Other reasons why blood samples could not be collected included no suitable vein identified (17 (3%) children) and children feeling unwell at the time of testing (one child). Another child felt unwell but a specimen was collected. Collection of a less than desirable volume of blood was recorded for 17 (4%) children, but 14 of these samples were still analysed. The number of technical failures was none of 279 venepunctures for phlebotomist 1, one (1%) of 67 venepunctures for phlebotomist 2, and 16 (22%) of 72 venepunctures for phlebotomist 3, the latter having a higher failure rate than either of the other two ($p < 0.001$).

Only one child did not have a sample collected without the reason being recorded. Nine samples were reported as collected but were not analysed. Four of these were sent to the wrong address and the fate of the other five samples is unknown. In total there were difficulties in delivering nine (2%) of 387 samples from the schools to the laboratory analyser.

A total of 378 blood samples were finally available for analysis, of which 375 were fully analysed.

Discussion

Overall response rates were satisfactory, though there was a variation in the level of positive consent given between schools. Response rates to a request to collect blood by venepuncture were as high as a previous study by the same workers assessing the response to a request to collect a capillary blood sample from children by fingerprick (unpublished data).

The socioeconomic composition of a school appeared to affect parental response rates. The two schools with the lowest response rates were identified by participating head teachers and local community paediatricians as having larger numbers of children from lower socioeconomic groups and deprived social backgrounds. Conversely, high response rates were obtained from the most middle class schools in the sample.

As found in other studies of invasive testing in children,³ response rates in the younger age groups (the rising 6 year age group) were lower than those of the rising 9 year age group. The response rate after the introduction of venepuncture is important as it may have a 'knock on' effect for obtaining consent to the other less invasive tests included in a test battery and affect the overall success of a study.

A small number of parents asked to be present at the time their child was tested. This was allowed, but the venepuncture was often more upsetting for these children than those without parents present. It has been suggested that parents can accurately predict their child's distress associated with painful or anxiety provoking procedures³ and parents may wish to be present because they recognise their child's concern. It has also been found that the parent's level of anxiety can influence the child and contribute to the overall apprehension surrounding the procedure.⁴ This is an area that needs further investigation in the context of non-therapeutic research.

Anaesthetic cream has been shown to be highly effective at relieving the pain associated with venepuncture if applied at least one hour before the procedure.⁵⁻⁷ Most children appeared to feel minimal, if any, discomfort. The friendly attitudes of the phlebotomists and auxiliary staff and the reassurance that the test was completely voluntary also appeared to be important in minimising children's anxiety.

In this study we have shown that taking blood by venepuncture from even fairly young children in schools for surveillance studies is technically possible. Postal delivery of blood samples to a central laboratory was successful, with minimal loss of specimens. Obtaining positive consent from parents was difficult for some groups of children, raising some concern about the representativeness of the final sample, though the overall response rate obtained in this study was acceptable.

Our recommendations have to be scrutinised in the context of recent guidelines on the conduct of research in children by the Medical Research Council⁸ and British Paediatric Association.⁹ In our view venepuncture is ethical provided that the problem under investigation is of great importance, the response rate is high, and the sample size is appropriate for the question being asked.

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Commentary (1)

In 1978 the British Paediatric Association (BPA) set up a working party on the ethics of research in children and as a result a set of guidelines to aid ethical committees considering research involving children was published in 1980.¹ Two of the premises on which the guidelines were based were that (a) research which involves a child and is of no benefit to that child (non-therapeutic research) is not necessarily either unethical or illegal and (b) that the degree of benefit resulting from a research should be assessed in relation to the risk of disturbance, discomfort, or pain – the risk:benefit ratio.

