

Oxygen (O₂) Guidelines for Nebraska Schools

Purpose

Oxygen administration in school is indicated to treat either acute or chronic hypoxia as prescribed for a specific student by a treatment procedure authorization from a licensed health care prescriber. The use of oxygen is increasing and is becoming the standard of care for some children with special health care needs. It is important to enable the child to receive oxygen therapy safely and take part in education while minimizing the disruption oxygen therapy can cause to the child's lifestyle. It is essential to ensure that fire and explosion risks are adequately controlled when oxygen.

Definition

Oxygen therapy is "the administration of oxygen at concentrations greater than that in ambient air (~21%), with the intent of treating or preventing the symptoms and manifestations of hypoxia" (4). Oxygen therapy increases oxygen in the lungs and bloodstream. It is sometimes used for people with diseases that make it hard to breathe, such as COPD, cystic fibrosis, or heart failure. Oxygen therapy can make it easier to breathe and it can reduce the heart's workload.

Forms of Oxygen

- Compressed oxygen gas. Tanks of oxygen gas come in several sizes. Small tanks can be carried when away home.
- Liquid oxygen. Oxygen takes up less space in liquid form than as a gas. Compared to tanks of oxygen gas, tanks of liquid oxygen weigh less and hold more oxygen.

Methods of Delivery

- Nasal Cannula: Plastic tubing that connects on one end to an oxygen source (tank) with the other end having two short prongs that fit into each nostril. Generally indicated as an option for planned use of continuous or intermittent oxygen.
- Mask: A plastic facemask with tubing connected to an oxygen source. The two main sizes of oxygen masks are pediatric and adult. They are generally indicated for emergency situations.
- Tracheostomy Mask: A plastic mask designed to fit over a tracheostomy cannula and secured by an elastic strap around the neck (over the tracheostomy ties). This may be indicated for planned use of continuous or intermittent oxygen.
- Mechanical Ventilation: A variety of portable mechanical ventilation devices may be used for children who attend school. They are attached to the student via a tracheostomy and may or may not involve the routine delivery of supplemental oxygen.
- Ambu Bag (Manual Resuscitation): In a case of extreme medical emergency (i.e., severe oxygen desaturation, impending respiratory failure, or respiratory or cardiac arrest), oxygen can be delivered at full flow (> 10 L/min.) with an Ambu Bag using an appropriately sized sealed face mask or fitted directly onto a tracheostomy cannula.

Nursing Considerations

- **Care Plan:**
 - Oxygen is a medication and requires written orders from a medical prescriber that needs to specify the amount of oxygen and method of delivery.
 - Medical provider's orders for handling emergencies for the student are included in the nursing care plan.
 - The Emergency Care Plan (ECP) takes into consideration the lack of immediate access to licensed health care professionals and emergency drugs and equipment.
 - Communicate any signs of infection, inflammation, or complications to the family and the healthcare provider.
 - Document:
 - All care and communication in the student health record.
 - Indications for and response to O₂ therapy.
- **Storage:**
 - Consideration of distance and response time of nearest EMS should be taken in to consideration for storage and emergency situations involving administration of oxygen.
- **Assessment:**
 - Assess the student's status and response to oxygen therapy when the student arrives at school and as needed through the day.
 - Assess any humidification devices associated with oxygen delivery. Humidification is needed to prevent drying of the student's mucosa.
- Assess student's rate and depth of breathing, ease of chest movement, air entry, and use of accessory muscles; assess for presence of adventitious breath sounds, cough, chest pain, and obstruction; assess heart rate, skin color, and mental status; monitor for apnea.
- Assess oxygen saturation as ordered.
- Assess how long each container lasts and make provisions to replace at appropriate intervals.

