****

**EMS SKILL**

**BREATHING EMERGENCY: OXYGEN DELIVERY**

**NOTE:**

**THIS SKILL SHOULD BE TAUGHT AFTER PATIENT ASSESSMENT**

**PERFORMANCE OBJECTIVES**

Demonstrate proficiency in the administration of oxygen by utilizing an oxygen tank and regulator, oxygen masks, nasal cannula, and providing oxygen by blow-by method.

**CONDITION**

Administer oxygen to a patient whose condition requires supplemental oxygenation by a mask, nasal cannula (NC), or blow-by method. Necessary equipment will be adjacent to the manikin or brought to the field setting.

**EQUIPMENT**

Adult CPR manikin, O2 connecting tubing, simple O2 mask, non-re-breather mask, nasal cannula, oxygen source with flow regulator, oropharyngeal and nasopharyngeal airways appropriate for manikin, silicone spray, water-soluble lubricant, goggles, masks, gown, gloves, suction, timing device, airway bag

**PERFORMANCE CRITERIA**

• Items designated by a diamond (⧫) must be performed successfully to demonstrate skill competency.

• Items identified by double asterisks (\*\*) indicate actions that are required, if indicated.

• Items identified by (§) should be practiced.

|  |  |
| --- | --- |
|  | |
| **PREPARATION** | |
| **Skill Component** | **Key Concepts** |
| ⧫ Establish body substance isolation precautions | • Mandatory (minimal) personal protective equipment – gloves |
| ⧫ Assess scene safety/scene size-up  ***\*\* Consider Spinal Motion Restriction - if indicated*** | • If trauma is suspected, treat as trauma (determined by environment and information obtained from bystanders). |
| ⧫ Evaluate need for additional BSI precautions | • Situational - goggles, mask, gown |
| ⧫ Introduce yourself to the patient/caregivers | * Communication is important when dealing with the patient, family, or caregiver. This is a very critical and frightening event for all involved and providing information helps in decreasing the stress they are experiencing and promotes patient cooperation. |
| ⧫ Determine the need for oxygen administration  \*\*Place a pulse oximetry device on the patient and determine the need for oxygen delivery – *if available.*  *\*\*Clean the patient’s finger by using an alcohol wipe, or 2X2 gauze soaked in Normal Saline.*  *\*\*Palpate the radial pulse to ensure that it correlates with the LED display*  *\*\*Read the display* | * If pulse oximetry is not available on a BLS unit, and the patient is in mild or moderate respiratory distress, provide oxygen via nasal cannula (NC) at 2-6 liters per minute. * When available, use pulse oximetry to guide oxygen delivery. The desired SpO2 for most non-critical patients is 94-98%. * Signs and symptoms of hypoxia may include O2 saturation (SpO2) less than 94% with respiratory distress, altered mental status, or changes in skin signs. |

