

- Research

# Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomised controlled trial



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## Abstract

**Objectives** To compare standard high flow oxygen treatment with titrated oxygen treatment for patients with an acute exacerbation of chronic obstructive pulmonary disease in the prehospital setting.

**Design** Cluster randomised controlled parallel group trial.

**Setting** Ambulance service in Hobart, Tasmania, Australia.

**Participants** 405 patients with a presumed acute exacerbation of chronic obstructive pulmonary disease who were treated by paramedics, transported, and admitted to the Royal Hobart Hospital during the trial period; 214 had a diagnosis of chronic obstructive pulmonary disease confirmed by lung function tests in the previous five years.

**Interventions** High flow oxygen treatment compared with titrated oxygen treatment in the prehospital (ambulance/paramedic) setting.

**Main outcome measure** Prehospital or in-hospital mortality.

**Results** In an intention to treat analysis, the risk of death was significantly lower in the titrated oxygen arm compared with the high flow oxygen arm for all patients (high flow oxygen n=226; titrated oxygen n=179) and for the subgroup of patients with confirmed chronic obstructive pulmonary disease (high flow n=117; titrated n=97). Overall mortality was 9% (21 deaths) in the high flow oxygen arm compared with 4% (7 deaths) in the titrated oxygen arm; mortality in the subgroup with confirmed chronic obstructive pulmonary disease was 9% (11 deaths) in the high flow arm compared with 2% (2 deaths) in the titrated oxygen arm. Titrated oxygen treatment reduced mortality compared with high flow oxygen by 58% for all patients (relative risk 0.42, 95% confidence interval 0.20 to 0.89; P=0.02) and by 78% for the patients with confirmed chronic obstructive pulmonary disease (0.22, 0.05 to 0.91; P=0.04). Patients with chronic obstructive pulmonary disease who received titrated oxygen according to the protocol were significantly less likely to have respiratory acidosis (mean difference in pH 0.12 (SE 0.05); P=0.01; n=28) or hypercapnia (mean difference in arterial carbon dioxide pressure -33.6 (16.3) mm Hg; P=0.02; n=29) than were patients who received high flow oxygen.

**Conclusions** Titrated oxygen treatment significantly reduced mortality, hypercapnia, and respiratory acidosis compared with high flow oxygen in acute exacerbations of chronic obstructive pulmonary disease. These results provide strong evidence to recommend the routine use of titrated oxygen treatment in patients with breathlessness and a history or clinical likelihood of chronic obstructive pulmonary disease in the prehospital setting.

**Trial registration** Australian New Zealand Clinical Trials Register ACTRN12609000236291.

## Footnotes

- We thank the patients who participated in the study, the clinical and clerical staff of the Tasmanian Ambulance Service and emergency department at the Royal Hobart Hospital, laboratory staff at the Royal Hobart Hospital, and members of the respiratory department at the Royal Hobart Hospital, whose participation made this project possible.
- Contributors: MAA contributed to the concept and design of the trial, recruitment and training of paramedics, implementation and management of the trial, analysis and interpretation of data, and writing of the report. KEW contributed to management of the trial, data management, data analysis and interpretation, and writing the report. LB advised on data analysis and interpretation and reviewed the report. EHW contributed to data interpretation and reviewed the report. RW-B contributed to the concept and design of the trial, data interpretation, and writing the report. MAA is the guarantor.
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- Competing interests: All authors have completed the Unified Competing Interest form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf) (available on request from the corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.
- Ethical approval: The Human Research Ethics Committee (Tasmania) Network approved this study (study number H0008413).
- Data sharing: The statistical code and dataset are available from the corresponding author at [maaustin@utas.edu.au](mailto:maaustin@utas.edu.au).

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