In the light of changes in the understanding of children's interests and in legal requirements, these guidelines were revised in 1992.² The section on the interpretation of assessment of risk in the earlier document was expanded and the particular issue of whether taking blood from children should be regarded as a minimal or low risk procedure was considered in more detail. It was concluded that taking blood from a child's vein was a low risk rather than a minimal risk procedure. Professor Sir David Hull in his foreword to the revised BPA report states 'The sentence on low risk that "Many children fear needles and to them low rather than minimal risks are often incurred by injection and venepuncture" is intended to encourage research workers to recognise the distress of these children'. The Department of Health's 1991 circular on local research ethics committees states in para 4.3 'Where the proposal is for non-therapeutic research . . . the child must be subject to no more than minimal risk as a result of his/her participation'.³ In the Medical Research Council publication, *The Ethical Conduct of Research on Children*, it is stated in para 8.1 that 'We recommend that children should only be included in research if in the case of non-therapeutic research, participation places a child at no more than negligible risk of harm'.⁴

The work of Hammond and her colleagues into the many factors which influence the child's and parent's decision to donate venous blood is important in that it challenges the revised guidelines and goes against the Department of Health's 1991 circular.³ They provide clear evidence on the acceptability of blood sampling by venepuncture in primary schoolchildren and the effects of age of the child, parental attitudes to testing, and peer group pressure on the child's perception of the benefits of participation. They also reported no difference between the response rate to venepuncture compared with an earlier study involving the collection of fingerprick capillary blood. Anaesthetic cream was used in the recent study but while being effective in relieving pain associated with needle insertion it might have contributed to the child's anxiety. Parental presence at the time of blood sampling was also a factor which might have increased anxiety levels. Parental attitudes, presumably determined by their own levels of education and life experience, also affected the uptake and the child's attitude to blood testing. These factors together with the child's age resulted in the acceptance rate in one school being 46% and in another 91%. It could be argued that there was a potential benefit to the individual child detected to be anaemic on the basis of the blood tests. What was not discussed was the fact that measurement of cholesterol in the blood samples was performed and there is no indication that the parents were counselled as to the family implications of the detection of significant hypercholesterolaemia. On the other hand without the valid information of the sort to be derived from the study we would have no knowledge of the definition of significant hypercholesterolaemia in young British children.

Many adults who donate blood or take part in medical research have an extreme dislike of venepuncture and the anxiety that precedes the insertion of the needle. This fear and dislike of pain however slight or transient is normal and outweighed by the altruism of the participant. It would be wrong to presume that the child is incapable of altruism and as Mott and Chambers comment 'both sentimentality and insensitivity are unhelpful attitudes in responsible and medical care of children'. They also emphasised the need to know normal ranges of blood biochemistry at various ages, particularly as child reference ranges often differ substantially from those in adults.⁵ Failure to obtain clinical and biochemical measures of the influence of diet on health and disease during the early years of life can only serve to delay our understanding of the environmental factors that cause later ill health and early degenerative disease.

The present guidelines are being interpreted by some ethic committees as precluding venepuncture in children for non-therapeutic research. This view must be challenged if it threatens studies which are essential to provide 'normal' data. I hope that the BPA Ethics Advisory Committee will review their revised guidelines.

FORRESTER COCKBURN
University Department of Child Health,
Royal Hospital for Sick Children,
Yorkhill,
Glasgow G3 8SJ

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Commentary (2)

Judith Hammond and her colleagues assess the feasibility and acceptability of collecting blood by venepuncture from two groups of primary schoolchildren. They state that 'venepuncture is ethical provided that the problem under investigation is of great importance, the response rate is high, and the sample size is appropriate for the question being asked'.

Embarking on trivial research is obviously wrong, but no information is given on which we can judge the relative importance of this project. I assume that the study was properly designed and appropriate to its objective. However, it is potentially dangerous for investigators to use the argument that it is ethical *because* of its scientific value. It also cannot be argued retrospectively that a study is ethical because there was a high response rate. 'A study is ethical or unethical at its inception; it does not become ethical *post hoc* - ends do not justify means'.¹

Another issue is the question of coercion or even subtle pressure on the subjects to