Oxygen therapy in patients with chest pain of acute onset: single centre audit experience

Introduction: Although oxygen therapy has been commonly used in the treatment of acute coronary syndromes, evidence shows that oxygen administration is not always beneficial to patients with acute chest pain and in certain circumstances may, in fact, be harmful. Hence, several national and international organizations have issued guidelines restricting its use to hypoxic patients only.

Aim: To audit and change the inappropriate practice of administering oxygen therapy indiscriminately to patients with acute chest pain.

Setting: Emergency department, coronary care unit and heart assessment centre in a large teaching hospital.

Methods: The authors identified 100 patients who presented with acute chest pain and collected data on oxygen prescription, administration and documentation from clinical notes and observation charts.

Results: Only 71% of patients in a hospital setting were correctly assessed for requiring oxygen therapy. After introducing local guidelines and a series of lectures, this rose to 94%. A third audit showed sustained change, with 96% of patients being appropriately assessed for needing oxygen therapy.

Discussion: The introduction of local guidelines and a series of lectures improved handling of oxygen in patients presenting with acute chest pain.

Oxygen therapy has been used in the treatment of acute coronary syndromes for over a century as there was a widespread belief that hyperoxaemia increased the amount of oxygen being delivered to the myocardium, improving symptoms as well as minimizing the extent and severity of myocardial ischaemia (Wijesinghe et al, 2009). Evidence showing no benefit of such an approach has existed for over 30 years (Rawles and Kenmure, 1976; Ranchord et al, 2012).

The potential harms of high flow oxygen therapy include a drop in cardiac output and heart rate, a rise in systemic vascular resistance (Park et al, 2010), a decrease in left ventricular perfusion (Bodetoft et al, 2011), and increased release of cardiac enzymes, suggesting a greater infarct size (Rawles and Kenmure, 1976). Hyperoxia can also cause coronary vasoconstriction and decrease coronary blood flow (McNulty et al, 2005) while not improving organ-specific oxygen delivery (Moradkhan and Sinoway, 2010).

The guidelines issued by the National Institute for Health and Clinical Excellence in March 2010 advise that high flow oxygen therapy should not be used routinely but that oxygen saturation should be monitored instead. Oxygen should be offered to patients with oxygen saturation below 94%, aiming for a target oxygen saturation of 94–98%, unless there is a risk of hypercapnic respiratory failure when the target oxygen saturation should be 88–92% until blood gas analysis is available (National Institute for Health and Clinical Excellence, 2010). This recommendation followed an earlier set of guidelines on emergency oxygen use, published by the British Thoracic Society, which also favoured a controlled oxygenation strategy (O'Driscoll et al, 2008).

Despite the guidelines, the authors observed that it was common practice in their university hospital to administer oxygen indiscriminately to patients with chest pain of acute onset.

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Baseline

Initial audit results

In order to quantify this problem the authors identified 100 patients presenting with chest pain of acute onset to the emergency department, coronary care unit and heart assessment centre at their institution between June and July 2010. They assessed the appropriateness of oxygen therapy in a hospital and pre-hospital setting, taking into consideration initial oxygen saturation, appropriate target saturation, received oxygen therapy and oxygen saturation achieved on it. They also assessed its documentation and prescription.

The authors found that only 60% of patients in a pre-hospital setting (n=33) and 71% in a hospital setting (n=71) were correctly assessed for requiring oxygen therapy, which meant that it was given when needed, with the oxygen saturation on oxygen within the target saturation, and not given when not needed (*Table 1*). This translated into 31% of patients in a pre-hospital setting (n=17) and 25% in a hospital setting (n=25) receiving oxygen inappropriately. Where oxygen was given, it was recorded in only 30% of patients' notes (n=9) by doctors and was never prescribed.

Intended improvement

The authors' aim was to facilitate a responsible approach to oxygen therapy and to reduce the potential harm to patients. In order to measure the effectiveness of the intervention they planned a re-audit between April and May 2012 and between February and March 2013.

Methods

Ethical approval

This observational service evaluation was approved by the local audit and clinical governance department and, according to current local practice, formal research ethics committee approval was not needed.

