

Guidelines for a First Aid Oxygen Administration Enrichment Program

A course development guideline containing the essential elements of a first aid oxygen administration training program for use in occupational settings. Intended for use by first aid program developers, institutions teaching first aid courses, regulatory agency personnel who review and/or approve first aid courses and the consumers of these courses.

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It is important to understand that these guidelines are not stand-alone documents. They must be read and understood in the context of the entire NGFATOS document. The First Aid Provider Core Elements established by NGFATOS are the minimum knowledge and skills necessary for the individual to provide first aid with a limited amount of equipment. These guidelines are designed to expand on, not replace the First Aid Provider's minimum knowledge, skills and equipment.

These *Guidelines for First Aid Oxygen Administration Enrichment Programs* have been conceived with the sole purpose of fostering safe, helpful and proper training programs for administering emergency oxygen in occupational settings. The Project Management Team, National Advisory Board or Peer Reviewers do not collectively endorse First Aid Oxygen Administration Enrichment Programs, products, or manufacturers and assume no liability for its contents or the use thereof.

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Objectives

Objectives Legend

- C=Cognitive A=Affective P=Psychomotor
- 1=Knowledge
- 2=Application level
- 3=Problem-solving level

Cognitive Objectives

At the completion of this lesson, the First Aid student will be able to:

- 1.1 Describe the importance of oxygen delivery by the First Aid Provider. (C-1)
- 1.2 Describe the indications for using portable oxygen. (C-1)
- 1.3 List the components and functions of a portable oxygen device and delivery system. (C-1, 2)
- 1.4 Describe the use of a nasal cannula. (C-1)
- 1.5 Describe use of a simple mask. (C-1)
- 1.6 Describe the use of a non-rebreather mask. (C-1, 2)
- 1.7 Describe the use of a demand inhalator valve. (C-1,2)*
- 1.8 Describe the components of a barrier mask with oxygen inlet. (C-1)
- 1.9 Describe how to ventilate an ill or injured person with a barrier mask. (C-1, 2)
- 1.10 Discuss the important first aid issues associated with the use of oxygen in an emergency. (C-1, 2, 3)
- 1.11 Discuss the important issues associated with the regulatory labeling, safe handling, maintenance and storage of oxygen. (C-1, 2, 3)

Affective Objectives

At the completion of this lesson, the First Aid student will be able to:

- 1.11 Explain the value of providing emergency oxygen to breathing ill or injured persons. (A-2)
- 1.12 Explain the value of providing emergency oxygen during rescue breathing. (A-2)
- 1.13 Demonstrate a caring attitude towards ill or injured persons who require emergency oxygen and request emergency medical services. (A-3)
- 1.14 After rescuer safety is assured, place the interests of the ill or injured persons as the foremost consideration when making any and all emergency care decisions. (A-3)

Psychomotor Objectives

At the completion of this lesson, the First Aid student will be able to:

- 1.15 Demonstrate the proper safe handling and storage procedures associated with oxygen cylinders and other components. (P-1, 2)
- 1.16 Demonstrate the assembly and set-up of a portable oxygen device. (P-1, 2)
- 1.17 Demonstrate how to connect and use oxygen delivery systems in conjunction with oxygen regulators and flow controllers. (P-1, 2)
- 1.18 Demonstrate the administration of emergency oxygen using a nasal cannula and/or a simple mask. (P-1, 2)
- 1.19 Demonstrate the administration of emergency oxygen using a non-rebreather mask. (P-1, 2)
- 1.20 Demonstrate the administration of emergency oxygen using a demand inhalator valve (P-1,2)*
- 1.21 Demonstrate the administration of emergency oxygen using a barrier mask. (P-1, 2)

*Optional: The demand inhalator valve is not commonly used. However, it provides 100% inspired oxygen – the highest oxygen concentration available.

Preparation

Motivation:

Oxygen is essential for life. When the oxygen supply to the body is reduced due to illness or injury, permanent damage to the brain and other vital organs may result. Unresponsive persons in respiratory or cardiac arrest have a critical need for emergency oxygen to help prevent damage to the brain and heart. Emergency (or supplemental) oxygen should be used during cardiopulmonary emergencies such as respiratory or cardiac arrest, as soon as it is available.¹

First Aid Providers trained in the use of emergency oxygen should provide it to seriously ill or injured persons, responsive or unresponsive, after assuring the person has a clear and open airway.

