reduce the risk of myocardial infarction "could easily be as little as 3%"?

Finally, Ramsay and colleagues were surprised that in our study the control diet induced an increase in "baseline" cholesterol values. The habitual diet of people living in southern Italy is a typical example of the "Mediterranean diet," which is generally considered to be a model hypocholesterolaemic diet. Moreover, patients referred to our lipid clinic are often already taking a therapeutic diet and their cholesterol concentrations cannot be considered to be true baseline values. A standard procedure of good medical research is to start intervention studies with a run in period, in which any treatment is stopped. This is what we did. Moreover, as consumption of saturated fat in our control diet was "only" 14% we predict that if our test diets were used in any northern European country or in the United States (where habitual consumption of saturated fat is usually higher) their efficacy would be even more pronounced.

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- 1 Keys A, Anderson JT, Grande F. Serum cholesterol response to changes in the diet. IV. Particular saturated fatty acids in the diet. *Metabolism* 1965;14:776-86.
- 2 Mensink RP, Katan MB. Effect of dietary fatty acids on serum lipids and lipoproteins. *Arteriosclerosis and Thrombosis* 1992;12:911-9.
- 3 Altman DG. The scandal of poor medical research. *BMJ* 1994;308:283-4. (29 January.)
- 4 Lipid Research Clinics Program. The Lipid Research Clinics coronary primary prevention trial results. I. Reduction in incidence of coronary heart disease. *JAMA* 1984;251:351-64.

Accuracy of peak flow meters

Don't interchange devices

EDITOR,—Peter D Sly and colleagues' paper highlights a common mistake in the management of asthma—namely, interchanging devices measuring peak flow.¹ In 1990 colleagues and I designed a small study (unpublished) to investigate possible discrepancies between readings obtained with Wright mini peak flow meters and standard Wright peak flow meters. It was undertaken because of the lack of consensus in the literature regarding the comparability of the two devices and after a suggestion that regression analyses commonly used in previous research were inappropriate for comparing the results of two measurement techniques. In addition, earlier comparisons had looked primarily at flow ranges appropriate to adults.

Peak flows were recorded from 186 children, who used both devices. In the laboratory 61 Wright mini peak flow meters were calibrated against known flows with a spirometer. Limits of agreement were then calculated for clinical and laboratory data and showed that the two devices may differ by more than 100 litres/min. The greatest percentage discrepancy occurred at lower flow rates, when the Wright mini peak flow meter tended to read higher flow values than the standard Wright peak flow meter.

As the two meters do not give comparable peak flow measurements it is inappropriate to monitor control of asthma with the Wright mini peak flow meter by using centile charts that have been created by using the standard Wright peak flow meter—a common practice. Wright mini peak flow meters are widely used in the home, in general practice, and at the bedside in hospital. Until a standard measure of flow is available, new centile charts for children need to be devised to reflect this widespread use of the Wright mini peak flow meter. Inaccuracy among meters is to be distin-

guished from consistent measurements made with a single device. What exactly a particular variety of flow meter measures is to some degree irrelevant when the meter is used in self management plans; in such plans change in that measure is of prime importance even if that measure is not peak flow.

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Readings vary between measurements

EDITOR,—Martin R Miller and Philip H Ouanjer point out that peak flow meters may underestimate or overestimate peak expiratory flow rates at different parts of their ranges.¹ A paper in the same issue suggests that clinically important reductions in peak expiratory flow rates are not always detected by meters.² Neither article mentions within patient and temporal repeatability, which are important confounding factors in the interpretation of peak expiratory flow rates.

Over three months 33 children with established asthma were issued with a mini Wright peak flow meter and diaries for recording their peak expiratory flow rate. After supervised instruction they were asked to record their first three readings of peak expiratory flow rate in the morning and last thing at night. They also recorded any symptoms and what medication they required each day. Twenty one children completed the diaries for five weeks, which allowed them a two week run in period to learn the technique.

The median age of the children was 10 (range 6-15), and the asthma varied from mild to severe, with peak flow readings from 90 to 500 l/min. None of the children had an exacerbation during the three week study period. Coefficients of repeatability were calculated³ with one way analysis of variance for the three early morning measurements on day 15; the best of three morning measurements on days 15, 16, and 17; and the best of three measurements on days 15, 22, and 29. The coefficients were, respectively, 37 l/min, 50 l/min, and 54 l/min. The coefficient of repeatability encompasses 95% of the differences between repeated measurements; the above results for within patient repeatability and repeatability over time show how dangerous it is to rely on peak flow readings in asthma self management plans.

