Management of infants with respiratory faiure

Management of patients concerning for possible impending respiratory failure:

- Obtain ABG
- Escalate oxygen therapy to high-flow NC, CPAP, BiPAP
- Be aware that respiratory failure may be due to mucus plugging and therefore sudden. Suctioning may help.

High-flow nasal cannula (HFNC)

- Works well in bronchiolitis
- Best when the main problem is hypoxemia
- Provides some (variable amount) of PEEP
- Maximum flow rate is around 2 L/kg/min

CPAP

- Can be delivered by nasal prongs, nasal mask or face mask
- Best for recruiting alveoli and treating hypoxemia
- Does not prevent or treat apnea
- Does little to improve work of breathing
- Must specify CPAP level (typically 4-5 cm H_2O) and FiO_2

BiPAP

- Improves oxygenation, decreases CO_2, decreases work of breathing
- Has minimal respiratory rate to treat apnea
- Must specify IPAP, EPAP, rate, FiO_2
- IPAP: minimum 8, maximum 20
- EPAP: minimum 4, maximum 15
- The difference between IPAP and EPAP (IPAP – EPAP) should not be < 4 cm H_2O or > 10 cm H_2O
- See the rate chart for ventilator settings

Predictors of NPPV failure

- FiO2 requirement > 0.6 1 hour after initiation
- elevated pCO2 at presentation
- elevated pCO2 after initiation of NPPV
- apnea

Intubation of infants with respiratory failure:

Review the section on pediatric intubation and vent management in Tintinalli's Emergency Medicine, chapter 113. This can be found on the Access Emergency Medicine app on Zenith.

Use the Broselow tape

Age	Weight (kg)	Cuffless	Cuffed	Depth	Miller
Preterm	1-2.5	3.0	-	7-9	0
Neonate	2.5 - 4	3.0	-	10	0
6 mo	6 – 7.5	3.5	3.0	10-11	1

If you are using an uncuffed tube, use 0.5 larger than a cuffed tube.

It's easy to go too deep with the laryngoscope. If you don't see what you are looking for, slowly pull out.

Take care to only inflate the cuff enough to prevent air leak. Too much balloon pressure can cause permanent damage.

Appropriate depth for a 3 kg infant is 9 cm at the lip.

Intubating stylets can be used, but you need a pediatric stylet. Stylets used for adults won't fit.

The connector end of the ETT may need to be shortened to prevent kinking of the tube.

Maximize oxygenation prior to intubation to avoid bradycardia. Washing out nitrogen and having lungs full of oxygen provides a wide margin. Infants can develop bradycardia quickly with desaturation. Doing CPR on an infant raises the stress level in the room and makes intubation harder.

Avoid over-bagging too rapidly or with too much pressure. This is easy to do when stressed and can cause major injury to the patient. Watch the pressure on the Ambubag. Only give enough volume to achieve adequate chest rise. Tidal volume on a 10 kg child is 80 mL, but the volume of a pediatric BMV is 500 mL.

<u>Medications:</u>
Induction agents:

Etomidate	0.3 mg/kg	Preserves hemodynamic stability
Ketamine	1-2 mg/kg	Bronchodilator; preserves respiratory drive

Paralytics:

Rocuronium	1 mg/kg	Long duration of action
Succinylcholine	< 10 kg: 1.5-2 mg/kg > 10 kg: 1-1.5 mg/kg	Short duration of action May cause bradycardia in children Hyperkalemic arrest w/ undiagnosed neuromuscular disease

Rocuronium is often preferred in children. However, most of our patients will not be at risk for using succinylcholine. Since rocuronium takes a long time to wear off, if you use rocuronium, you have to bag longer if you fail intubation, and there is a substantial risk the patient may experience paralysis while awake.

Sedatives:

Versed	0.1 mg/kg

Analgesia:

Fentanyl	1-2 mcg/kg

Don’t rely on the nurses for doses or calculations. It is difficult to recognize that a miscalculated dose doesn’t seem right when dealing with unfamiliar amounts, especially in stressful situations.
Overdosing an adult requires multiple syringes. But a single syringe can hold 10 times the proper dose needed for an infant.
A newborn is typically about 3 kg.

		3 kg
Etomidate	0.3 mg/kg	1 mg
Ketamine	1-2 mg/kg	3-6 mg
Rocuronium	1 mg/kg	3 mg
Succinylcholine	1.5-2 mg/kg	4.5-6 mg
Versed	0.1 mg/kg	0.3 mg
Fentanyl	1-2 mcg/kg	3-6 mcg

Maintenance of sedation in an intubated infant:

Versed	0.1-0.2 mg/kg/hr, titrate
Fentanyl	1-5 mcg/kg/hr

Ventilator settings:

Use volume-assist control
Tidal volume: 6-8 mL/kg
PEEP: 5 cm H2O

Target a peak inspiratory pressure < 30-35 cm H_2O and/or plateau pressure < 28 cm H_2O

I:E ratio

- typically 1:2
- neonates may need lower (1:1.5-2) due to faster respiratory rate
- breath stacking can occur in obstructive disease (asthma) and may need longer expiratory time (I:E of 1:3-5)