Delegation Considerations

- Initiation of oxygen therapy: registered nurse (RN), practical nurse, (LPN), or respiratory therapist (RT).
- Oxygen therapy needs to be monitored.
- *(Non-complex – may be delegated)* Continuous or long-term oxygen use that does not require continuous pulse oximetry (see Pulse Oximetry): RN, LPN, RT, physical therapist, occupational therapist, teacher, or other certified personnel or
- *(Complex – not to be delegated)* Continuous, intermittent, or emergency that requires continuous or frequent assessment of pulse oximetry or respiratory status: RN, LPN, or RT.
- An appropriately trained individual should be present while the child is using oxygen, but this does not necessarily require a school nurse or healthcare professional. The goal is to minimize the risk and support the child safely while achieving full-time education.

Safety Considerations

- **Environment**
 - Oxygen is a safe gas as long as it is used properly.

- The potential for a fire hazard around oxygen is well-known.
- School follows guidelines from oxygen suppliers over the storage of cylinders.
- Notifications:
 - The Local Fire Department is alerted when oxygen is stored in a school.
 - School notifies building insurance company that oxygen is stored on the premises.
- Assessment:
 - School reviews their Fire Risk Assessment to take into account the presence and use of oxygen around the school.
 - Risk control measures are taken in the vicinity of the oxygen cylinder at all times – at all times.
 - Activities where fire risks would be generally increased by the presence of excess oxygen are highly controlled or not undertaken when oxygen is being supplied from a cylinder.
- The presence of any source of supplemental oxygen requires strict fire safety guidelines.
 - “Oxygen in Use” signs should be posted at the entrance of all building sections, classrooms, or nursing offices; on vehicles during transportation of students; and wherever oxygen is stored or potentially used.
 - Any oxygen tank that is heard hissing or noted to be leaking needs to be replaced promptly.
 - Checking daily to ensure that they have an adequate supply to use in an emergency situation is a reasonable option.
- Tanks noted to be less than half-full or expired should be refilled or replaced.
- Do not smoke in the same room as the oxygen equipment.
- Do not use oxygen near a fire or naked flame.
- Do not hang clothes or dusters on oxygen cylinders or concentrator.
- Aerosol cylinders (e.g. furniture polish) should not be discharged near oxygen source.
- Do not let a concentration of oxygen build up in confined spaces. Ensure good ventilation.
- **Personal Safety**
 - Assessments:
 - Skin assessments around tubing or elastic straps are indicated.
- Safe Practices:
 - Do not use oil, grease or petroleum-based products on or near the equipment. These materials are highly flammable and will burn readily with the presence of oxygen. Check the ingredients of such products before purchase. If a skin moisturizer is needed, consider using cocoa butter, aloe vera or other similar products. For lubrication or rehydration of dry nasal passages, use water-based products.
 - Create and practice an escape and rescue plan in the event of a fire.
 - Game controllers should not be used near oxygen sources. The new systems that vibrate and have other functions have caused issues with patients on oxygen.

- Never use more than 50 feet of oxygen tubing. This can dilute the concentration of oxygen that you are receiving.
- Safe storage practices:
 - Do not carry liquid oxygen in a backpack or other enclosed space. Carrying cases, shoulder or hand bags, shoulder straps and backpack oxygen units are available to provide proper ventilation for the unit to ensure safety.
- **Handling the equipment**
 - Opening and closing equipment:
 - Open cylinders gently to avoid a ‘rush of pressure’.
 - Ensure the flow meter is properly connected to the oxygen delivery source.
 - Make sure that the cylinder valves are closed when not in use
 - Close cylinders without unnecessary force (excessive force will result in damage to both valve seats and spindles).
 - Close cylinder valves directly after use and ensure the pressure in the regulator is released.
 - Handling empty cylinders:
 - When the cylinder is empty, the valve must be closed and the plastic cap refitted to the valve outlet to prevent moisture entering the cylinder.
 - Arrange for all empty cylinders to be returned home.
 - Safety considerations:
 - Do not allow children or untrained persons to operate oxygen equipment.
- Handle cylinders with care and ensure they are not knocked violently or allowed to fall over; a secure stand should be provided.
- Should a leakage of gas occur, it would usually be evident by a hissing sound. The supplier should be contacted as soon as possible.
- Be familiar with the equipment and the safety checks established by the medical equipment provider. Do not try to repair broken equipment on your own. Report to parent/guardian.
- Make sure smoke detectors (if present) are working. Have fresh batteries installed. Perform monthly checks. Have a fire extinguisher available as well. (Use type ABC.)
- Storing the equipment
 - Do not store oxygen in same area as flammable liquids (e.g. paint, petrol, paraffin, turpentine).
 - Whenever practical, place cylinders near an exit so that they can be removed quickly in an emergency such as fire; they should not block the exit.
 - Keep cylinders under cover, preferably inside and protected from extremes of heat or cold.
 - The storage area must be clean, dry and well ventilated, away from direct sunlight, and away from highly flammable liquids, other combustible material and sources of heat and ignition
 - Cylinders should be kept free of rust or dirt, should not be