Withholding oxygen for fear of causing respiratory arrest in responsive ill persons with chronic obstructive pulmonary disease (COPD) is of no demonstrated relevance and may cause harm.²

Emergency oxygen is necessary and should never be withheld from anyone with a potentially life-threatening illness or injury.

Emergency oxygen and its related components may be acquired without a prescription to personnel properly trained in oxygen administration.³ First Aid Providers in occupational settings trained to provide care with emergency oxygen would enhance the likelihood of a better outcome for all suddenly ill or injured persons if used. A successful enrichment program in first aid oxygen administration should create an attitude in the First Aid Provider to administer, without hesitation, emergency oxygen for all suddenly ill or injured persons.

Prerequisites

Modules 1-5 and Module 6 if children are present or reasonably anticipated in the workplace.

Materials

AV Equipment

Utilize various audio-visual materials relating to first aid and oxygen administration. The continuous development of new audio-visual materials relating to first aid requires careful review to determine which best meets the needs of the program. Materials should be edited to assure the objectives of these guidelines are met.

Equipment:

Barrier mask, oxygen cylinder, nasal cannula, simple mask, non-rebreather mask, demand inhalator valve, regulator, flow meter/controller, oxygen tubing, oxygen device cases and carts, CPR mannequin. Service and maintenance schedules, storage, refilling and safe handling signs.

Recommended Minimum Time to Complete:

The time to complete each lesson will vary according to factors such as instructional design, the varying nature of adult learners, and their number in a given class. The recommended time to complete the lesson and present cognitive, affective, and psychomotor objectives is 2 to 3 hours.

¹Emergency Cardiac Care Committee and Subcommittees, American Heart Association, Guidelines for cardiopulmonary resuscitation and emergency cardiac care. *JAMA* 1992; 268:2199.

²Schmidt GA, Hall JB Danger in the patient with COPD? *Intensive & Critical Care Digest*, Vol.8, No. 3 Dec 1989

³Food and Drug Administration (FDA) response to Compressed Gas Association (CGA) Citizens Petition # 87P-0167/CP1 regarding Precautionary Labeling of Compressed Medical Gases: Letter dated September 19, 1996.

Presentation

- I. Importance of emergency oxygen
 - A. Oxygen is essential for life
 - B. Decreased amount of oxygen in the blood (hypoxia) as a result of life-threatening illness or injury is most often a result of hypoperfusion (shock)
 - C. Decreased oxygen in the blood may also result from over-exposure to an atmosphere which contains an inadequate amount of available oxygen
 - D. Shock results from the inadequate delivery of oxygenated blood to body tissues caused by:
 - 1. Failure of the heart to provide oxygenated blood
 - 2. Abnormal dilation of the vessels
 - 3. Blood volume loss
 - E. Shock is a complex physiological condition but has a simple outcome: lack of oxygen to body tissues and death if not treated promptly.
 - F. Responsive persons with life-threatening illness or injury will benefit from emergency oxygen
 - G. Unresponsive persons in respiratory or cardiac arrest have a critical need for emergency oxygen to help reduce the probability of damage to the brain, heart and other organs
- II. Indications for Emergency Oxygen Use
 - A. Responsive persons with serious bleeding
 - B. Responsive persons with warning signs and symptoms of serious illness
 - C. Responsive persons with obvious or suspected head/neck/spine injuries
 - D. Unresponsive ill or injured persons (in combination with care of the airway, breathing and circulation).
 - E. Unresponsive ill or injured persons in respiratory or cardiac arrest (in combination with external chest compressions and ventilations with a barrier mask and oxygen inlet)
 - F. When First Aid Provider is in doubt about the severity of illness or injury, emergency oxygen should be given
 - G. Basic emergency care for the ill or injured person should not be delayed to obtain or apply emergency oxygen when it is not immediately available
- III. Oxygen System Components and Use⁴
 - A. Oxygen cylinders
 - 1. Aluminum or steel
 - 2. Different sizes and volumes range from 76 liters (B cylinder) to more than 7000 liters (H cylinder). Most are between 300-650 liters
 - 3. Important to handle carefully since contents are under pressure
 - 4. Tanks should be secured to prevent falling in use or in transport
 - 5. Pressure regulators and flow controllers
 - 1. Controls and measures pressure and flow rate of oxygen. Full tank should read Up to 2200 psi, but varies with ambient temperature.
 - 2. "Dry" oxygen appropriate for short term emergency care
 - 3. Regulators reduce cylinder pressure to safe delivery pressure
 - a. Settings may be preset or variable
 - 4. Flow devices measure or control flow /concentration of oxygen delivered in liters per minute (L/min). Settings may range up to 25 L/min
 - 5. Many "emergency oxygen" regulators pre-set to deliver minimum of 6L/min.
 - B. Oxygen delivery Systems

⁴ Oxygen systems should provide the highest oxygen concentration possible to both a breathing and non-breathing person. The type of delivery device used should be based on the ease of use and its ability to provide high concentrations of oxygen.

