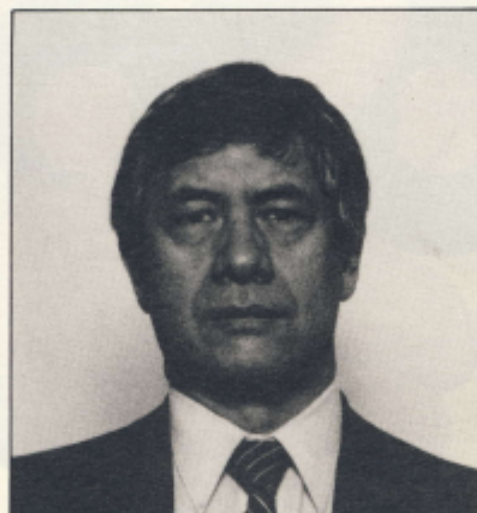


Hypertension in children

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Curriculum vitae

James Edward Carter studied at UCT and obtained the MB ChB in 1962. After some hospital experiences in the RSA, he went to further his studies in Canada and has been a staff-member of the University of British Columbia since 1970. He is currently Associate Professor, Division of Paediatric Nephrology in Vancouver BC. He has published numerous scientific papers in his two main fields of interest: paediatric nephrology and child abuse, and serves on a long list of professional societies. Jimmy is married to Lynn, and they have four lovely, lively boys.

KEYWORDS: Hypertension; Child; Normal values

Summary

There is an increasing awareness of hypertension in children; the GP is in an ideal situation to screen children for this, and to follow these patients through to young adulthood. Very practical guidance is given on the taking of accurate blood-pressure in children as well as norms for defining hypertension in various age groups.

There is an increasing awareness of the occurrence of hypertension in children. This awareness includes an appreciation that essential hypertension (i.e. hypertension without a discernible primary cause) is more common in children than previously recognised.

The primary care physician (or a properly trained designate) must be capable of taking an accurate BP which must be part of a complete physical examination. Ideally this should be performed at regular intervals and at all doctor-patient contact points in emergency rooms and hospitals.

Before hypertension could be diagnosed, acceptable standards of BP measurement in children had to be developed. The initial standards by the 1st Task Force¹ on BP in children have been superseded by the 2nd Task Force² on Blood Pressure Control in children.

BP may be taken by:

- Flush method
- palpation
- auscultation or
- doppler technique.

This latter procedure has replaced the manual taking of BP in well established hospitals but because of cost is not generally available. Thus manual recording is the method of practice. Careful attention must be paid to technique. A cuff of appropriate size and length must be chosen for the child. It is recommended that primary care physicians have available a choice of three sizes of cuff for their patients. The width of the cuff must cover at least $\frac{2}{3}$ of the upper arm - smaller cuffs will lead to abnormally high recordings. Large cuffs may obstruct the brachial artery so that the bell of the stethoscope cannot be properly applied to the arm.

The length of the cuff must then cover the circumference of the arm (this refers to the bladder and not the cloth covering).

The environment where the reading is made must be suitable. A busy practitioner's office may not be

to the chart for a normal for age value appropriate to children. Newborns have a low average blood pressure which gradually increases through childhood to reach adult values at mid-adolescence. Thus the adult standard of hypertension of systolic 140 diastolic 90 is largely not applicable to children (see Table 1 below).

Severe hypertension may be defined as ≥ 95 th centile for age appropriate controls. The current values (from the 2nd Task Force on BP in children) also takes into account the stature of the child, recognising that a larger, well proportioned child has a higher BP reading which may be considered normal. Since obesity is a pathological state, higher readings in the obese patient are considered abnormal.

It is well accepted that the child identified as hypertensive tracks along the same high percentile and becomes the hypertensive young adult. This places the primary care physician in the ideal position to carefully follow the patient and institute comprehensive counselling, life style change and

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ideal. Any interpretation of blood pressure must take into account the background distraction and the emotional status of the child. The child should be calm and reassured. If the blood pressure is elevated, it must not be interpreted until it is repeated and the high reading confirmed. If the blood pressure is only moderately elevated, repeat examination can be deferred to another visit.

Five Korotkoff sounds (or phases) are noted when blood pressure is taken. Phase 1 (Korotkoff sound 1) marks the onset of the tapping sound i.e. systolic pressure.

The 4th Korotkoff sound is indicated by the muffling of the arterial beat. It is generally accepted that this 4th Korotkoff sound best indicates the diastolic pressure in the child. The fifth Korotkoff phase is marked by the disappearance of the sound which can give difficulty as in the child the arterial sound is frequently heard down to zero pressure.

Once the BP is taken in the child, one should refer

Long-term effects on children of pharmacological treatment for hypertension are not yet well known

pharmacological intervention when necessary. Before the latter is done in children however, appropriate consultation must be sought. It must be emphasised that the primary care physician will provide the continuity of care from childhood to adulthood.

