The Use of Supplemental Oxygen in the Coronary Care Unit - Completing the Audit Cycle.

K. Ghoorah[1], J. Cam[1], A. Harper[1], D. P. Ripley[2],
N. Swanson[2], M. A. de Belder[2]

1 University of Newcastle Medical School, Framlington Place, Newcastle Upon Tyne, NE2 4HH
2 Cardiology Department, The James Cook University Hospital, Marton Road, Middlesbrough, TS3 4BW
kuldeepa.ghoorah@newcastle.ac.uk

Background

Supplemental oxygen is widely recommended for the management of acute coronary syndromes (ACS). Research on its safety and effectiveness in the management of patients with chest pain however suggests that supplemental oxygen may do more harm than good.

There is no supporting evidence to show that administering oxygen in these patients improves oxygenation of ischaemic myocardial tissue[1,2]. In fact, trial evidence suggests that that the common practice of giving high-flow oxygen in ACS may actually be associated with a greater infarct size resulting in greater morbidity and mortality[3,5,6]. Laboratory studies also suggest that hyperoxaemia from administration of supplemental oxygen may cause coronary vasoconstriction[4].

Although robust clinical evidence is not available, it is recognized that hyperoxaemia may be detrimental in ACS. National Institute for Health and Clinical Excellence (NICE) and British Thoracic Society (BTS) guidelines recommend the use of oxygen therapy in the initial treatment of ACS only if there is evidence of hypoxaemia (Oxygen saturation less than 94%) or signs of heart failure or shock[7,8]. Clinicians should aim at achieving a target saturation of 94-98% for those who are not at risk of hypercapnic respiratory failure or 88-92% for those at risk of hypercapnic respiratory failure. The target saturation should also be written (or encircled) on the drug chart[7,8].

In 2010, an audit was carried out in the coronary care unit (CCU) of The James Cook University Hospital (JCUH). It revealed 45% patients having oxygen administered titrated to saturations according to guidelines with only one patient (6%) having oxygen prescribed.

In view of this discrepancy between current practice and recommended guidelines, changes were implemented. Posters summarizing the relevant BTS/NICE guidelines were displayed on CCU and throughout the cardiothoracic division in an attempt to minimize the use of supplemental oxygen in those patients who are not hypoxaemic and to encourage prescription of oxygen on the drug chart.

Aims and Objectives

To re-audit the use of supplemental oxygen in the CCU with reference to NICE/BTS guidelines and review the prescription of oxygen. To compare findings to the previous audit and to identify areas for improvement and give recommendations.

Methods

This was a prospective, cross-sectional audit in the 14-bed Coronary Care Unit at JCUH. Data were collected on an observational basis at 8am each morning, from the 9th of January to the 25th of January 2012. This provided a 'snap shot' of coronary care patients and their oxygen status over 16 consecutive days.

A data collection proforma recording the same parameters as the original 2010 audit was implemented. Each patient's hospital number, date of birth and sex were recorded and their diagnosis was confirmed. Oxygen administration parameters recorded were as follows: litres of oxygen administered per minute, route of oxygen administration, oxygen saturation prior to and following the use of oxygen, and whether the oxygen had been prescribed in accordance with NICE guidance. Documented features of

heart failure and/or cardiogenic shock were also recorded.

Results

Data from 66 consecutive admissions were collected at 08.00. Forty six (70%) were male and 20 (30%) were female with a mean age of 65 years.

The majority (73%) of admissions during the 14 day period were due to acute coronary syndromes (ACS), comprising ST segment elevation myocardial infarction (STEMI) and non ST segment elevation myocardial infarction (NSTEMI) (Figure 1).

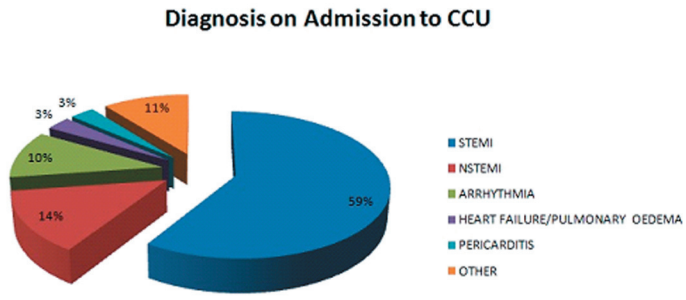

Figure 1: *Diagnoses on CCU during audit period*

A total of 14 patients (21%) received supplemental oxygen during the audit period. Of these patients, 11 (79%) had a diagnosis of ACS, two (14%) a diagnosis of arrhythmia and one (7%) post transcatheter aortic valve implantation (TAVI).

Of the 11 patients admitted with chest pain/acs who were receiving supplemental oxygen, one patient (9%) had an oxygen saturation of ≥94%, and six (55%) had oxygen saturations of less than 94% prior to its administration. Oxygen saturations prior to its supplementation were not documented for the remaining four patients (36%). Oxygen was not prescribed for any patient.

Chest Pain / Acute Coronary Syndrome

Of the data gathered from 66 patients on CCU, 51 (77%) presented with chest pain, or were diagnosed with ACS. Ten of these patients were hypoxaemic with oxygen saturations <94%. According to current guidelines, such patients should receive oxygen supplementation via either nasal cannulae (2-6 l/min) or simple face mask (5-10 l/min), aiming for a target saturation range of 94-98%[8]. Of the ten hypoxaemic patients, only six received supplemental oxygen, with all but one reaching the recommended target saturations.

