The initiation of positive pressure ventilation is delayed during elective newborn intubation

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Background

- Desaturation or bradycardia occurs in 50% of premature infants during intubation [1]
- Attempts take longer than recommended [2]
- Onset of desaturation in apnoeic patients is age dependent and younger patients have less tolerance for apnoea
- International Resuscitation guidelines recommended that Positive Pressure Ventilation (PPV) is commenced immediately after the onset of apnoea to maintain stability [3]
- During a recent RCT recording preterm intubations in RWH NICU it was observed that commencement of PPV after apnoea was often delayed, that some infants had a period of unsupported apnoea and that physiological instability was common

Objectives

- To assess the duration of unsupported apnoea ie time between the last infant breath and initiation of PPV
- To determine if this was associated with desaturation or bradycardia before or during PPV

Methods

- Design: Observational study of preterm infants (<33 weeks gestational age) undergoing semi-elective intubation in RWH NICU. Consent was prospective/retrospective
- Duration: September 2014 – November 2017
- All infants underwent sedation and muscle relaxation
- Equipment: Pulse-oximeter, video, respiratory function monitor
- Defined last breath as an Expired Tidal Volume (V_{Te}) ≤2ml/kg
- This was the minimal tidal volume that produced visible chest rise (sample of 10 videos) and the operator was reasonably expected to commence PPV after this breath

Results

- 96 patients were analysed with a median (IQR) gestational age of 27 weeks (26, 29) and median weight at intubation of 967g (820, 1262) (Table 1.) The mean age at intubation was 26 hours (8.5 – 179)
- 50% of infants experience desaturation during PPV (Fig 1 & table 4)
- There was a median 12 second delay IQR (4, 29) range (0-62) in initiation of PPV after the last effective breath
- This delay was not correlated with oxygen saturation (r= -0.01, p= 0.96) or heart rate (r= -0.01, p= 0.98) during PPV.

Table 1. Demographics

Characteristic	Total (96)
Birth gestation (weeks),	27 (2.0)
Corrected Gestation (weeks)	28 (1.6)
Weight at time of intubation (g)	1061' (326)
Age at intubation* (hours)	26 (9 to 179)

All values Mean (SD) unless otherwise indicated, *Median (IQR)

Table 2. Results: Duration of apnoea

Characteristic	Total
Unsupported apnoea (s), Median(IQR)	12 (4 to 29)

