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Prophylactic Pharyngeal Surfactant with Simultaneous Sustained Inflation in Prematures Born < 25 Weeks

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The Quality Care Improvement of Preterm Newborns; No. *CZ.2.16/3.1.00/21564*

Prophylactic Pharyngeal Surfactant with Simultaneous Sustained Inflation in Prematures Born < 25 Weeks

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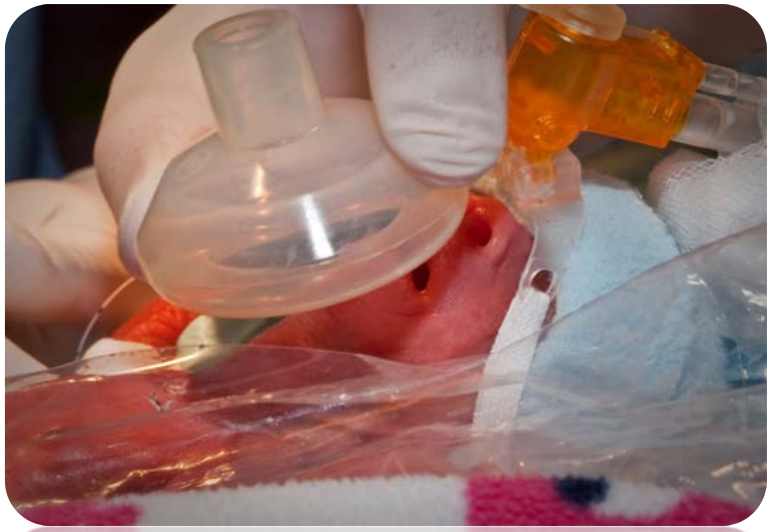
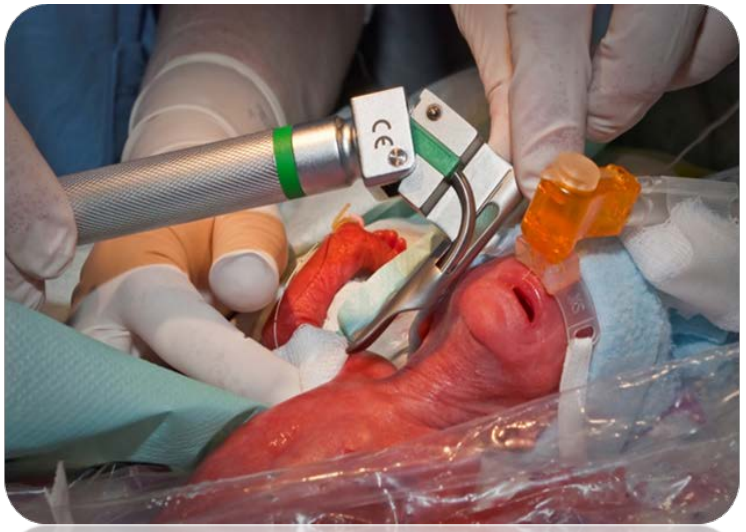
Have documented no financial relationships to disclose or Conflicts of Interest (COIs) to resolve

Background

Babies born at < 25 weeks of gestation

- Most of them require rescue intubation which may often be repeated in the delivery room (DR)
- > 90% are treated with endotracheal surfactant during the first hours of life
- Inappropriate instrumentarium for uniquely tiny babies (interface, blade)





Background

Pharyngeal surfactant before the first breath:

- increased survival and enhanced lung aeration in premature rabbits *Robertson B and Enhorning G 1974*
- appeared to be relatively safe and simple in premature infants. *Kattwinkel J et al 2004*

Sustained inflation:

- facilitates more uniform lung aeration *Te Pas A et al 2009*
- increases heart rate and cerebral oxygenation *Fuchs H et al 2011*

Hypothesis

Pharyngeal surfactant with facilitation of lung aeration by simultaneous sustained inflation performed immediately after delivery can be feasible even in uniquely immature infants and may facilitate their stabilization in the delivery room.

Prophylactic Pharyngeal Surfactant with Simultaneous Sustained Inflation in Prematures Born< 25 Weeks.