The oxygen administered to five of these six patients was delivered via the recommended route (nasal cannulae or simple face mask) with one receiving CPAP due to respiratory failure. The remaining four hypoxic patients (3 STEMI, 1 Pericarditis) did not receive supplemental oxygen, despite meeting the current criteria for oxygen treatment[8].

Six of the 51 patients did not have oxygen saturations on room air documented; four of these patients received oxygen. Saturations were elevated above 98% in three out of four of these patients whilst on oxygen. The remaining 35 patients had oxygen saturations on air of ≥94%, of which only one received supplemental oxygen.

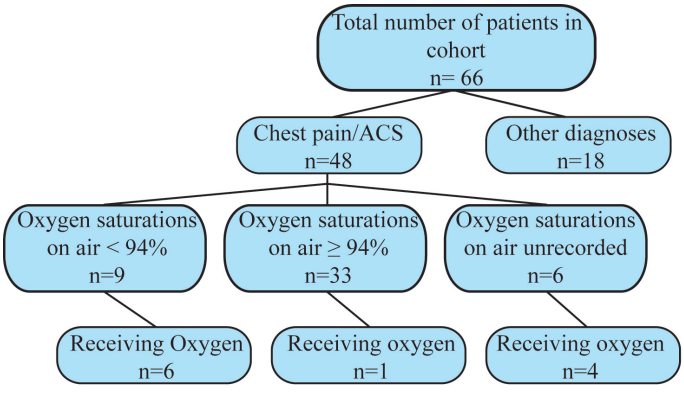

Figure 2: *Diagnosis and oxygen saturations on air of those receiving supplemental oxygen*

With regard to chest pain/ACS patients, the British Thoracic Society guidelines recommend a target SpO2 saturation range between 94 and 98% in hypoxic patients not at risk of developing hypercapnic respiratory failure. Of the six chest pain/ACS patients receiving oxygen, two did not meet the recommended SpO2 target range. However, none of these patients was given supplemental oxygen to the extent of hyperoxaemia; a well-documented cause of coronary vasoconstriction in the setting of ACS[4].

SpO2 ≥94%

Current British Thoracic Society (BTS) guidelines state that the majority of patients with acute coronary syndromes are not clinically hypoxaemic[7]. Indeed, of the 51 patients admitted to CCU with chest pain/ACS during the audit period, 35 (68.6%) had SpO2s ≥94%. Only one of these patients (STEMI, SpO2 94% on air) received supplemental oxygen. This is an improvement over the original audit, in which three ACS patients with SpO2s ≥94% received oxygen. Such practice is of unproven benefit, as reported by Rawles et al[2].

Oxygen Prescription

Oxygen should be prescribed on drug charts except in an emergency. In the event of an emergency, it should be documented retrospectively. The following data should be recorded: mode of delivery, flow (l/min), target SpO2, along with the prescriber's signature. No patient had oxygen prescribed, suggesting that despite clear advice to regard oxygen as a drug, it is not regarded as such in practice.

Limitations

- This audit only looks at the use of supplemental oxygen and its prescription in CCU, which is a high dependency ward. The results and conclusions are not necessarily generalizable to other general cardiology wards or other hospitals especially if their observations/drug charts are designed differently.
- A significant number of patients did not have their oxygen saturations recorded which may bias the results.
- The audit does not take into account the possible administration of oxygen whilst under the care of paramedics/accident and emergency staff.
- The study was not designed to find reasons for non-concordance with current guidelines.

Recommendations

Although this re-audit revealed a reduction in the number of patients receiving oxygen who were not hypoxic, opportunities to provide oxygen to patients with SpO2s <94% remained overlooked. Further education on the safe use of supplementary oxygen may help raise awareness of this important issue, and could be provided at multidisciplinary team meetings and junior doctor teaching sessions or even during trust induction. Oxygen prescribing could also be added as an outcome that needs to be signed off in a junior doctor's logbook or e-portfolio. Furthermore, this audit could be presented during Directorate meetings or on an Audit Day to communicate our findings with various health care professionals. Posters summarizing the findings of this audit will be positioned in CCU and accident and emergency departments to further raise awareness. Finally, a re-audit should be planned in order to monitor any changes in practice.

Conclusion

Traditional teaching suggests that supplemental oxygen should be given in the management of chest pain in the belief that it will help reduce myocardial ischaemia by correcting the oxygen demand. However, there have been numerous

reports of potentially harmful effects of giving supplemental oxygen in patients with ACS in whom the oxygen saturation is normal. This has led to NICE/BTS guidelines which recommend oxygen should not be used routinely and that such practice should be reserved for hypoxaemic patients, as determined by oximetry[7,8]. Despite this, a recent national survey found that only a third of coronary care units adhere to current guidance[9].

The results of this re-audit show that there has been a marginal improvement from 2010 suggesting that the implemented changes have had a positive impact on performance although further education is required to reach the target of 100%. Documentation of oxygen saturations and prescribing on the drug chart remains poor.

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