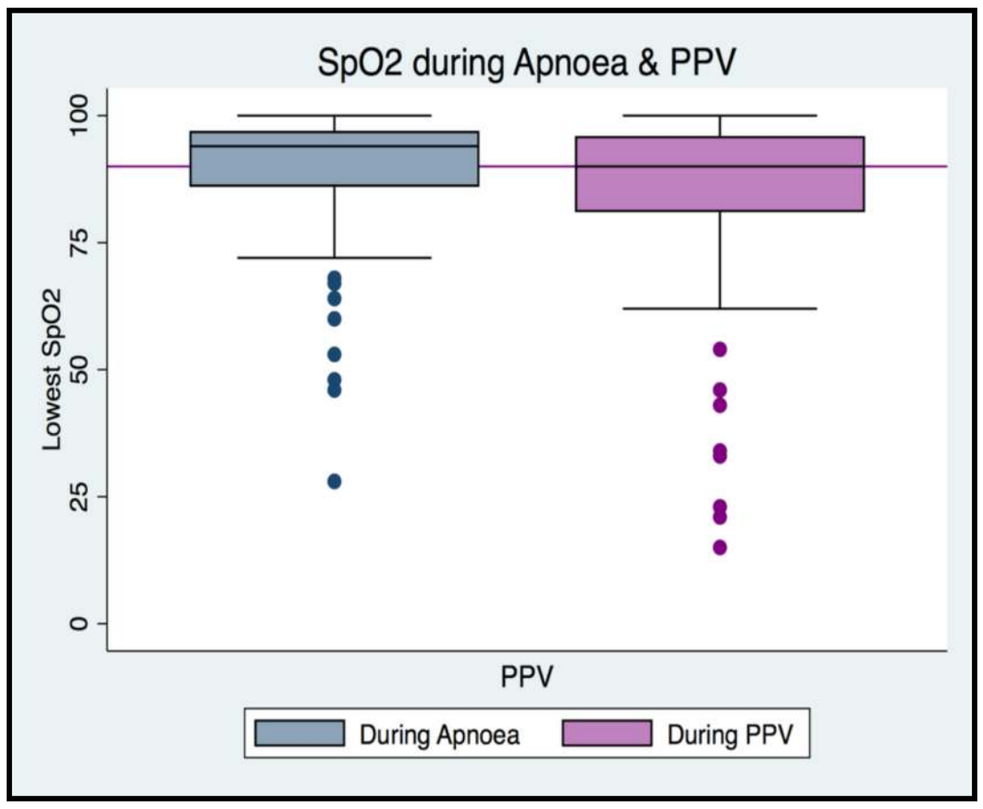

Fig 1. Lowest oxygen saturation (SpO_2) during unsupported apnoea and PPV

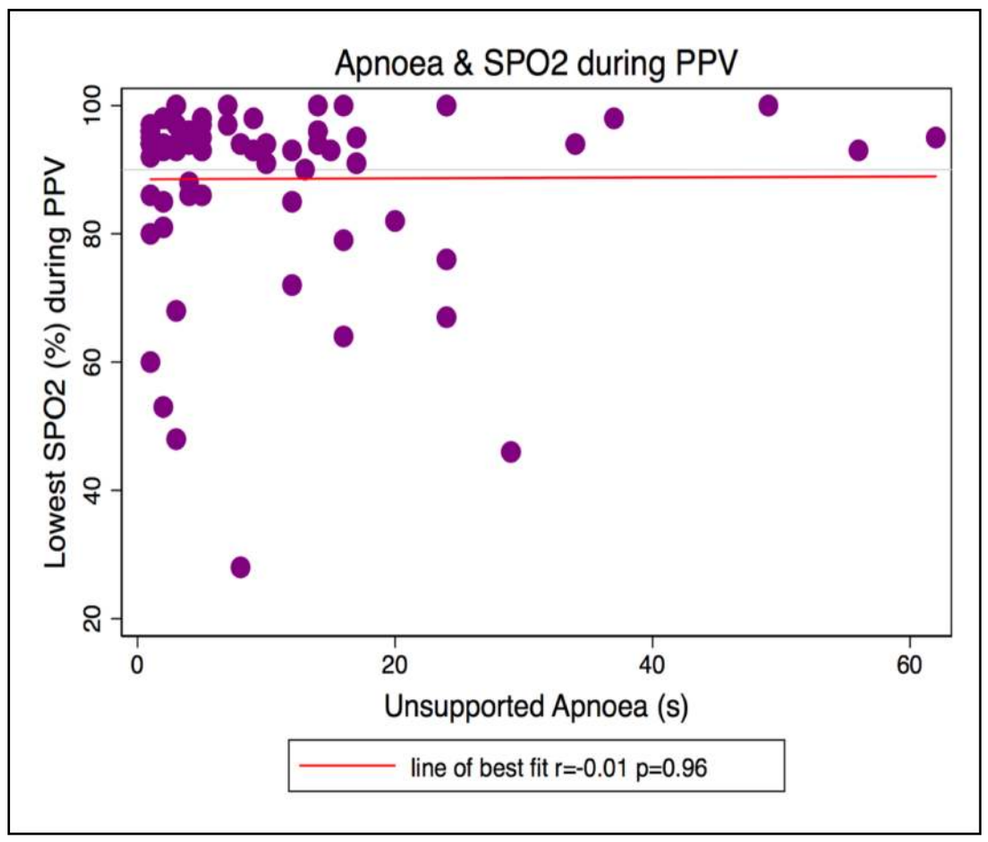

Fig 2. Relationship between unsupported apnoea and oxygen saturation (SpO2) during PPV

Table 3. Results: Physiological measurements

Characteristic	During Apnoea	During PPV
Lowest SPO2*	94 (86 to 97)	90 (81 to 100)
Lowest HR	153 (28)	156 (25)

All values Mean (SD) unless otherwise indicated, *Median (IQR)

Conclusions

- The median duration of unsupported apnoea was 12 seconds
- The duration of apnoea did not correlate with oxygen saturation
- Unsupported apnoea of up to 62 seconds was observed
- The incidence of desaturation was high during PPV
- Further research aimed at improving the quality of PPV is needed

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2. Lane B, Finer N, Rich W. Duration of intubation attempts during neonatal resuscitation. The Journal of pediatrics. 2004;145(1):67-70.
3. Wyckoff MH, Aziz K, Escobedo MB, Kapadia VS, Kattwinkel J, Perlman JM, et al. Part 13: Neonatal Resuscitation: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (Reprint). Pediatrics. 2015;136 Suppl 2:S196-218.