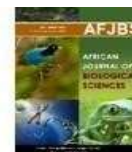


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Evaluating the Appropriateness, Documentation, and Monitoring of Oxygen Therapy in Adult Inpatients A Clinical Audit against National and International Guidelines

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Abstract

Background: Oxygen therapy is a cornerstone of inpatient care, yet its safety and efficacy depend on appropriate prescription, accurate documentation, and continuous monitoring. International guidelines from the British Thoracic Society (BTS), American Association for Respiratory Care (AARC), and the World Health Organization (WHO) emphasize titrated oxygen delivery with defined target saturations to minimize risks of hypoxemia and hyperoxemia. However, compliance remains inconsistent in many healthcare settings.

Objective: To evaluate the appropriateness, documentation, and monitoring of oxygen therapy in adult inpatients at Lady Reading Hospital, Peshawar, against established national and international standards.

Methods: A retrospective clinical audit was conducted over three months, reviewing 220 adult inpatient records from medical and surgical wards. Patients in critical care or palliative care units were excluded. Data were extracted using a structured audit tool based on BTS, AARC, and WHO guidelines, focusing on three domains: (1) appropriateness of prescription, (2) documentation quality, and (3) monitoring adherence. Descriptive statistics were used to analyze compliance rates.

Results: Appropriate indication for oxygen therapy was documented in 58.6% of cases, target saturation in 42.3%, and complete prescription documentation in 43.6%. Monitoring adherence was achieved in 52.7% of patients, while adjustments based on saturation readings were documented in only 37.7%. Overall compliance with all standards was 41.4%.

Conclusion: Significant deficiencies were identified in oxygen prescription, documentation, and monitoring. Structured prescription tools, staff education, and electronic monitoring alerts are recommended to enhance compliance and improve patient safety.

Keywords: Oxygen Therapy, Clinical Audit, Patient Safety, Documentation, Monitoring

INTRODUCTION

Oxygen is one of the most commonly used treatment measures in hospitals, but the treatment is too much reliant on accurate prescription, strict documentation, and close monitoring¹⁻³. Despite seemingly being a harmless intervention, improper oxygen use may lead to both hypoxaemia and hyperoxaemia, especially in the case of vulnerable groups, including patients with chronic respiratory illnesses (e.g., COPD) or those who are at risk of hypercapnic respiratory failure⁴⁻⁶. Considering oxygen as a drug requires an organized method in line with evidence-based practice to maximize patient safety and outcomes⁷⁻⁹.

The British Thoracic Society (BTS) presents a framework of principles on inpatient oxygen therapy including suggesting a range of target oxygen saturation (SpO₂) of 94-98% in the majority of acutely ill adults, and a lower limit of 88-92% in those who are at risk of hypercapnic respiratory failure, including persons with COPD. All these recommendations are highly supported in the multidisciplinary respiratory and emergency medicine domains, and support the need to have controlled, titrated oxygen therapy.

In addition to the BTS recommendations, the American Association for Respiratory Care (AARC) has recently provided clinical practice recommendations based on systematic review and the RAND/UCLA Appropriateness methodology¹⁰. These imply the targeting of SpO₂ at 94-98% during the majority of the hospitalized patients (and 88-92% in COPD patients), the promotion of the early adoption of high-flow oxygen (HFO) usage when it is necessary, the use of HFO to prevent the onset of non-invasive or invasive ventilation, and the consideration of humidification in situations where the flow rates are more than 4 L/min^{11 12}. This fact highlights not only the effectiveness of adequately focused oxygen therapy but also the possible dangers of over-delivery of oxygen.

The World Health Organization (WHO) categorizes oxygen as a vital medicine on the global stage, typically necessary in the emergency, surgical, trauma, and respiratory sectors, but recognizes the systemic issues related to a dependable supply, especially in low- and middle-income countries^{13 14}. This brings out clinical and infrastructural two-fold aspects of quality oxygen therapy.

Although these strong guidelines exist, audits continue to reveal systemic failures in clinical practice, especially in the areas of clarity in prescription, full documentation, and consistent monitoring. Research has found that the failure to state target saturation ranges is a frequent oversight, and patients are at risk of under- and over-oxygenation¹⁵. Equally, the surveillance of SpO₂ at recommended intervals and regulation of oxygen supply in response to saturations are often suboptimal, which brings up concerns regarding workflow integration and staff awareness¹⁶⁻¹⁸.

