final outcome in children who have been screened with that in those who have not, and the value of these screening programmes has therefore not been properly evaluated.⁸

In contrast with the issue of the early detection of amblyopia, the outcome of treatment has received almost no attention outside the ophthalmological and orthoptic journals. In clinical practice it is clear that children do not like having their eye occluded, and achieving compliance is a serious challenge. Many studies attest to the size of this problem, with as many as 59% of patients in one large study being excluded from analysis because of failure to comply with treatment or failure to attend.⁹ In a recent multicentre study of nearly 1000 patients treated for amblyopia in the United Kingdom, in which all patients starting treatment were included, only 48% of patients achieved a final acuity of 6/9 and 17% of children achieved an acuity of less than 6/18.¹⁰ The children in this series were of a similar age to those described by Lithander and Sjostrand in their prospective study with an 89% success rate² but were less intensively treated and supervised.

While there are good reasons for thinking that delay in detection contributes to the high prevalence of visual loss from amblyopia in the community, this is clearly not the only cause. We need prospective controlled studies to investigate the whole management of amblyopia from diagnosis to out-

come, which should look at screening, methods of treatment, and factors affecting compliance. Public health advisers, paediatricians, community medical officers, health visitors, and general practitioners should be concerned about not only the detection of amblyopia but also the outcome of treatment.

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- 1 Hillis A. Amblyopia: prevalent, curable, neglected. *Public Health Rev* 1986;14:213-35.
- 2 Lithander J, Sjostrand J. Anisometric and strabismic amblyopia in the age group 2 years and above: a prospective study of the results of treatment. *Br J Ophthalmol* 1991;75:111-6.
- 3 Tommila V, Tarkkanen A. Incidence of loss of vision in the healthy eye in amblyopia. *Br J Ophthalmol* 1981;65:575-7.
- 4 Leicowitz HM, Kreuger DE, Maunder LR, Milton RC, Kini MM, Kahn HA, et al. The Framingham eye study monograph. An ophthalmological and epidemiological study of cataract, glaucoma, diabetic retinopathy, macular degeneration and visual acuity in a general population of 2631 adults, 1973-1975. *Surv Ophthalmol* 1980;24(suppl):335-610.
- 5 Taylor D. Screening for squint and poor vision. *Arch Dis Child* 1987;62:982-3.
- 6 Stewart-Brown SL, Haslum MN, Howlett B. Preschool vision screening: a service in need of rationalisation. *Arch Dis Child* 1988;63:356-9.
- 7 Bolger PG, Stewart-Brown SL, Newcombe E, Starbuck A. Vision screening in preschool children: a comparison of orthoptists and clinical medical officers as primary screeners. *BMJ* 1991;303:1291-4.
- 8 Hall DMB. Report of a joint working party on child health surveillance Oxford: Oxford University Press, 1989.
- 9 Bremner MH. Visual acuity in the primary school child aged four to twelve years: a review of amblyopia treatment in this age group at Princess Margaret Hospital. *Aust J Ophthalmol* 1984;12:395-9.
- 10 Woodruff G, Hiscox F, Thompson JR, Smith LK. Factors affecting the outcome of children treated for amblyopia. *Eye* 1994;8:627-31.

Calculating drug doses

Doctors need to be drilled to calculate doses accurately in emergencies

See p 1153

About 70-80% of undergraduates entering medical training in Britain have passed mathematics at A level, and virtually all will have passed the subject at O level. Yet, as Rolfe and Harper show, among a representative sample of 150 doctors asked to perform simple calculations converting drug doses from a percentage or dilution to mass per volume the success rate was as low as 16% (p 1173).¹ The results showed that senior doctors (consultants and senior registrars) were better at calculating the correct answer, and anaesthetists were notably better. While these data seem to suggest a hierarchy in numerical skill among doctors, in terms of both age and specialty, clearly there are other more likely reasons.

The five questions used in the survey concerned tasks regularly performed by anaesthetists, most of whom would have known the answers even if unable to perform the calculation. It would have been interesting to see if the anaesthetists tested would have scored as highly if the questions had been more abstract—for example, how much drug is there in a one in 350 000 solution? In any event, all anaesthetists are regularly required to convert drug doses in this way and—perhaps more important—have this skill reinforced with frequent practice. Nurses are another group who are regularly called on to calculate drug doses, and Adams and Duffield found that their accuracy in doing so improved with regular drills and testing.² That study concluded, not surprisingly, that drills and experience in clinical practice have an important effect on nurses' ability to calculate drug doses accurately. Furthermore, after a relatively short break from this aspect of training nurses' skills deteriorated rapidly. The published study of Rolfe and Harper effectively reaches the same conclusions for doctors.¹

Having drug ampoules universally labelled in mg/ml would not necessarily eliminate confusion or the need to convert doses since many drugs—electrolytes, for example—are regularly considered and prescribed in terms of amount

(millimoles), while biological substances such as insulin are usually measured in units of activity.

What may we draw from this and a previous, similar study?³ Firstly, when drug doses are usually prescribed in terms of mg or mmol/kg body weight the ampoule containing these drugs should be labelled with the concentration of the contents in mg or mmol/ml. This labelling could be provided in addition to more traditional information about dilution or percentage content. One possible difficulty with dual labelling is ensuring legibility. Unlike the United States, Britain has no standard for the size of lettering in labelling on ampoules,⁴ so squeezing more information on to ampoules, particularly smaller ones, could increase illegibility. Adopting similar labelling standards to those in existence in the United States might prevent this potential problem.

Secondly, drills for calculating doses of those drugs that make up the first line of treatment in resuscitation should be taught as rigorously and as dogmatically as other topics when advanced cardiac life support and advanced trauma life support are taught. Finally, if the situation is not an emergency and the doctor is unsure of the dose or contents of an ampoule the advice to "look it up first" or ask for advice holds especially true. With repeated reference to the *British National Formulary* the doctor will in effect be performing his or her own drill and with time will become adept at the calculations needed to convert drug doses.

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- 1 Rolfe S, Harper NJN. Ability of hospital doctors to calculate drug doses. *BMJ* 1995;310:1173-4.
- 2 Adams A, Duffield C. The value of drills in developing and maintaining numeracy skills in an undergraduate nursing programme. *Nurse Education Today* 1991;11:213-9.
- 3 Scrimshire J. Safe use of lignocaine. *BMJ* 1989;298:1494.
- 4 James RH, Rabey PG. Illegibility of drug ampoules. *BMJ* 1993;307:658-9.