Curr Pediatr Res 2016; 20 (1&2): 250-252 *ISSN 0971-9032*
www.currentpediatrics.com

An audit of oxygen prescribing practices in a tertiary care hospital.

Janani Sankar

Department of Pediatrics, Kanchi Kamakoti Childs Trust Hospital, Tamil Nadu, India.

Abstract

Introduction: Oxygen is the first drug that is administered to a sick child. However prescribing oxygen is not done like other drugs like antibiotics, anticonvulsants, etc. A background knowledge about the various oxygen delivery devices is required to give a proper prescription of oxygen.

Aims and objectives: To analyse the prescription of oxygen to inpatients by doctors in a tertiary care hospital and studied the prescribing practices.

Materials and methods: The audit was undertaken between October 2009-March 2010. Patients between 1 month to 18 years of age was randomly selected for chart review from the records section.

Results: A total of 300 in patients with principle diagnostic categories of respiratory, cardiovascular and neurological illness were included in the audit. Respiratory distress was the commonest indication for initiating oxygen therapy, 63.7% followed by seizures, 15.2%, shock in 13.7%, severe anemia in 2%, low GCS in 4.8%, sepsis and cyanosis in 0.3% each. Formal prescription of oxygen was found only in 43.5% whereas in 56.5% of children oxygen was administered without any prescription. The mean duration of oxygen administration was 24 h. The shortest duration of administration was 1 h and the longest was 16 days.

Conclusion: Oxygen prescription and/or delivery are associated with significantly greater error than that seen with antibiotics. Education of medical personnel should stress more prudent prescription and use of oxygen in hospitalized patients. Supplemental oxygen is actually detrimental to many of the patients who receive it. Supplemental oxygen is much overused and its use should be limited to the few conditions and situations in which it is truly effective, useful and non-detrimental.

Keywords: Diagnostic, Antibiotics, Child.

Accepted September 29, 2016

Introduction

Oxygen is widely available and used in a range of settings and conditions. Since its discovery by Scheele and Priestly in the 1770s, it has remained one of the most effective therapeutic agents available. However as a result of poor prescribing and monitoring, inappropriate doses are often given to ensure the safe and effective delivery of oxygen, the prescription should include the flow rate, the concentration, the delivery device, the duration, and the method for monitoring treatment [1]. We analysed the prescription of oxygen to inpatients by doctors in a tertiary care hospital and studied the prescribing practices.

An ideal Oxygen Prescription should contain the Indication for oxygen administration, the preferred mode of administration and the amount to be sent in litres per minute.

Aims and Objectives

To analyse the prescription of oxygen to inpatients by doctors in a tertiary care hospital and study the prescribing practices.

Materials and Methods

The audit was undertaken between October 2009–March 2010. Patients between 1 month to 18 years of age were randomly selected for chart review from the records section. Those patients who were admitted in the medical wards and received oxygen therapy as documented in their observation chart were included in the audit. Children admitted in the High Dependency Unit and intensive care units were not included.

A total of 300 in patients with principle diagnostic categories of respiratory, cardiovascular and neurological

illness were included in the audit. For each patient, the clinical diagnosis, oxygen prescription (if present), and implementation were analysed in conjunction with the oxygen flow rate and oxygen saturations (as documented in the observation chart).

Results

Analysis of the observed data revealed the following:

Respiratory distress was the commonest indication for initiating oxygen therapy, 63.7% followed by seizures, 15.2%, shock in 13.7%, severe anemia in 2%, low GCS in 4.8%, sepsis and cyanosis in 0.3% each (Figure 1).

A combination of shock and respiratory distress were the indication in 2.8% of children. The mean age was 12 months. The mean oxygen saturation prior to starting oxygen was 85%, however in about 12.5% of children oxygen saturation was not checked prior to starting oxygen therapy.

Formal prescription of oxygen was found only in 43.5% whereas in 56.5% of children oxygen was administered without any prescription. Target oxygen saturation to be achieved was mentioned only in 21% of patients as against 79% of patients where there was no mention about the target range.

The mode of oxygen administration was mentioned only in 35% of children as against 65% where there was no mention about the device. Face mask was used in 14.13% followed by non-re-breathing Mask (NRM) in 5.86%, venturi in 2.06% and hood and nasal prongs in 1.03% each (Figure 2).

