Emergency use of nebulised bronchodilator drugs in British hospitals

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ABSTRACT A telephone survey was conducted to determine the emergency use of nebulised bronchodilator drugs by the registrar or senior house officer on duty for medical admissions at 67 British hospitals. All used a nebulised β agonist (usually 5 mg salbutamol) as first line treatment for severe acute asthma or reversible obstructive lung disease. Twenty three doctors used ipratropium bromide occasionally and 38 used it frequently, usually mixing ipratropium and a β agonist in the nebuliser chamber. Only five doctors routinely specified whether the nebuliser should be driven by air or by oxygen. In the case of a hypercapnic patient with chronic bronchitis, 11 respondents would not specify which gas should be used and a further 14 would use oxygen, a potentially dangerous practice. In the case of a hypoxic asthmatic patient, 22 doctors would not prescribe oxygen as the driving gas. The driving gas flow rate was almost invariably determined by nursing staff. Intravenous aminophylline was used by all 67 respondents (52 of them frequent users) but only 24 used intravenous β agonists (five of them frequent users). It is concluded that nebulised bronchodilator drugs are the most commonly used treatment for acute asthma and reversible obstructive lung disease in hospital, but further instruction in their use is required for the staff who use them most frequently.

Although nebulised bronchodilator drugs are widely used for the emergency treatment of acute asthma, there have been few surveys of their use in British hospitals. A recent study in four Cardiff hospitals found that techniques and dosages varied widely from ward to ward and both medical and nursing staff displayed a poor understanding of correct nebuliser use.1 A postal survey of 67 chest physicians also revealed great variation in recommended doses of nebulised β agonists, diluent volumes, and flow rates and in the choice of propellant gas.2

Ipratropium bromide has been proposed as a useful additional bronchodilator in acute severe asthma3–5 and a recent review of this condition suggested that it should be used as a second line agent when salbutamol alone proves insufficient.6 The extent to which ipratropium is used in British hospitals and its relationship to the use of β agonists is unknown. We conducted a survey of nebuliser use by the doctors on duty for emergency medical admissions in 67 British hospitals.

Methods

Sixty seven hospitals were contacted by telephone to determine the prescribing habits of the medical registrar on duty for emergency admissions. The senior house officer (SHO) was contacted if the registrar was busy or unavailable. At least two hospitals from each English regional health authority were studied, along with five Scottish and four Welsh hospitals. Twenty four undergraduate teaching hospitals, four postgraduate centres, and 39 district general hospitals were included.

Each doctor was asked a standard series of questions concerning nebulised and injected bronchodilator drugs (see appendix). The telephone questionnaire was brief, to achieve a high response rate among busy staff on emergency duty. Questions concerning nebuliser chamber types and volume of diluent were omitted since this information has been reported elsewhere.1 2

Results

The response to the telephone questionnaire was 100% (54 registrars, 13 SHOs). All 67 doctors used
nebulised $\beta$ agonists as first line treatment in acute severe asthma and reversible obstructive lung disease. The usual dose of salbutamol and terbutaline was 5 mg (table).

Most respondents also used ipratropium bromide on some occasions at least—two always, 36 frequent, 23 rarely, six never; the most common dose was 0.25 mg (table). Twenty-nine respondents were more likely to use this drug if they considered that the patient had an acute exacerbation of chronic bronchitis. Thirty-one of those who used ipratropium bromide, including 24 of the 38 regular users, routinely mixed ipratropium and a $\beta$ agonist in the same nebuliser chamber. A further six did not know whether their nursing staff mixed the drugs.

Only five of 67 doctors routinely specified whether the nebuliser should be driven by oxygen or by compressed air, but on direct questioning 45 stated that they would prefer to give oxygen to hypoxic asthmatic patients and 42 that they would prefer to use air for bronchitic patients with known hypercapnia. Most respondents, however, admitted that even in these cases the choice of propellant gas was frequently left to the nursing staff.

Only one of the first 30 respondents specified a flow rate when writing a prescription for a nebulised drug, so this question was deleted from the remaining questionnaires. Of the 29 doctors who did not specify a flow rate, only eight believed that a flow rate of six or more litres a minute should be used.

If an injected bronchodilator was required, all 67 doctors used intravenous aminophylline (52 of them were frequent users) and 24 used intravenous $\beta$ agonists in some cases (five of them frequent users). None of those questioned had ever given $\beta$ agonists by the subcutaneous route.

