

FREQUENCY OF ACCURACY OF OXYGEN PRESCRIPTION IN A TEACHING HOSPITAL OF KHYBER PAKHTUNKHWA

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ABSTRACT

Objective: To determine the frequency of accuracy of oxygen prescription in a teaching hospital of Khyber Pakhtunkhwa.

Methodology: This was a hospital based descriptive study performed in Lady Reading Hospital, Peshawar, Khyber Pakhtunkhwa, in May and June 2015. The study sample included a total of 110 admitted patients of either gender and of any age in various units (Medical and allied, Surgical and allied, Gynae/OBstetrics and Paediatrics), who were on oxygen therapy and the oxygen was prescribed on treatment charts. Data was collected regarding oxygen prescription, administration and monitoring. Accuracy of oxygen prescription was determined. Descriptive statistical analysis was employed utilizing SPSS version 21.0.

Results: Of the 110 in-patients who were on oxygen therapy, 52 (47.3%) were males and 58 (52.7%) were females. Source of Oxygen (as centralized supply or oxygen cylinders) was not mentioned in 89 (80.9%) patients. Face mask was used for administration of oxygen in 95 (86.4%) of patients. Method of oxygen administration was not mentioned in 90.0% patients, duration of therapy not mentioned in 86.4%, oxygen flow rate not mentioned in 83.6% and signature of doctor or prescriber not found in 81.8% patients. Only 17 (15.5%) prescriptions stated all the required parameters and were considered as accurate.

Conclusion: Accuracy of oxygen prescriptions based on required parameters were found only in a minority of prescriptions. Most frequent deficiency in oxygen prescriptions was lack of mention of FiO₂ followed by method of oxygen administration, oxygen flow rate and signature of doctor or prescriber. Face mask was the most frequent device for administration of oxygen.

Key Words: Oxygen administration, Oxygen therapy, Prescription

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INTRODUCTION

Oxygen is administered in different clinical conditions in hospitalized patients. Oxygen therapy plays a crucial role in the management of respiratory, cardiac and other serious conditions¹. Indications for its use continue to expand. It is the most commonly used drug in emergency medicine, 34% of ambulance patients receive oxygen during transit and 15–17% of hospital in-patients will be receiving oxygen at any given time^{2,3}.

Despite advances in the understanding of physiological and clinical aspects of oxygen, as a therapeutic agent it is one of the most ill-prescribed/Inadequately practiced item in clinical settings^{4,5} and therefore the patients requiring oxygen therapy do not get optimal benefits. Most often, the prescription either includes

single written word 'oxygen' or merely a verbal mention of the order to the staff nurse. It is generally left to the ward attendant or a nursing student to administer oxygen to a patient⁶. It is often administered to patients at attendants' discretion while its safety or efficacy are not considered properly⁷. A common mistake committed by physicians, nursing staff and occasionally the patient's attendants is to increase the flow of oxygen to improve oxygen saturation. Oxygen, if given in inappropriate dose, can be dangerous⁸. In COPD patients, both hypoxaemia and hyperoxaemia can result in adverse clinical outcomes^{9,10}.

Oxygen therapy should be administered according to guidelines. Mostly there are no protocols for oxygen therapy in many hospitals¹¹. A study showed that there was a gross inadequacy regarding oxygen prescription

with no clear indication for about 25 percent of patients. Similarly, only 25% of the patients receiving oxygen had a written prescription in their medical notes¹².

Various hospital based audits have shown that oxygen was poorly prescribed and inappropriately administered¹³⁻¹⁵. It is important to consider oxygen as a drug to get the optimal benefits. Education of the staff and use of prescription charts significantly improved the prescription of oxygen¹⁶. Unlike the prescription for a drug, oxygen is not prescribed with any degree of careful consideration. Current practices of oxygen prescription in medical wards are not satisfactory¹⁴. The purpose of this study was to determine the frequency of accuracy of oxygen prescription in a teaching hospital of Khyber Pakhtunkhwa. Current prescribing practices and methods of oxygen delivery to inpatients in different clinical units were assessed. This study may help improve prescription of oxygen therapy by the clinicians more scientifically and hence improvement in patient outcomes.

METHODOLOGY

This was a hospital based descriptive study and was carried out in May and June 2015. The study sample included a total of 110 admitted patients in various units (Medical and allied, Surgical and allied, Gynae/Obstetrics and Paediatrics) of Lady Reading Hospital, Medical Teaching Institution, Peshawar, Khyber Pakhtunkhwa. The total number of in-patients in the wards on that day was noted and the number of patients on oxygen therapy was recorded. Data collection of the patients was started after getting permission from the Hospital Ethical Committee to conduct the study. An informed written consent was obtained from all the patients or their relatives.

