Archives of Disease in Childhood, 1988, **63**, 347–349

Annotations

Blood pressure

The National Heart, Lung and Blood Institute, Bethesda, has commissioned two reports of the Task Force on Blood Pressure Control in Children in the last decade. The first report appeared in 1977 and enjoyed wide distribution becoming a major reference for blood pressure standards in children.[1] The second report was published last year with, in its own words, the following objectives: (a) to identify the proper techniques for measuring blood pressure in infants, children, and adolescents; (b) to characterise the existing data base on blood pressure distributions throughout childhood and to prepare distribution curves of blood pressure by age accompanied by height and weight information; (c) to recommend blood pressure ranges for children denoting normal, high normal, or hypertensive; (d) to present guidelines for detecting children with hypertension and, at the same time, guard against inappropriate labelling of children as hypertensive who are not hypertensive; (e) to identify the appropriate diagnostic steps to be taken in the evaluation of children with hypertension; and (f) to delineate non-pharmacologic and pharmacologic treatment strategies in the management of children with hypertension.[2] Has it succeeded? Are its standards and recommendations applicable to European and, in particular, British children? The answers to these questions are not straightforward but might be summed up as 'not quite' and 'possibly'.

The data used for the 1987 report were taken from nine different studies performed in the United States and Great Britain involving more than 70 000 white, black, and what are described as Mexican-American children.[3–13] The British source was the Brompton study[11–13] involving 7804 subjects from birth to 3 years of age when material was extracted from it for the task force report. Most of the data are, hence, from North American studies, which may or may not be relevant to other parts of the world. Furthermore, the report appears to be written with the United States paediatrician in mind who, unlike his counterparts in many other countries, will be regularly reviewing 'well' children as opposed to only seeing referred 'sick' children as, for example, in the United Kingdom. This places a different emphasis on recommendations especially in the context of 'screening'.

Measurement technique

The most practical technique for measurement of blood pressure is the mercury sphygmomanometer, although for young children accurate recordings may only be possible using the Doppler ultrasound. An appropriate compression cuff is essential, and a useful rule of thumb is to use the largest cuff width that covers the upper arm yet still allows the bell of the stethoscope to be placed over the brachial artery in the antecubital fossa. There is not much argument with the task force in this respect, although it does dwell on the diastolic measurement, which is usually less accurately recordable and less important than the systolic value.[14]

Blood pressure

Amazingly the task force, although extolling the virtues of several blood pressure recordings in an individual child before drawing conclusions about the height of the blood pressure, have used the first blood pressure reading in the 70 000 subjects to prepare its standards because in one of the nine studies used only one blood pressure measurement per subject was available! After this incredible admission it goes on to generate percentiles of the age and sex specific blood pressure distributions by complex multiple regression and spline fitting methods shown by a series of rather small figures with charts for boys and girls from birth to 12 months, 1–13 years, and 13–18 years. These charts only give the 50th–95th percentiles with no thought given to the importance of identifying 'hypotension' and irritatingly a change from the Korotkoff phase IV (muffling) to phase V (disappearance) for diastolic blood pressure at the age of 13 years. Having identified normality as systolic or diastolic blood pressure of less than the 90th percentile and high normal blood pressure between 90th and 95th percentile, hypertension is defined as systolic or diastolic blood pressure, or both, equal to or greater than the 95th percentile for age and sex on at least three occasions. In an attempt to incorporate the important contribution of body size into the analyses the task force have added the 90th percentile details of height and weight for normal children at the bottom of the charts to help with the interpretation

of blood pressure values of an individual child. It would have been so much more helpful if it had considered generating percentile charts relating blood pressure to height (or some other index of body size) rather than age; this has been incorporated in the charts produced by Andre *et al*[15] in France and eliminates the errors of age related percentiles and the resulting cumbersome technique to factorise for size of the task force.

Guidelines for detecting children with hypertension

The task force does not recommend mass community blood pressure screening programmes for children and adolescents. It does, however, focus on surveillance of blood pressure of children under continuous care by a primary physician in the United States and recommends, in accordance with the guidelines of the American Academy of Pediatrics, annual determinations of blood pressure in children from 3–20 years of age by their primary physicians. What is this if it is not screening? Clearly these recommendations are of no relevance to countries in the world where primary physicians are predominantly concerned with treating the sick rather than undertaking health checks on well children.

What is appropriate for the United Kingdom? Two working parties (BPA Working Party on Child Health Surveillance and the British Hypertension Society Working Party on Blood Pressure Measurement) are currently considering this matter but have not made their recommendations. Meanwhile it would seem reasonable for all sick children to have their blood pressure measured whenever there is an indication for a general medical examination. As far as screening for hypertension is concerned this has to be considered in relation to the likely prevalence of the disorder. It has been suggested that the prevalence of hypertension in school children is of the order of 1%[16] but in only 10% of these children will the blood pressure be appreciably increased and require treatment. Most children with mild increases in blood pressure will turn out to have primary (essential) hypertension. The important 0·1% of children with more severe hypertension, usually secondary in origin, will have renal disease as the commonest cause. There are certainly advantages in detecting these severely hypertensive children but the cost-benefit ratio in identifying those with primary hypertension remains unclear.[17] In the present state of knowledge it cannot be recommended that all children should have their blood pressures measured at school medical examinations. As it is not difficult to measure blood pressure, however, the Working Party of the British Hypertension Society concerned with blood pressure measurement in children are likely to suggest that individual authorities decide on a policy of screening in childhood, balancing cost against demands on limited resources and bearing in mind the facilities locally for investigation of children in whom apparent hypertension is identified. There are, however, certain children who ought to have regular blood pressure measurements undertaken including those in whom a high blood pressure has been previously detected; those with renal or cardiovascular disease; those with diabetes or neurofibromatosis, and those with a family history of hypertension.