- repainted, have any markings obscured or any labels removed.
 - Oxygen canisters should be kept at least 5-10 feet away from gas stoves, lighted fireplaces, woodstoves, candles or other sources of open flames.
 - Secure an oxygen cylinder to a solidly fixed object to avoid creating a missile out of the tank. This might happen if it was accidentally knocked over and gas was allowed to escape.
- Hygiene considerations:
 - Wash hands before changing oxygen cylinder heads.
 - Keep the oxygen system clean and dust-free.

Procedure

- High pressure tanks (standard metal oxygen tanks) require a regulator that has:
 - A valve to turn the oxygen source on and off.
 - A flow meter to measure and adjust the flow of oxygen.
 - A pressure gauge to determine the amount of oxygen remaining in the tank.
- Open the tank by turning the valve at the top counter clockwise until the needle on the pressure gauge moves.
- Set the flow meter to the prescribed rate (liters/minute) by turning the dial to the number or until the ball rises to the correct level on the scale.
- If using a nasal cannula:
 - Place prongs into nose so they follow the curve of the nostrils.
 - Secure around back of ears.
 - Adjust below the chin.
- If using a face mask:
 - Place mask over nose and mouth.
 - Secure with elastic strap around the head and above the ears.
 - The mask needs to be comfortably, but firmly against the face:
 - Any space between the mask and face dilutes the intended concentration of oxygen.
 - For students unable to tolerate the elastic strap around their head, the mask can be held against the face without the strap (only appropriate for a limited period of time).
- If using a tracheostomy mask:
 - Follow the same procedure as a facemask, except cover the tracheostomy cannula with the mask and secure it around the neck.
- If using an Ambu Bag:
 - Turn oxygen flow rate > 10 L/min.
 - Administer by either face mask or tracheostomy connection:
 - Either option requires a tight seal to the airway.
 - Rate and force of manual resuscitation breaths is determined by CPR certified personnel.
- To close the tank:
 - Disconnect oxygen from the student;
 - Turn valve clockwise until it cannot go any further. The flow meter should steadily decrease to zero, indicating that no oxygen is flowing (or leaking) from the tank (referred to as “bleeding” the tank off).

- Turn the flow meter dial to zero.
- Check that all electrical equipment in the area near the oxygen is properly grounded.
- Secure floor mats and rugs so that you will not trip or fall when using an oxygen system.
- Never use extension cords with any medical equipment.
- Be sure doorways, hallways and rooms can accommodate you if you have a portable oxygen system.
- Always have backup tanks available, and know how to use them.

