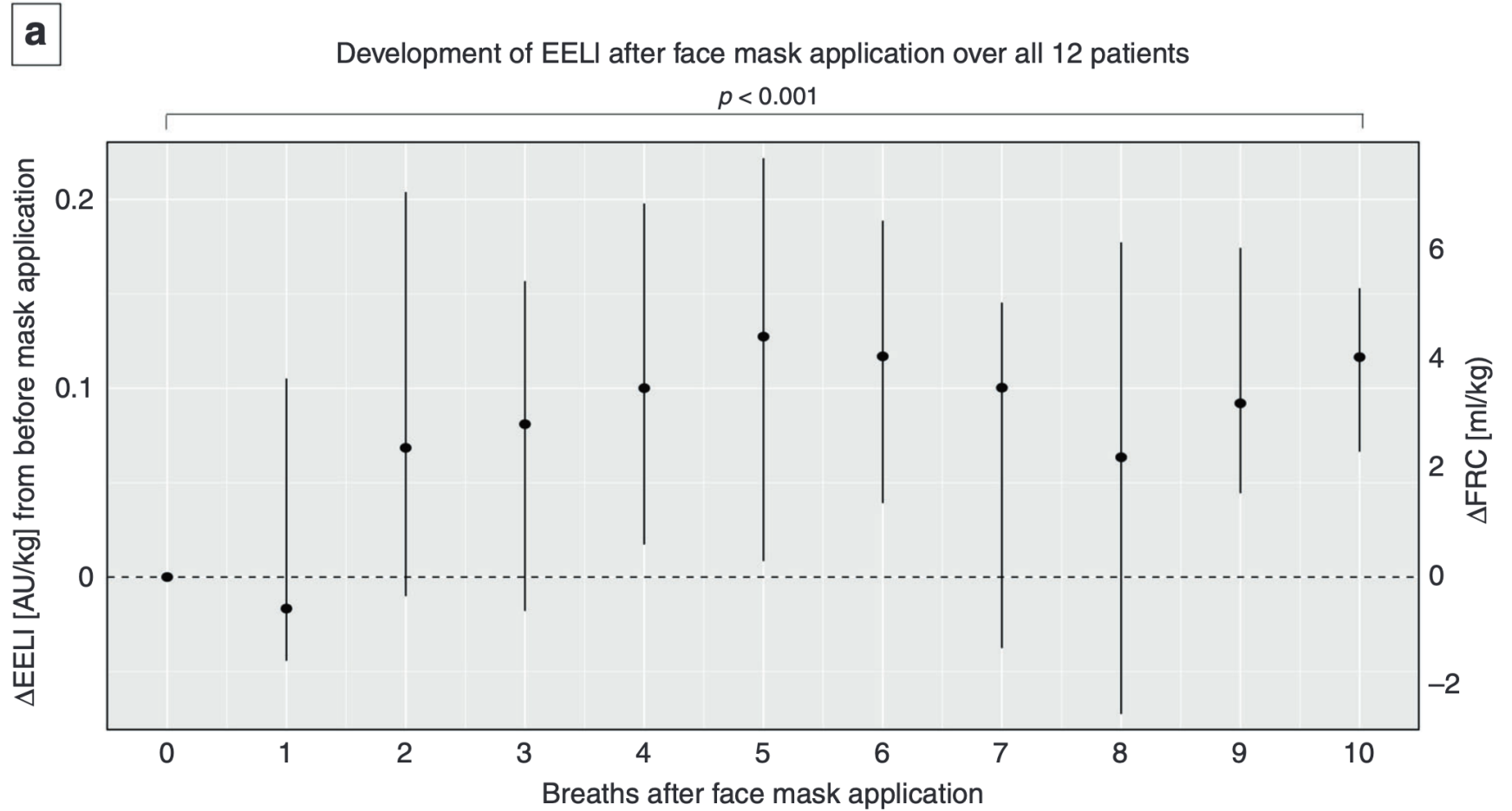




# Initiation of NIV

39% of FRC regained within 10 breaths

FRC: + 4.0 ml/kg



# Conclusion

- Significant decrease in lung volumes during the extubation process
- **Adhesive tape removal** = major factor contributing to **FRC loss**
- **Turning infant prone** = major factor contributing to **FRC gain**
- Alveolar recruitment starts with the first breaths after application of NIV

**Next step:** extubation in prone position, cutting adhesive tape

# Thank you very much!

## Project Team

Dr. med. Vincent D. Gaertner, Bsc  
Andreas Waldmann, Msc  
Dr. med. Janine Thomann  
Prof. Dr. med. Dirk Bassler  
PD Dr. med. Christoph M. Rüegger

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... the staff of the NICU at USZ  
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