The inclusion criteria were patients of either gender and of any age who were on oxygen therapy and the oxygen was prescribed on treatment charts. Those patients who were receiving oxygen therapy without being prescribed on treatment charts were excluded from the study. Similarly other units like Dermatology and Psychiatry units where oxygen is rarely used for inpatients were not studied in this research.

Relevant history was obtained from all the study participants (or their relatives) and focused examination was carried out accordingly. For each patient, the clinical diagnosis, initial medical plan and need for oxygenation were assessed. Data was collected regarding oxygen prescription, administration and monitoring.

Oxygen prescription was analyzed for accuracy of oxygen prescription. Each researcher observed whether the patient was receiving oxygen and if so, whether the method of delivery was consistent with what had been prescribed.

Although all of the following parameters are important to mention in prescription but for study purpose, the oxygen prescription was considered as accurate when 5 out of 7 of the following were present:

- Method of O₂ Administration/Devices,
- Amount/Dose/Flow Rate of Oxygen (liters/min),
- Source of oxygen (Centralized supply/O₂ Cylinders),
- Percentage of oxygen to be delivered (FiO₂),
- Target Saturation range (SpO₂),
- Monitoring /review parameters (vitals, pulse oximetry and ABGs), and
- Doctor's or prescriber's signature.

All information was recorded on a pre-designed structured proforma. Descriptive statistical analysis (frequency, percentage, ratio and range) was employed for variables of interest. Data storage, processing and analysis was done utilizing SPSS version 21.0.

RESULTS

A total of 110 in-patients were on oxygen therapy, 52 (47.3%) were males and 58 (52.7%) were females. Male to female ratio was 1:1.115.

Twenty one (19.1%) patients were less than 12 years of age (range from 01 month to 11 years, mean 4.062±3.6451). Eighty nine (80.9%) patients were more than 12 years old (range from 12 to 85 years, mean 45.607±18.9044).

Source of Oxygen, whether centralized or oxygen cylinders, was not mentioned in 89 (80.9%) patients and mentioned in only 21(19.1%). Face mask was used for administration of oxygen in 95 (86.4%), nasal prong in 06 (5.5%), nasal cannulae in 05 (4.5%) and venturi masks in 04 (3.6%) patients. Duration of therapy was not mentioned in (86.4%) patients. Other Parameters regarding accuracy of oxygen prescription are shown in table 1.

Only 17 (15.5%) of prescriptions fulfilled the required parameters as shown in table 2. Among these, Pulmonology Unit had 10 out of 16 (62.5%) prescriptions adequate, Medical Units had 06 out of 27 (22.2%) and General ICU had 01 out of 03 (33.3%) prescriptions as accurate.

DISCUSSION

There is evidence that inappropriate administration of supplemental oxygen therapy can have serious consequences^{17, 18}. In our study, the flow rate or amount of oxygen was mentioned in only 16.4% of cases. The dangers of high-flow oxygen in COPD have been well documented. However, the first randomized trial of con-

Table 1: Oxygen prescription parameters (n=110)

Parameter	Mentioned	Not Mentioned
Method of Oxygen Administration	11 (10%)	99 (90%)
Flow rate or Amount of Oxygen	18 (16.4%)	92 (83.6%)
Target saturation (SpO ₂)	27 (24.5%)	83 (75.5%)
Percentage of oxygen to be delivered (FiO ₂)	5 (4.5%)	105 (95.5%)
Monitoring of Oxygen therapy	50 (45.5%)	60 (54.5%)
Arterial blood gases	28 (25.5%)	82 (74.5%)
Signature of Doctor or prescriber	20 (18.2%)	90 (81.8%)

Table 2: Accuracy of oxygen prescription (n=110)

Accuracy	Frequency
Yes	17 (15.5%)
No	93 (84.5%)
Total	110 (100%)

trolled oxygen therapy in acute exacerbations of COPD was published in 2010 and confirmed that mortality was increased when high concentration of oxygen was given compared with controlled oxygen, with a target range of 88–92%, (mortality 9% versus 4%, respectively)¹⁹. Recent randomized controlled trials have shown that using high concentration of oxygen is associated with increased risk of hypercapnia in patients with acute asthma and pneumonia^{20, 21}.