References

1. Bowden, V.R., and Greenberg, C.S. (2008). Pediatric Nursing Procedures, 2nd edition. Philadelphia, PA: Lippincott Williams and Wilkins. Retrieved 2//2014 from http://www.nmschoolhealthmanual.org/shm_15.pdf
2. Cincinnati Children's Hospital; Oxygen Use Precautions; (2011). Retrieved 2/4/2014 from <http://www.cincinnatichildrens.org/health/o/oxygen-precautions/>
3. Connecticut State Department of Education; Oxygen Therapy; (2012); Retrieved 2 /4/2014 from <http://www.sde.ct.gov/sde/cwp/view.asp?a=2663&q=334304>
4. Great Ormand Street Hospital for Children, Oxygen therapy administration in a non-emergency situation (2012). Retrieved 2/4/2014 from <http://www.gosh.nhs.uk/health-professionals/clinical-guidelines/oxygen-therapy-administration-in-a-non-emergency-situation/>
5. NHS Quality Improvement Scotland; Home oxygen therapy for children being cared for in the community (2010). Retrieved 2/4/2014 from <http://www.cen.scot.nhs.uk/files/12d-home-oxygen-therapy-for-children-being-cared-for-in-the-community.pdf>
6. Selekman, Janice DNSc, RN, NCSN, FNASN; (2013) School Nursing A Comprehensive Text 2nd Edition; pages 1054-1055
7. Thompson, MD, E. Gregory; Yoneda, MD, Ken Y.; "What is oxygen therapy?"; WebMD (2010) Retrieved 2/4/2014 from <http://www.webmd.com/lung/using-oxygen-at-home#>
8. WebMD; Oxygen Therapy Safety Tips: Preventing Fires and Other Accidents; (2010) Retrieved 2/4/2014 from <http://www.webmd.com/lung/copd/safety-tips-for-using-oxygen>

Guidelines Regarding the Safe Transportation of Oxygen on a School Bus

- Oxygen shall be transported on school buses only when it is medically necessary. The Individualized Education Program (IEP) for a child with disabilities will document the oxygen use requirement. Changes in medical equipment or transportation must be so noted on the IEP also.
- Prior to initial transportation, school administration and transportation personnel should be informed as to the type and size of the oxygen tank to be transported.
- Regarding a student using oxygen only on an “as needed” basis, the decision as to what is necessary is the responsibility of licensed health care provider. This decision is not the responsibility of the bus operator or bus aide.
- A determination must be made as to who will load and unload the medical support equipment. Appropriate training must be provided for these procedures.
- The development of an emergency plan is strongly recommended in the event of a medical emergency or equipment failure.
- It is recommended that only one medical support device per student be transported.
- The transportation department will not assume responsibility for storing any medical equipment.
- A contingency procedure should be developed to avoid oxygen being transported without proper securement in the event the regular bus breaks down.
- Oxygen must be transported in a secure container maintained in accordance with the manufacturer’s instructions. The oxygen must be housed in a portable unit and should be less than 15 pounds total weight.
- Gas oxygen tanks will have a maximum capacity of twenty-two (22) cubic feet (Medical E). Medical E tanks are usually no larger than 4 ½ inches in diameter and 31 inches in length.
- Liquid oxygen units shall have a maximum capacity of thirty-eight (38) cubic feet and be no larger than 5 inches in diameter and 13 inches in length. For transportation purposes, these units must not be larger than 38 cubic feet.
- All oxygen will have valves and regulators that are protected against breakage. Manufacturer’s precautions are usually printed on a label attached to the cylinder and are to be followed whenever possible.
- All oxygen tanks will be securely attached to prevent movement and leakage. This securement should be located on the sidewall of the school bus in the upright position at a rib or body support in a rack or mounting bracket capable of sustaining five (5) times the weight of the tank and contents.
- Since they are under pressure and could accelerate a fire, all oxygen tanks (gas or liquid) must be secured away from intense heat or friction.
- In cases where the oxygen is attached to a wheelchair or other support equipment, the tank shall be removed and secured prior to transport.
- Oxygen tanks or other medical support equipment will never be stored or secured in the head impact zone.
- While it is not mandatory to place any placards or labels on the bus, a decal indicating medical support equipment is in use may be helpful to emergency personnel in the event of an accident.

Ohio Department of Education, Pupil Transportation Office; Guidelines Regarding the Safe Transportation of Oxygen on a School Bus; (2013). Retrieved 2/4/2014 from

<http://education.ohio.gov/getattachment/Topics/Finance-and-Funding/School-Transportation/Transportation-Rules-and-Regulations/Position-Papers/Oxygen-Position-Paper.pdf.aspx>