High-concentration oxygen therapy in COPD

The potential risks of high-concentration oxygen therapy in acute exacerbations (AE) of chronic obstructive pulmonary disease (COPD) were first reported more than 50 years ago. Since that time, high-concentration oxygen treatment has been shown to cause an increase in arterial partial pressure of CO₂ (PaCO₂) in both stable COPD and AECOPD, and, in some patients, the effect can be both rapid and pronounced with an increase in PaCO₂ of more than 20 mm Hg within 60 min. Studies identified that low-concentration oxygen therapy might also cause CO₂ retention, but to a lesser degree than do high concentrations. Rebound hypoxaemia to a PaO₂ lower than that present before the initiation of oxygen therapy can occur if oxygen treatment is abruptly stopped either inadvertently or in response to hypercapnia. In patients with AECOPD transferred by ambulance, the risk of worse clinical outcomes increases progressively with increasing PaO₂ at presentation to the emergency department. By contrast, at initial ambulance pick-up before oxygen is given, progressively higher oxygen saturations are associated with better outcomes.

To add to this evidence, the first randomised trial of high-concentration versus titrated oxygen treatment in the pre-hospital treatment of AECOPD has been published. In this Australian study, paramedics gave 8–10 L/min of oxygen via a non-rebreather face mask and bronchodilator via oxygen-driven nebulisation, or oxygen via nasal prongs titrated to achieve oxygen saturations between 88% and 92% and bronchodilator via air-driven nebulisation. In an intention-to-treat analysis, the risk of death in all patients with suspected AECOPD was significantly reduced by 58% with titrated oxygen treatment. In the subgroup of patients with confirmed COPD, the risk of death was reduced by 78% with titrated oxygen treatment.

Mortality in patients with confirmed COPD given titrated-oxygen treatment in the Australian study (2%) was lower than the overall inpatient mortality reported in the 2003 and 2008 UK national audits of COPD admissions (7.4% and 7.7%, respectively). The fact that the UK overall inpatient mortality rate has not declined during this period, in which there have been advances in inpatient management such as the greater availability of non-invasive ventilation, indicates that it is the management before hospital admission that might be crucial in determination of survival.

Thus, there is now level-1 evidence that controlled oxygen therapy titrated to achieve oxygen saturations of 88–92% substantially reduces the risk of death associated with high-concentration oxygen treatment in AECOPD, and can now be considered the preferred therapeutic regimen, as recommended in the British Thoracic Society guidelines. However, two major obstacles to the implementation of this regimen exist. The first is the requirement to win the hearts and minds of health professionals, such as ambulance paramedics, their medical advisers, and hospital staff. The magnitude of this issue was portrayed in the Australian study, in which more than half of the patients with confirmed COPD randomly assigned to the titrated-oxygen group received high-concentration oxygen at some stage during their ambulance transfer, in violation of the protocol, and despite 1 month of familiarisation and training of health professionals before the commencement of data collection. A major change needs to be made in the entrenched culture and belief that high-concentration oxygen saves lives in acute respiratory and cardiac emergencies in the absence of severe hypoxaemia.

The other potential difficulty is the method of delivery of bronchodilator medications to patients with AECOPD in transit to hospital by ambulance. Because of the unavailability of compressed air in ambulances, bronchodilator treatment is traditionally delivered with nebulisers driven by high-flow oxygen. However, in patients with chronic respiratory failure, a bronchodilator nebulisation driven by oxygen might result in a rise in PaCO₂, during the period of nebulisation. In a prolonged ambulance transfer, with repeated administration of nebulised bronchodilator, this might essentially result in continuous high-concentration oxygen therapy being delivered. Furthermore, a risk exists that high-concentration oxygen via a nebuliser mask might be continued long after the nebulised treatment has been completed. Alternatives include use of air-driven nebulisers with supplemental nasal oxygen, restriction of the time during which oxygen-delivered nebulised bronchodilator is given, or administration of bronchodilator via metered-dose inhaler with a spacer, as recommended by British guidelines.
Thus, the jury is in—the routine use of high-concentration oxygen therapy in AECOPD is contra-indicated. The preferred initial regimen is to titrate oxygen treatment to achieve an oxygen saturation of 88–92%, thereby avoiding the risks of both hypoxaemia and hyperoxaemia. The challenge will be to achieve a paradigm shift in practice. Anything less than adoption of the British guidelines can now be considered professionally and ethically unacceptable.

*Richard Beasley, Mitesh Patel, Kyle Perrin, B Ronan O’Driscoll
Medical Research Institute of New Zealand, Private Bag, Wellington 6242, New Zealand (RB, MP, KP); Capital and Coast District Health Board, Wellington, New Zealand (RB, KP); and Manchester Academic Health Sciences Centre, University of Manchester, Salford Royal University Hospital, Salford, UK (BRO’D) richard.beasley@mrinz.ac.nz

BRO’D was co-chair of the British Thoracic Society emergency oxygen guideline development group. We declare that we have no conflicts of interest.


Global anti-smoking campaigns urgently needed

Mass-media campaigns about the harms of tobacco can induce quitting and prevent young people from taking up the habit, especially if implemented as part of a comprehensive tobacco-control programme. In many developed countries, anti-tobacco public-education campaigns have been a regular feature of these efforts. As a consequence, basic awareness of the harms is high although many users are still unaware of the full extent of their risk.

WHO recently published its 2011 report on the global tobacco epidemic, which includes the first-ever systematic assessment of anti-tobacco public-education campaigns implemented globally. The report reveals that only a quarter of the world’s population was exposed to at least one high-quality campaign during the reporting period.

Although these results are promising, much more needs to be done: 72% of the world’s population was not exposed to even one best-practice campaign. In nearly 150 countries, including 110 low-income and middle-income countries, there is a paucity of any anti-tobacco public education via mass media. This absence is troubling, because tobacco use is the leading cause of preventable death globally, and the overwhelming burden of tobacco-related deaths and diseases is shifting toward the world’s poorest populations. In view of the aggressive marketing practices adopted by the tobacco industry in many poor countries, the need to counter industry propaganda is all the more urgent.

There is good news, however: Of the 23 countries reporting at least one best-practice campaign, 16 were low income or middle income. These findings suggest that mass media need not be a tool of only rich governments of developed countries.

Understanding what is effective is critical, and in its report WHO used an established framework to make this determination. Campaigns were considered most likely to be effective if they included message pretesting, adequate media planning and delivery to reach target audiences through the optimum combination of reach and frequency, publicity to make sure the campaign also received media coverage, and an evaluation to assess whether the campaign’s objectives were met. WHO also used a minimum campaign-duration standard in its assessment: a campaign had to be run over a minimum of one short-burst 3-week period.

W

Published Online July 8, 2011
DOI:10.1016/S0140-6736(11)61058-1