|  |  |  |
| --- | --- | --- |
|  | | |
| **SETTING UP OXYGEN CYLINDER AND REGULATOR**  **PROCEDURE** | | |
| **Skill Component** | | **Key Concepts** |
| ⧫ Confirm that it is a “medical grade” oxygen cylinder | | • To confirm that the cylinder contains medical grade oxygen:  - check color of cylinder - green and white, solid green, or unpainted aluminum with a green ring around top of cylinder  - pin index groupings line up with oxygen regulator |
| ⧫ Clear dust or debris from the opening | | • To clear dust or debris from the opening, open the main valve slowly until gas flow is heard and then immediately close valve.  • The valve stem should not be covered with adhesive tape or petroleum based substances. Both of these may contaminate the oxygen or result in spontaneous combustion due to the presence of pressurized oxygen. |
| ⧫ Place a new O-ring (flexible gasket) over the large opening on either the cylinder or regulator | • Some regulators have fixed O rings. **DO NOT** apply an additional O ring.   * The O-ring can be placed over the large opening on either the cylinder or regulator opening.   • O-rings are manufactured for single-use only and must be replaced every time a regulator is attached. | |
| ⧫ Secure the regulator to the valve stem:  • Align the pin index from the regulator with the holes in the cylinder  • Insert the pins of the regulator with the holes in the cylinder  • Tighten screw bolt with firm hand pressure to ensure an adequate seal | • Gas regulators have a different pin index and the cylinder valves have specific configurations of holes to prevent accidental administration of the wrong gas.  • Tightening the screw bolt with a wrench or other device may cause a break in the seal and damage to the regulator. | |
| ⧫ Open valve two (2) full turns  ***\*\* If cylinder leaks, turn off valve and check connections*** | • A leaking cylinder may be the result of an O-ring this is improperly seated, poor connection between the regulator pins and the cylinder, or debris that does not allow for a proper seal. | |
| ⧫ Read the pressure gauge to determine the oxygen pressure (psi) in the cylinder  ***\*\* If cylinder is not in use and is near 500 psi – Do Not put in service***  ***\*\* If cylinder is in use and reaches 200 psi – change cylinder immediately*** | • The amount of oxygen pressure in the cylinder is read as pounds per square inch (psi).  • The gauge should read approximately 2000 psi. The volume of oxygen varies in the different size cylinders, but when the cylinder is full they will contain a pressure of 2000 psi.  • Ideally, portable cylinders should be changed out when the psi is between 500 and 1000 psi.  • Cylinders containing < than 200 psi should be changed immediately. | |
| ⧫ Determine the appropriate oxygen delivery system | * The appropriate oxygen delivery system is dependent on the information gathered during the primary assessment. As the patient’s condition changes, the oxygen delivery method may change. * Oxygen delivery devices include nasal cannulas (NC), simple face mask, non-rebreather, bag-mask-ventilation, or blow-by oxygen. | |

