teaching, intraosseous access may be secured without difficulty and should be considered in any paediatric emergency in which intravenous access cannot be secured promptly. Bolus and infusion doses of adrenaline can be given safely by this route, as can other pharmacological agents recommended in anaphylaxis.

In children with signs of upper airway obstruction caused by laryngeal mucosal oedema, nebulised adrenaline may lead to prompt resolution of stridor.[5] It should be given as a dose of either 0·05 ml of a 2·25% (racemic) solution/kg diluted to 2 ml with normal saline or, more conveniently, as 0·5 ml of a 1/1000 solution/kg (to a maximum of 5 ml). The child whose clinical history prompted Fisher's review would probably have benefited from this treatment.

Finally, in both his article and the summary in "This week in *BMJ*" Fisher states that oxygen should be given in severe anaphylaxis. We prefer the recommendations of the Association of Anaesthetists of Great Britain and Ireland that oxygen should be given in all cases of anaphylaxis regardless of the initial severity.[3] Hypoxaemia will develop quickly if a patient suddenly develops airway obstruction as a late complication of an initially mild attack.

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Expressing the dose of adrenaline in milligrams is easier

EDITOR,—In his article on the treatment of anaphylaxis Malcolm Fisher emphasises the role of adrenaline.[1] The dose that he recommends is expressed as two volumes of two solutions of differing concentration. Quoting a dose in this way increases confusion and makes the dose less memorable—which may partly explain why the doctor described in the introductory letter "fumbles through pages of a book to figure out adrenaline dosage."

The revised guidelines of the European Resuscitation Council's working party now express the adrenaline dose in milligrams, and this has both simplified resuscitation algorithms and made them more memorable.[2] This has been complemented by the availability of adrenaline in rapid assembly preloaded syringes of 1 mg (10 ml of 1/10000) (Min-I-Jet). Although these syringes are currently recommended by the manufacturers for only intravenous or intracardiac use, they will readily accept a 21 gauge syringe and could therefore also deliver an intramuscular dose.

If the recommended dose of adrenaline was expressed in milligrams and delivered by a preloaded syringe the correct treatment of anaphylaxis would be swifter, simpler, and easier to remember.

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Treatment takes precedence over monitoring

EDITOR,—We believe that the ability to start immediate and effective treatment for acute anaphylactic shock is an essential skill for any medical practitioner. Unfortunately, Malcolm Fisher may have caused confusion with his recommendations for the use of intravenous adrenaline.[1] Fisher contradicts himself by stating that intravenous adrenaline should not be given to an "unmonitored patient" and then subsequently recommends its use in this very situation. We agree that early placement of cardiorespiratory monitoring devices is essential in any severe anaphylactic episode but would strongly urge that the administration of intravenous adrenaline should not be deferred until such equipment is available. In its recommendations for the management of anaphylactoid reactions the Association of Anaesthetists of Great Britain and Ireland emphasises the need for early administration of adrenaline intravenously.[2]

With regard to the management of bronchospasm, we agree that inhalation of the volatile anaesthetic agent isoflurane may have a role but would suggest that halothane, which has more potent effects as a bronchodilator, is more appropriate.[3] Numerous reports describe the use of inhaled and nebulised adrenaline solutions in life threatening acute upper and lower airway obstruction caused by anaphylaxis.[4,5] We are therefore surprised that this accepted therapeutic regimen is omitted from the recommended treatment protocols for bronchospasm and angio-oedema.

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Investigations help to confirm diagnosis

EDITOR,—Malcolm Fisher's review highlights the need for adrenaline along with volume replacement in the management of severe systemic anaphylaxis.[1] This observation was recognised by the Association of Anaesthetists of Great Britain and Ireland, which in 1990 produced a booklet for all members[2] and a wall chart for the theatre area.

As Fisher states, cardiovascular collapse is a common feature of anaphylaxis, but, particularly in the context of surgery, it is not the only diagnosis that has to be considered: myocardial infarction, pulmonary embolus, and concealed hypovolaemia are some of the diagnoses that have to be excluded. The diagnosis may be unclear, especially if the patient dies. Furthermore, the management of an acute systemic anaphylaxis is stressful. Information is often not readily available about which investigations to carry out or what to do with samples, so blood tests can be spoiled or results misplaced. The relevant history and clinical signs may not be documented. To combat these shortcomings a plastic laminated action card has been written, which is placed in the operating theatres of the hospitals in Bristol. It describes in simple terms how to investigate a case of suspected anaphylaxis (figure).