1. Tubing: clear, opaque (colored green), kinkable, unkinkable, length
 2. Masks: Preferred prehospital method of delivering oxygen.
 3. Nasal cannula
 - a. Should only be used only on responsive ill or injured persons who will not tolerate a mask
 - b. Limits concentration of oxygen delivered
 - c. May cause drying of nasal passages
 - d. Flow rate should be a maximum of 6 liters per minute
 4. Simple mask
 - a. Common in portable emergency oxygen units
 - b. Used only for breathing persons
 - c. Mixes ambient air with oxygen to deliver increased oxygen concentration
 - d. concentration
 - e. Flow rate of 6 – 10 liters per minute
 5. Non-rebreather mask
 - a. Improved method of giving oxygen in emergency care of breathing persons
 - b. Used only for breathing persons
 - c. High oxygen concentration delivered
 - d. Non-rebreather bag must be full/primed before mask is placed on the ill or injured person and bag must remain inflated during oxygen delivery
 - e. Flow rate should be set to 15 liters per minute
- C. Demand inhalator valve (optional)
1. Provides 100% inspired oxygen
 2. Provides 100% of respiratory needs
 3. Used only for breathing persons
 4. Commonly used for first aid of scuba diving injuries
 5. Must be used with demand regulator
 6. Demand inhalator valve should not be confused with flow restricted oxygen powered ventilators (FROPV) which may also be used on a non-breathing person.
- D. Barrier mask (pocket mask) with oxygen inlet
1. Used to provide ventilations during rescue breathing or CPR
 1. Provides enhanced oxygen concentration
 2. Flow rate should be highest available
 3. Flow Rates of 6 –10 liters per minute are beneficial
- E. Oxygen system assembly procedures
1. Remove protective seal on cylinder post valve
 2. Connect handle
 3. Quickly open and close the valve to test and clean. Be sure exit port is directed away from user
 4. Check to assure sealing mechanism (gasket or washer) is in place on regulator or at connection to tank stem
 5. Attach regulator/flow controller to cylinder post valve
 6. Attach oxygen delivery system (tubing and mask/cannula) to oxygen outlet port.
 7. Adjust flow control to desired setting
 8. Test for oxygen flow and then administer to the patient
 9. When complete, remove delivery system (mask/cannula) from patient, then turn off valve and release excess gas from the regulator and delivery system
- IV. Oxygen Administration to the Non-breathing Patient
- A. Mouth –to-barrier mask with oxygen inlet
1. Review technique for ventilating a non-breathing person in Module 2: Airway
 2. Connect the barrier mask to oxygen tubing
 3. The oxygen flow should be set at the highest available setting
 4. Techniques for use
 - a. Release flow from oxygen device and be sure oxygen is being delivered