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- 1 Miller MR, Ouanjer PH. Peak flow meters: a problem of scale. *BMJ* 1994;308:548-9. (26 February.)
- 2 Sly PD, Cahill P, Willet K, Burton P. Accuracy of mini peak flow meters in indicating changes in lung function in children with asthma. *BMJ* 1994;308:572-4. (26 February.)
- 3 Bland JM, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet* 1986;i:307-10.

Lack of a standard meter is bad for patients

EDITOR,—Peter D Sly and colleagues' article discussing peak flow and spirometry highlights the need for standards on peak flow, the absence of which prevent accurate peak flow measurements for British patients with asthma.¹ One good standard has been published in the United States.² By refusing to accept this standard in Europe we waste time, cause unnecessary delay, and possibly endanger patients.³

A peak flow meter is not a spirometer. It

measures only a single variable, which makes quality assurance difficult. Clinically, measurements of more lung function variables are usually required to detect important changes. Practitioners require accuracy and standardised measurements from any brand of instrument, in any location. Spirometers fulfil these essential criteria; peak flow meters do not. Peak flow meters are designed for use at home. Patients should always take their peak flow meter to the asthma clinic to check their test technique, the measurements, and for obvious damage. The meter should be replaced every three years. In the clinic it is vital to observe routine calibration protocols for all measuring instruments. Peak flow meters should be returned for a calibration check or replaced annually. The cost is small compared with the cost of wrong medicines or unnecessary morbidity.

Vitalograph peak flow meters conform to all standards: those of the British Department of Health⁴ and the American national asthma education programme and draft standards in other countries, including Australia. Without exception, standards require readings obtained with peak flow meters to correlate closely with those obtained with a pneumotachygraph; this was intended for the Wright peak flow meter (with the big round dial), which, sadly, is little used today. The original Wright peak flow meter had long been regarded as a standard in Britain before high speed sampling and test equipment showed errors of up to 15%.⁵ Numerous studies globally, which have used a wide variety of test equipment, have shown similar conclusions.

The Department of Health, understandably, insists that we should resist change until a European standard has been developed; this is a long way off. Adopting the world's best standard and then improving it is a far more rational approach, bringing benefits immediately to patients and practitioners.

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- 1 Sly PD, Cahill P, Willet K, Burton P. Accuracy of mini peak flow meters in indicating changes in lung function in children with asthma. *BMJ* 1994;308:572-4. (26 February.)
- 2 International consensus report on diagnosis and management of asthma. Bethesda, Maryland: National Heart, Lung, and Blood Institute, 1992. (Publication No 92.3091.)
- 3 Miller MR, Dickenson SA, Hitchings DJ. The accuracy of portable peak flow meters. *Thorax* 1992;47:904-9.
- 4 Department of Health. *Drug tariff No 51*. London: DoH, 1990.
- 5 Miller MR, Ouanjer PH. Peak flow meters: a problem of scale. *BMJ* 1994;308:548-9. (26 February.)

Management of breast cancer

EDITOR,—A M Chouillet and colleagues report appreciable departures from consensus guidelines in the management of breast cancer in the Thames regions.¹ We are concerned that the study made no detailed reference to the United Kingdom's breast screening programme, which has been screening women in England since 1988, although evaluation of the screening programme was cited as an important reason for monitoring the management of breast cancer. The programme has rigorous quality standards relating to the treatment and follow up of breast cancer. As professionals working in breast screening we would be interested to know what proportion of women included in the 1990 study group were detected by screening and how this subgroup compared with the main group in terms of the more general consensus guidelines used in the Thames study.

The paper suggests that Chouillet and colleagues made a fairly unilateral decision to investigate the implementation of treatment guidelines. We wonder how the clinicians responsible for managing breast cancer have responded to the results. The study provoked a predictable reaction in the

media but a lesser response in the *BMJ*'s correspondence columns. We are also interested to know why the study did not relate staging to outcome—for instance, in 74 women who had died by the time the study was under way. Was much less information on staging available for these women?

Having worked extensively with both cancer registry and pathology records, we wonder whether the authors determined how often notes kept about treatment corresponded with the records of treatment or surgery recorded by other hospital departments. We have found considerable discrepancies, for example, between incidences of breast cancer recorded by registries and hospitals. Would this introduce bias?