Intervention

In order to address the problem, the authors devised an oxygen therapy flow chart (*Figure 1*), based on the guidelines

Table 1. Patient demographics and audit results

		2010	2012	2013
Number of patients		100	100	105
Patients brought by ambulance		55	47	47
Male		62	57	55
Female		38	43	50
Age (years)		61±16	57±20	52±20
Known chronic obstructive pulmonary disease		9	10	10
Previous carbon dioxide retention		1	0	0
Retention on this admission		1	0	0
Pre-hospital setting	Inappropriate oxygen therapy	31%	13%	2%
	Appropriate assessment for the need of oxygen therapy	60%	81%	96%
Hospital setting	Inappropriate oxygen therapy	25%	1%	3%
	Appropriate assessment for the need of oxygen therapy	71%	94%	96%
	Documentation of oxygen therapy (by doctors)	30%	67%	75%
	Prescription of oxygen	0%	17%	50%

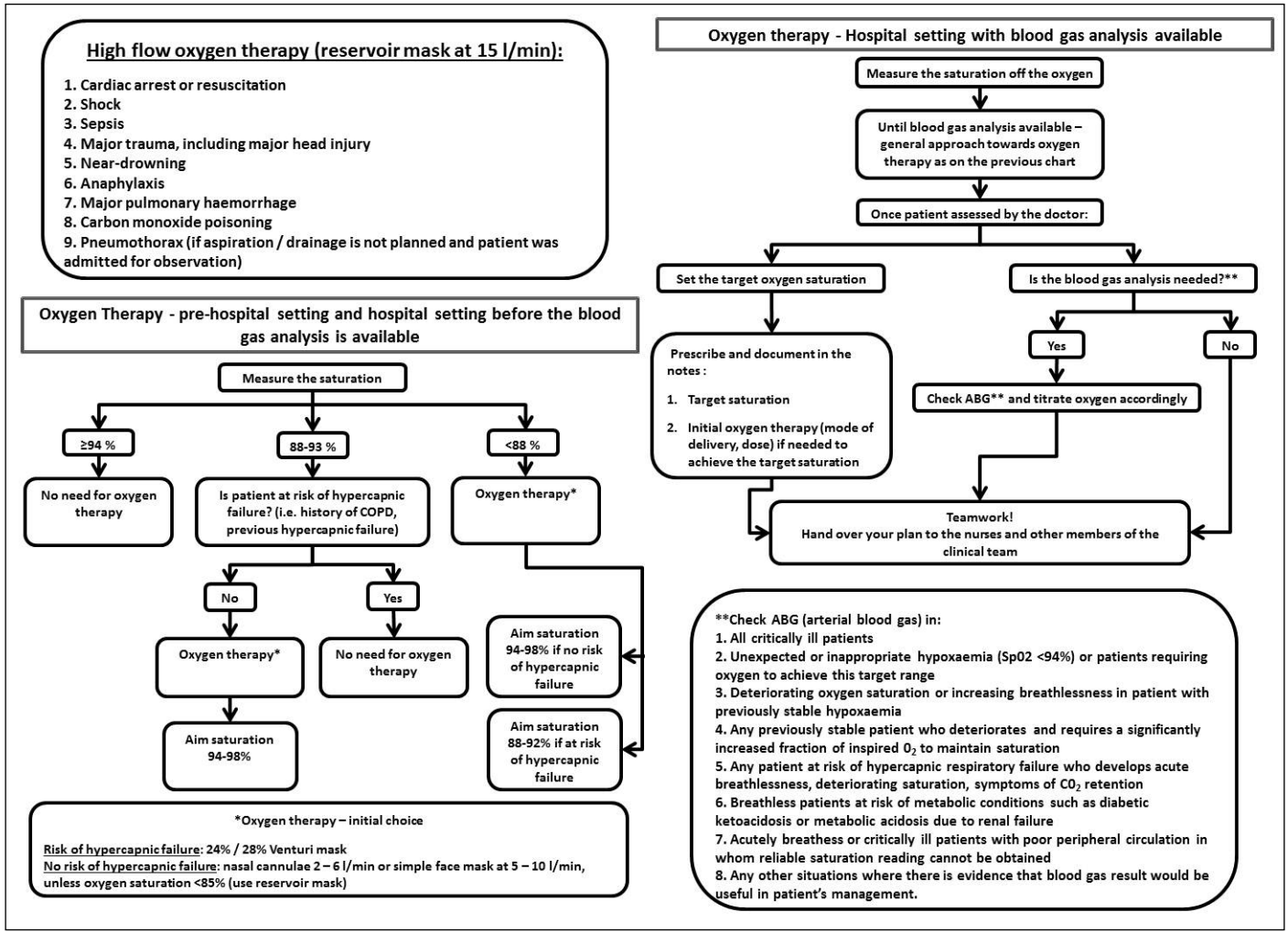
(O'Driscoll et al, 2008). It was published on the hospital intranet and disseminated within the hospital. Furthermore, nine lectures were organized for medical, nursing and auxiliary staff in the emergency department, coronary care unit and heart assessment centre, as these were the staff members most commonly involved in the management of patients with acute chest pain. Staff from the medical assessment unit and cardiology ward were also included.