|  |  |  |
| --- | --- | --- |
| **GUIDELINES FOR THE DELIVERY OF OXYGEN** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Initiate O2 therapy for stable patients with mild hypoxia (SpO2 less than 94%):  ***\*\*Start O2 with NC at 2-6 liters per minute by NC or basic mask at 8-10 liters per minute***  ***\*\* Use blow-by technique at 15L/minute if the patient is unable to tolerate an NC or basic mask***  ***\*\*Titrate to an SpO2 of 94-98%*** | * A goal of oxygen administration is to deliver the minimum amount of oxygen to meet the needs of the patient and to maintain an oxygen saturation level at or above 94-98%. * Providing oxygen to EMS patients may be a lifesaving measure. Too little and too much oxygen are potentially harmful; therefore, oxygen delivery should be treated like any drug and only administered when indicated.   • Patients who are mouth breathers receive minimal benefit from NC oxygen administration. | |
| **NASAL CANNULA (NC)**  **PROCEDURE** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Choose the appropriate size nasal cannula | * Nasal cannulas come in adult, child, and infant sizes. | |
| ⧫ Attach the NC tubing to the regulator |  | |
| ⧫ Set oxygen to appropriate liter flow (2-6 Liters/minute) | • NC is a low-flow, low-oxygen concentration delivery device that delivers 24%-44% of oxygen with flow rates of 2-6 Liters/minute.  • The flow rate that may be administered via a NC **CANNOT EXCEED** 6 Liters/minute by NC. This will dry out the mucosa or cause oxygen burns to nostrils, but will not increase oxygen delivery. | |
| ⧫ Check for the flow of oxygen through the NC  ***\*\* Listen for leaks where the tubing attaches to the***  ***cylinder*** | * If leaks are not corrected, the actual concentration of oxygen delivered to the patient may not be accurate. | |
| ⧫ Place the nasal cannula prongs into the nostrils (nares) correctly | • Curvature of the prongs should be oriented so that the tips will curve down and are slightly posterior once inserted. | |
| ⧫ Secure the NC by:  ***\*\*Hold loop of tubing anterior to face and neck***  ***\*\*Slip tubing around the patient’s ears and under the chin*** | • Placing the tubing behind the head may decrease the flow of oxygen. Therefore, slip the tubing around the patient’s ears and under the chin. | |
| ⧫ Adjust the tubing under the chin until the NC is secure | • Tightening the tubing on the NC too tight will cause discomfort. | |
| ⧫ Evaluate the patient’s comfort | * Evaluating the patient’s comfort level will assist in the patient’s compliance with keeping the NC in place. | |
|  | | |
| **MEDIUM CONCENTRATION OXYGEN MASK (SIMPLE FACE MASK)**  **PROCEDURE** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Choose the appropriate size oxygen mask | * Simple face masks come in adult, child, and infant sizes. | |
| ⧫ Attach oxygen mask tubing to the regulator |  | |
| ⧫ Set oxygen to appropriate liter flow (8-10 Liters/minute) | • A simple face mask delivers up to 60% of oxygen with flow rates of 6-10 Liters/minute. Do not use less than 6 Liters/minute. The most common flow rate used with a simple face mask is 10 Liters/minute.  • Flow rates greater than 10 Liters/minute does not increase oxygen delivery and may result in patient discomfort and drying of mucus membranes. | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Check for the flow of oxygen through the simple face mask  ***\*\* Listen for leaks where the tubing attaches to the***  ***cylinder*** | * If leaks are not corrected, the actual concentration of oxygen delivered to the patient may not be accurate.   🕱 ***Never apply an oxygen mask on the patient without supplemental oxygen flowing; this results in the patient re-breathing their own CO2, acidosis, hypoxia and possible death.*** | |
| ⧫ Place the narrow end of the mask over the bridge of the patient’s nose |  | |
| ⧫ Place the oxygen mask on patient’s face covering both nose and mouth with narrow end over the bridge of the nose | * The application of an oxygen mask on the patient poses a risk for aspiration if the patient vomits. Therefore, the mask must be removed if the patient complains of nausea. Consider switching the patient to a NC. | |
| ⧫ Secure the mask by slipping elastic strap over patient’s head and either above or below ears |  | |
| ⧫ Adjust elastic strap until mask is secure | • Tightening the straps on the mask too tight will cause discomfort. | |
| ⧫ Form the metal strip over the bridge of the nose for a secure fit | • Leakage around the mask decreases the delivery of oxygen. | |
| ⧫ Evaluate the patient’s comfort | * Evaluating the patient’s comfort level will assist in the patient’s compliance with keeping the mask in place. | |
|  | | |
| **HIGH CONCENTRATION OXYGEN MASK (NON-REBREATHER RESERVOIR MASK)**  **PROCEDURE** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Choose the appropriate size non-rebreather mask | * Non-rebreather masks in adult, child, and infant sizes. | |
| ⧫ Attach the non-rebreather tubing to the regulator |  | |
| ⧫ Unroll the oxygen reservoir bag – if appropriate |  | |
| ⧫ Ensure oxygen tubing is attached to the non-re-breather device | • Using a smaller reservoir bag in infants and children is appropriate as they have a smaller tidal volume. | |
| ⧫ Set oxygen to appropriate liter flow 15 Liters/minute | * A non-rebreather mask is a low-flow, high-oxygen concentration device that delivers up to 90-95% with flow rate of 15 Liters/minute. | |
| ⧫ Inflate reservoir bag completely by holding finger over valve located inside the mask above the reservoir bag insertion | • The reservoir bag must be inflated completely before placing the mask on the patient. | |
| ⧫ Check for the flow of oxygen through the non- rebreather  mask  \*\* ***Feel for the flow of oxygen through the tubing***  ***\*\* Listen for leaks where the tubing attaches to the***  ***cylinder***  ***\*\* If the oxygen reservoir bag dislodges, replace the device.*** | | • If leaks are not corrected, the oxygen concentration  delivered to the patient will not be accurate.  🕱 ***Never apply an oxygen mask on the patient without supplemental oxygen flowing; this results in the patient re-breathing their own CO2, acidosis, hypoxia and possible death.*** | |
| ⧫ Attach oxygen supply tubing to the oxygen mask | |  | |
| ⧫ Place the narrow end of the mask over the bridge of the patient’s nose | |  | |