Despite our queries about the research, we share Chouillet and colleagues' belief in the value of audit of treatment of breast cancer as a means of improving services for patients with the disease.

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1 Chouillet AM, Bell CMJ, Hiscox JG. Management of breast cancer in southeast England. *BMJ* 1994;308:168-71. (15 January.)

Hyperlipidaemia and hypothyroidism

Screen patients for hypothyroidism before treatment

EDITOR,—M A Al-Jubouri and colleagues report a case of subclinical myopathy in association with hypothyroidism and simvastatin treatment.¹ In line with existing guidelines,² the authors highlighted the importance of excluding secondary causes of hypercholesterolaemia before starting hypolipidaemic treatment. Hypothyroidism is a well recognised cause of secondary hyperlipidaemia, and in our lipid clinic every new patient's thyroid stimulating hormone and thyroxine concentrations are screened irrespective of the presenting lipid pattern. We recently audited this practice and present our findings on the incidence of previously unrecognised hypothyroidism at presentation and the effect of thyroxine treatment on patients with hypothyroidism.

Of 1190 new referrals (623 men, 567 women), 11 were found to have biochemical hypothyroidism (thyroid stimulating hormone concentration >6 mU/l; thyroxine concentration <50 nmol/l) and 13 to have compensated biochemical hypothyroidism (thyroid stimulating hormone >6 mU/l; thyroxine 50-150 nmol/l), giving incidences of 0.92% and 1.1% respectively. The thyroid stimulating hormone concentration was significantly higher and thyroxine concentration lower in biochemical hypothyroidism than com-

pensated biochemical hypothyroidism, but other characteristics, including the lipid profile at presentation, were similar in both groups (table). While most patients had a type IIa lipid pattern, one patient with compensated biochemical hypothyroidism had a type III lipid pattern with apo E phenotype E2/2 and another had combined hyperlipidaemia with a triglyceride concentration of 12.5 mmol/l.

All patients with biochemical hypothyroidism were treated with thyroxine (100-150 µg/day) and rendered biochemically euthyroid, with normalisation of the lipid profile in eight. Five patients with compensated biochemical hypothyroidism received treatment with thyroxine because of further increases in their thyroid stimulating hormone concentration with or without a further fall in thyroxine concentration. Four of these required additional hypolipidaemic agents to achieve desirable lipid concentrations. None of the patients in either group had a raised creatine kinase value at presentation or during treatment.

Many hypothyroid patients may present with hypercholesterolaemia in the absence of clinical features, as shown by our population. Furthermore, our data suggest that the presenting lipid profile of demographic features cannot be used to distinguish between biochemical hypothyroidism and compensated biochemical hypothyroidism. The incidence of biochemical hypothyroidism in this series is lower than that reported in other populations in lipid clinics.^{3,4} The differences probably reflect local variations in the overall incidence of hypothyroidism or in the practices of the primary referral clinicians. Although the effect of thyroxine treatment on the lipid profile in biochemical hypothyroidism differs in various studies,⁵ our results indicate that thyroxine treatment alone should normalise lipid concentrations in most patients with biochemical hypothyroidism but that most patients with compensated biochemical hypothyroidism need additional hypolipidaemic agents.

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- 1 Al-Jubouri MA, Briston PG, Sinclair D, Chinn RH, Young RM. Myxoedema revealed by simvastatin induced myopathy. *BMJ* 1994;308:588. (26 February.)
- 2 Betteridge DJ, Dodson PM, Durrington PN, Hughes EA, Laker MF, Nicholls DP, et al. Management of hyperlipidaemia: guidelines of the British Hyperlipidaemia Association. *Postgrad Med J* 1993;69:359-69.
- 3 O'Kane MJ, Neeley RDG, Trimble ERT, Nicolls DP. The incidence of asymptomatic hypothyroidism in new referrals to a hospital lipid clinic. *Ann Clin Biochem* 1991;28:509-11.
- 4 Bruckert E, De Gennes JL, Dairou F, Turpin G. Frequency of hypothyroidism in a population of hyperlipidaemic subjects. *Presse Med* 1993;22:57-60.
- 5 Fowler PBS, Stubbs P. Asymptomatic hypothyroidism and hypercholesterolaemia. *J R Soc Med* 1992;85:244-5.

