OXYGEN DELIVERY: NON-REBREATHER MASK AND MANUAL VENTILATION BAG

THEORY
For many children, hypoxia can be easily treated with low-flow supplemental oxygen. Some critically-ill child with respiratory distress require additional support to correct their hypoxemia. Providing high-flow oxygen therapy through a non-rebreather mask can correct hypoxemia in some cases. Other patients, including those with inadequate ventilation or those undergoing sedation for procedures or prior to intubation, may require assistance with a manual ventilation bag.

PATIENT SELECTION
Indications:
• To provide high-flow, 100% oxygen to children in respiratory distress, who have hypoxia despite use of low-flow oxygen or simple face mask.
• To provide assistance with ventilation and/or continuous positive airway pressure (CPAP) to children with inadequate ventilation, or who are undergoing sedation for procedures or prior to intubation.

Contraindications:
• There are no contraindications to providing oxygen via a non-rebreather or manual ventilation bag.
• However, exercise caution in patients with inadequate ventilation, as supplemental oxygen can correct hypoxemia while leaving hypercarbia untreated.
• Caution performing manual ventilation in patients with a full stomach

EQUIPMENT
• Non-rebreather mask
• High-flow oxygen source
• Manual ventilation bag
• Appropriately-sized mask
• Monitoring equipment

NON-REBREATHER MASK
• Provides a high concentration of oxygen by avoiding the entrainment of room air that occurs when using a blow-by apparatus, nasal cannula or simple mask. Flap valves prevent rebreathing of CO2.
• Consider humidification and delivery of higher oxygen concentrations when supplemental oxygen delivery is necessary for a prolonged period of time.

Procedure
1. Turn on oxygen flow to fill reservoir bag (Figure 1).
2. Create a tight seal on the baby’s face by tightening straps as needed.
3. Adjust the flow of oxygen (Liters per minute) so that the bag never completely deflates. This allows for excess air to come from the bag, rather than room air, if a large inhalation occurs.

MANUAL VENTILATION BAGS
1. Self-inflating or Ambu Bag
• Use on patients who are not breathing on their own.
• One-way valves prevent CO2 rebreathing.
• You do not need a fresh gas source to ventilate the patient.
• Oxygen may be attached to allow delivery of 100% oxygen.
• Pop-off valves displaces (Figure 2) pressure to avoid transmitting excessive pressure to patient which could cause complications such as pneumothorax.
• If your patient requires more pressure than allowed by the pop-off valve, this can be counteracted, but the specifics of this mechanism varies between bags. Make sure to be familiar

Figure 1: Patient receiving 100% oxygen from a non-rebreather mask.

Figure 2: A patient being ventilated by a self-inflating bag. Oxygen source (a), Pop-off valve (b), Pressure manometer (c).
with your bag beforehand!
• Pressure manometer (Figure 2) can be used to estimate inflating pressure.
• Adjust the size of tidal volumes delivered by how much you squeeze the bag.
• Choose a mask that covers the nose and mouth without covering the eyes or going below the chin (Figure 3). This will provide the most effective seal.
• When choosing mask size, it may be better to choose a smaller mask rather than a larger one for an effective seal.

2. Mapleson/McGill Circuit or Anesthesia Bag
• Use on a patient who is not breathing on their own or is breathing spontaneously.
• If you have a good mask seal, movement of bag will indicate the patient is breathing.
• Requires a fresh gas source and a good seal on the patient’s face with the mask to operate.
• Allows you to either give continuous positive airway pressure (CPAP) to assist a patient’s breathing, or to fully support a patient with manual ventilation breaths.
• An advantage is that you can change easily between manual ventilation and spontaneous breathing based on patient needs. This can be quite helpful when administering sedation or anesthesia to a patient for a procedure.
• If the oxygen flow rate is too low, there is the possibility of re-breathing CO₂.
• Therefore, set the oxygen flow 2.5-3 times the patient’s normal minute volume. A normal minute ventilation is approximately 100mL/kg/min, but this may increase significantly in patients with tachypnea or respiratory distress.
• Typical oxygen flow rates: infant= 3-4L/min, child= 6-7 L/min, adolescent=10-15L/min

COMPLICATIONS
• Oxygen desaturation as a sign of hypercarbia may be masked with administration of supplemental oxygen.
• Aspiration of gastric contents can occur during mask ventilation.

ASSESSMENT AND MONITORING
• Monitor vital signs (oxygen saturation, heart rate, and blood pressure) while patient is receiving oxygen therapy.
• Assess skin every 4 hours while non-rebreather mask is in place
• Monitor for adequate movement of the chest with mask ventilation

DOCUMENTATION
• Indication for oxygen therapy or manual ventilation
• Date and time of start of oxygen delivery
• Oxygen delivery device used
• Amount of oxygen delivered
• Respiratory status, including work of breathing, breath sounds, and chest movement
• Vital signs before, during, and after oxygen therapy, with special attention to oxygen saturation

REFERENCES