|  |  |
| --- | --- |
| **Skill Component** | **Key Concepts** |
| ⧫ Place the mask on the patient’s face covering both the nose and mouth with the narrow end over the bridge of the nose | * If the non-rebreather mask is placed upside down on the patient’s face there will not be an adequate seal and the oxygen concentration being delivered to the patient will be significantly decreased. * The reservoir bag will be below the mask. | |
| ⧫ Slip the elastic strap over patient’s head and place just above the ears |  | |
| ⧫ Adjust elastic straps until the mask is secure | * Mask must be secure, but not so tight that it causes discomfort | |
| ⧫ Form the metal strip over the bridge of the nose for a secure fit | • Leakage around the mask decreases the delivery of oxygen. | |
| ⧫ Evaluate the patient’s comfort | * Evaluating the patient’s comfort level will assist in the patient’s compliance with keeping the mask in place. * During inspiration -- exhalation valves on the sides of the mask close, valve above the reservoir bag opens, and reservoir bag deflates slightly. * During exhalation – exhalation valves at the sides of the mask open, valve above the reservoir bag closes, and reservoir bag expands completely. | |
|  | | |
| **BLOW-BY OXYGEN ADMINISTRATION**  **PROCEDURE** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Choose the appropriate size oxygen face mask to use with blow-by oxygen | * Simple face masks come in adult, child, and infant sizes.   **NOTE:** The appropriate oxygen delivery device is dependent on the information gathered during the primary assessment. As the patient’s condition changes, the oxygen delivery method may change. | |
| ⧫ Attach oxygen supply tubing the regulator | * Blowing oxygen near the patient’s face is not a reliable means of oxygen delivery and generally should not be used with adults. However, for agitated patients who do not tolerate a nasal cannula or face mask, it may provide some oxygen to the patient when oxygen is indicated by the SpO2 reading. | |
| ⧫ Set oxygen to appropriate liter flow:  • Adult –15 Liters/minute  • Infant/Child - 15 Liters/minute  • Neonate –15 Liters/minute | • The use of blow-by oxygen is controversial as studies have demonstrated that the blow-by technique does not provide adequate oxygen to a patient who needs oxygen delivered.  • For infant/child the liter flow depends on the flow rate and proximity to the face.   * Oxygen flow rates less than 15 Liters/minute would not deliver much, if any oxygen to the patient. * Blow-by oxygen administration is **NEVER** considered a first-line method for oxygen delivery. | |
| ⧫ Check for the flow of oxygen through the tubing | * Feel for the flow of oxygen through the tubing and listen for leaks where the tubing attaches to the cylinder. | |