Characteristics of hyperlipidaemic patients with biochemical hypothyroidism among 1190 patients referred to lipid clinic. Values are means (ranges) except for thyroid stimulating hormone, which is expressed as median (range)

	Biochemical hypothyroidism	Compensated biochemical hypothyroidism
No (M/F)	4/7	2/11
Mean age (years)	57.0 (39-67)	56.9 (37-72)
Body mass index	26.1 (20-31)*	25.3 (20-30)
Thyroid stimulating hormone (mU/l)	44.0 (8.1-50)*	9.8 (6.1-50)
Thyroxine (nmol/l)	39.5 (20-49)*	77.1 (60-100)
Cholesterol (mmol/l)	8.9 (7.9-10.3)	8.81 (6.1-11.2)
Triglycerides (mmol/l)	2.1 (1.1-3.3)	3.9 (1.3-12.5)
High density lipoprotein cholesterol (mmol/l)	1.22 (0.83-1.75)	1.37 (0.70-2.1)
Low density lipoprotein cholesterol (mmol/l)	6.4 (4.3-7.7)	5.9 (3.7-6.8)
No treated with thyroxine	8	1
No treated with thyroxine and hypolipidaemic agent	3	4

*P<0.0001 compared with patients with compensated biochemical hypothyroidism.

Screening everyone would be expensive and unnecessary

EDITOR,—M A Al-Jubouri and colleagues' lesson of the week highlights the pitfalls of treating patients with hypercholesterolaemia without due consideration of secondary causes.¹ The lesson offered by the authors—that myxoedema should be considered in people with hypercholesterolaemia before hypolipidaemic treatment is started—may not, however, provide the answer. To perform thyroid tests for all patients who have hypercholesterolaemia would be unnecessary and not cost effective. Previous work suggests that biochemical assessment of thyroid status in patients with a total cholesterol concentration ≥8 mmol/l would be beneficial.² If this criterion was used only a minority of patients with hypercholesterolaemia would have to be checked. A similar argument could be made for tests for other causes of secondary hyperlipidaemia.

The patient does not seem to have had his liver enzyme and creatinine kinase activities checked before treatment with simvastatin was started. For a patient who is likely to require treatment for several years it is prudent to obtain baseline liver enzyme activities (recommended in the *British National Formulary*) and creatine kinase activities before treatment is started. The liver enzyme activities would help to identify secondary causes of hyperlipidaemia related to the liver, and raised creatine kinase activity would be identified; the clinician would then be alerted to existing abnormalities that might be influenced by lipid lowering drugs.

Finally, it might have been better to use the term biochemical hyperthyroidism rather than myxoedema to describe the thyroid status of the patient. After all, the patient did not have signs or symptoms to support the diagnosis.

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1 Al-Jubouri MA, Briston PG, Sinclair D, Chinn RH, Young RM. Myxoedema revealed by simvastatin induced myopathy. *BMJ* 1994;308:580. (26 February.)

2 Series JJ, Biggart EM, O'Reilly DS, Packard CJ, Shepherd J. Thyroid dysfunction and hypercholesterolaemia in the general population of Glasgow, Scotland. *Clin Chim Acta* 1988;172: 217-21.

Human parvovirus B19

EDITOR,—After investigating an outbreak in December 1993 of 24 cases of infection with parvovirus B19 in primary schools in Dublin, we wish to comment on J R Pattison's editorial.¹ Firstly, Pattison noted that parvovirus B19 infection is often misdiagnosed as allergy, rubella, or other "viral infection" and may be clinically recognised only in an outbreak. The most striking feature reported in the case we investigated was the evanescence of the rash (which usually but not exclusively affected the face). The rash flared up in minutes and faded over a few hours only to reappear some hours or days later. Perhaps this feature could be a useful clinical marker that might help to distinguish parvovirus B19 infection from other causes of rashes.

Secondly, Pattison advised caution in the use of commercial diagnostic kits. We initially tested sera from seven children for parvovirus B19 IgM with an immunofluorescence test made in house and found them to be weakly positive. The test was made from a recombinant baculovirus expressing VP1 protein of parvovirus B19 at a dilution of 1:10 after adsorption with goat antibodies to human IgG (Gull Sorb). However, a strong parvovirus B19 IgG reaction was found on western blotting for IgG specific to the VP1 and VP2 proteins of parvovirus B19 prepared in house by recombinant baculoviruses. The immunofluorescence test was there-