- b. to the barrier mask
 - c. Open airway using appropriate method
 - d. Place apex of mask over bridge of nose, then lower mask over mouth and upper chin. If mask has large round cuff surrounding a ventilation port, center port over mouth
 - e. Use ring and little fingers to bring jaw up to mask
 - f. Ventilate (blow oxygenated air into the patient's lungs) slowly – 1.5-2 second duration until the chest rises
 - g. Repeat every 5 seconds for adults and every 3 seconds for children and infants
5. Oxygen administration for persons with stomas or tracheostomy tubes (As Required)
- a. Definition of tracheostomy – an artificial permanent opening in the
 - b. Trachea
 - c. A breathing tube may be present. If it is obstructed, wipe clean as much as possible
 - d. Release flow from oxygen device and be sure oxygen is being
 - e. delivered to the mask
 - f. Use infant and child mask to seal around stoma
 - g. Ventilate (blow oxygenated air into the patient's lungs) slowly – 1.5-2 second duration until the chest rises
 - h. Repeat every 5 seconds for adults and every 3 seconds for children and infants
 - i. If unable to ventilate:
 - 1) Clean around stoma area
 - 2) Attempt to ventilate through mouth and nose
 - 3) Sealing stoma may improve ability to ventilate from above or may clear
 - 4) Masks come in different sizes for adults, children and infants. Be sure to select the correct size mask
 - 5) Some persons have partial laryngectomies. If upon ventilating stoma air escapes from the mouth or nose, close the mouth and pinch the nostrils during ventilation
- B. Role of the First Aid Provider
- 1. Complete the First Aid Provider assessment
 - a. Complete a scene assessment and use appropriate BSI equipment before initiating first aid
 - 2. Complete an initial assessment
 - a. Establish unresponsiveness
 - b. If unresponsive, activate EMS or occupational emergency plan
 - c. Open the Airway
 - d. Assess breathing - Look, listen and feel for breathing. If absent provide two rescue breaths
 - e. Assess circulation – Check carotid pulse
 - f. If pulse is absent provide chest compressions (and defibrillation, if indicated)
 - g. If pulse is present, provide rescue breathing
 - 3. As soon as possible, perform all ventilation with oxygen supply connected to barrier mask.⁵
 - 4. Continue to deliver care as indicated
 - 6. If the ill or injured person becomes responsive; comfort, calm, and reassure the person. Continue to supply emergency oxygen to person with barrier mask while

⁵ A single First Aid Provider should not delay ventilations, chest compressions or attaching an AED to provide emergency oxygen. Two or more rescuers should provide emergency oxygen as soon as it is available.

awaiting EMS.

- V. Oxygen Administration for the Breathing Ill or Injured Person
- A. Assure ill or injured person has an open airway and is breathing
 - B. Assure control of external bleeding
 - C. Ill or injured person may be responsive or unresponsive
 - 1. Unresponsive person without obvious or suspected head/spine injury may be placed in recovery position
 - 2. Unresponsive or responsive person with obvious or suspected head/spine injury should not be moved unless threat to life exists
 - 3. Responsive person without obvious or suspected head/spine injury may be placed in a position of comfort
 - D. Assemble and set-up oxygen device
 - 1. Place in close proximity to the patient's airway
 - 2. Secure equipment to prevent accidental falling
 - E. Release oxygen at appropriate flow for device used
 - 1. Nasal cannula – Maximum 6 liters per minute
 - 2. Simple Mask – 6-10 liters per minute
 - 3. Non-rebreather – 15 liters per minute
 - 4. Demand inhalator valve – does not require flow rate as device is activated by respiratory demand
 - E. Be sure oxygen is flowing into delivery device
 - 1. Describe to ill or injured person that oxygen is being delivered and that it is colorless, odorless, tasteless, and will help to support breathing.
 - 2. Tell ill or injured person to breath normally
 - F. Bring delivery device to person's face, and cover nose and mouth with mask or place cannula in nose
 - 1. If responsive, ill or injured person may assist in placing device on face
 - 2. Adjust strap to hold device securely to head
 - G. Provide on-going assessment to ensure open airway and continued breathing
 - 1. If at any time breathing stops, switch to barrier mask and ventilate as described in Section IV A.
 - 2. Repeat ventilations every 5 seconds for adults and every 3 seconds for children and infants
 - 3. If chest won't rise after repositioning airway, treat as foreign body airway obstruction.
 - H. Monitor oxygen flow to ensure continued operation and delivery.
 - 1. When tank is empty (200 psi), prepare to change tank if a replacement is available.
 - 2. If an additional tank is not available, prepare to remove the delivery device.
 - I. Role of the First Aid Provider
 - 1. Complete the First Aid Provider assessment
 - a. Complete a scene assessment and use appropriate BSI equipment before initiating first aid
 - b. Complete an initial assessment on all ill or injured persons
 - c. Assure that EMS is activated
 - d. As soon as possible, provide emergency oxygen.
 - e. Complete the physical assessment (optional)
 - f. Complete on-going assessments
 - 2. Comfort, calm and reassure the ill or injured person while awaiting EMS
- VI. Regulatory Issues
- A. Food and Drug Administration (FDA) regulatory issues
 - 1. Emergency versus prescription oxygen devices
 - 2. FDA requirements apply mostly to manufacturers. However, oxygen device users are required to report any device problems.

