How would British stroke physicians diagnose and treat hypoxia in patients with acute stroke?

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Abstract

There is no evidence from randomised controlled trials to guide oxygen treatment after stroke. This survey aims to establish a snapshot of views of clinicians on best current practice relating to the management of hypoxia early after acute stroke.

A postal questionnaire was sent to all 231 members of the British Association of Stroke Physicians (BASP). For 88% of the 130 respondents the decision to give oxygen was guided by the oxygen saturation, and for 67% it was guided by clinical criteria. The mean cut-off for oxygen supplementation suggested was ≤ 93% SD 2 (range 85–98%). Sixty-seven respondents would give oxygen by nasal cannulae and 74 via face mask. The oxygen concentration selected was 24% (n=17), 28% (n=31), 35% (n=15), 40% (n=3) and 100% (n=3).

This shows there is wide variation amongst stroke physicians about when to start oxygen, how much to give and by which route. There is a need for a randomised clinical trial to guide oxygen therapy after acute stroke.

Key words: hypoxia, acute stroke, diagnosis, treatment.

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Introduction

The American Heart Association guidelines for the management of patients with acute ischaemic stroke[1] state that "maintaining adequate tissue oxygenation is of great importance during periods of acute cerebral ischaemia in order to prevent hypoxia and potential worsening of the neurological injury." They also state that "patients with acute stroke should be monitored with pulse oximetry with a target oxygen saturation level of ≥ 95% (level V)" and that "supplemental oxygen should be administered if there is evidence of hypoxia". The European Stroke Initiative Recommendations declare that "adequate blood oxygenation with normal respiratory function is required for stroke management, although there is no convincing prospective clinical evidence that oxygen supply at low flow rates is useful in human brain infarction".[2] There is no express guidance on oxygen treatment in the UK National Clinical Guidelines for Stroke.[3] Thus, while management of hypoxia is considered an important aspect of acute stroke care, uncertainty remains as to when and how to treat.

This questionnaire survey establishes views of clinicians on best current practice relating to the management of hypoxia during the first few days after acute stroke.

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Methods

A two-page questionnaire with questions relating to diagnosis and treatment of hypoxia was sent to all members of the British Association of Stroke Physicians (BASP, n=231). Respondents were instructed to record their views on what should be best current practice rather than to report actual practice.

Results

Baseline demographic data of the respondents

One hundred and thirty completed questionnaires were returned. Ninety-three respondents (72%) were consultants, 11 (8%) were specialist registrars, four (3%) were staff grades, four (3%) were from other professions and 18 (14%) did not mark any reply option. The majority (n=93, 72%) were geriatricians, 18 (14%) were neurologists, two (2%) were both, eight (6%) were general physicians, and nine (7%) were other specialists. Ninety-five (73%) of the respondents regularly looked after patients on a stroke unit, 11 (8%) did so in the past, and 16 (12%) did not have past or present experience of looking after patients on a stroke unit.

Which patients should receive oxygen after a stroke?

Eight (6%) respondents would give oxygen to all patients, 118 (91%) would give it for specific indications, four (3%) did not respond to this question, and nobody stated that oxygen should not be given. One hundred and fourteen (88%) replied that the decision to give oxygen should be guided by the oxygen saturation, and 87 (67%) thought that the decision should be guided by clinical criteria (table 1). The mean cut-off value for oxygen supplementation suggested by respondents was ≤ 93% SD 2

Table 1. Clinical criteria for giving oxygen to patients with acute stroke

List of potential criteria for giving oxygen	Number (%) of respondents who agreed
Cyanosis	75 (86%)
Dyspnoea	74 (85%)
Heart failure	79 (91%)
Pneumonia	82 (94%)
Chronic obstructive pulmonary disease	77 (89%)
Pulmonary embolism	82 (94%)
Coma	63 (72%)
Drowsiness	56 (64%)
Severe stroke	50 (57%)
Lacunar syndrome	33 (40%)
Total anterior circulation syndrome	35 (40%)
Partial anterior circulation syndrome	34 (39%)
Posterior circulation syndrome	35 (40%)

(median 94%, range 85–98%). A scatter plot of the replies (figure 1) shows that the majority of respondents chose either 90% or 95%, with some lying in-between and few above and below.

How much oxygen should be given, by which route and for how long?