After resuscitation carry out the following:

Blood tests
Take 20 ml of blood for mast cell tryptase, specific IgE antibodies, and complement at **1, 3 and approximately 8 hours** after the suspected reaction.

Bottle as follows:
10 ml in an activated gel bottle (speckled top) for serum and 5 ml in each of two edetic acid (EDTA) (full blood count) bottles. Label the form correctly. Send to the department of immunology in Southmead. If outside laboratory hours inform the haematologist, who will separate the serum and, if necessary, store it at −20°C. The samples must be processed as soon as possible, but they need not be sent to immunology out of hours.

Part of follow up card for anaphylaxis

Requests are made for full details from a checklist, including history of allergies; use of latex (urinary catheter or sterile gloves); treatment with antibiotics, colloid, and blood; date, time, and severity of reaction; etc. The action card instructs the attending anaesthetist to pass the patient's details to a designated consultant anaesthetist, who has an interest in anaphylaxis and who then refers the patient to the immunologist.

Assay of serum mast cell tryptase is helpful in the follow up.[3,4] Tryptase is liberated along with histamine from mast cells when they degranulate. Furthermore, unlike histamine, it is stable in blood. If tryptase is increased then mast cells have been degranulated. It has also been assayed after death, which could be important medicolegally.[4] Specific IgE is also helpful in this respect, a view shared by Laroche *et al.*[5]

Immunologists from other regions may disagree with the investigations or the timing of the samples as written in the extract from our follow up card. Nevertheless, the instructions have increased the amount of useful information for the immunologists and have enabled suspected systemic anaphylaxis to be diagnosed and more fully investigated.

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Chart helps with calculation of dose of adrenaline for children

EDITOR,—In the report of a case of anaphylaxis that prompted Malcolm Fisher's review the casualty officer had difficulty in determining the correct dose of adrenaline for a 5 year old child.[1] Fisher recommends 0·01 ml of 1/1000 adrenaline solution/kg by intramuscular injection or 0·1 ml of 1/10000 solution/kg intravenously. This advice would not have helped the attending doctor to check the

correct dose rapidly, and one can imagine the reaction of parents if children are taken to be weighed before emergency treatment is given.

Doses should be stated clearly according to expected body weight by age and should be displayed in accident and emergency departments. Current recommendations for the treatment of anaphylaxis in a 5 year old child are that 0·4 ml of 1/1000 adrenaline should be given by intramuscular injection.[2,3]

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Teachers need to know the basics too

EDITOR,—A point not mentioned in Malcolm Fisher's review of the treatment of anaphylaxis is the need to remember that children are at risk of anaphylaxis while at school.[1] Once anaphylaxis has been diagnosed it is the doctor's responsibility to inform the school. Teachers must have clear guidelines to follow should an anaphylactic reaction occur, and they should be trained to deal with such an emergency. Teachers do not have a legal duty to give drugs in school, but, as adrenaline may be life saving, some members of staff must take the responsibility for giving it. Such staff must be guaranteed professional indemnity. There should be several trained members of staff in each school to cover emergencies. Adrenaline should be kept in the school, and an emergency kit and a trained member of staff should go on school trips with pupils at risk. During training, teachers should be made aware of the different types of anaphylactic reaction that may occur, how reactions may be avoided, and emergency management.

These issues must be addressed. Each child health department should draw up local policies and coordinate training for school staff. With careful planning, potential disasters in school may be avoided.

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Symptomatic carotid lesions in young adults

EDITOR,—In their paper on symptomatic stenoses of the internal carotid artery in young adults (aged 15-44) Antonio Carolei and colleagues conclude that the prognosis was apparently benign in a subgroup with complete occlusions.[1] Several factors need to be considered.

Firstly, although carotid angiography was performed in 73% of the study population, the number with occlusions that were angiographically confirmed is unstated.

