Oxygen Therapy in an Acute Exacerbation of COPD

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Acute Exacerbations of COPD and CO2 Retention

- There are several mechanisms thought to be responsible for increased O2 leading to hypercapnia in susceptible individuals:
  - Decreased hypoxic drive
  - Decreased minute ventilation
  - Increased ventilation perfusion mismatch
Hypercapnia

- Hypercapnia leads to:
  - Worsened acidosis
  - Increased systemic vascular resistance
  - Increased blood pressure
  - Decreased cardiac output
  - Reduced coronary, cerebral and renal blood flow
Hyperoxaemia can lead to:
- Hypercapnia
- Absorption atelectasis
- Pulmonary toxicity
- Increased systemic vascular resistance and blood pressure
- Reduced coronary artery blood flow
- Reduced cardiac output
- Reduced cerebral blood flow
- Increased reperfusion injury
“Swimming Between the Flags”
Oxygen should be considered a drug, and should be prescribed.

Oxygen is for hypoxaemia, not breathlessness.

Hypoxaemia is both a marker of risk of poor outcome due to underlying cause, and an independent risk factor of poor outcome.

Major limitation is variable accuracy of pulse oximetry.

The use of unnecessarily high flow O2 to maintain ‘normal’ SpO2 has the potential to delay recognition and treatment for deteriorations.
Recommendations

- Pulse oximetry should be available in all clinical situations where O2 is used.
- Pulse oximetry (including delivery system and flow rate of oxygen) should be documented with other ‘vital signs’.
Recommendations

- ABGs should be considered for:
  - Critically ill patients with cardiorespiratory or metabolic dysfunction
  - Patients with SpO2 < 92%
  - Deteriorating SpO2
  - Patients at risk of hypercapnia
  - Breathless patients where a reliable pulse oximetry can’t be obtained
Recommendations

- In conditions associated with chronic respiratory failure aim for SpO2 88-92%
  - No need for O2 if sats ≥88%
- In other acute medical conditions, aim for SpO2 92-96%
  - No need for O2 if sats ≥92%
Recommendations

• In conditions associated with chronic respiratory failure, the preferred method of administration of bronchodilator is an air-driven nebulizer, or MDI + spacer

• For most patients, nasal cannulae are the preferred method of O2 delivery
A Retrospective Audit

- Wijesinghe et al (2011) carried out a retrospective audit on 250 patients in ED with exacerbation of COPD, who were brought in by ambulance.
- Looking at combined risk of death/assisted ventilation/respiratory failure with O2 administration.
- Oxygen flow rate was recorded in 73% of cases.
- Documentation of room air SpO2 was only recorded in 36.9% of cases.
A Retrospective Audit

- 92% received oxygen $\geq 3\text{L/min}$
- 49% received oxygen $\geq 8\text{L/min}$
  - Or
- 72% received high flow oxygen
- 21% received low flow oxygen

- On arrival to ED
  - 75% patients had SpO2 $> 92$
  - 29% patients had SpO2 $\geq 98$
  - Median PaCO2 on ABG was 54mmHg
  - Median pH on ABG was 7.36
A Retrospective Audit

- Ten patients (4%) died
- In total 31% patients met the outcome criteria
- It was found the risk of adverse outcome rose progressively as the flow rate of oxygen increases
  - This risk was also seen to increase with increasing PaO2
- The results were adjusted for severity of illness, and the association was not due to more unwell patients receiving higher concentrations of oxygen therapy