Pre-hospital non-invasive ventilation for acute respiratory failure: a systematic review and cost-effectiveness evaluation

Abdullah Pandor,[1] Praveen Thokala,[1] Steve Goodacre,[1]* Edith Poku,[1] John W Stevens,[1] Shijie Ren,[1] Anna Cantrell,[1] Gavin D Perkins,[2] Matt Ward[3] and Jerry Penn-Ashman[3]

[1]School of Health and Related Research (ScHARR), University of Sheffield, Sheffield, UK
[2]Critical Care Medicine, University of Warwick, Coventry, UK
[3]West Midlands Ambulance Service NHS Foundation Trust, West Midlands, UK

*Corresponding author

Declared competing interests of authors: none

Published June 2015
DOI: 10.3310/hta19420

Plain English summary

Pre-hospital non-invasive ventilation for acute respiratory failure

Health Technology Assessment 2015; Vol. 19: No. 42
DOI: 10.3310/hta19420

NIHR Journals Library www.journalslibrary.nihr.ac.uk

Plain English summary

Acute respiratory failure occurs when heart or lung disease leads to the patient being unable to maintain oxygen levels in their blood. It can be treated with non-invasive ventilation (NIV), which involves delivering oxygen under increased pressure through a tight-fitting face mask. There are two types of NIV: continuous positive airway pressure (CPAP) provides constant pressure, while bilevel inspiratory positive airway pressure (BiPAP) increases pressure as the patient breathes in. NIV (usually CPAP) provided by paramedics in an ambulance on the way to hospital is known as pre-hospital NIV.

This study aimed to find out if pre-hospital NIV reduces the risk of a patient with acute respiratory failure dying or needing to be put on a ventilator, and if the costs required to set up and run pre-hospital NIV are justified by the improvements in patient health. We did this by collecting and analysing all the available research into pre-hospital NIV and by developing a cost-effectiveness model.

We found 10 studies that showed that pre-hospital CPAP appears to reduce the risk of dying or being put on a ventilator, while the effect of pre-hospital BiPAP is uncertain. The cost-effectiveness model showed that providing pre-hospital CPAP would cost an ambulance service an extra £235,683–582,300 per year. It was uncertain whether or not this represented value for money for the NHS. Cost-effectiveness depended on the number of people who could receive, and benefit from, pre-hospital NIV each year. More research is needed to find out how many people can receive pre-hospital NIV and how much they benefit from it.

Health Technology Assessment

HTA/HTA TAR

ISSN 1366-5278 (Print)

ISSN 2046-4924 (Online)

Impact factor: 5.116

Health Technology Assessment is indexed in MEDLINE, CINAHL, EMBASE, The Cochrane Library and the ISI Science Citation Index.

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) (www.publicationethics.org/).

Editorial contact: nihredit@southampton.ac.uk

The full HTA archive is freely available to view online at www.journalslibrary.nihr.ac.uk/hta. Print-on-demand copies can be purchased from the report pages of the NIHR Journals Library website: www.journalslibrary.nihr.ac.uk

Criteria for inclusion in the *Health Technology Assessment* journal

Reports are published in *Health Technology Assessment* (HTA) if (1) they have resulted from work for the HTA programme, and (2) they are of a sufficiently high scientific quality as assessed by the reviewers and editors.

Reviews in *Health Technology Assessment* are termed 'systematic' when the account of the search appraisal and synthesis methods (to minimise biases and random errors) would, in theory, permit the replication of the review by others.

HTA programme

The HTA programme, part of the National Institute for Health Research (NIHR), was set up in 1993. It produces high-quality research information on the effectiveness, costs and broader impact of health technologies for those who use, manage and provide care in the NHS. 'Health technologies' are broadly defined as all interventions used to promote health, prevent and treat disease, and improve rehabilitation and long-term care.

The journal is indexed in NHS Evidence via its abstracts included in MEDLINE and its Technology Assessment Reports inform National Institute for Health and Care Excellence (NICE) guidance. HTA research is also an important source of evidence for National Screening Committee (NSC) policy decisions.

For more information about the HTA programme please visit the website: http://www.nets.nihr.ac.uk/programmes/hta

This report

The research reported in this issue of the journal was funded by the HTA programme as project number 11/36/09. The contractual start date was in October 2012. The draft report began editorial review in October 2013 and was accepted for publication in January 2015. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors' report and would like to thank the reviewers for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report.

This report presents independent research funded by the National Institute for Health Research (NIHR). The views and opinions expressed by authors in this publication are those of the authors and do not necessarily reflect those of the NHS, the NIHR, NETSCC, the HTA programme or the Department of Health. If there are verbatim quotations included in this publication the views and opinions expressed by the interviewees are those of the interviewees and do not necessarily reflect those of the authors, those of the NHS, the NIHR, NETSCC, the HTA programme or the Department of Health.

Published by the NIHR Journals Library (www.journalslibrary.nihr.ac.uk), produced by Prepress Projects Ltd, Perth, Scotland (www.prepress-projects.co.uk).