Delivery **R**oom **S**ustained **I**nflation and **Su**rfactant (**DRSISU)**

Design: One tertiary centre prospective trial

Study period: 2013-2014

Ethical approval: Ethical Committee of General Faculty Hospital in Prague

Aims of the Study

- To evaluate the feasibility and safety
- To compare study group with historical cohort of 22-24 weekers born in 2010-2012 in terms of:
  - Need for delivery room interventions
  - Heart rate and oxygen saturation development related to Dawsons percentiles
  - Short term outcome

Outcomes

Primary outcome

Intubation in the delivery room

Secondary outcomes

- Repetition of sustained inflations
- Requirement of suction without further intubation
- Requirement of PIP increasing
- Crossover to bag and mask PPV
- Subsequent surfactant in NICU

Inclusion Criteria

- Inborn infants delivered at < 25 weeks of gestation
- Parents agreed with pro-active approach in the DR and signed informed consent

Methods

Surfactant administration and sustained inflation maneuvre (SIM)

1.5 ml of Curosurf (80mg/1ml) administered through the mouth as a rapid bolus via a catheter inserted into the oropharynx 3-4 cm from the upper lip.

SIM (PIP 25 cm/H_2O for 15 secs) simultaneously performed via rubber bi-nasal cannula (Argyle XS size);

- If bradycardia persisted >10 secs after initial SIM, SIM was repeated a maximum of 2 times.

Mouth was closed during whole procedure by a lower jaw thrust using the fingers.

Methods

Resuscitation Procedure
(the same for study and historical groups)

Indications for intubation in DR

- HR <100 bpm after 180 secs of PPV with PEEP
- PPV with PEEP was not effective to achieve a target SpO2 >80% after 5 mins
- External cardiac compressions

All intubated infants received the surfactant (Curosurf 1.5.ml)

Methods

Resuscitation Procedure

Primary settings of T-piece device (Neopuff®)

- Flow 10l, PIP 25 cm H_2O, PEEP 6 cm H_2O, fr. 30-60/min
- PIP increase to 30 cmH2O and crossover to bag and mask ventilation were permited.

Primary setting of FiO_2 was 0.3

- FiO_2 was titrated in 0.10-0.20 increments every 30-60 secs

Target time-related SpO2 ranges

- SpO_2 60-85% at 2-6 minutes, then between 80-93%

Results

Baseline Characteristics (Study Group, N = 19)

Gestational age, mean ± SD, wks	23.9 ± 0.9
Birthweight, mean ± SD, g	634 ± 98
Any antenatal steroids, n (%)	18 (95)
Cesarean section, n (%)	4 (21)
Milking, n (%)	19 (100)
Male gender, n (%)	10 (53)
Umbilical pH, mean ± SD	7.36 ± 0.07
The time of surfactant injection, median (IQR), secs	40 (25; 75)
Apgar score at 5 min, median (IQR)	7 (6; 8)

Results

Primary outcome	N = 19
ET intubation in the DR, n (%)	3 (16)
Secondary outcomes	
2nd SIM, n (%)	9 (47)
3rd SIM, n (%)	5 (26)
Requirement of suction without further intubation, n (%)	1 (5)
Increase of PIP up to 30 cm H_20, n	0
Crossover to bag and mask PPV, n	0
Subsequent surfactant in NICU, %	12 (63)

Results

Comparison with Historical Cohort (2010-2012)

Baseline Characteristics

	Study Group N = 19	Control Group N = 20	p- value *
Gestational age, wks †	23.9 ± 0.9	23.9 ± 0.7	0.925
Birthweight, g †	634 ± 98	627 ± 87	0.886
Any antenatal steroids, %	95	75	0.644
Cesarean section, %	21	55	0.333
Placental transfusion, %	100	85	0.230

† data are presented in mean ± SD

* Student *t*-test and Fisher exact test

Results

Delivery Room Interventions

	Study Group N = 19	Control Group N = 20	p - value *
PPV, %	100	90	0.487
FiO2 1.0, %	47	40	0.751
ET intubation, %	**16**	**75**	**0.001**
ET surfactant, %	16	75	0.001

* Fisher exact test

Results

Respiratory Management

	Study group N = 19	Control Group N = 20	p - value *
Early NCPAP (within 30 min after delivery), %	**95**	**60**	**0.019**
Any Surfactant, %	100	90	0.487
Subsequent surfactant (NICU), %	**63**	**20**	**0.009**
Mechanical ventilation day 1, %	32	50	0.333
Mechanical ventilation day 3, %	37	55	0.340
Air leaks, %	0	0	1.0