The mean duration of oxygen administration was 24 h. The shortest duration of administration was 1 h and the longest was 16 days.

Arterial Blood Gas (ABG) analysis was not done routinely in children who were admitted to the wards and SpO_2 reading as shown by the pulse oximeter was used as a guideline for initiating or stopping oxygen.

Among the children with respiratory distress, bronchiolitis was the commonest indication followed by Wheeze Associated Lower Respiratory Infection and community acquired pneumonia. Febrile status epilepticus and break through seizures were the neurological indications. For children with seizures oxygen was continued even after control of seizures in about 20% of the subgroup with seizures.

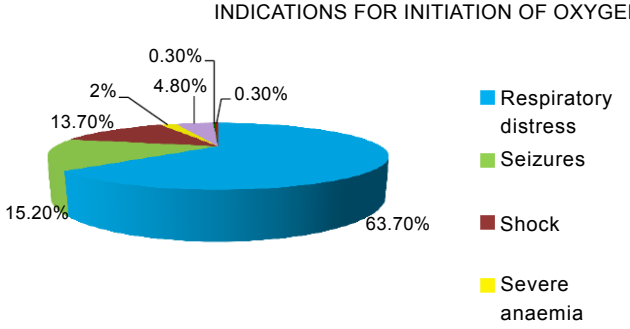

Figure 1: *Indications for initiation of oxygen*

Discussion

Oxygen therapy can be life- saving as treatment of hypoxemia is essential. Oxygen is a drug and should be prescribed with caution as it can have detrimental effects. Current rates of oxygen prescription in medical wards are unsatisfactory; only 43.5 % of patients who were receiving oxygen during the study had oxygen prescribed, with the majority of oxygen prescriptions being inadequate.

Oxygen is most commonly delivered by devices with variable performance such as face masks and nasal cannulae. These can produce unexpectedly high concentrations of inspired oxygen, particularly when ventilation is depressed [2].

In addition masks that incorporate a reservoir bag are often used in emergencies; following the widespread adoption of PALS & ATLS guidelines [3]. These appliances may produce systemic hyperoxia which may be harmful. In the present study face mask was most commonly used followed by nasal prongs and NRM.

Studies have also shown that routine administration of high concentrations of oxygen in adults with myocardial infarction and acute ischemic stroke are more hazardous and the outcome has been better when oxygen was used cautiously [4-6]. This apparent paradox occurs because supraphysiological oxygen tensions produce little increase in the oxygen carrying capacity of blood, but they promote reflex vasoconstriction via local regulatory mechanisms in arteriolar smooth muscle [7].

The dangers of pulmonary toxicity due to oxygen ranging from atelectasis to pro inflammatory processes and the risks of prescribing oxygen for patients with chronic respiratory illness has been widely appreciated. Injudicious use of oxygen in these patients produces respiratory Acidosis [8]. The treatment guidelines should be based on achieving target arterial oxygen tensions and saturations rather than on giving predetermined concentrations or flow rates of inspired oxygen. In the present study target oxygen percentage was mentioned only in 21% of patients.

Inevitably, oxygen continues to be given on the basis of presumed need rather than of documented low oxygen saturation. This may be acceptable in emergencies but in more controlled situations, efforts should be made to confirm the presence of hypoxia by pulsoximetry before giving oxygen. In this way normoxic patients who do not require oxygen therapy will avoid the risks of hyperoxia. In the present study pulsoximeter was used to document the oxygen saturation prior to initiation of oxygen in 87.5% of patients.

