

applied. They work best after a bath and should be used sparingly, in thin layers, and smoothed gently into the skin. Little is gained by applications more frequent than twice a day or by vigorous rubbing. Polyethylene gloves help to avoid atrophy of the applying hand.

No two patients are the same, and guidelines can never cover everything. Above all, patients—and the parents of patients—should be told what benefits may be expected from topical corticosteroids and what harm they can do. As Helen Keller has said, “We cannot freely and wisely choose the right way for ourselves unless we know both good and evil.”

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Home nebulisers for airflow limitation

The respiratory drugs that may be given by nebuliser include not only the β sympathomimetic agonists and anticholinergics but also disodium cromoglycate,¹ surface active corticosteroids,² mucolytic agents,³ anaesthetics,⁴ and antibiotics.⁵ The past four years have seen a rapid growth in the use of domiciliary nebulisers for the administration of bronchodilators. Purchase of a nebuliser unit and air compressor should be approved by a doctor, but some patients have bought them on their own initiative.

Nebulisers have become popular for two reasons. Firstly, they provide a convenient method for giving high doses of bronchodilators, and, secondly, they do not require the same “hand-lung” coordination as a conventional pressurised inhaler. A high dose of β agonist (or other bronchodilator) may be delivered to the patient—indeed, the initial quantity of drug placed in the nebuliser is some 25-50 times higher than a conventional dose from a pressurised inhaler. The actual percentage of the dose which enters the airways (10-15%) is similar with both devices.⁶⁻⁸

In most patients with mild to moderate asthma near maximal bronchodilatation may be achieved with conventional doses of a β agonist delivered from a pressurised inhaler.⁹ An increase in dosage may result in side effects such as tremor and tachycardia,¹⁰ and nebulisers bring such patients no benefit. Other patients, however, do benefit from regular nebulised treatment: these include those unable to use the pressurised inhaler or its various modifications—for example, the very young¹¹—and those with severe chronic airflow limitation who have been shown to benefit from higher than the usual recommended doses of inhaled β agonists.¹²⁻¹⁷ In such patients there is often a dose response

relation to both β agonists^{14,16} and ipratropium bromide.¹⁸ Uncontrolled studies have shown that regular inhaled high dose nebulised β agonists may improve lung function^{15,17} and provide symptomatic relief in some patients with chronic airflow limitation.^{12,13,15,17} This may allow a reduction in the dose of other potentially toxic drugs such as oral corticosteroids.¹² Satisfactory double blind prospective trials of high dose bronchodilator treatment have not, however, been published.

The other use of nebulised bronchodilators is as occasional treatment in acute episodes of asthma where conventional treatment has failed.¹⁹ Once again this benefit is almost certainly related to the quantity of drug delivered to the airways rather than the method of delivery. In chronic airflow limitation high dose treatment by metered dose inhaler,²⁰ Rotahaler,¹⁶ tube spacer,¹⁵ or Nebuhaler²¹ is as efficient as by nebuliser, and bronchodilator delivery by Nebuhaler compares well with nebuliser treatment in acute asthma.²²

The widespread use of domiciliary nebulisers has led to concern by physicians over three factors. Firstly, a patient with acute asthma might be tempted to “rely” on his nebuliser, repeating administrations over a short period of time during severe asthma and delaying, perhaps fatally, his decision to call for further help. Some clinicians fear a repeat of the 1960s epidemic of deaths from asthma, which may have been linked with inappropriate reliance on inhalers.²² The explanations offered for the recent increase in deaths in New Zealand include overreliance on home nebulisers, late referral, and underuse of corticosteroids.^{23,24} The second concern is that high doses of β adrenoceptor agonists might be toxic. Overdosage of salbutamol in healthy people appears to present remarkably few problems,²⁵ though hypokalaemia may occur.²⁶ Ischaemic heart disease may be worsened by high dose inhaled β agonists,²⁷ and, though no direct association has been shown between sudden death and high dose β agonists, the possibility that arrhythmias or myocardial infarction might be precipitated warrants caution in patients with ischaemic heart disease. The third worry is that tolerance might occur in inhaled β agonists after prolonged high dose use; but this has not been shown in practice.^{17,28}