|  |  |
| --- | --- |
| **Skill Component** | **Key Concepts** |
| ⧫ Administer oxygen by appropriate method:  • Adult –  - Use face mask and hold approximately 1”-2” from face  • Infant/Child –  - Use face mask and hold approximately 1”-2” from face  - Hold tubing 1”-2” from nose and mouth  - Place oxygen tubing through small hole in the bottom of a 6-8 oz. paper or cup and hold cup approximately 1”-2” from child’s nose and mouth  • Neonate – hold tubing 1”-2” from nose and mouth | • Blow-by oxygen can be delivered by a mask, corrugated tubing, O2 tubing or through bottom of a paper cup (not Styrofoam cup) or in a toy.  • The cup also acts as an oxygen reservoir allowing for better oxygen delivery than if only using the tubing.   * If a patient is claustrophobic, attempt the use of a NC prior to switching to blow-by oxygen.   • Nasal cannulas and masks may frighten young children. In this case, the use of oxygen tubing may be considered.  • With neonates, you must hold the tubing with the opening facing the nose and mouth.  • If there is no improvement and hypoxia is suspected another form of oxygen delivery device should be considered. | |
| **CHANGING THE OXYGEN SOURCE** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Prepare the new oxygen delivery system | * When a patient is placed into the back of the ambulance, the oxygen delivery system may change to the oxygen delivery system within the transport ambulance. * When the patient reaches the Emergency Department (ED) the oxygen delivery system will change to the oxygen delivery system in the hospital | |
| ⧫ Turn on the new oxygen cylinder  ***\*\*Check the pressure gauge to determine how many psi is in the new tank***  ***\*\*Ensure the psi in the new cylinder exceeds 500 psi*** | * Preparing the new oxygen delivery system prior to discontinuing the oxygen source from the patient minimizes periods of hypoxia. | |
| ⧫ Remove the tubing from the existing oxygen cylinder |  | |
| ⧫ Attach the oxygen delivery tubing immediately to the new cylinder | * Rapid re-attachment of the oxygen tubing to the new system is essential in minimizing periods of hypoxia. | |
| ⧫ Check the old pressure gauge to determine how many psi oxygen remains in the original tank – if applicable | * Ideally, portable cylinders should be replaced when the pressure in the tank is between 1000 and 500 psi.   • Cylinders should not be put into service if near 500 psi.   * If the cylinder is in use, it should never be allowed to go below 200 psi. Oxygen pressure below 200 psi does not deliver the appropriate liter flow and will empty rapidly depending on the liter flow. | |
| ⧫ Turn off the existing oxygen regulator |  | |
| ⧫ Take the cylinder out of service – if indicated |  | |
|  | | | |
| **DISCONTINUING OXYGEN ADMINISTRATION AND DISCONNECTING CYLINDER AND REGULATOR**  **PROCEDURE** | | | |
| **Skill Component** | **Key Concepts** | | |
| ⧫ Remove oxygen delivery device from patient and regulator | * The flow of oxygen must be first discontinued from the patient prior to turning off the flow of oxygen. | | |
| ⧫ Check pressure gauge for psi remaining in cylinder | * Ideally, portable cylinders should be replaced when the pressure in the tank is between 1000 and 500 psi.   • Cylinders should not be put into service if near 500 psi.   * If the cylinder is in use, it should never be allowed to go below 200 psi. Oxygen pressure below 200 psi does not deliver the appropriate liter flow and will empty rapidly depending on the liter flow. Replace the tank immediately. | | |