In the light of these identified gaps, clinical audit can be seen as a critical quality improvement tool. Systematic development of the gaps can be done by comparing institutional practices with BTS, AARC, and WHO standards and, with the combination of methods, such as Plan-Do-Study-Act (PDSA), allows implementing specific interventions, such as structured oxygen prescription charts, employee education, and electronic alert systems.

Here, we performed a retrospective clinical audit in Lady Reading Hospital (LRH), Peshawar, a tertiary-care teaching hospital, with a significant and heterogeneous inpatient population, to assess the appropriateness, documentation, and monitoring of inpatient oxygen therapy in relation to national and international standards. We pre-emptively evaluate compliance in three areas: (1) appropriateness of prescription (indication, target saturation, device choice), (2) quality of documentation (completeness of prescription chart and nursing records), and (3) monitoring practices (frequency of SpO₂ measurements and device adjustments based on target ranges) by focusing on adult inpatients receiving care in non-critical-care medical and surgical wards. We sought to measure compliance, find key areas of concern and educate specific quality improvement initiatives that are responsive to the high standards established by the BTS, AARC, and WHO.

Intended to add to the global discussion on safe oxygen delivery, this audit aims to inform the general public about the state of oxygen therapy practice in a Pakistani tertiary hospital and to remind the audience that safe oxygen delivery is a high-risk but fundamentally essential medication, whereby structured prescribing, careful documentation, and proactive monitoring are not a luxury, but a necessity.

METHODOLOGY

This clinical audit was carried out in Lady Reading Hospital (LRH), Peshawar, which is a tertiary care teaching hospital that offers a wide range of healthcare services to a great number of patients of diverse profiles. The audit was designed to assess the suitability, recording, and supervision of the oxygen therapy given to adult inpatients and to compare present practices with national and international standards, such as the British Thoracic Society (BTS) and World Health Organization (WHO) guidelines. The audit was conducted using a three-month retrospective, descriptive design and was conducted between [insert start date] and [insert end date].

The target population was patients ([?]18 years) admitted to medical and surgical wards and received oxygen therapy during their hospitalization. Critical care unit patients or those undergoing palliative or end-of life care were not included to create consistency in the clinical setting. The systematic sampling method was applied and patient records were determined using electronic and paper-based hospital records.

The predefined standards and guidelines were transformed into a structured audit tool, which included three core areas: (1) appropriateness of oxygen prescription, including indication, target saturation and delivery device; (2) quality of documentation, including the completeness of prescription charts and nursing records; and (3) monitoring parameters, including the frequency of SpO₂ monitoring and adjustment based on target ranges. Two trained clinical auditors extracted data to promote consistency, and possible discrepancies were resolved either through consensus or through consultation with a senior clinician.

Data analysis consisted of descriptive analysis of the data with the categorical variables presented as frequencies and percentages and continuous variables presented as mean + standard deviation (SD). The rate of compliance with each audit standard was determined, and practice gaps were determined. The results were discussed in accordance with the Plan-Do-Study-Act (PDSA) cycle in order to formulate specific interventions to enhance oxygen therapy practice within the institution.

The audit received ethical approval by the Institutional Review Board of Lady Reading Hospital and patient confidentiality was ensured by anonymizing all identifiable data.

RESULTS

Two hundred and twenty inpatient records of adults that met the inclusion criteria were analyzed. The average age of patients was 57.3 ± 16.8 years, and a majority were men (n=126, 57.3%). Most of the patients were hospitalized under general medicine (n=134, 60.9%), then surgery (n=86, 39.1%) (Table 1).

A proper documented indication of oxygen therapy according to national and international guidelines was only observed in 58.6% of patients (n=129). In 42.3% (n=93) of prescriptions, saturation ranges were given, and the rest had no target recorded (n=104, 47.3) or had a target recorded inconsistently (n=23, 10.5) (Table 2). The most common delivery device used was nasal cannulae (n=148, 67.3%), then simple face mask (n=56, 25.5%), and non-rebreather mask (n=16, 7.2%).

In 96 patients (43.6%), full documentation with details of prescription chart, flow rate, and type of device were present and in 92 patients (41.8 percent), partial documentation was obtained. There were 32 patients (14.5%) who were not recorded with a formal prescription despite being given oxygen therapy (Table 3).