With these considerations in mind, the survey of domiciliary nebuliser usage in this week's *BMJ* makes disturbing reading (p 1611). Using a home questionnaire, Laroche *et al* found that 12 of 53 patients given a nebuliser for home bronchodilator use had received no instructions on its use, and less than half of the patients had been given peak flow meters to monitor their asthma. Two thirds of the 7-15 age group were receiving only inhaled β stimulant aerosols and apparently were taking neither regular oral nor inhaled corticosteroids. The dose of salbutamol varied among patients, but many were taking up to 50 mg a day and even at this dose symptoms were not relieved in some patients. Though most said that if the nebuliser failed to relieve their symptoms they would call their general practitioner, 17% said they would take further doses of nebulised β stimulant and not seek help. Laroche *et al* suggest a series of sensible recommendations for home nebuliser treatment, but these concentrate on occasional symptomatic use and fail to include the recommendations for long term nebulisation.

Our unit has adopted strict guidelines for the use of nebulisers. We urge our hospital colleagues and local general practitioners to refer patients to our clinic for full assessment before consideration of nebuliser treatment. Many patients are not using pressurised inhalers correctly when first seen,²⁹

and the first essential is to assess inhaler technique and to correct it if necessary. Even with education some patients cannot acquire hand-lung coordination, and an alternative handheld inhalational device may need to be introduced.³⁰ Peak expiratory flow and symptom scores (on diary cards) should be monitored at home and used to assess response to correctly administered β agonists and oral and inhaled corticosteroids. Many patients may be managed satisfactorily in this way, but those who are poorly controlled with conventional medication but respond to high dose inhaled β agonist treatment are considered for nebuliser treatment. Alternative devices for high dose drug administration (Rotahaler, Nebuhaler) are often tried first but failure leads to a trial of home nebulisation. Laboratory assessment indicates the optimal dosages of β agonist (which for salbutamol should rarely exceed 5 mg³¹), frequency of delivery, and whether addition of ipratropium bromide provides further bronchodilatation. Each patient is then issued with a written statement of drug dosage and frequency and urged to continue monitoring peak expiratory flow and symptom scores. The respiratory technician gives instruction on the use and cleaning of the nebuliser unit. If the patient improves, appears compliant, does not report troublesome side effects (for example, tremor or angina), and keeps the nebuliser clean, we recommend it for long term use. The patient must be supervised by a clinician fully conversant in the problems of home nebuliser treatment, and a full technical and service back up must be available with regular servicing of the equipment.

Some patients who are normally well controlled with conventional inhaler treatment may have recurrent acute attacks of asthma unresponsive to their usual medication. High dose inhaled bronchodilators may abort an attack. Doctors who recommend home nebulisers or other methods for high dose bronchodilator administration in these circumstances must ensure that patients understand the use of such treatment and will obtain immediate expert help if the expected symptomatic and objective relief (as indicated by improvement in peak expiratory flow) does not occur. Tattersfield has suggested that each nebuliser should carry a warning stating that it is dangerous to exceed the stated dose and that failure to respond indicates that further medical care is necessary.³² Immediate planned access to emergency help is essential.

Some 17 000 nebuliser units were sold in Britain in 1983. Many would not have been necessary if patients had been adequately assessed, if appropriate treatment had been given with inhaled bronchodilators and corticosteroids, and if alternative inhalational devices had been tried where conventional inhalers failed. The unsupervised acquisition and use of home nebulisers is a reflection of inadequate assessment and management of asthma by doctors. This should not obscure the fact that a few patients with chronic airflow limitation may gain considerable benefit from regular or occasional administration of high doses of inhaled bronchodilator.

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Two cheers for the computer?

"It is extraordinary to consider that the general form of a scientific paper has changed less, in nearly 300 years, than any other class of literature, except the bedroom farce."¹

The past year is likely to be remembered by medical journals as the one when computers came into their own. For some years large editorial offices have used computers for listing referees and keeping track of manuscripts, while libraries have had data bases of references and abstracts available on line. This year has seen two new developments: the transmission on line of complete articles from general medical journals and the launch of an electronic journal, *Clinical Notes On-line*.

The journals concerned in the first of these developments are the *Annals of Internal Medicine*, *BMJ*, *Lancet*, and *New England Journal of Medicine*. In the USA all the scientific articles that have appeared for the past three years can now be obtained on a videodisplay unit at home or in the office through the Bibliographic Retrieval Services network, and under the name "Colleague" the service will be extended to Europe later this year. There are plans to include the main