* Fisher exact test

Results

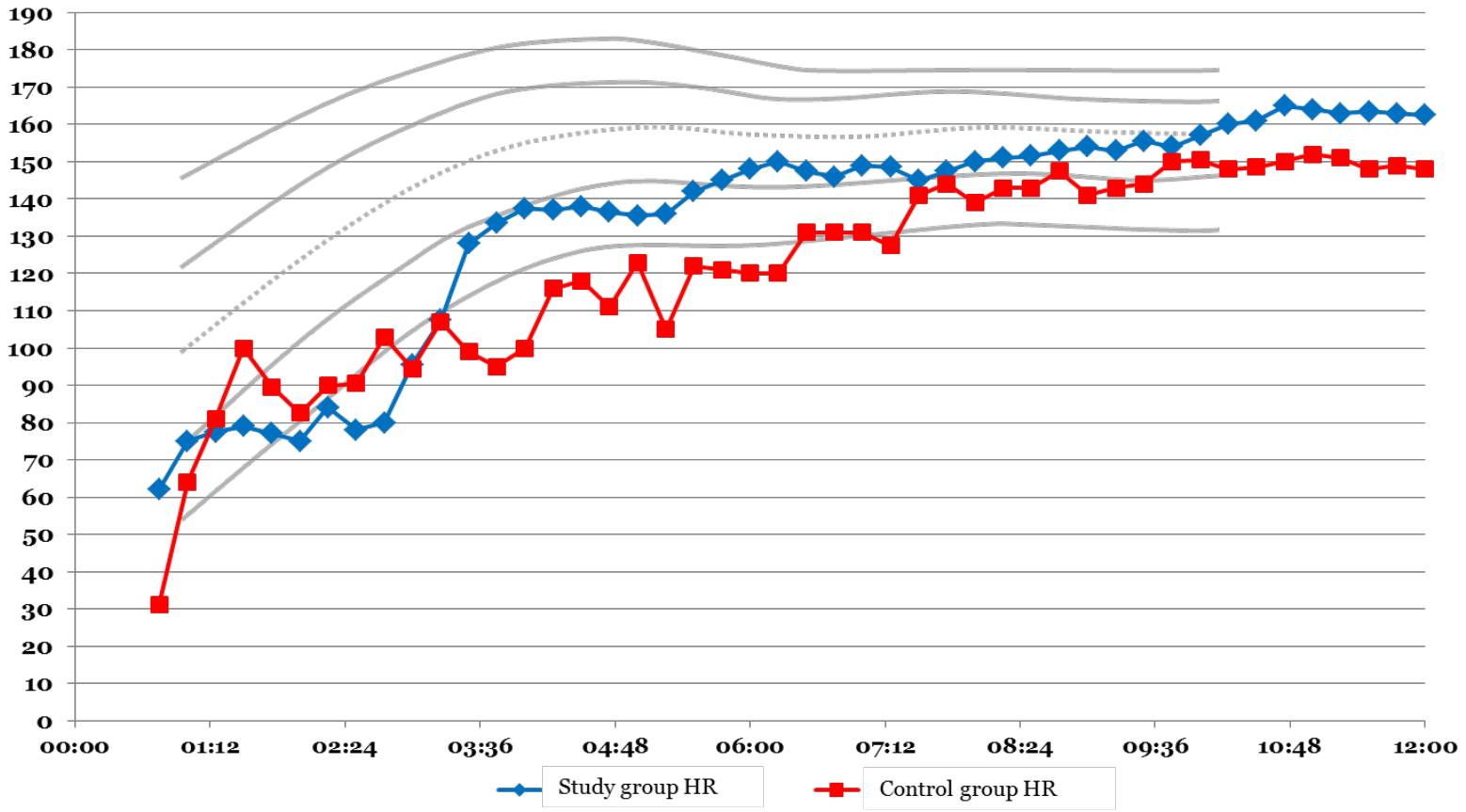
Main Neonatal Outcome

	Study Group N = 19	Control Group N = 20	p - value *
Death, %	32	35	1.0
IVH gr. 3-4, %	11	35	0.067
Laparotomy, %	26	20	0.716
Oxygen dependency at 36 wks, %	37	36	1.0
ROP > II. stage, %	0	5	0.87