Sixty-seven (52%) respondents would give oxygen by nasal cannulae. Of these, two (3%) would prescribe a flow rate of 1 L/min, with 54 (81%), 2 (3%), and 8 (12%) prescribing a flow rate of 2 L/min, 3 L/min and 4 L/min, respectively. One respondent did not specify the flow rate. Seventy-four respondents chose oxygen supplementation via face mask at a concentration of 24% (n=17, 23%), 28% (n=31, 42%), 35% (n=15, 20%), 40% (n=3, 4%), 60% (n=5, 7%) and 100% (n=3, 4%). Some respondents opted for both options. Some respondents (57%) did not specify a standard duration of oxygen treatment but would use individual clinical criteria. One (0.7%) would use it for < 24 hours, 11 (8%) for 24 hours, 16 (12%) for 48 hours, and 10 (8%) for 72 hours.

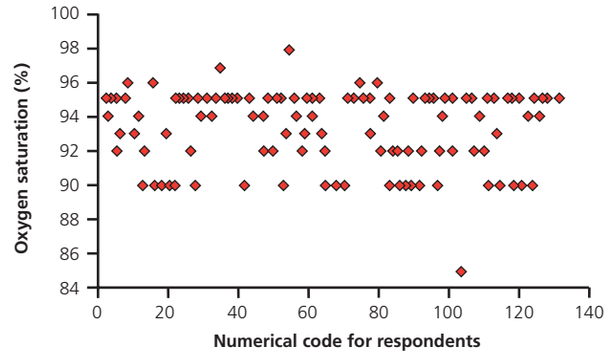
Use of diagnostic tests

Most respondents (n=108, 83%) would perform pulse oximetry in all patients, 14 (11%) in selected patients and nobody considered it unnecessary. Most would check blood gases in selected patients (n=111, 85%), seven (5%) considered blood gases unnecessary, and none would do blood gases in all patients. A routine chest X-ray was considered necessary in all patients by 74 (57%), necessary in selected patients by 46 (35%) and not necessary by four (3%) respondents.

Use of mechanical ventilation

Sixty-one (47%) respondents would consider this in exceptional cases, 40 (31%) in some cases, seven (5%) in most cases, and 16 (12%) respondents would not consider mechanical ventilation for stroke patients.

Figure 1. Oxygen saturation cut-off values for starting oxygen supplementation in patients with acute stroke



Discussion

Most respondents would perform pulse oximetry in all, and arterial blood gases in selected stroke patients. There is, however, much less agreement as to what to do with the results. The suggested cut-off value for oxygen saturation below which oxygen supplementation should be considered ranged from as low as 85% to as high as 98%. The majority of respondents chose either a cut-off of 90% (which is the same as that suggested by the American College of Chest Physicians, and the National Heart, Lung and Blood Institute Consensus Conference on Oxygen therapy)[4] or chose 95% (which represents the mean oxygen saturation of a healthy older person).[5] Although nasal cannulae are better tolerated than oxygen masks, more stroke physicians chose oxygen supplementation via mask than via nasal cannulae. There was also a wide range of opinion on how much oxygen should be given, with most opting for 24% or 35% and some choosing concentrations up to 100%.

There is only one controlled clinical study of oxygen treatment after acute stroke.[6] This study was quasi-randomised and showed that routine oxygen supplementation at a flow rate of 3 L/min for the first 24 hours after the stroke did not improve outcome in unselected stroke patients. However, there are several theoretical reasons to advocate oxygen supplementation: the cells in the ischaemic penumbra are vulnerable, and may deteriorate when exposed to even mild hypoxia. In healthy brains, mild hypoxia is compensated by increased blood flow and vasodilatation,[7] but in the ischaemic area, the vessels are either already maximally dilated or blocked, and cannot increase flow.[8] Hypoxia is often intermittent, and may be missed even with tight oxygen monitoring, exposing patients who are not given oxygen to the risk of hypoxia.[9]

There is general agreement that hypoxia needs to be managed well after acute stroke, but no evidence from clinical trials on how to do it. Randomised controlled trials are needed to establish which patients should be given oxygen, how much, and for how long.

Key messages

- There is uncertainty as to when and how to treat stroke patients with oxygen
- Some stroke physicians are guided by oxygen saturation and some are guided by clinical criteria
- More stroke physicians chose oxygen supplementation via mask than via nasal cannulae
- Randomised controlled clinical trials should determine guidance for oxygen therapy after acute stroke

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Conflict of interest

None declared.

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