|  |  |  |
| --- | --- | --- |
| **Skill Component** | **Key Concepts** | |
| ⧫ Close the regulator valve |  | |
| ⧫ Remove the oxygen tubing from regulator stem | * Once the oxygen delivery tubing has been removed from the regulator stem, it may be placed in the regular trash unless the patient is known to have a respiratory related communicable disease. When this occurs, discard the tubing in a red infectious waste bag. | |
| ⧫ Close the valve at top of cylinder |  | |
| ⧫ Bleed oxygen out of system  • Open regulator valve  • Listen for oxygen flow to stop  • Close regulator  • Check that gauge reads zero with the cylinder valve closed. | * By slowly opening the regulator valve after closing the valve at the top of the cylinder, the oxygen will “bleed” out of the system. Once the sound of oxygen flow ceases, you have cleared the oxygen pressure out of the regulator. * If the oxygen flow gauge does **NOT** say “0,” oxygen remains in the line. If this occurs, re-check the valve to ensure it is closed tightly. | |
| ⧫ Detach regulator by loosening the screw bolt |  | |
| ⧫ Log or label cylinder with psi reading per department or agency protocol | • The oxygen cylinder should be labeled as **“EMPTY”** if near 500 psi.  • Various departments and agencies may use a log or use commercial tags.   * Adhesive tape should never be used to label readings. | |
| ⧫ Store oxygen cylinder appropriately | • Never leave cylinders standing in an upright position unless properly secured. If cylinder is dropped and the valve breaks off, the cylinder will act as a missile projectile. | |
| **RE-ASSESSMENT**  **(Ongoing Assessment)** | | |
| **Skill Component** | **Key Concepts** | |
| ⧫ Re-assess the patient at least every five (**5) minutes for** unstable patients and every **15 minutes for stable** patients.  • Primary assessment  • Relevant portion of the secondary assessment  • Vital signs: BP, Pulse, Respirations | * An unstable patient is one who have abnormal vital signs, S/S of poor perfusion, or if there is a suspicion that the patient’s condition may deteriorate.   • Continue to monitor the remaining psi of oxygen in the tank. | |
| ⧫ Evaluate response to treatment | • Patients must be re-evaluated at least every five (5) minutes if any treatment was initiated, medication administered or unless a change in the patient’s condition is anticipated. | |
| ⧫ Evaluate results of on-going assessment and compare to baseline condition and vital signs  ***\*\*Manage patient condition as indicated.*** | • Evaluating and comparing results assists in recognizing patient improvement, responsiveness to treatment, or if the patient is deteriorating.   * The need for additional treatment is based upon the information gained during the reassessment. | |
| ⧫ Continue O2 therapy until the transfer of patient care has  occurred. | * Once oxygen therapy has been initiated, it should be continued until the transfer of patient care has occurred. |
|  | | |
| **PATIENT REPORT AND DOCUMENTATION** | | |
| **Skill Component** | **Key Concepts** | |
| § Give appropriate report to equal or higher level of care personnel | • The patient report should consist of all pertinent information regarding the assessment findings, treatment rendered, and the patient’s response to the care provided.  • Report may be given to a lower level of care provider when an ALS to BLS downgrade has occurred  **EXCEPTION** – ALS to BLS downgrade | |

|  |  |
| --- | --- |
| **Skill Component** | **Key Concepts** |
| § Document:  • Oxygen administration device used  • Percent of oxygen/Liter flow  • Dentures and location - *if removed*  • Respiratory rate and tidal volume  • Skin color  • Level of consciousness  • Response to oxygen administration   * SpO2 | * Documentation must be on either the Los Angeles County EMS Report Form, ePCR, or departmental form. * The response to oxygen administration may include but not be limited to improved SpO2 reading, level of consciousness, and work of breathing. | |

Developed: 10/04 Revised 10/2018



**BREATHING EMERGENCY: OXYGEN ADMINISTRATION**

**Supplemental Information**

**Definitions:**

• Hypoxia – insufficient oxygen delivery to body cells which may lead to organ ischemia and eventually death. Signs/symptoms of hypoxia include increased respiratory rate, increased heart rate, and changes in level of consciousness, restlessness, irritability, and cyanosis.

• Minute volume – total volume inhaled in a minute calculated by multiplying tidal volume and the number of respirations for one minute.

• Respiratory distress – acute condition in which the patient needs to work harder to breath. Signs/symptoms include increased respiratory rate, accessory muscle use, nasal flaring, and difficulty speaking in complete sentences. The patient may assume an upright or a tripod position to aid respiratory muscles.

• Respiratory failure – acute condition in which there is inadequate ventilation to support life and requires immediate positive-pressure ventilations. Signs and symptoms of respiratory failure include altered mental status, loss of muscle tone that progresses to inadequate minute volume. This condition develops when there is respiratory muscle fatigue after prolonged respiratory distress or obstruction of the upper or lower airway.

• Respiratory arrest – agonal or complete cessation of breathing.

• Tidal volume – amount of air inhaled and exhaled during a normal breath.

• Vital capacity (lung capacity) – is compose of the maximum inspiratory reserve volume (IRV), maximum expiratory reserve volume (ERV) and the tidal volume (TV) of a single breath.