* Fisher exact test

Results

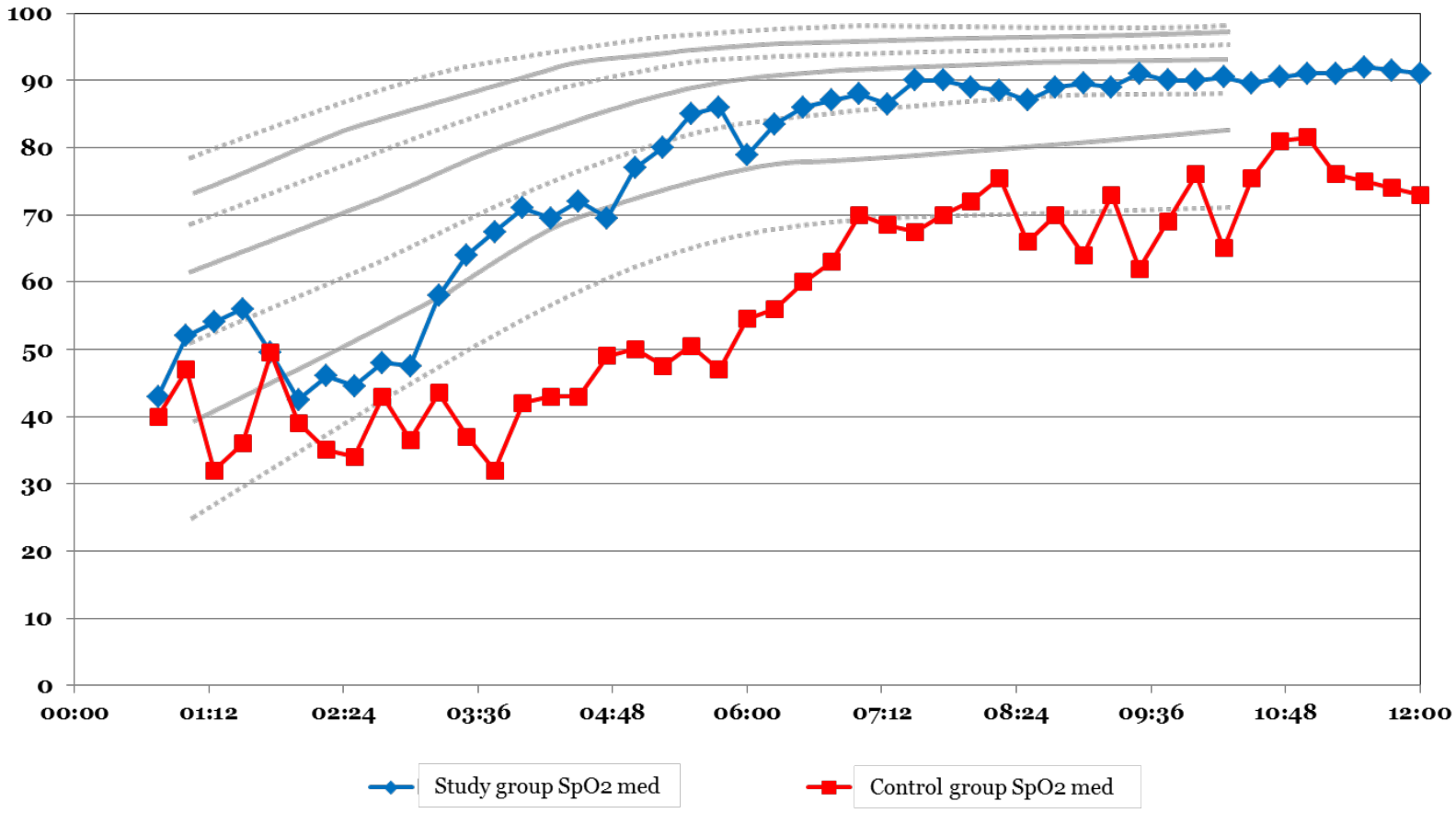
Development of Heart Rate (median)



Dawson J. A. et al. Changes in heart rate in the first minutes after birth.
Arch Dis Child Fetal Neonatal Ed. 2010 May;95(3):F177-81.

Results

Development of Preductal Oxygen Saturation (median)



Dawson J. A. et al. Defining the reference range for oxygen saturation for infants after birth. *Pediatrics 2010;125:e1340-e1347*

Conclusions

- Oropharyngeal surfactant administration with simultaneous nasal sustained inflation is a feasible, safe and easily performed method which can reduce the need for rescue intubation and may facilitate the use of non-invasive ventilatory support during the first days of life.