Pulsoximeters should be available in all critical areas where acutely ill patients are managed. Supplemental oxygen can then be given on a rational basis focusing on the attainment of target oxygen saturations which may

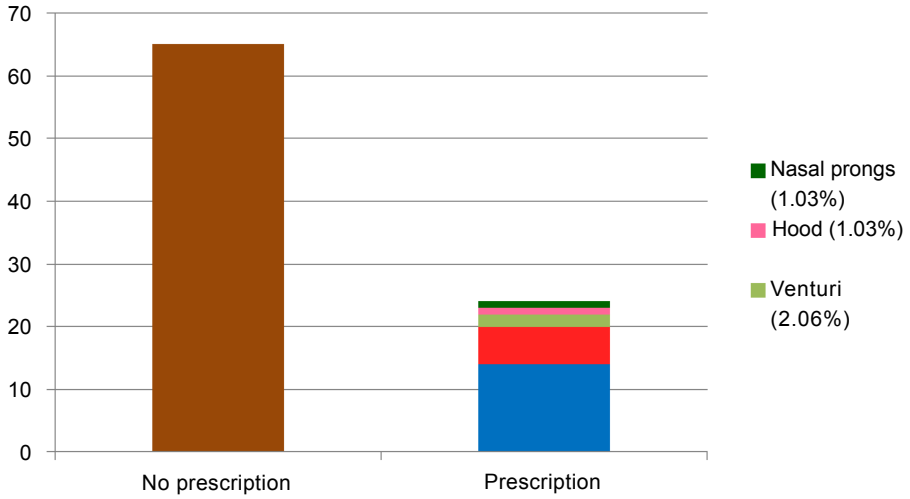

Figure 2. *Modes of administration of oxygen*

differ between patient groups rather than using fixed flow rates and devices. In addition, arterial blood gas analysis can be used in sick children to confirm the appropriate pH, oxygen and carbon dioxide tensions. The use of oxygen prescription charts similar to those advocated by Dodd and colleagues may help to achieve these aims [1].

Conclusion

Oxygen therapy remains a cornerstone of medical practice and doctors should strive to ensure that oxygen is prescribed, administered and monitored with care. Oxygen therapy is neither prescribed nor administered with the same attention that is given to other drugs such as antibiotics. Oxygen prescription and/or delivery are associated with significantly greater error than that seen with antibiotics. Education of medical personnel should stress more prudent prescription and use of oxygen in hospitalized patients.

Supplemental oxygen is actually detrimental to many of the patients who receive it. Supplemental oxygen is much overused and its use should be limited to the few conditions and situations in which it is truly effective, useful, and non-detrimental.

One should also be aware of the prohibiting cost of oxygen and use it judiciously. It may be wise to use a separate oxygen prescription format to avoid such errors in practice.

References

1. Dodd ME, Kellet F, Davis A, et al. Audit of oxygen prescribing before and after the introduction of a prescription chart. AMJ 2000; 321: 864-865.
2. Leigh JM, Variation in performance of oxygen therapy devices – towards the rational employment if "the dephologisticated air described by Priestley". Am R Col Surg Engl 1973; 52: 234-253.
3. Thomson AJ, Webb DJ, Simon, et al. Maxqill.Oxygen therapy in arte medical care. BMJ 2002; 324: 1406-1407.
4. Rivas F, Rembert JC, Bache RJ, et al. Effect of hyperoxia on regional blood flow after coronary occlusion in awake dogs. Am J Physiol 1980; 238: h244-h248.
5. Kenmure AC, Murdoch WR, Veattie AD, et al. Circulatory and metabolic effects of oxygen in myocardial infarction. BMJ 1968; iv: 306-304.
6. Haque WA, Boehmer J, Clemson BS, et al. Hemodynamic effects of supplemental oxygen administration in congestive heart failure. J Am Coll Cardiol 1996; 27: 353-357.
7. Welsh DG, Jackson WF, Segal SS. Oxygen induces electromechanical coupling in arteriolar smooth muscle cells: A role for L-type Ca^{2+} channels, Am J Physiol 1998; 43: 8-24.
8. Plant PK, Owen JL, Elliott MW. One year period prevalence study of respiratory acidosis in acute exacerbations of COPD: Implications for the provision of non-invasive ventilation and oxygen administration. Thorax 2000; 55: 550-554.

Correspondence to:

Janani Sankar,
Senior Consultant,
Department of Pediatrics,
Kanchi Kamakoti Childs Trust Hospital,
12A, Nageswara Road,
Nungambakkam, Chennai,
Tamil Nadu 600034,
India.
Tel: 04442001800
Fax: 04428259613
E-mail: janani.sankar@yahoo.com

Special issue: Pediatric Research
Editor: Abdulla A Alharthi, Department of pediatric nephrology, Taif University, Saudi Arabia