Occasionally, oxygen is administered at a very low flow rate of less than 0.5 L/min at the opening of the nostrils. This is like ‘smelling’ oxygen which is more of a ritual than a therapy. In the study by Singh et al¹¹, in 23 (35.2%) cases, oxygen was flowing at lower than prescribed flow rates. O’Driscoll et al³ reported that in UK hospitals, a target saturation range for oxygen therapy was considered in only 10% of cases. De Jonge et al²², in the Netherlands, performed a retrospective observational study on oxygenation in the first 24 hours after admission to the ICU in 36307 consecutive patients who were mechanically ventilated. The results showed that in-hospital mortality was increased with both abnormally low and abnormally high oxygen levels. Another observational study was performed in the US, based on a database of 6326 adult patients from 120 ITUs admitted after resuscitation from cardiac arrest. This study showed that arterial hyperoxaemia was independently associated with increased in-hospital mortality compared with either hypoxaemia or normoxaemia and that there was a dose-dependent association between supra-normal oxygen levels and the risk of in-hospital mortality²³.

In our study, target saturation (SpO₂) was mentioned in only 24.5% cases. In all acutely ill patients, not at risk of type 2 respiratory failure (T2RF), the recommended target saturation range is 94–98%²⁴. Keeping oxygen

saturation levels in the normal range (94–98%) in critically ill patients is best, as no increase in mortality was seen in the normoxaemic range in these studies. In patients at risk of T2RF a target saturation range of 88–92% is suggested pending the availability of ABGs^{1, 25}.

In the present study, method of oxygen administration was mentioned in only 10% cases. Face mask was the most frequent device for administration of oxygen in 86.4%. A range of fixed and variable performance devices allows accurate titration to patient needs. The percentage of oxygen to be delivered (FiO₂) was mentioned in only 4.5% cases. The FiO₂ required to be delivered depends upon the acuteness of illness and severity of hypoxemia²⁶. Fixed performance devices provide a constant and predictable inspired oxygen concentration (FiO₂), irrespective of the ventilatory pattern of the patient, whereas variable performance devices provide a FiO₂ that varies according to the gas flow rate and ventilatory pattern of the patient.

Similarly, monitoring of oxygen therapy was mentioned in only 45.5% cases in the present study. Adequate monitoring (vital parameters and the laboratory tests) is essential for alterations in the prescribed modes of therapy. Oxygen is administered according to the type and chronicity of disease and the degree of hypoxemia. Analysis of arterial blood gases were mentioned in only 25.5% cases. In a study from UK, 33.6% of patients on oxygen therapy had no record of arterial gas estimation²⁷. Similarly, an audit of COPD patients on oxygen therapy in Australia revealed that they received oxygen therapy not in accordance with the guidelines and often their ABGs were not monitored²⁸.

In the present study, signature of doctor or prescriber was mentioned in only 18.2% cases. Reports on assessment of uses and misuses of oxygen are almost

universal including those from the developed countries of the Europe²⁹. In the UK hospitals, less than one third of patients on oxygen therapy had any written prescription, and in only 5% of cases it was signed to indicate that oxygen had been administered². The duration should be specified and reviewed frequently for stopping of oxygen therapy³⁰. Singh et al reported that in 47 patients (69%) the criteria of starting oxygen therapy were met as per American College of Chest Physicians (ACCP) guidelines¹¹.

Similarly in one study from New Zealand, only 8% of patients on oxygen had a prescription in their medication chart. The majority (75%) of oxygen prescriptions were inadequate¹⁴. In England, an audit of 55 patients on Oxygen therapy, only 5% of patients had a prescription. Education of the staff resulted in better awareness and the figure increased to 20% after education ($p=0.042$)⁸.

Oxygen therapy is a special form of treatment and must be tailored to the individual needs for better outcome^{12,31}. Optimum use of oxygen is not only important for patient care but also for economic reasons as well because of the expense of oxygen and the cost of devices utilized³². Current unsatisfactory practices of oxygen prescription can result in serious potential consequences¹⁴.

CONCLUSION

Accuracy of oxygen prescriptions based on required parameters were found only in a minority of prescriptions. Most frequent deficiency in oxygen prescriptions was lack of mention of FiO₂ followed by method of oxygen administration, oxygen flow rate and signature of the doctor or prescriber. Face mask was the most frequent device for administration of oxygen.

RECOMMENDATIONS

Oxygen is a drug and hence should be prescribed and administered by trained staff. Proper monitoring of oxygen therapy is recommended to ensure adequate oxygenation. A proper oxygen prescription must specify the percentage of oxygen (FiO₂) to be delivered, target saturation range (SpO₂), flow in liters/min, source of oxygen, the method of delivery, monitoring parameters (ABGs/Pulse oximetry) and signature of the doctor or prescriber.

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CONTRIBUTORS

MARA conceived the idea, planned the study, and drafted the manuscript. RM, ZA, AK and SH helped acquisition of data and did statistical analysis. IA supervised the study and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.