- Further randomized trial may clarify the surfactant and SIM contribution in this approach.

Thank you

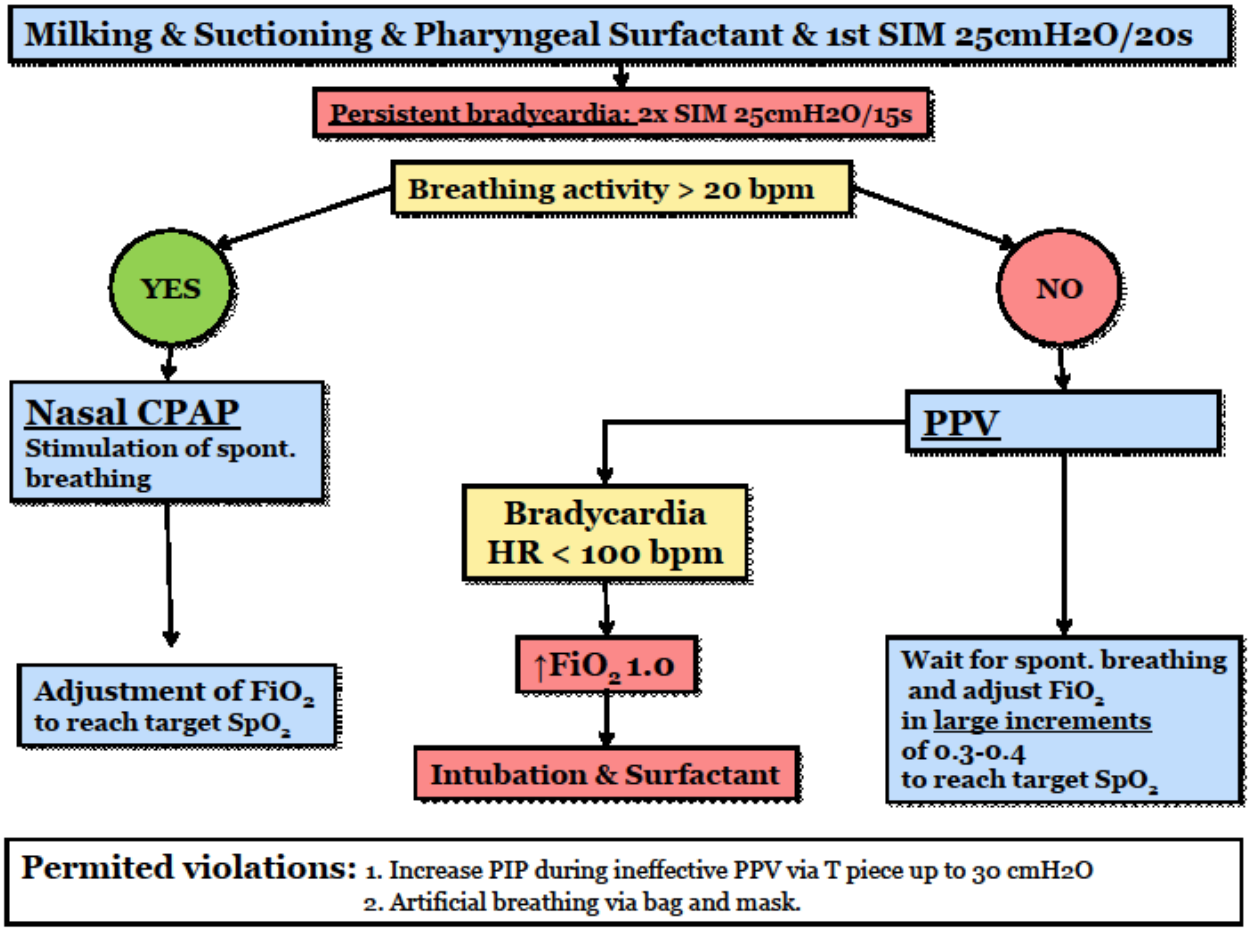
Aknowledgements:

Supervisor: **Richard Plavka**

Co-investigators: **Marketa Luksova, Jan Smisek**

Trial statistician: **Jana Vankova**

The babies, their families and nurses caring for them



Permited violations: 1. Increase PIP during ineffective PPV via T piece up to 30 cmH2O
2. Artificial breathing via bag and mask.

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Thank you for your attention.

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