- B. Some states regulate oxygen use. Oxygen providers should be familiar with regulations in their state

VII. Safe Use and Handling

- A. Proper instruction means safe use and safe handling
 - 1. Set-up at emergency scene
 - a. Transport and positioning of equipment
 - b. Connecting parts, testing for flow, determining contents
 - 2. Hazards
 - a. Oxygen is nonflammable, but supports combustion
 - b. Cylinder is under pressure
 - c. Avoid storage above 125 F (51.7 C), or use above 120 F (48.9 C) **
 - d. Avoid contact with any flammable or combustible material including storage or use in close proximity to cylinders containing flammable gas**
 - e. Maintain clean and secure connections between post valve of tank and regulator
- B. Service, maintenance and safe handling
 - 1. Cylinder refilling or replacement
 - 2. Regulator and component service and maintenance (test accuracy, cleanliness)
 - 3. Scheduled examination for delivery system component maintenance (test for damage, contaminants)
 - 4. Written directions and procedures for proper storage and safe handling of components
 - 5. Written directions and procedures for compliance with FDA labeling, refilling, storage, DOT (shipping and package labeling) regulations, and CGA safe handling and storage guidelines.
 - 6. Written directions and procedures for proper disposal and replacement of oxygen components following use

** Oxygen. CGA Document CGA G-4, Compressed Gas Association, Inc., Arlington, VA, 1996.

Application

Procedural (How)

1. Demonstrate the safe use and handling of oxygen system components.
2. Demonstrate how to assemble oxygen system components.
3. Demonstrate how to operate a portable oxygen device.
4. Demonstrate how to operate a demand inhalator valve (optional).
5. Demonstrate how to provide emergency oxygen to a breathing ill or injured person using a non-rebreather mask, simple mask or nasal cannula.
6. Demonstrate how to provide emergency oxygen while ventilating a non-breathing ill or injured person with a barrier mask with oxygen inlet.

Contextual (When, Where, Why)

Most ill or injured persons will benefit from the administration of emergency oxygen during emergency care. Emergency oxygen increases oxygen in the blood, which reduces the chance of permanent damage to vital organs. The First Aid Provider will use emergency oxygen during emergency care of a breathing or non-breathing ill or injured person. Because emergency oxygen is used as an adjunct to other first aid maneuvers, its priority and relationship to other emergency care procedures must be understood. First Aid Providers must not delay other life-supporting care such as rescue breathing or CPR while oxygen equipment is being prepared. First Aid Providers must be familiar with the devices used in their organization as well as the federal, state and local laws that govern the use of oxygen equipment in their area.

Student Activities

Auditory (Hearing)

1. Students should hear about safe handling and use of emergency oxygen equipment.
2. Students should hear about legal issues associated with providing supplemental oxygen.
3. Students should hear the benefits of providing supplemental oxygen.
4. Students hear the indications for use of various oxygen delivery devices.

Visual (Seeing)

1. Students should see the components of an oxygen delivery system.
2. Students should see how to assemble the components of an oxygen delivery system.
3. Students should see how to operate the valve and flow control of an oxygen delivery device.
4. Students should see how to operate a demand inhalator valve (optional).
5. Students should see how emergency oxygen is administered to a breathing injured or ill person using a nasal cannula, simple mask or non-rebreather mask.
6. Students should see how emergency oxygen is provided while ventilating a non-breathing person with a barrier mask with oxygen inlet.

Kinesthetic (Doing)

1. Students should practice assembling the components of an oxygen delivery system.
2. Students should practice operating the valve and flow control of an oxygen delivery device.
3. Students should practice administering emergency oxygen to a breathing injured or ill person (simulated) using a nasal cannula, simple mask or non-rebreather mask.
4. Students should practice operating a demand inhalator valve (optional).
5. Students should practice providing emergency oxygen while ventilating a CPR mannequin with a barrier mask with oxygen inlet.

Instructor Activities

- Facilitate discussion and supervise practice.
- Reinforce student progress in cognitive, affective and psychomotor domains.
- Redirect students having difficulty with content.

Evaluation

Evaluate the actions of First Aid students during role play, practice and other skill stations to determine their comprehension of the cognitive and affective objectives and reasonable proficiency with the psychomotor objectives.

Remediation

Identify students or groups of students who are having difficulty with this subject content.

Enrichment

Address unique student requirements or local area needs concerning this topic.