Each lecture lasted for 1 hour and advised how to use oxygen in an emergency setting, when to use high flow oxygen and when to perform blood gas analysis. It also explained the rationale behind target saturation, the risks of hypercapnic respiratory failure and the potential effects of supplemental oxygen on myocardium.

Re-audit results

Between April and May 2012, oxygen therapy administration, prescription and docu-

Figure 1. Oxygen flowchart. ABG = blood gas analysis; COPD = chronic obstructive pulmonary disease; SpO_2 = oxygen saturation.



mentation was re-evaluated using the same methods. Inappropriate therapy had fallen for both pre-hospital and hospital care (*Table 1*). The authors found that 81% of patients in a pre-hospital setting (*n*=38) and 94% in a hospital setting (*n*=94) were appropriately assessed for requiring oxygen therapy. This meant that only 13% of patients (*n*=6) in a pre-hospital setting and 1% (*n*=1) in a hospital setting were given oxygen incorrectly. The therapy was mentioned in 67% of patients' notes (*n*=4) and it was prescribed for 17% of the patients (*n*=1).

The third audit between February and March 2013 showed a sustained change in practice (*Table 1*). Both in a pre-hospital (*n*=45) and hospital setting (*n*=101), 96% of patients were appropriately assessed for needing oxygen therapy. In the hospital, oxygen therapy was documented in 75% of notes (*n*=3) and prescribed in 50% (*n*=2).

Discussion

Despite the introduction of guidelines on emergency oxygen use in patients with acute chest pain (National Institute for Health and Clinical Excellence, 2010) and the longstanding evidence against the indiscriminate use of it (Rawles and Kenmure, 1976), oxygen therapy was still being used inappropriately. It was apparent that the nursing, medical and auxiliary staff were not aware of the changes in the management of chest pain of acute onset and were following a long-lasting, traditional approach which was not supported by any evidence. Additionally, the documentation and prescription of oxygen therapy was very poor.

Newly introduced local hospital guidelines combined with educational lectures facilitated significant and sustained changes in this approach, especially a dramatic decrease in the number of patients being given oxygen therapy inappropriately in the hospital setting and an overall increase in the amount of patients being appropriately assessed for therapy. A more modest improvement was observed in the prescription and documentation of oxygen therapy. In the lectures which were given, particular emphasis was put on identifying situations where high flow oxygen therapy is crucial, such as cardiac arrest, shock, sepsis, major trauma, anaphylaxis, near drowning, major pulmonary haemorrhage or carbon monoxide poisoning, where oxygen can be a lifesaving treatment. In order to facilitate further improvement in oxygen documentation and prescription, the authors plan to repeat the original teaching programme and to include it in the induction for all new staff members.

Limitations

It was not possible to involve paramedics in this educational programme. The improvement in the pre-hospital setting can be explained by the change in adult life support guidelines (Resuscitation Council (UK), 2010) which endorse controlled oxygenation.

Conclusions

Targeted education aimed at key staff members and the creation of local guidelines allowed improvements to be made in the management of patients presenting with chest pain of acute onset and reduced potentially harmful practices. BJHM

Conflict of interest: none.

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LEARNING POINTS

- For over 30 years evidence has existed showing no benefit of using high flow oxygen therapy indiscriminately in patients with suspected myocardial infarction and acute coronary syndrome.
- Patients with chest pain of acute onset should be monitored closely but oxygen therapy is not required unless the patient is hypoxaemic.
- In myocardial infarction and acute coronary syndrome, aim for an oxygen saturation of 94–98% or 88–92% if the patient is at risk of hypercapnic respiratory failure.
- Targeted education aimed at key staff members and the creation of local guidelines allowed improvements to be made in the management of patients presenting with chest pain of acute onset and reduced potentially harmful practices.

Quality improvement projects

BJHM has launched a new section to encourage the publication and dissemination of findings from quality improvement projects undertaken in a hospital setting. These should follow the Squire guidelines (http://squire-statement.org/assets/pdfs/SQUIRE_guidelines_table.pdf). The article should be no longer than 1800 words with up to two figures or tables and a maximum of 10 references. There should be no more than 4 authors and a statement of contribution for each author should accompany the submission. All submissions should also include ethics form A confirming exemption from ethics submission – this form should be obtained locally from the authors' local research and development or audit office.
Full details for submission are available at www.bjhm.co.uk/BJHM/Brochure/157