Monitoring adherence was suboptimal, with 52.7% (n=116) of patients having their oxygen saturation monitored at recommended intervals. Adjustments in flow rates based on SpO₂ measurements were documented in only 37.7% (n=83) of cases. Notably, 18.6% (n=41) of patients had prolonged oxygen therapy without any documented reassessment beyond 24 hours.

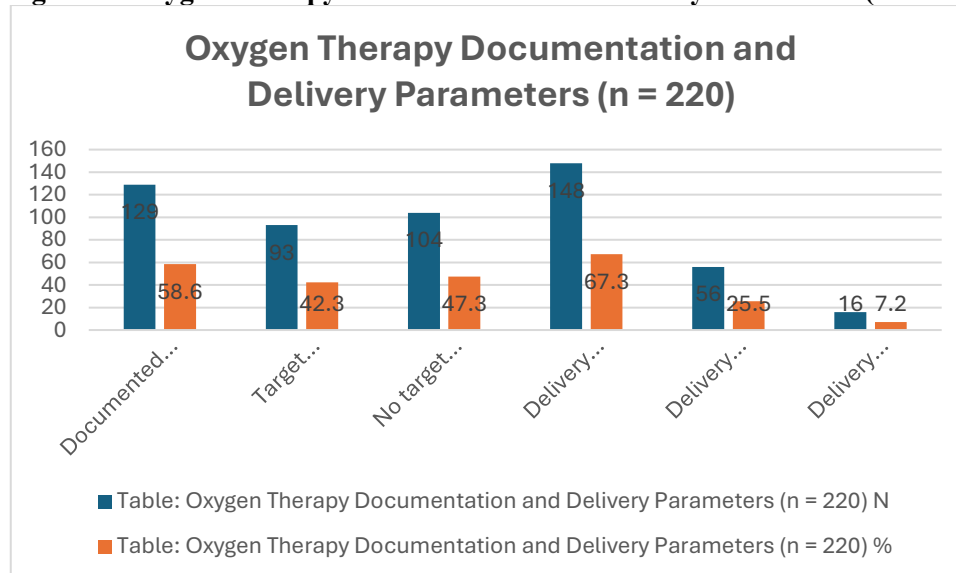
Overall compliance with the combined standards (indication, documentation, monitoring) was 41.4%, with the major gaps identified in the documentation of target saturations and monitoring frequency (Table 4).

Table 1: Baseline Characteristics of Patients Receiving Oxygen Therapy (n=220)

Characteristic	N (%) / Mean $\pm$ SD
Age (years)	57.3 $\pm$ 16.8
Male	126 (57.3)
Female	94 (42.7)
Ward type – Medical	134 (60.9)
Ward type – Surgical	86 (39.1)
Average duration of therapy (hours)	28.6 $\pm$ 12.4

Table 2: Appropriateness of Oxygen Therapy

Parameter	N	%
Documented indication	129	58.6
Target saturation specified	93	42.3
No target saturation recorded	104	47.3
Delivery devices – Nasal cannula	148	67.3
Delivery devices – Face mask	56	25.5
Delivery devices – Non-rebreather mask	16	7.2

Figure 1: Oxygen Therapy Documentation and Delivery Parameters (n = 220)**Table 3: Documentation of Oxygen Prescription**

Documentation Parameter	N (%)
Complete (chart, flow rate, device)	96 (43.6)
Partial documentation	92 (41.8)
No prescription documented	32 (14.5)

Table 4: Overall Compliance with Oxygen Therapy Standards

Compliance Domain	N (%)
Full compliance (all domains)	91 (41.4)
Non-compliance (any domain missing)	129 (58.6)

DISCUSSION

This clinical audit evaluated the suitability, recording, and follow-ups of oxygen therapy in adult inpatients in Lady Reading Hospital, Peshawar, by comparing the current practices with the recommended national and international practices. The results showed that compliance had a lot of gaps

as only 41.4% of the cases followed all three major domains-indication, documentation, and monitoring, and this needs to be systematically improved.

The general compliance rate in this audit is equal to reports in other tertiary care settings where compliance with oxygen therapy guidelines has been reported variably between 35-55%. Specifically, documentation of target saturation was less than optimal (42.3%), which is consistent with the results of past audits that reported this parameter among the most commonly neglected elements in oxygen prescription. This is a clinical limitation, because lack of specification of target saturation can lead to both hypoxemia and hyperoxemia, especially in chronic respiratory disease patients like COPD, where titrated oxygen is essential.

