



# Hypertension: Under Recorded and Under Recognised in General Paediatric Outpatient Clinics

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## Abstract

**Background:** In conjunction with the increasing obesity epidemic there are concerns that hypertension is increasing. Many argue that blood pressure measurement should be an essential part of all consultations.

**Objectives:** This study sought to establish whether General Paediatricians were recognising hypertension.

**Methods:** The clinic letters of each patient attending general paediatric outpatient clinics at Tauranga Hospital for the month of March 2013 were reviewed for demographic data, diagnosis, blood pressure recording and BMI.

**Results:** Three hundred and forty two patients were seen. Forty six percent of patients had a blood pressure taken. Sixteen percent had an elevated reading. Thirty nine percent of these patients had a plan to manage the elevated reading recorded in their notes. Forty five percent of patients were thought to have needed a blood pressure and 85% of these received one. Two thirds of patients who were overweight/obese had their blood pressure taken.

**Conclusions:** Hypertension is under recognised by General Paediatricians. Ensuring all children who are at increased risk get a blood pressure measurement should be the first priority.

**Keywords:** Hypertension, Paediatrics, Recognition, Screening

## 1. Background

It is estimated that between 1% and 5% of children as well as adolescents have hypertension (1). Hypertension can be primary with no cause identified or secondary, most commonly related to underlying renal or cardiac disease. As with adults, the majority of children and adolescents with mild to moderate hypertension have primary hypertension (2). The prevalence of primary hypertension has increased with the obesity epidemic (1).

The rationale for blood pressure measurement is to identify hypertension at an early stage where intervention could be initiated. There is evidence that childhood hypertension continues into adulthood (2). In addition, it is postulated that children with hypertension are, like their adult counterparts, at risk of cardiovascular disease (1).

The diagnosis of hypertension is dependent on accurate blood pressure measurement, which is often difficult to achieve. A number of factors affect the accuracy of measurement including the equipment, observer bias, and the mental status of the patient (3). Many children who have elevated blood pressure on screening will not have hypertension.

Despite recommendations to routinely measure blood pressure in children, it is still not the norm (4-6). Shapiro and colleagues found that in overweight/obese children who are at higher risk of hypertension, screening only occurred during 35% of ambulatory pediatric visits, 67% of preventive visits, and 84% of preventive visits, in which overweight/obesity was diagnosed (7).

Even when blood pressure is taken it is often not recognized. In the Brady and colleagues study, 39% of patients had an elevated blood pressure measurement; however, only 13% were recognized by their health care provider (8). Similarly, Shapiro and colleagues found that of the children with hypertension in their study, only 26% had a diagnosis of hypertension or elevated blood pressure documented in the electronic medical records (9).

## 2. Objectives

This study sought to establish whether general pediatricians recognized hypertension in patients presenting to outpatient clinics.

### 3. Methods

The clinic letters for every patient presenting to a general pediatric clinic at Tauranga Hospital from March 1, 2013 until April 1, 2014 were reviewed by 2 members of the Pediatric department. Demographic details such as, height, weight, diagnosis, whether blood pressure was recorded, and action taken if hypertensive, were recorded. A decision was also made regarding whether blood pressure should be taken, based on whether the 2 pediatricians reviewing the letter would both have requested blood pressure.

Blood pressure was taken with a DINAMAP (non-invasive oscillometric blood pressure machine). For the purpose of this study, a one off elevated blood pressure was considered hypertension, although this is not the correct diagnosis. A diagnosis of hypertension is made when repeat blood pressure values on at least 3 separate visits, separated by days or weeks, are greater than the 95th percentile for age, gender, and height (6). Patients are considered pre-hypertensive if their recordings are consistently between the 90th and 95th percentiles.

The blood pressure percentiles were taken from PediaCents, (a smart phone application available at itunes. <https://itunes.apple.com/nz/app/pediacents/id383540285?mt=8>). PediaCents is a software tool providing simple access to blood pressure percentiles calculated from the regression formulas published in the fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents (10). It was selected due to the fact that the majority of pediatricians in the department have access to this application and use it in the clinic for calculating blood pressure percentiles.

The data was entered into an Excel spreadsheet (Microsoft Corporation Remond, Washington) and analyzed using Statview (SAS Institute inc. Cary, North Carolina. USA). Chi Square and Fisher's exact tests were used for nominal data and Students t-test for continuous data.

### 4. Results

A total of 342 patients were seen during the 1 month time period. Patients ranged in age from 0 - 19 with an average age of 7 years and a mode of less than 1 year. The demographics of the patients are described in Table 1.

Of the patients, 46% (158) seen had their blood pressure recorded. Patients who did not get their blood pressure taken were younger in comparison with those who did ( $P < 0.001$ ). There was very little difference between the 2 groups in terms of gender ( $P = 0.08$ ), ethnic group ( $P = 0.12$ ), or rates of obesity.

**Table 1.** Characteristics of the Hypertensive Patients Versus the Total Population<sup>a</sup>

Variables	Hypertensive Patients	Total Population	P Value
<b>Female</b>	18 (64)	150 (44)	
<b>Male</b>	10 (36)	192 (56)	$P < 0.05$
<b>NZ European</b>	17 (61)	226 (66)	
<b>Maori</b>	5 (18)	53 (15)	
<b>Other European</b>	5 (18)	37 (11)	
<b>Asian</b>	1 (3)	8 (2)	
<b>Indian</b>	0	9 (3)	
<b>Pacific Islander</b>	0	8 (2)	
<b>Other</b>	0	1 (< 1)	$P = NS$

<sup>a</sup>Values are expressed as No. (%).

