AARC Clinical Practice Guideline

Oxygen Therapy in the Acute Care Hospital

OT-AC 1.0 PROCEDURE:
The procedure addressed is the administration of oxygen therapy in the acute care hospital other than with mechanical ventilators and hyperbaric chambers.

OT-AC 2.0 DEFINITION/DESCRIPTION:
Oxygen therapy is the administration of oxygen at concentrations greater than that in ambient air with the intent of treating or preventing the symptoms, and manifestations of hypoxia.(1)

OT-AC 3.0 SETTING:
This Guideline is confined to oxygen administration in the acute care hospital.

OT-AC 4.0 INDICATIONS:
4.1 Documented hypoxemia
   4.1.1 in adults, children, and infants older than 28 days, arterial oxygen tension (PaO2) of < 60 torr or arterial oxygen saturation (SaO2) of < 90% in subjects breathing room air or with PaO2 and/or SaO2 below desirable range for specific clinical situation(1,2)
   4.1.2 in neonates, PaO2 < 50 torr and/or SaO2 < 88% or capillary oxygen tension (PcO2) < 40 torr(1,3,4)
4.2 An acute care situation in which hypoxemia is suspected(1,5,6-8)--substantiation of hypoxemia is required within an appropriate period of time following initiation of therapy
4.3 Severe trauma(7,8)
4.4 Acute myocardial infarction(1,9)
4.5 Short-term therapy (eg, post-anesthesia recovery)(7,10)

OT-AC 5.0 CONTRAINDICATIONS:
No specific contraindications to oxygen therapy exist when indications are judged to be present.

OT-AC 6.0 PRECAUTIONS AND/OR POSSIBLE COMPLICATIONS:
6.1 With PaO2 > or = 60 torr, ventilatory depression may occur in spontaneously breathing patients with elevated PaCO2.(8,11,12)
6.2 With FIO2 > or = 0.5, absorption atelectasis, oxygen toxicity, and or depression of ciliary and/or leukocytic function may occur.(12,13)
6.3 In newborns
   6.3.1 In premature infants PaO2 of > 80 torr should be avoided because of the possibility of
6.3.2. Increased PaO2 can contribute to closure or constriction of the ductus arteriosus—a possible concern in infants with ductus-dependent heart lesions.

6.4. Supplemental oxygen should be administered with caution to patients suffering from paraquat poisoning and to patients receiving bleomycin.

6.5. During laser bronchoscopy, minimal levels of supplemental oxygen should be used to avoid intratracheal ignition.

6.6. Fire hazard is increased in the presence of increased oxygen concentrations.

6.7. Bacterial contamination associated with certain nebulization and humidification systems is a possible hazard.

OT-AC 7.0 LIMITATIONS OF PROCEDURE:

Oxygen therapy has only limited benefit for the treatment of hypoxia due to anemia, and benefit may be limited with circulatory disturbances.

Oxygen therapy should not be used in lieu of but in addition to mechanical ventilation when ventilatory support is indicated.

OT-AC 8.0 ASSESSMENT OF NEED:

Need is determined by measurement of inadequate oxygen tensions and/or saturations, by invasive or noninvasive methods, and/or the presence of clinical indicators as previously described.

OT-AC 9.0 ASSESSMENT OF OUTCOME:

Outcome is determined by clinical and physiologic assessment to establish adequacy of patient response to therapy.

OT-AC 10.0 RESOURCES:

10.1. Equipment

10.1.1 Low-flow systems deliver 100% (i.e., FIO2 = 1.0) oxygen at flows that are less than the patient's inspiratory flowrate (i.e., the delivered oxygen is diluted with room air) and, thus, the oxygen concentration inhaled (FIO2) may be low or high, depending on the specific device and the patient's inspiratory flowrate.

10.1.1.1 Nasal cannulas can provide 24-40% oxygen with flowrates up to 6 L/min in adults (depending on ventilatory pattern) but in newborns and infants flows should be limited to a maximum of 2 L/min. Oxygen supplied to adults via nasal cannula at flowrates less than or equal to 4 L/min need not be humidified.

10.1.1.2 Simple oxygen masks can provide 35-50% oxygen at flowrates from 5-10 L/min. Flowrates should be maintained at 5 L/min or more in order to avoid rebreathing exhaled CO2 that can be retained in the mask.