* **Manageable Airway**
* The patient is breathing adequately through a patent airway with effective ventilation.
* The patient is mechanically ventilated effectively via bag-mask-ventilation (BMV), King LTS-D, but the airway is not fully protected from risk of aspiration.
* **Unmanageable Airway-** The patient is not able to breathe adequately and EMS personnel are not able to maintain the patient’s airway and cannot ventilate the patient effectively via BMV, King-LT-D. This is an example of a patient in extremis.
* **Unprotected Airway –** The patient is not able to protect his/her airway from the risk of aspiration and is not being ventilated via a cuffed endotracheal tube. Ventilation may be effective with a BMV, but it is not fully protected from aspiration.

**Indications for supplemental oxygen administration:**

• Goal of providing supplemental oxygen is to treat patients in respiratory distress and prevent respiratory failure and respiratory arrest.

• Patients should receive oxygen only when needed. Pulse oximetry should be used to guide therapy whenever available. The oxygen saturation goal for most patients is 94-98% and for COPD patients, the goal is 88-92%.

• When pulse oximetry is not available, patients with mild or moderate respiratory distress should receive oxygen at

2-6 Liters/minute via nasal cannula. Oxygen administration should be reassessed once pulse oximetry is available.

• Consider oxygen when respiratory rates suggest respiratory distress or rates do not allow for adequate gas exchange:

- Adults < 12 and > 20 breaths per minute

- Children < 15 and > 30 breaths per minute

- Infants < 25 and > 50 breaths per minute

• When patients do not have adequate improvement with a nasal cannula or their condition worsens, oxygen therapy can be increased to a simple face mask or a non-rebreather mask (NRBM) as needed.

* Blow-by oxygen should **ONLY** be considered when no other oxygen delivery method is tolerated by the patient.

**Indications for immediate high-flow O2 include: Per Los Angeles County EMS Agency Reference No. 1304.**

* Respiratory Arrest
* Cardiac Arrest
* Shock/Poor Perfusion
* Anaphylaxis
* Traumatic Brain Injury
* Carbon Monoxide Poisoning
* Suspected pneumothorax

**BREATHING EMERGENCY: OXYGEN ADMINISTRATION**

**Supplemental Information (Continued)**

**Initiation of O2**

Start O2 using the appropriate O2 delivery system based on the patient’s condition and the appropriate oxygen delivery device.

* + Nasal Cannula – 2-6L/minute
  + Simple Face Mask – 8-10L/minute
  + Non-re-breather mask –15L/minute
  + Blow-by oxygen – 15L/minute
  + BMV with reservoir – 15L/minute
  + Endotracheal tube - 15L/minute

Advanced airways

* + King LTS-D - 15L/minute

**Indications for positive-pressure ventilations:** (DO NOTplace on supplemental oxygen via nasal cannula or mask)

• Patients with inadequate respirations and tidal volume

• Patients with respiratory failure

• Patients with respiratory arrest

**Contraindications:**

• None in prehospital care with the above conditions.

**Adverse effects of oxygen** (can occur even with brief administration in the prehospital setting)

• Oxidative stress on body leading to increased cell death

• Damage to the retina and lungs in newborns

• Respiratory depression, arrest, or altered mental status in patients with COPD

• Delayed recognition of patient deterioration

• Constriction of blood vessels reducing blood flow to vital organs

• Rebound hypoxemia from sudden oxygen withdrawal

**Hazards of Oxygen Administration:**

**Equipment**

• There is an increased chance of fire if a spark or flame is introduced into an oxygen-rich environment

• The cylinder becomes a missile if it is punctured or if a valve breaks off

• Explosion may occur if any device attached to the cylinder or outlet valve comes in contact with a petroleum product (lubricant or cleaner; fat-based soap; or adhesive tape)

🕱 **Warning:**

• **Patients with cellular hypoxia may develop irreversible cell death leading to vital organ failure and ultimately death.**

• **Never apply an oxygen mask without oxygen flowing, this will result in hypoxia and possible death.**

• **If the reservoir bag from a non-rebreather mask deflates completely, the patient is unable to inhale and hypoxia and/or death will occur.**

**Notes:**

• Room air (21% oxygen) is sufficient for normal metabolism of healthy individuals. However, if they suffer with a condition resulting in inadequate cellular metabolism they need to be supplemented with enriched levels of oxygen. *Patients with cellular hypoxia will develop irreversible cell death leading to vital organ failure and ultimately death.*

• High-flow oxygen should NOT be withheld from patients with chronic obstructive pulmonary disease (COPD). These patients also may have sustained significant trauma or other acute medical emergencies that lead to hypoxia and hypo- perfusion. If the respiratory drive becomes inadequate then ventilate the patient with a bag-valve-mask as necessary.

