

Oxygen Therapy Practices in a Tertiary Hospital in Perth, Western Australia - A Retrospective Audit

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Introduction

A number of audits related to oxygen therapy have been conducted internationally, showing relatively widespread substandard practices.¹⁻³ Inappropriate oxygen therapy can result in a wide range of adverse outcomes.⁴⁻⁷

There is limited data on current oxygen therapy practices in Australian tertiary hospitals. Royal Perth Hospital (RPH) is governed by Western Australian (WA) oxygen therapy guidelines⁸ (see Figure 1), which were developed to standardize the safe and effective use of oxygen in WA hospitals.

The accurate completion of a dedicated oxygen prescription chart is instituted in the guidelines, and this has been implemented at RPH since 2012.

The aim of this audit is to create a snapshot of current oxygen practices at RPH, using the Acute Medical Unit (AMU) as a base, in order to guide future recommendations and interventions. This busy unit comprises 43 beds and has an average length of stay of 1.6 days for AMU patients. The daily patient turnover is approximately 72%.

Figure 1. Key points of Western Australian Hospital Guidelines for Acute Oxygen Therapy⁸

1. No patient should be denied oxygen therapy in an emergency.
2. Patients commenced on acute oxygen therapy should be assessed promptly, carefully and regularly.
3. Once the patient is stable, oxygen therapy must be prescribed on a dedicated oxygen prescription form by a doctor or, where this is not possible, an appropriately authorized nurse.
4. Oxygen saturation should be monitored by pulse oximetry. Oxygen therapy should be titrated to the lowest concentration that meets oxygenation goals. Urgent medical review and arterial blood gas measurement is required if the patient develops signs of deterioration.
5. Oxygen therapy should be prescribed cautiously to patients with severe chronic lung disease and other conditions at risk of hypercapnic respiratory failure.
6. Oxygen therapy should be reduced and discontinued in stable patients with satisfactory oxygen saturation.

Methods

All patients with an inpatient stay in RPH AMU between 1st – 14th September 2015 (inclusive) were selected for this audit. Patients who were provided supplemental oxygen at any point of their hospital stay were selected for further analysis.

Patients' notes were checked for the presence of filled oxygen prescription charts to determine the target saturation level prescribed ('P'). Filled charts were also examined for any errors or omissions. Observation charts were used to determine each patient's average oxygen saturation ('S') as a result of supplementation.

Previous arterial or venous blood gases were checked for each patient, to determine any background of type 2 respiratory failure. This data was reviewed by a Respiratory Consultant, who led the consensus on deciding the appropriate target oxygen saturation that should have been prescribed for each patient (medically indicated target – 'IP').

The prescribed targets (P), medically indicated targets (IP) and average oxygen saturations achieved (S) were evaluated and compared to determine any potential or real risk to patients.

Key Terms	
P	Prescribed Target Saturation Level
S	Average Oxygen Saturation while on Supplementation
IP	Ideal Medically Indicated Target Oxygen Saturation

Results

65 patients received oxygen therapy during the study period. For the patients who had an oxygen prescription chart completed, only 3.1% were error-free (see Figure 2).

An average of 2 errors/omissions were noted per chart, most commonly in the field related to weaning instructions.

In total, 36 patients (55.4%) had a target oxygen saturation (P) prescribed. The remaining 44.6% received oxygen therapy without any prescription.

32.3% of patients were identified to have a background risk of developing type 2 respiratory failure. Comparing prescribed target saturations (P) with medically appropriate target saturations (IP) for each patient showed that 25% of prescriptions were incorrect (see Figure 3).