10.1.1.3 Masks with reservoir bags (partial rebreathers and non-rebreathers) are designed to provide FIO2s of 0.5 or greater. In practice, both partial and non-rebreathers function in a similar manner and provide FIO2 of about 0.6 (depending on mask fit and ventilatory variables) provided the flowrate is sufficient to
keep the reservoir bag inflated during inspiration. Higher FIO2 is possible depending on mask fit and ventilatory variables.(1,22)

10.1.1.4 Patients who have been receiving transtracheal oxygen at home may continue to receive oxygen by this method in the acute care hospital setting provided no problems present. If difficulties related to the transtracheal route of administration appear, oxygenation should be assured by other means.

10.1.1.5 Because of the fluctuations in oxygen concentration that occur when oxygen is supplied directly to incubators at low flows, supplemental oxygen should be supplied via a high-flow hood system.

10.1.2 High-flow systems deliver a prescribed gas mixture—either high or low FDO2—at flowrates that exceed patient demand.(22,23,29)

10.1.2.1 Currently available jet-mixing masks can accurately deliver predetermined oxygen concentration to the trachea up to 40%. Jet-mixing masks rated at 50% or higher usually do not deliver flowrates adequate to meet the inspiratory flowrates of adults in respiratory distress.(9,23,29)

10.1.2.2 Aerosol masks, tracheostomy collars, T-tube adapters, and face tents can be used with high-flow supplemental oxygen systems. The gas flow can be humidified by a continuous aerosol generator or large-reservoir humidifier. Some aerosol generators cannot provide adequate flows at high oxygen concentrations.(1)

10.1.2.3 Mist tents may also be used to provide supplemental oxygen to pediatric patients (and occasionally to adults), although FIO2 control and infection control are difficult in such tents.

10.1.2.4 Supplemental oxygen may be administered to newborns and infants by hood, with the high-flow oxygen source provided by heated or cool humidifiers or continuous aerosol generators. In newborns, humidifiers are preferred, to reduce noise level30 and minimize cross-contamination. Heated humidifiers are recommended to maintain thermoneutral environments.

10.2 Personnel

10.2.1 Level I personnel—ie, any person who has adequately demonstrated the ability to perform the task—may check and document that a device is being used appropriately and the flow is as prescribed.

10.2.2 Level II personnel—licensed or credentialed respiratory care practitioners or persons with equivalent training and documented ability to perform the tasks—may assess patients, initiate and monitor oxygen delivery systems, and recommend changes in therapy.

OT-AC 11.0 MONITORING:

11.1 Patient

11.1.1 clinical assessment including but not limited to cardiac, pulmonary, and neurologic status

11.1.2 assessment of physiologic parameters: measurement of oxygen tensions or saturation in any patient treated with oxygen

11.1.2.1 in conjunction with the initiation of therapy; or
11.1.2.2 within 12 hours of initiation with FIO2 < 0.40
11.1.2.3 within 8 hours, with FIO2 > or = 0.40 (including postanesthesia recovery)
11.1.2.4 within 72 hours in acute myocardial infarction(9)
11.1.2.5 within 2 hours for any patient with the principal diagnosis of COPD
11.1.2.6 within 1 hour for the neonate(2)

11.2 Equipment

11.2.1 All oxygen delivery systems should be checked at least once per day.
11.2.2 More frequent checks by calibrated analyzer are necessary in systems
   11.2.2.1 susceptible to variation in oxygen concentration (eg, hoods, high-flow blending systems)
   11.2.2.2 applied to patients with artificial airways
   11.2.2.3 delivering a heated gas mixture
   11.2.2.4 applied to patients who are clinically unstable or who require an FIO2 of 0.50 or higher.

11.2.3 The standard of practice for newborns appears to be continuous analysis of FDO2 with a system check at least every 4 hours, but data to support this practice may not be available.

OT-AC 12.0 FREQUENCY:

Oxygen therapy should be administered continuously unless the need has been shown to be associated only with specific situations (eg, exercise and sleep).

OT-AC 13.0 INFECTION CONTROL:

Under normal circumstances, low-flow oxygen systems (including cannulas and simple masks) do not present clinically important risk of infection and need not be routinely replaced. High-flow systems that employ heated humidifiers and aerosol generators, particularly when applied to subjects with artificial airways, can pose important risk of infection. In the absence of definitive studies to support change-out intervals, results of institution-specific and patient-specific surveillance measures should dictate the frequency with which such equipment is replaced.

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