• Supplemental oxygen with a mask or cannula in patients with inadequate minute volume may progress to cellular hypoxia unless the patient is properly ventilated.

**BREATHING EMERGENCY: OXYGEN ADMINISTRATION**

**Supplemental Information (Continued)**

**Oxygen Source:**

• Medical grade oxygen is labeled “Oxygen U.S.P.”. This oxygen is more carefully cleaned and refined than commercial types of oxygen.

• To confirm cylinder contains medical grade oxygen:

- Check color of cylinder - green and white, solid green, or unpainted aluminum with a green ring around top of cylinder

- Pin index groupings line up with oxygen regulator

• Compressed O2 tanks for prehospital use come in 4 sizes: “D” and “E” are small and portable; “M” and “H” or sometimes labeled “K” are significantly larger and used on-board the ambulance.

• Never leave cylinders standing in an upright position unless properly secured. Large tanks must be held in place by a chain or metal strip. If cylinder is dropped and the valve breaks off, the cylinder will act as a missile projectile.

- Portable tanks should be placed on their side on the floor, in a case or other secure carrier. When transporting a

patient on a gurney, the cylinder should be secured between the patient’s lower legs.

**Nasal Cannula**

• Nasal cannula is a low-flow, low-oxygen concentration delivery device that delivers 24%-44% of oxygen at flow rates of 1-6 Liters/minute. The patient breathes in room air with the oxygen delivered by the nasal cannula.

• Initial treatment in most patients with mild or moderate respiratory distress.

• Use also for patient who needs oxygen administration but cannot tolerate restrictive feeling of a mask or patient that is vomiting.

• Never place the tubing behind the head since this may decrease the flow of oxygen or the patient may strangle if the cannula slips around the neck.

**Medium Concentration Oxygen Mask (Simple Face Mask)**

• Consider for patients that do not have adequate improvement for a nasal cannula or who require higher flow rates to meet their oxygen saturation goal.

• Ensure that mask fits properly since leakage around the mask decreases the delivery of oxygen.

**High Concentration Oxygen Mask (Non-rebreather Mask)**

• Indications - when a patient requires high oxygen concentration.

- Severe respiratory distress

- Shock

- Poor tissue perfusion

- Carbon monoxide poisoning

- Traumatic brain injury

- Inadequate improvement of deterioration despite treatment with nasal cannula or simple face mask

• Assure that there is adequate and uninterrupted oxygen flow to patient or patient may not be able to inhale adequate volume or oxygen needed.

• Never connect the oxygen connector in the mask directly to an endotracheal or tracheostomy tube.

• High flow rates are needed to keep reservoir bag inflated.

**BREATHING EMERGENCY: OXYGEN ADMINISTRATION**

**Supplemental Information (Continued)**

**Blow-By**

• The blow-by method does not provide a high concentration of oxygen but does provide some oxygenation when patients are unable to tolerate or frighten infants and children if other oxygen devices are attempted.

• Appropriate liter flow administration is 15L/minute for all devices and age groups.

|  |  |
| --- | --- |
| **COMPONENTS OF AN AIRWAY BAG:** | |
| **BMV devices – adult, child, infant** | **Portable suction** |
| **OP/NP airways – all sizes** | **Suction equipment– various sizes** |
| **Nasal cannula** | **Portable oxygen cylinder and oxygen regulator** |
| **Simple face mask – adult, child, and infants** | **Pulse Oximeter** |
| **Non-rebreather – adult, child, and infants** | **Water soluble lubricant** |