

Newborn Critical Care Center (NCCC) Clinical Guidelines

Guidelines for Initial Ventilation of Infants < 28 Weeks

1. Initial Mode and Settings

- A. AC/VG
- B. Tidal Volume (Vt):
 - a. For infants ≤ 750 g: 5.5 mL/kg
 - b. For infants > 750 g: 5 mL/kg
- C. Respiratory rate (RR) 40
- D. PEEP 6 cm H₂O
- E. Time (Ti): 0.25 seconds
- F. P-max limit setting: 26
 - a. Consider increases in P-max up to 30 prior to considering HFJV

Goal PaCO₂ (permissive hypercapnia) for first 72 hours 50-60 mmHg; after 72 hours 55-65 mmHg

2. Poor Ventilation (PaCO₂ > 60 mmHg first 72 hours, > 65 mmHg after 72 hours)

- A. First assess infant's breath sounds, chest movement, and evaluate pressure readings and pressure/flow/volume tracings on the ventilator. Also consider recent chest radiographs.
- B. Is the infant breathing above the ventilator?
 - a. If yes:
 - i. Consider the presence of a metabolic acidosis which could contribute to respiratory compensation (tachypnea)
 - ii. If respiratory problem suspected, consider increasing Vt 0.5 mL/kg (max 7)
 - b. If no:
 - i. Consider increasing Vt 0.5 mL/kg (max 7)
 - ii. Consider increasing RR to a maximum of 50
- C. If eligible for surfactant, administer surfactant (see ELBW Surfactant Administration Guideline)

3. Poor Oxygenation (FIO₂ \geq 0.35)

- A. First assess breath sounds, chest movement, and evaluate pressure readings and pressure/flow/volume tracings on the ventilator. Also consider recent chest radiographs looking specifically at expansion. Consider suctioning.
- B. Individually consider
 - a. Increasing PEEP by 1 cm H₂O (max 7)
 - b. Increasing Vt 0.5mL/kg (max 7)
 - c. If MAP > 12 consider need for HFJV
- C. If eligible for surfactant, administer surfactant (see ELBW Surfactant Administration Guideline)

4. If PIP is reading > 26 (PIPs of up to 28-30 may be appropriate after a team discussion) OR at upper limit of VT and PaCO₂ > 60-65, consider High Frequency Jet Ventilation

5. Once stable, consider early decrease in respiratory rate (RR) to 30-35 to encourage improve infant participation and synchrony; with eventual decrease in RR to 20 prior to extubation

6. Weaning Ventilation (PaCO₂ < 50 mmHg in first 72 hrs, < 55 after first 72 hrs)

- A. First assess breath sounds, chest movement, and evaluate pressure readings and pressure/flow/volume tracings on the ventilator. Also consider recent chest radiographs.

- B. Is there tachypnea (RR > 75)?
- a. If yes:
 - i. Consider the presence of a metabolic acidosis which could contribute to respiratory compensation (tachypnea)
 - ii. If no metabolic acidosis, then consider extubating if meets criteria (see below)
 - iii. Consider changing the mode of ventilation (consider SIMV-VG) if there is a reason for infant to remain intubated and a need to avoid overventilation
 - b. If no:
 - i. Consider weaning Vt by 0.5 mL/kg
 - ii. Minimum Vt (mL/kg):
 1. ≤750g: 5.5
 2. 750g - 1kg: 5
 3. ≥1 kg: 4.5
 - c. Pay close attention to low peak inspiratory pressures (PIPs) as Vt is weaned, low PIPs can suggest that the infant is not receiving enough respiratory support

7. Weaning Oxygenation

- A. If FiO₂ < 0.5 and normal work of breathing, decrease PEEP by 1 cm H₂O, to a minimum of 6

8. Discuss extubation criteria daily on interdisciplinary rounds

- A. Extubation within 24 hours of the following criteria being met:
- a. Infant receiving caffeine
 - b. Hemodynamically stable (i.e. no vasopressors except dopamine < 6 mcg/kg/min; hydrocortisone okay)
 - c. MAP less than 10 cm H₂O
 - d. FiO₂ < 0.50
 - e. Ventilator rate of ≤ 20 breaths per minute
 - f. pH > 7.20
 - g. pCO₂ < 65 mmHg
- B. Do not transition to SIMV as a means of weaning towards extubation; the decrease in respiratory rate to =/<20 in this mode will lead to atelectasis (approaching ET-CPAP settings)
- C. Do not use ET-CPAP prior to extubation to evaluate respiratory drive (not a good measure of extubation readiness in ELBW infants)

9. Respiratory Support Following Extubation

- A. Extubate to bCPAP with PEEP 6-8 cm H₂O
- a. If PEEP >8 is required, consider CXR to evaluate lung expansion
 - b. The maximum allowed PEEP is 10
- B. Consider escalation/transition to NI-NAVA for the following:
- a. Apnea (once fully maximized on caffeine and PEEP at least 8 cmH₂O)
 - b. Increased work of breathing and/or FiO₂ requirement >0.6 once expansion optimized on PEEP of 8-10
- C. NI-NAVA should be weaned once infant is stable with goal to resume bCPAP within 3-7 days
- a. Apnea delay should be weaned unless there are clinically significant cardiopulmonary events occurring

References

1. Finer N, Carlo W, Network. TSSoTNNR. The Surfactant Positive Airway Pressure and Pulse Oximetry Trial in Extremely Low Birth Weight Infants – The SUPPORT Trial. *NEJM*. 2010;1670.1
2. Shalish W, et al. Assessment of Extubation Readiness Using SBTs in extremely preterm neonates. *JAMA Netw Open* 2019/2020. (SBT performance vs clinical judgment.)
3. Mukerji A, et al. CPAP Versus NIPPV Postextubation in Preterm Neonates: A Comparative-Effectiveness Study. *Pediatrics*. 2024 Apr 1;153(4):e2023064045. doi: 10.1542/peds.2023-064045.