There were also poor practices in monitoring, as only 52.7 percent of patients underwent SpO₂ assessment at the advised frequency. This is not a surprise considering research findings that oxygen, though commonly viewed as non-dangerous, is usually under-observed as opposed to other important treatments. The absence of reassessment, which was witnessed in almost one in five patients, could be indicative of lapses in nursing processes, a lack of awareness of the guidance, or a lack of assimilation of monitoring protocols into the routine ward practice.

The under-documentation experienced (43.6% full documentation) indicates organizational deficiencies in the practice of physician prescriptions as well as handovers between nurses. Such a high level of oxygen administration (14.5) without prescription is a reminder of the necessity to institutionally reinforce oxygen as a prescribed treatment, not a usual nursing practice.

Our results demonstrate the necessity of specific quality improvement measures, such as the education of staff, the introduction of standardized oxygen prescription forms, and the incorporation of electronic warnings about saturation monitoring. Plan-Do-Study-Act (PDSA) cycles were used in previous quality improvement projects that showed substantial compliance rate increase after the implementation of structured oxygen prescribing tools and multidisciplinary training programs.

Strengths and Limitations: This audit has advantages such as a systematic sampling strategy, application of validated audit guidelines, and coverage of several wards, which contributes to the representativeness of this audit. Its retrospective design, however, reduced the capability of capturing real-time clinical decisions, and the enforced exclusion of critical care and palliative patients could limit the extrapolation of results to specialized environments.

Practical Implications: The identified gaps demonstrate that there is an urgent necessity to consider oxygen a high-risk drug with a strong prescribing and monitoring guideline. The focus of interventions must be on education, structured documentation, and automated monitoring reminders integrated into hospital information systems.

Future Directions: A re-audit following the implementation of these interventions will be essential to assess their impact, in line with the cyclical nature of clinical audit. Moreover, extending this evaluation to include clinical outcomes, such as length of stay, adverse events, or readmission rates, would provide further insight into the consequences of suboptimal oxygen therapy practices.

CONCLUSION

This clinical audit has shown significant deficiencies in prescribing, recording, and following up on oxygen therapy in adult inpatients and only 41.4% of the respondents exhibited full compliance with the set standards. Of special interest is the inadequacy of documentation of target saturation and ineffective monitoring practices, which subject patients to avoidable injuries, such as hypoxemia and hyperoxemia. Results highlight the necessity to consider oxygen treatment as a controlled drug, not as an ordinary nursing procedure. Introducing standardized prescription charts, the introduction of electronic warnings in case of saturation reassessment, and specific multidisciplinary training become the next important steps. These interventions have been demonstrated in other environments to significantly increase compliance and patient outcomes. Such measures should be followed by a follow-up re-audit to evaluate the efficiency of these measures and to ensure long-term changes in oxygen therapy practices so that the protocols used in the institution would be in line with the international best practice guidelines.

