Domiciliary Oxygen for Children

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KEYWORDS

• Oxygen • Domiciliary • Home • Neonatal lung disease

The pediatric use of domiciliary oxygen (supplemental oxygen delivered in the home) has been steadily increasing since its first reported use in children in the 1970s.[1] Like much pediatric practice, because of a scarcity of good evidence to inform clinicians, there is a lack of consensus over many issues. Most available evidence relates to infants discharged home with chronic neonatal lung disease (CNLD), which is easily the largest patient group receiving domiciliary oxygen. Because this article is part of a series on ''evidence-based management,'' much of it relates to CNLD; however, other conditions are also covered, remembering the adage ''lack of evidence of benefit is not the same as evidence for lack of benefit'' (**Box 1**). Nevertheless, whenever possible, recommendations are accompanied by a grade indicating quality of evidence and strength of the recommendation using the GRADE system.[2]

DEFINITIONS

Although domiciliary refers to the home, in the context of oxygen therapy, it refers to delivery of supplemental oxygen outside the hospital because it may also be used outside the home, especially by children. Modes of delivery fall into three categories. Long-term oxygen therapy (LTOT) is defined as the provision of oxygen for continuous use at home for patients who have chronic hypoxemia (attributable to any cause) to maintain oxygen saturation (SaO_2) at or greater than 92% (depending on the type of oximeter) or PaO_2 greater than 8 kPa.[3] It may be required 24 hours per day or during periods of sleep only; thus, the adult definition that includes a requirement for more than 15 hours per day is not relevant. Ambulatory oxygen therapy (AOT) refers to the provision of portable oxygen that can be used outside the home. In adult patients, this is not always necessary because many are house-bound (although they may still need to attend hospital appointments). All children on LTOT require facilities for portable AOT unless they only use nighttime oxygen. This particularly applies to the infant age group (who spend periods during the day sleeping) because parents need to be able to take the baby outside the home to lead as normal a life as possible. Short burst oxygen therapy (SBOT)

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Box 1
Principal pediatric conditions that may require long-term oxygen therapy

- CNLD (bronchopulmonary dysplasia)
- Other neonatal lung conditions (eg, pulmonary hypoplasia)
- Congenital heart disease with pulmonary hypertension
- Pulmonary hypertension secondary to pulmonary disease
- Interstitial lung disease
- Obliterative bronchiolitis
- Cystic fibrosis and non-cystic fibrosis bronchiectasis
- Obstructive sleep apnea syndrome and other sleep-related disorders
- Neuromuscular conditions requiring noninvasive ventilation
- Disorders of the chest wall (eg, thoracic dystrophy, severe kyphoscoliosis)
- Sickle cell disease
- End-of-life palliative care

refers to acute use of short-term oxygen, and there are few indications specific to children, although it is undoubtedly used that way in many families (eg, during seizures).

NORMAL OXYGEN LEVELS

Painful arterial stabs result in a crying (and sometimes hypoxic) child, which gives unreliable results; thus, studies of oxygen levels in children are invariably performed using pulse oximetry. The issue here, however, is that pulse oximeters do not all give equivalent readings of SaO_2; thus, it is necessary to know which oximeter was used when comparing studies. A group of investigators have studied children at varying ages using the same equipment (**Table 1**). Their study of healthy term infants in the first month of life measured by pulse oximetry found in the first week of life that the baseline SaO_2 ranged from 92% to 100% (median of 97.6%), whereas in weeks 2 through 4, it ranged from 87% to 100% (median of 98.0%).[4] Episodes of desaturation (SaO_2 $\leq$80% for $\geq$4 seconds) occurred in 35% of recordings in week 1 and in 60% in weeks 2 through 4. These investigators also studied 67 older healthy full-term infants aged 4 to 8 weeks and found that their baseline SaO_2, measured by pulse oximetry, ranged from 97% to 100% (median of 99.8%).[5] Short

Table 1
Normal oxygen saturation levels in healthy children, measured by the same group of investigators using pulse oximetry

Age	n	Median	Range	Reference
Ex-preterm babies at term	66	99.4	89–100	6
1 week	50	97.6	92–100	4
2–4 weeks	50	98.0	87–100	4
4–8 weeks	67	99.8	97–100	5
2–16 (mean 8) years	70	99.5	96–100	8