Overall, 16% of patients (28) had a systolic blood pressure greater than the 95th percentile and 19% (33) greater than or equal to the 90th percentile. A total of 2% (4) of patients had diastolic BP greater than the 95th percentile and 5% (9) greater than or equal to the 90th percentile. One patient had both a systolic and diastolic BP greater than the 95th percentile. Table 1 shows the characteristics of the 28 hypertensive patients, compared to the total population.

Of the 28 patients with hypertension (systolic blood pressure greater than the 95th centile), only 11 (39%) had a plan to manage the result recorded in their notes. All the patients who were hypertensive were thought to have needed their blood pressure recorded.

Of the 28 patients with hypertension, 25% (7) had a BMI greater or equal to the 95th percentile, 32% (9) above the 90th percentile, and 39% (11) above the 85th percentile.

A little under half of the patients (45%) (155) seen in the clinic were thought to have needed their blood pressure recorded. Of the 155 patients thought to have needed their blood pressure taken, 85% (131) did and 15% did not (24) have their blood pressure taken. Table 2 lists the diagnosis of patients thought to have needed their blood pressure taken but did not get one. The patients who were thought to need their blood pressure taken but did not get one were similar to those patients who were thought to have needed their blood pressure taken and had one taken in terms of gender, age, and ethnic group.

Of the 131 patients thought to have needed their blood pressure taken and had it done, 20% (27) had a blood pressure greater than the 95th percentile, 24% (31) greater than or equal to the 90th percentile, and 26% (34) greater than or equal to the 85th percentile.

A BMI was able to be calculated for 75% of patients (255). A total of 68 patients were unable to have their BMI calcu-

**Table 2.** Diagnoses of Patients Who Needed Their Blood Pressure Taken But Did Not Get One

Diagnosis	Number of Patients
Obesity	4
Hearing loss (first presentation)	3
Murmur	3
Hemihypertrophy	2
Arthritis	2
Short stature (first presentation)	1
ADHD	1
Chronic granulomatous disease	1
Osteosarcoma	1
MODY type 3	1
Pectus carinatum	1
CVA	1
Haematuria	1
Tuberculosis sclerosis with cardiac rhabdo	1
Recent urosepsis	1

lated as they were too young or there were recorded reasons as to why their height or weight could not be taken.

Of the patients, 9% (30) had a BMI greater or equal than the 95th percentile and 18% (63) greater or equal than the 85th percentile. Two thirds of the patients with a BMI at or above the 85th percentile had their blood pressure taken and recorded. This decreased to 60% for patients with a BMI at or above the 95th percentile.

## 5. Discussion

Only 46% of patients had their blood pressure recorded. There are real barriers when taking a patients blood pressure. The main barrier is time. An accurate blood pressure requires at least 5 minutes and if the initial measurement is elevated, it needs to manually be repeated. It is especially difficult to get an accurate blood pressure on infants and toddlers. The group of patients who did not get their blood pressure taken were younger than those who did. Clinicians are often reluctant to spend precious consulting time in the pursuit of blood pressure, especially on a patient who is unlikely to have an elevated pressure and who has more pressing needs to address. Moreover, a child made fractious by blood pressure measurement makes subsequent physical examination difficult.

More children were “hypertensive” in our study than would be statistically expected. This was not surprising

given that hypertension was based on 1 measurement. The majority of these patients will likely be normotensive after further review. In addition, the population attending a general paediatric clinic is almost certainly at a higher risk of having hypertension than the general population. All the patients noted to be hypertensive were considered to have needed their blood pressure taken suggesting a higher risk group.

It is a concern that only 39% of patients with an elevated blood pressure had a plan documented in their notes. One of the study's limitations is that it relied on clinic letters. Clinicians may have made a plan to address an elevated blood pressure, however they did not record it. Documented care is not necessarily a complete reflection of the care received (11). However, the lack of plans may also reflect that the hypertension wasn't recognized as occurred in the study by Brady and colleagues (8). Definitions of hypertension rely on age, gender, and height, making it difficult to identify hypertension easily without plotting it. To help clinicians recognize hypertension, perhaps plotting blood pressures on charts needs to become a standard practice as is routine for growth.

The study highlights that there were opportunities missed for measuring blood pressure. A total of 15% patients who deemed worthy of a blood pressure measurement failed to have one taken. There may be several reason for this. The difficulties in getting blood pressure measurements has already been discussed. Another possibility is that such patients may be attending clinics frequently and who recently had a normal blood pressure were deemed to not need one at this time.

Perhaps more disappointing is that opportunities to measure blood pressure on children who were overweight were missed. Only 65% of overweight patients had their blood pressure taken and this decreased to 60% in the most overweight children. Overweight children are already at increased risk of cardiovascular disease and therefore should be screened.

Overall, there were clearly opportunities to screen for hypertension, which were missed. In addition, even when measured hypertension was not necessarily recognized or a management plan recorded. It is perhaps time to advocate for routine screening of blood pressure in all pediatric visits.

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## Footnotes

**Authors' Contribution:** Dr Kendall Crossen, study concept and design, analysis and interpretation of data, writing manuscript.

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