Investigation and treatment

Justification for investigation according to the task force unusually emphasises the importance of a diastolic blood pressure of greater than the 95th percentile whereas on this side of the Atlantic most workers in the field would use the systolic value. The investigations recommended, should hypertension be detected, differ in a number of respects to those agreed on at the Second International Symposium on Hypertension in Children and Adolescents in Heidelberg in 1985[18] with surprisingly no form of renal imaging, plasma renin or catecholamine measurements included in the initial screening procedures. These would certainly be part of the basic investigative protocol in the United Kingdom with more complex tests added subsequently if indicated.[19]

The emphasis on non-pharmacological treatment where indicated is laudable but only appropriate, in isolation, for mild hypertension. This type of treatment surprisingly, seems to be recommended by the task force for any children with systolic or diastolic blood pressure, or both, greater than the 90th percentile. For more severe increases in blood pressure, a 'stepped care' approach for drug treatment is suggested, although the drug choices and dosages are different and, at times, modest compared with European experience.[19] Intravenous labetalol and sublingual nifedipine for severe hypertension are conspicuous by their absence and there is inadequate guidance about inappropriate drugs in children and about side effects.

Task force and the United Kingdom

Although welcome, the Report of the Second Task Force on Blood Pressure Control in Children must be viewed circumspectly by paediatricians and those involved in the community child health services in the United Kingdom. In particular, the age specific percentile charts may not reflect blood pressure

norms for British children, quite apart from criticism of them in terms of relating blood pressure to age as opposed to height. There may be an argument, in view of the former, for utilising British age related systolic blood pressure charts for younger children,[20] or, in view of the latter, for adopting the French charts, which are commonly used in Europe.[15] The recommendations concerning screening are acceptable even though the reasoning behind such decisions in the United Kingdom may be rather different from that in the United States. Investigation and treatment proposals should be viewed in the context of current practice in Britain, which differs in a number of respects to the North American recommendations.

References

1 Report of the task force on blood pressure control in children. *Pediatrics* 1977;**59:**797–820.

2 Report of the second task force on blood pressure control in children. *Pediatrics* 1987;**79:**1–25.

3 Lauer RM, Clark WR, Beaglehole R. Level, trend and variability of blood pressure during childhood: the Muscatine study. *Circulation* 1984;**69:**242–9.

4 Lackland DT, Riopel DA, Shepard DM, *et al.* Blood pressure and anthropometric measurement results of the South Carolina dental health and pediatric blood pressure study. South Carolina Dental Health and Pediatric Blood Pressure Study. Columbia, South Carolina: South Carolina Health Board, January 1985.

5 Gutgesell M, Terrell G, Labarthe DR. Pediatric blood pressure: ethnic comparison in a primary care center. *Hypertension* 1980;**3:**39–47.

6 Voors AW, Foster TA, Frericks RR, *et al.* Studies of blood pressure in children ages 5–14 years in a total biracial community—The Bogalusa Heart Study. *Circulation* 1976;**54:** 319–27.

7 McDowell A, Engel A, Massey J, *et al. The plan and operation of the second national health and nutrition examination survey, 1976–1980.* Department of Health and Human Services Publication No (PHS) 81-1317, Series 1. No 15. Washington DC: Government Printing Office, 1981.

8 Baron AE, Freyer B, Fixler DE. Longitudinal blood pressure in blacks, whites, and Mexican Americans during adolescence and early adulthood. *Am J Epidemiol* 1986;**123:**809–17.

9 Schachter J, Kuller LH, Perfetti C. Blood pressure during the first five years of life: relation to ethnic group (black or white) and to parental hypertension. *Am J Epidemiol* 1984;**119:**541–53.

10 Zinner SH, Rosner B, Oh WO, *et al.* Significance of blood pressure in infancy. *Hypertension* 1985;**7:**411–6.

11 de Swiet M, Fayers P, Shinebourne EA. Blood pressure survey in a population of newborn infants. *Br Med J* 1976;**ii:**9–11.

12 de Swiet M, Fayers P, Shinebourne EA. Systolic blood pressure in a population of infants in the first year of life: the Brompton Study. *Pediatrics* 1980;**65:**1028–35.

13 de Swiet M, Fayers P, Shinebourne EA. Value of repeated blood pressure measurement in children: the Brompton study. *Br Med J* 1980;**280:**1567–9.

14 Whyte RK, Elseed AM, Fraser CB, *et al.* Assessment of Doppler ultrasound to measure systolic blood pressure in infants and young children. *Arch Dis Child* 1975;**50:**542–4.

15 Andre JL, Deschamps JP, Gueguen R. La tension arterielle chez l'enfant et l'adolescent. Valeurs rapportées à l'âge et à la taille chez 17067 sujets. *Arch Fr Pediatr* 1980;**37:**477–82.

16 Leumann EP. Blood pressure and hypertension in childhood and adolescence. *Ergeb Inn Med Kinderheilkd* 1979;**43:**109–83.

17 Hofman A. Blood pressure in childhood: an epidemiological approach to the actiology of hypertension. *J Hypertens* 1984;**2:** 323–8.

18 Dillon M, Schärer K. Recommendations for the diagnosis of hypertension in children and adolescents. *Clin Exp Hypertension [A]* 1986;**8:**913–4.

19 Dillon MJ. Investigation and management of hypertension in children. A personal perspective. *Pediatr Nephrol* 1987;**1:**59–68.

20 de Swiet M, Fayers PM, Shinebourne EA. Blood pressure in four and five-year-old children. The effects of environment and other factors in its measurement. The Brompton Study. *J Hypertens* 1984;**2:**501–5.

M J Dillon
Hospital for Sick Children, Great Ormond Street, London WC1N 3JH