Secondly, there were only eight patients in this subgroup. Although no neurological events were observed during five years of follow up, the effect of studying such small numbers is reflected by the confidence intervals of 0% to 32·4% for both transient ischaemic attacks and strokes. Other prospective studies, with larger number of patients,

Results of prospective studies of complete occlusions of internal carotid artery treated non-surgically

Study	No of patients	Deficit at entry	Duration of follow up (months)	Ipsilateral TIA		Ipsilateral stroke		Death	
				No	%/year	No	%/year	No	%/year
Fields *et al*, 1976[2]	359	40% Severe stroke	44	—	—	30 89*	2·3 6·8	155	11·8
Sampson *et al*, 1977[3]	7	TIA	17	4*	40·3	2	20·2	0	0
Cote *et al*, 1983[4]	47	TIA or minor stroke	34	24 27*	17·8 20·0	7 11*	5·2 8·2	4	3·0
EC/IC, 1985[5]	423	TIA or minor stroke	56†	—	—	123‡	≈6·3	§	—
Carolei *et al*, 1995	8	TIA or stroke	60	0	0	0	0	0	0

TIA=Transient ischaemic attack.
*Ipsilateral and contralateral events.
†Mean follow up for trial population.
‡Ipsilateral and contralateral fatal and non-fatal stroke.
§Included in column showing ipsilateral stroke.

suggest that the prognosis after total occlusions may not be entirely benign.[2-5] The variability in reported outcomes (table) may be related to differences in the patency of other extracranial or intracranial vessels in the populations studied. Indeed, recent evidence suggests that the prognosis after total occlusion of the internal carotid artery may depend on the residual cerebrovascular reserve capacities; stroke rates as high as 20% have been observed in the first year in those with poor reserves, compared with <5% in those with sufficient reserves. The benign prognosis in young adults reported by Carolei and colleagues, if confirmed, may be due to relatively unimpaired reserves in these patients.

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Authors' reply

EDITOR,—Ajith Goonetilleke proposes a possible explanation for the good prognosis in young patients with symptomatic occlusion of the internal carotid artery in our study. Goonetilleke's hypothesis about the role of the residual cerebrovascular reserve capacity is supported by recent studies that have used transcranial Doppler sonography[1] and is consistent with the young age of our patients. Unfortunately, transcranial Doppler sonography was not available in all participating centres at the time of the study, which hindered the evaluation of cerebrovascular reserve capacity in all patients. This factor, however, would be expected to influence the outcome in patients with stenosis of 50-99% as well; these patients, by contrast, had the worst prognosis.

In our series four of the eight occlusions diagnosed by Doppler sonography were confirmed by angiography, which also showed good collateral blood supply in all four cases. A contralateral stenosis was found on Doppler sonography in seven patients who presented with stenosis of the internal carotid artery of 50–99%, which confirms the low prevalence of coexisting carotid lesions. All of the eight patients with occlusion of the carotid artery had initially presented with stroke. After surviving the initial stroke these patients had no further cerebral ischaemic events and survived. One patient had a myocardial infarction.[2]

It is difficult to comment on data referring to older patients with diffuse atherosclerosis, who are more likely to have a poor prognosis. Indirect comparisons between patients from different studies (with the eventual aim of supporting the need for surgical procedures) may be misleading. On the other hand, the annual risk of stroke and death reported by the EC/IC Bypass Study Group in patients with occlusions (9.5%)[2] was higher than that in our young patients with occlusions but still lower than that reported in the North American symptomatic carotid endarterectomy trial in patients with carotid stenosis (21.5%).[3]

Despite the wide confidence intervals around the risk estimates, our figures for carotid occlusion are consistent with findings of other studies directly comparing patients with stenosis and occlusion of the internal carotid artery and showing a sudden drop in the risk of stroke once the artery occludes.[4] We remain confident that our data support the view that evolving carotid plaques are unstable and produce symptoms due to progression of the stenosis, whereas carotid occlusions are stable lesions.

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Beneficial effects of simvastatin may be due to non-lipid actions

EDITOR,—On the basis of new trial evidence Michael Oliver and colleagues claim that there is no longer any controversy about cholesterol lowering as secondary prevention of atherosclerosis and coronary heart disease.[1] To reach this conclusion they have disregarded many conflicting findings.

According to Oliver and colleagues, the first principle of the lipid hypothesis is the association between a raised plasma cholesterol concentration and risk of coronary heart disease. This association, however, has been found mainly in people without previous disease. A strong, graded, positive correlation has been found in a few studies of patients with coronary heart disease, but in at least 17 studies the correlation has been weak, dichotomous, or absent. Also, several studies have found no association between changes in serum