During a stroke event, hypoxic changes can occur slowly enough in some patients to suggest that the close management of factors designed to maintain oxygenation might be beneficial. Intensive stroke management protocols and antiplatelet therapy have been established on this basis with some success. Hyperbaric oxygen therapy (HBOT) was first proposed as an adjunct in the treatment of ischemic stroke 40 years ago because of the ability of this therapy to deliver a greatly increased partial pressure of oxygen to the tissues.1

HBOT is the therapeutic administration of 100% oxygen at pressures >1 atmosphere (101.3 kPa). Typically, treatments involve pressurization to between 152 and 304 kPa for periods between 60 and 120 minutes daily. The potential benefits of HBOT include a reduction of cerebral edema, decreased lipid peroxidation, inhibition of leukocyte activation, and restoration of the functional blood–brain barrier.2,3 Conversely, oxygen in high doses may increase oxidative stress through the production of oxygen free-radical species, and the brain is particularly at risk.4

Objective
The objective was to evaluate the effectiveness and safety of HBOT as an adjunctive therapy for the treatment of acute ischemic stroke.

Methods
We performed a sensitive electronic search of multiple reference databases in late 2004, including Medline (Ovid), Cochrane Stroke Group Trials Registry, the Database of Randomized Controlled Trials in Diving and Hyperbaric Medicine,5 and EMBASE. The reference lists of retrieved articles were also searched for further clinical trials. No language restrictions applied. We included all randomized controlled trials that compared the effect of adjunctive HBOT with either no treatment or sham and in which death or functional scales were assessed as outcomes. Two authors using standardized forms extracted the data independently, and each included trial was assessed for internal validity with differences resolved by discussion.

Main Results
Three small randomized controlled trials (total 106 participants) were included in analysis. There were no statistically significant differences in mortality rate at 3 to 6 months in those receiving HBOT compared with control (relative risk, 0.61; 95% CI, 0.17 to 2.2; \( P = 0.45 \); Figure). Two of 15 scale measures of disability or function indicated an improvement after HBOT, both at 1-year follow-up; the mean Trouillas Disability Scale was lower with HBOT (mean difference [MD] 2.2 points; 95% CI, 0.15 to 4.3; \( P = 0.04 \)), and the mean Orgogozo Scale was higher (MD, 27.9 points; 95% CI, 4.0 to 51.8; \( P = 0.02 \)). These improvements were not evident in previous assessments nor reflected in the other 13 functional scales recorded.

Conclusions
Implications for Practice
In the 3 small trials published there is insufficient evidence to suggest that HBOT significantly affects outcome after acute ischemic stroke. The routine use of HBOT in stroke patients cannot be justified by this review.

Implications for Research
Given the small number of participants in the trials included, we cannot be certain that a benefit from HBOT has been excluded. Although there is a case for further trials, such investigations would need to be carefully planned. More information may be useful on a subset of disease severity and the timing of therapy. The effect of differing oxygen dosage and of other therapies administered simultaneously is not known.

Note: The full text, data tables, analyses, results, and reference list of this article are available in the Cochrane Library. The full text article should be cited as: Bennett MH, Wasiak J, Schnabel A, Kranke P, French C. Hyperbaric oxygen therapy for acute ischemic stroke. The Cochrane Database of Systematic Reviews 2005, Issue 3. Art. No.: CD004954. DOI: 10.1002/14651858.CD004954.pub2.

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From the Department of Diving and Hyperbaric Medicine (M.H.B.), Prince of Wales Hospital, Randwick, NSW, Australia; Burns, The Alfred Hospital Melbourne (J.W.), Australia; Department of Neurology (C.F.), Prince of Wales Hospital, Randwick, NSW, Australia; Department of Anesthesiology (P.K.), University Hospital Wü rzburg, Germany; and University of Wü rzburg (A.S.), Germany.
Correspondence to Michael H. Bennett, Prince of Wales Hospital, Barker St, Randwick, NSW 2031, Australia. E-mail m.bennett@unsw.edu.au
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The Cochrane Library is available at: http://www3.interscience.wiley.com/cgi-bin/mrwhome/106568753/HOME. Reprints of the full-text version are available online from this site.

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**Disclosures**

None.

**References**


**Key Words:** brain infarction  hyperbaric oxygenation  meta-analysis

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![Image of a table with study outcomes and meta-analysis data. The table shows a meta-analysis of death at 3 to 6 months after stroke with and without adjunctive HBOT.]

Death at 3 to 6 months after stroke. Relative risk of death 3 to 6 months after stroke with and without adjunctive HBOT.
Hyperbaric Oxygen Therapy for Acute Ischemic Stroke
Graeme J. Hankey, Michael H. Bennett, Jason Wasiak, Christopher French, Peter Kranke and Alexander Schnabel

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