Table 1³ *Classification of Hypertension by Age Group*

Age Group	Significant Hypertension (mm Hg)	Severe Hypertension (mm Hg)
Newborn: 7 d	Systolic BP ≥ 96	Systolic BP ≥ 106
8-30 d	Systolic BP ≥ 104	Systolic BP ≥ 110
Infant (< 2 yr)	Systolic BP ≥ 112 Diastolic BP ≥ 74	Systolic BP ≥ 118 Diastolic BP ≥ 82
Children (3-5 yr)	Systolic BP ≥ 116 Diastolic BP ≥ 76	Systolic BP ≥ 124 Diastolic BP ≥ 84
Children (6-9 yr)	Systolic BP ≥ 122 Diastolic BP ≥ 78	Systolic BP ≥ 130 Diastolic BP ≥ 86
Children (10-12 yr)	Systolic BP ≥ 126 Diastolic BP ≥ 82	Systolic BP ≥ 134 Diastolic BP ≥ 90
Adolescents (13-15 yr)	Systolic BP ≥ 136 Diastolic BP ≥ 86	Systolic BP ≥ 144 Diastolic BP ≥ 92

The consequences of hypertension are well known. Target organs of small blood vessels, kidney, heart and brain are all adversely affected by prolonged hypertension. In the Evans County, Georgia study of 30 patients 15-24 years of age followed for a period of 7 years, 2 had died of cerebral haemorrhage, 4 had overt target organ damage and 18 had severe hypertension.

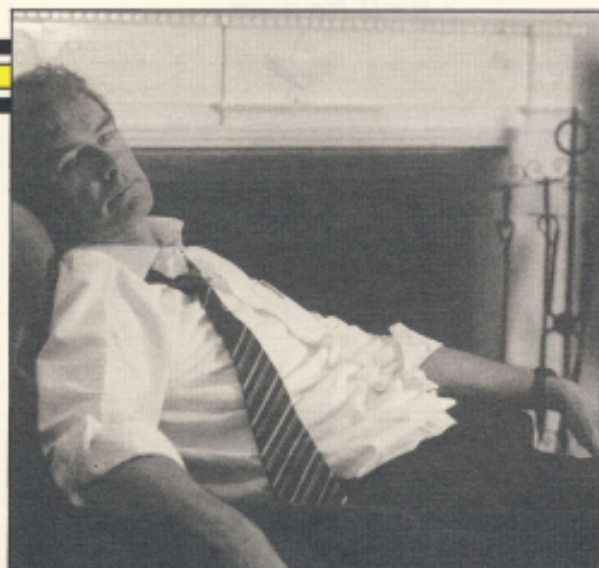
The GP has a major role in screening children for hypertension

Hypertension in children was usually considered to be secondary to other causes: over 80% usually was due to a nephrologic cause. Coarctation of the aorta and other cardiac causes, and endocrine causes including Cushing's syndrome or Pheochromotoma make up a further group. Generally speaking, the causes of secondary hypertension are obvious on

presentation e.g. oedema, haematuria in glomerulonephritis, or rash, labile hypertension for pheochromocytoma and the diagnosis is therefore not difficult. In many hypertension clinics today however, the incidence of essential hypertension has crept up to 50%. The physician faces a dilemma when the child is hypertensive and asymptomatic. The question is how far and what action needs to be taken.

If the BP is moderately elevated, repeat the reading. If within normal limits, return the child to regular follow up care.

If persistently moderately elevated and the patient is obese, try dietary manipulation (calorie and salt restriction) and follow up closely. If the BP is moderately elevated and there is a strong family history of essential hypertension again follow closely and perhaps ascertain the lipid profile status of the patient. If the child has severe hypertension refer for consultation and a full diagnostic workup may well be required. In these cases, essential hypertension is a diagnosis of exclusion and investigation including angiography



**PATIENT
PERFORMANCE
NEED NOT BE AFFECTED BY
ANTI-HYPERTENSIVE THERAPY.**

and selective renin/aldosterone estimation may be indicated.

Pharmacological treatment of the child is perhaps best done under the guidance of a consultant. The long-term effects of pharmacological treatment are not well known. Compliance is a recognised problem in the age group and the decision to use drugs has to be based on firm clinical grounds. A stepped care approach is also appropriate in children. One should start with a beta-blocker with or without a vasodilator as the second drug. Propranolol is easier to manipulate to obtain a good response compared to the long acting beta-blockers. The

Compliance is a recognised problem in children

addition of a diuretic may also be indicated in some children. Recently captopril has been shown to be effective in children.

In summary it is suggested the primary care

The GP is in an ideal situation to monitor high risk patients and follow them through to adulthood

physician has a major role in screening children for hypertension, in view of the increasing recognition of essential hypertension in children. He is also in an ideal position to follow these patients to young adulthood and designate those most likely to suffer from the long-term consequences of severe hypertension.

References

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