REFERENCES

1. Gottlieb, J., Capetian, P., Hamsen, U., Janssens, U., Karagiannidis, C., Kluge, S., ... & Fuehner, T. (2022). German S3 guideline: oxygen therapy in the acute care of adult patients. *Respiration*, 101(2), 214-252.
2. Buchan, C., Khor, Y. H., Thomas, T., & Smallwood, N. (2024). Implementing oxygen therapy in medical wards—a scoping review to understand health services protocols and procedures. *Journal of Clinical Medicine*, 13(18), 5506.
3. Al-Beltagi, M., Saeed, N. K., Bediwy, A. S., & Elbeltagi, R. (2024). Pulse oximetry in pediatric care: Balancing advantages and limitations. *World Journal of Clinical Pediatrics*, 13(3), 96950.
4. Lacasse, Y., Casaburi, R., Sliwinski, P., Chaouat, A., Fletcher, E., Haidl, P., & Maltais, F. (2022). Home oxygen for moderate hypoxaemia in chronic obstructive pulmonary disease: a systematic review and meta-analysis. *The lancet Respiratory medicine*, 10(11), 1029-1037.
5. Barnett, A., Beasley, R., Buchan, C., Chien, J., Farah, C. S., King, G., ... & Smith, S. (2022). Thoracic Society of Australia and New Zealand position statement on acute oxygen use in adults: 'swimming between the flags'. *Respirology*, 27(4), 262-276.
6. Curtis, B. R., Rak, K. J., Richardson, A., Linstrum, K., Kahn, J. M., & Girard, T. D. (2021). Perceptions of hyperoxemia and conservative oxygen therapy in the management of acute respiratory failure. *Annals of the American Thoracic Society*, 18(8), 1369-1379.
7. Roney, J. K., Whitley, B. E., Johnston, L., Deleon, M., & Robnett, J. C. (2023). Should adding pain, oxygen saturation and physical assessment to vital signs become the new standard of care for detecting blood transfusion reactions?. *Vox sanguinis*, 118(2), 109-120.
8. Saad, A., Alsadi, J., Al-Absi, D. T., Almulla, M., Simsekler, M. C. E., Sadeq, A. A., ... & Anwar, S. (2024). An integrative risk assessment approach to enhancing patient safety in continuous renal replacement therapy (CRRT). *Journal of Safety Science and Resilience*, 5(3), 344-354.
9. Bonaconsa, C., van den Bergh, D., Charani, E., Phillips, T., Spogter, A., Mohamed, A., ... & Mendelson, M. (2024). Co-design of a nurse handover tool to optimise infection control and antimicrobial stewardship in a low resource setting intensive care unit: A nurse led collaboration. *Wellcome Open Research*, 9, 583.
10. Zaccagnini, M., & Li, J. (2023). How to conduct a systematic review and meta-analysis: a guide for clinicians. *Respiratory Care*, 68(9), 1295-1308.
11. Roca, O., Caritg, O., Santafé, M., Ramos, F. J., Pacheco, A., García-de-Acilu, M., ... & Ricard, J. D. (2022). Closed-loop oxygen control improves oxygen therapy in acute hypoxemic respiratory failure patients under high flow nasal oxygen: a randomized cross-over study (the HILOOP study). *Critical Care*, 26(1), 108.
12. Thomas, T., Khor, Y. H., Buchan, C., & Smallwood, N. (2024). Implementing high-flow nasal oxygen therapy in medical wards: A scoping review to understand hospital protocols and procedures. *International Journal of Environmental Research and Public Health*, 21(6), 705.
13. Kodama, C., Kuniyoshi, G., Koya, S., Salem, M., Othman, M. M., Iwamoto, K., ... & Brennan, R. (2023). Medical Oxygen as a Life-Saving Medicine: A rapid review of the oxygen landscape and innovative efforts in the World Health Organization Eastern Mediterranean Region in Response to COVID-19 and Beyond. *Medical research archives*, 11(72), 4162.
14. Haque, E., Tarek, S. A., Sarker, F., Haque, M. A., & Mamun, K. A. (2022). A systematic review on medical oxygen ecosystem: current state and recent advancements. *medRxiv*, 2022-10.
15. Harper, J. C., Semprini, R., Kearns, N. A., Hatter, L., Bird, G. E., Braithwaite, I., ... & Beasley, R. (2021). Determination of oxygen saturation compared to a prescribed target range using continuous pulse oximetry in acutely unwell medical patients. *BMC pulmonary medicine*, 21(1), 332.
16. Gottimukkala, S. B., Sotiropoulos, J. X., Lorente-Pozo, S., Sharma, A. M., Vento, M., Saugstad, O. D., & Oei, J. L. (2021, April). Oxygen saturation (SpO2) targeting for newborn infants at delivery: Are

we reaching for an impossible unknown?. In *Seminars in Fetal and Neonatal Medicine* (Vol. 26, No. 2, p. 101220). WB Saunders.

17. Falsaperla, R., Giacchi, V., Saporito, M. A. N., Pavone, P., Puglisi, F., & Ruggieri, M. (2022). Pulse oximetry saturation (Spo2) monitoring in the Neonatal Intensive Care Unit (NICU): the challenge for providers: A systematic review. *Advances in Neonatal Care*, 22(3), 231-238.

18. Vijgeboom, T., Muller, M., Ebrahimkheil, K., van Eijck, C., & Ronner, E. (2024). Evaluation of photoplethysmography-based monitoring of pulse rate, interbeat-intervals, and oxygen saturation during high-intensity interval training. *BioMedical Engineering OnLine*, 23(1), 114.