### Discussion

The use of a doctor to doctor telephone interview achieved a 100% response rate and ensured that the prescribing habits studied were those of the doctors who were directly responsible for the management of asthmatic patients admitted to hospital. A telephone survey has a further advantage over a postal survey as the answers are more likely to reflect the doctor’s present practice accurately without the bias which might occur if there were time for discussion with colleagues or reference to books. The hospitals studied were distributed throughout the British mainland, so the results reflect the bronchodilator treatment given to patients with acute severe breathlessness associated with airflow obstruction on admission to British hospitals in early 1986.

We have confirmed that inhaled nebulised $\beta$ agonists are the standard first line treatment for acute severe asthma and obstructive lung disease. The doses given are within the recommended range, although the frequency of administration was not studied and so total daily doses could not be estimated.

Several studies have shown that the addition of a nebulised anticholinergic drug can produce further bronchodilation in patients with acute severe asthma already receiving nebulised $\beta$ agonist. These studies justify the frequent use of nebulised ipratropium bromide by 57% of the survey respondents. The more frequent use of ipratropium in bronchitic patients is also supported by published reports.

The manufacturers of salbutamol and ipratropium bromide were unable to comment on the safety and efficacy of mixing the two drugs in a nebuliser chamber, though the combination was effective in two published studies and the present survey shows that this mixture is in widespread use. The Committee on Safety of Medicines (personal communication) is aware of only three adverse responses to such a mixture, and in every case the now obsolete hypotonic solution of ipratropium was used. In two cases the solution was rendered even more hypotonic by the addition of sterile water as diluent.

A disturbing feature of this survey was the failure of the prescribing doctor in most instances to specify whether air or oxygen should be used to drive the nebuliser. Nine doctors would use air as a driving gas for hypoxaemic patients with asthma, depriving them of oxygen treatment for 10–15 minutes at the time when it is most needed. Fourteen of those interviewed would use oxygen to drive the nebuliser for potentially hypercapnic bronchitis patients and a further 11 left the choice of driving gas to nursing staff. This would usually result in the use of oxygen. Gunawardena et al have shown the danger of giving a nebuliser driven by oxygen to patients with carbon dioxide retention. Several of the doctors interviewed spontaneously reported that they had seen serious hypercapnia caused by oxygen driven nebulisers and three doctors mentioned instances in which death was probably precipitated by carbon dioxide.
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retention that occurred while the patient was being treated with a nebuliser driven by oxygen.

The doses of injected bronchodilator drugs and steroids were not studied in this survey, but we did ascertain that when injected bronchodilator was required aminophylline was the usual choice. Injected β agonists are strongly recommended in the British National Formulary, but only five doctors regularly gave intravenous salbutamol or terbutaline and none had given these drugs by subcutaneous injection.

Nebulisers provide a relatively new method of drug delivery and it is apparent that most doctors and nurses have little or no formal training in their use. We would suggest that guidelines for nebuliser use should be drawn up by the chest physician at each hospital and circulated to medical and nursing staff. In particular, the use of oxygen to drive nebulisers should be mandatory for young patients who clearly have asthma; but air, or, if facilities are available, low controlled concentrations of oxygen should be used in patients at risk from hypercapnia.

Appendix: Questionnaire

1  (a) Do you use nebulised salbutamol or terbutaline in the treatment of acute asthma and reversible obstructive lung disease?
   (b) How often?
       Always / Frequently / Rarely / Never
   (c) Which β agonist do you use?
   (d) What dose do you usually use?

2  (a) Do you use nebulised ipratropium bromide in these cases?
   (b) How often?
       Always / Frequently / Rarely / Never
   (c) What dose do you normally use?
   (d) Do you give β agonists and ipratropium separately or as a mixture?
   (e) Do you give asthmatics and bronchitis patients the same nebulised therapy? If different, state differences .................

3  (a) Do you use intravenous aminophylline in acute severe asthma?
   (b) How often?
       Always / Frequently / Rarely / Never

4  (a) Do you use intravenous salbutamol / terbutaline in acute severe asthma?
   (b) How often?
       Always / Frequently / Rarely / Never

5  (a) Do you use subcutaneous salbutamol / terbutaline in acute severe asthma?
   (b) How often?
       Always / Frequently / Rarely / Never

6  (a) Do you routinely specify whether the nebuliser should be driven by oxygen or by compressed air?
   (b) In the case of a hypoxic asthmatic patient would you specify oxygen or air as the driving gas?
   (c) In the case of a hypercapnic bronchitic patient would you specify oxygen or air as the driving gas?

7  (a) When prescribing a nebulised drug, do you specify the flow rate of the propellant gas?
   (b) What flow rate do you specify?

References

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*Thorax* 1987 42: 491-493
doi: 10.1136/thx.42.7.491

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