Use of excessive oxygen in the acutely ill increases mortality rate

In adults who are acutely ill, the liberal use of oxygen supplementation has been found to increase the risk of death compared with conservative oxygen strategies.

A systematic review and meta-analysis published by the National Institute for Health Research (NIHR) and summarised in an NIHR Signal shows that more liberal oxygen therapy increased patient mortality in hospital by about 11 deaths among 1,000 people exposed. The number of deaths continued to be higher 30 days after admission, without any notable improvements in other important health outcomes such as disability, infection and length of hospital stay.

Oxygen therapy is routinely used for acutely ill patients and is often considered by health professionals to be beneficial – or at least harmless. Oxygen therapy is considered appropriate if oxygen levels are low, however, there is increasing concern surrounding the over-use or liberal use of oxygen and its potentially harmful adverse effects.

This NIHR meta-analysis combined international data from 25 randomised controlled trials. The 16,037 participants required non-elective hospital admission for acute illness, which included sepsis, stroke, trauma and myocardial infarction. The trials were generally high-quality and six of them had been conducted in the UK. The meta-analysis did not include studies that focused on chronic respiratory disease.

The studies all compared 'liberal' and 'conservative' oxygen therapy. Treatment to achieve oxygen saturation levels above 94% was labelled ‘liberal’ (median baseline oxygen saturation 96% across trials, range 94-99%) and treatment to produce saturation levels of up to 94% was considered ‘conservative’.

The findings (Box 1) support the conservative use of oxygen therapy – the aim of which is to raise oxygen blood levels to no higher than 94%. This suggests that oxygen therapy should only be considered to produce a lower level of saturation that current guidelines suggest. However, the review did not differentiate between different clinical presentations and professional judgment should be used. The review serves as a reminder that oxygen therapy has significant risks and should be used cautiously.

In the UK, approximately one-third of patients in ambulances and a quarter of patients in emergency rooms are treated with supplemental oxygen. However, oxygen therapy is not always beneficial.

The British Thoracic Society’s guideline for oxygen use in healthcare and emergency settings (BTS, 2017) states that oxygen should be used as a treatment for low blood oxygen, not breathlessness. The guideline recommends immediate high-concentration oxygen for critically ill patients, but that this should be prescribed to achieve target oxygen saturations of 94-98% in most acutely ill patients, and 88-92% in those at risk of hypercapnic (high blood carbon dioxide) respiratory failure.

Despite this recommendation, in clinical practice, between 50% and 73% of critically ill patients in intensive care are given excess oxygen therapy and become hyperoxaemic.

A number of randomised controlled trials exist that compare different oxygen strategies in various acute illnesses, however, this NIHR systematic review is the first that synthesises the information.

The increased mortality observed makes it clear that excessive oxygen treatment should be avoided.

Implications for nursing

To read the full Signal report go to: Bit.ly/NIHRoxygen

References