

## Summary of RSV evaluation and management

### Risk factors for hospitalization:

- Congenital heart disease
- Bronchopulmonary dysplasia
- Chronic lung disease
- Cystic fibrosis
- Prematurity
- Immunodeficiency

### Consider hospitalization for:

- Premature birth
- Ill- or toxic-appearing
- Age < 3 months
- Decreased oxygen saturation
- Underlying heart or lung disease or immunodeficiency

### Evidence of impending respiratory failure:

- Episodes of apnea (often seen in infants < 2 months of age with RSV)
- Cyanosis
- Respiratory distress: tachypnea, retractions, nasal flaring, grunting
- Low oxygen saturation on pulse ox
- Low O<sub>2</sub>, high CO<sub>2</sub> on ABG
- Lethargy

### Normal vital signs:

|                  | <28 days         | 1-12 mo          | 1-2 yrs |
|------------------|------------------|------------------|---------|
| Heart rate       | 90-190 (avg 125) | 90-160 (avg 120) | 80-120  |
| Respiratory rate | 30-50            | 30-50            | 22-40   |

### Testing:

Typically, only needs RSV testing (often not really even that)

Chest xray and blood tests are usually not indicated, unless hospitalization is being considered

### Treatment:

- No treatment is available for those being discharged
- If there is a component of wheezing, a trial of bronchodilator is appropriate, but does not work for bronchiolitis alone. If nebulizer seems to help, then RT can arrange for home nebulizer
- For those requiring hospitalization, usually the sole treatment is supplemental oxygen

### Management of patients requiring hospitalization:

- Supplemental oxygen
- Assess for signs of impending respiratory failure
- Get chest xray to rule out pneumonia, which is only a rare complication of bronchiolitis

## Management of infants with respiratory failure

### 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 for infants
- Start flow rate at 15 L/min for children over 7.5 kg (can go up to 60 L/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<sub>2</sub>O) and FiO<sub>2</sub>

### BiPAP

- Improves oxygenation, decreases CO<sub>2</sub>, decreases work of breathing
- Has minimal respiratory rate to treat apnea
- Must specify IPAP, EPAP, rate, FiO<sub>2</sub>
- IPAP: minimum 8, maximum 20 (typically use 12-18)
- EPAP: minimum 4, maximum 15 (typically use 5-10)
- See the rate chart for ventilator settings

### Predictors of NPPV failure

- FiO<sub>2</sub> requirement > 0.6 1 hour after initiation
- elevated pCO<sub>2</sub> at presentation
- elevated pCO<sub>2</sub> 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.

#### Medications:

##### 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<br>> 10 kg: 1-1.5 mg/kg | Short duration of action<br>May cause bradycardia in children<br>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 PC-SIMV

Tidal volume: 6-8 mL/kg

PEEP: 5 cm H<sub>2</sub>O

Target a peak inspiratory pressure < 30-35 cm H<sub>2</sub>O and/or plateau pressure < 28 cm H<sub>2</sub>O

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)

## Management of patients requiring hospitalization with delayed transfer

### Respiratory status:

Reassess oxygen status, supplemental oxygen use, and respiratory effort every 2 hours  
Be aware that improving tachypnea may actually indicate fatigue and impending failure

### Feeding:

Children who are having difficulty breathing are likely to have difficulty eating. Suctioning the nose may help them breathe while they have a bottle in their mouths.

If they are unable to maintain adequate intake, they may need to be supplemented through an NG tube.

Caloric requirements: 80-120 kcal/kg/day. Formula has 20 kcal/oz

Fluid requirements are: 2-3 oz/lb/day, about 4-6 oz/kg/day

### Urine output:

Oliguria defined at  $< 0.5$  mL/kg/hr

Urine output under 1 mL/kg/hr may represent underhydration and over 3 mL/kg/hr may represent overhydration. Adjust IV fluids as needed.

### Maintenance IV fluids:

4 mL/kg/hr for the first 10 kg +

2 mL/kg/hr for each kg  $> 10$  kg and  $\leq 20$  kg +

1 mL/kg/hr for each kg  $> 20$  kg

Use D5  $\frac{1}{2}$ NS or normal saline, add KCl as needed.

Type of IV fluids is more debatable in children under 6 weeks. Consider expert consultation or more frequent checks of serum sodium levels in this age range.

### Sedation:

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

### Re-evaluation of intubated patients:

Daily chest xray as needed

Repeat CBC, BMP, ABG every 12 hours and as needed

Patient Name: \_\_\_\_\_

Room Number: \_\_\_\_\_

Date: \_\_\_\_\_

| Time        | HR | RR | O <sub>2</sub> use | PO intake | IVF in | Urine output | Tests done, results |
|-------------|----|----|--------------------|-----------|--------|--------------|---------------------|
| 0000        |    |    |                    |           |        |              |                     |
| <b>0100</b> |    |    |                    |           |        |              |                     |
| 0200        |    |    |                    |           |        |              |                     |
| <b>0300</b> |    |    |                    |           |        |              |                     |
| 0400        |    |    |                    |           |        |              |                     |
| <b>0500</b> |    |    |                    |           |        |              |                     |
| 0600        |    |    |                    |           |        |              |                     |
| <b>0700</b> |    |    |                    |           |        |              |                     |
| 0800        |    |    |                    |           |        |              |                     |
| <b>0900</b> |    |    |                    |           |        |              |                     |
| 1000        |    |    |                    |           |        |              |                     |
| <b>1100</b> |    |    |                    |           |        |              |                     |
| 1200        |    |    |                    |           |        |              |                     |
| <b>1300</b> |    |    |                    |           |        |              |                     |
| 1400        |    |    |                    |           |        |              |                     |
| <b>1500</b> |    |    |                    |           |        |              |                     |
| 1600        |    |    |                    |           |        |              |                     |
| <b>1700</b> |    |    |                    |           |        |              |                     |
| 1800        |    |    |                    |           |        |              |                     |
| <b>1900</b> |    |    |                    |           |        |              |                     |
| 2000        |    |    |                    |           |        |              |                     |
| <b>2100</b> |    |    |                    |           |        |              |                     |
| 2200        |    |    |                    |           |        |              |                     |
| <b>2300</b> |    |    |                    |           |        |              |                     |