Figure 2. Completion of oxygen prescription chart

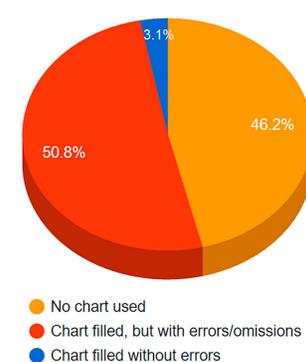
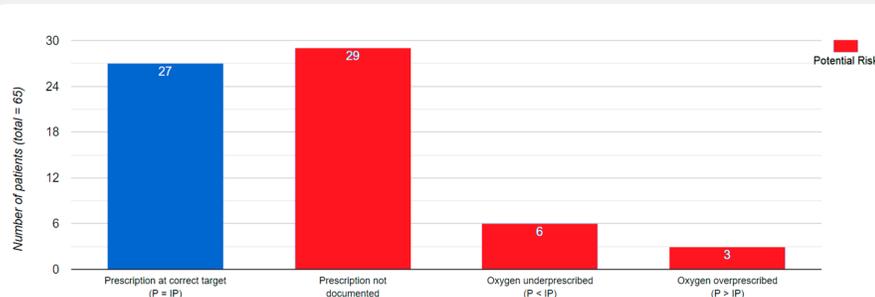
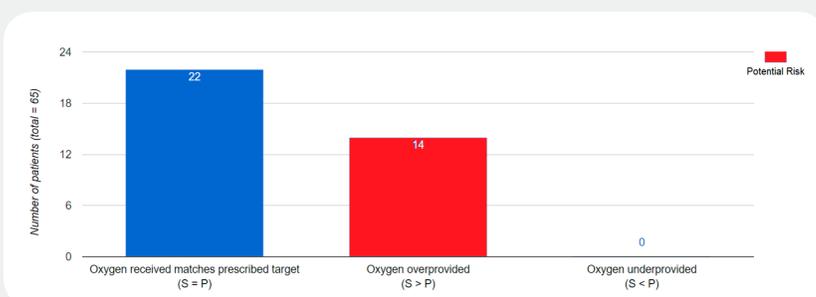


Figure 3. Oxygen prescriptions (P) compared to medically indicated target saturations (IP): Prescription errors causing potential patient risk



On comparing oxygen supplied (S) with prescribed targets (P), 38.9% of patients received oxygen above the prescribed level, while none had saturations below the prescribed level (see Figure 4).

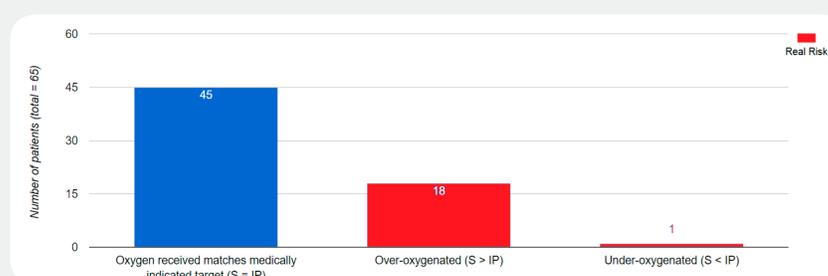
Figure 4. Oxygen supplied (S) compared to Prescribed targets (P): Delivery errors causing potential patient risk



75.4% of the patients who received oxygen therapy suffered a potential risk, due to errors related to prescription or delivery, as illustrated in the prior two graphs.

19 patients (29.2%) had a real risk of complications as a result of inappropriate oxygen therapy. These patients had average oxygen saturations (S) outside the medically indicated target range (IP) (see Figure 5).

Figure 5. Oxygen supplied (S) compared to medically indicated target saturations (IP): Patients at real risk of oxygen related adverse events



Discussion

The prescription, administration and monitoring of oxygen therapy is sub-optimal within Royal Perth Hospital. A significant proportion of patients are placed at risk of oxygen-related adverse events.

When prescriptions charts are completed, doctors have a bias towards under-oxygenation; two-thirds of prescriptions were below medically indicated target saturations in our study. Conversely, oxygen is often over-supplied on delivery, with insufficient focus on down-titrating supply to meet prescribed targets. Due to the counterbalancing nature of these errors, not all the patients at potential risk (75.4%) were at real risk.

The real risk of oxygen therapy to patients in our cohort was still significantly high. 27.7% were over-oxygenated with respect to their risk profiles, thus being at risk of oxygen toxicity. One patient (1.5%) was under-oxygenated and at risk of hypoxia.

Addressing noncompliance with oxygen administration standards is paramount to reduce the high percentage of patients being placed at risk. This study highlights several areas for improvement. Suggested recommendations are listed below, which we plan to implement across our institution.

Recommendations

Oxygen prescription education sessions for doctors and nurses, with emphasis on the frequent review and titration of oxygen supply.

Emphasis on oxygen related documentation in medical and nursing plans; especially regarding a plan for initial prescription.

Use of visual reminders on the ward promoting adherence to prescription standards.

Accountability for failure to adhere to oxygen prescription standards.

Promoting easy access to oxygen prescription charts on the ward

Re-evaluation of oxygen prescription chart and inpatient observation chart design.

A field for target oxygen saturation should be added to the observation chart.

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