Blood pressure charts for pediatrics

Blood pressure screening is essential throughout life. Adult blood pressure assessments have static thresholds of 140/90 for hypertension and 90/60 for hypotension but screening blood pressure in children is more complicated. As children grow, normal blood pressure naturally increases with age and height requiring dynamic thresholds for abnormal blood pressure based on gender, age, and height percentile. Consequently, the recognition of blood pressure abnormalities in children is more cumbersome and contributes to underdiagnoses.

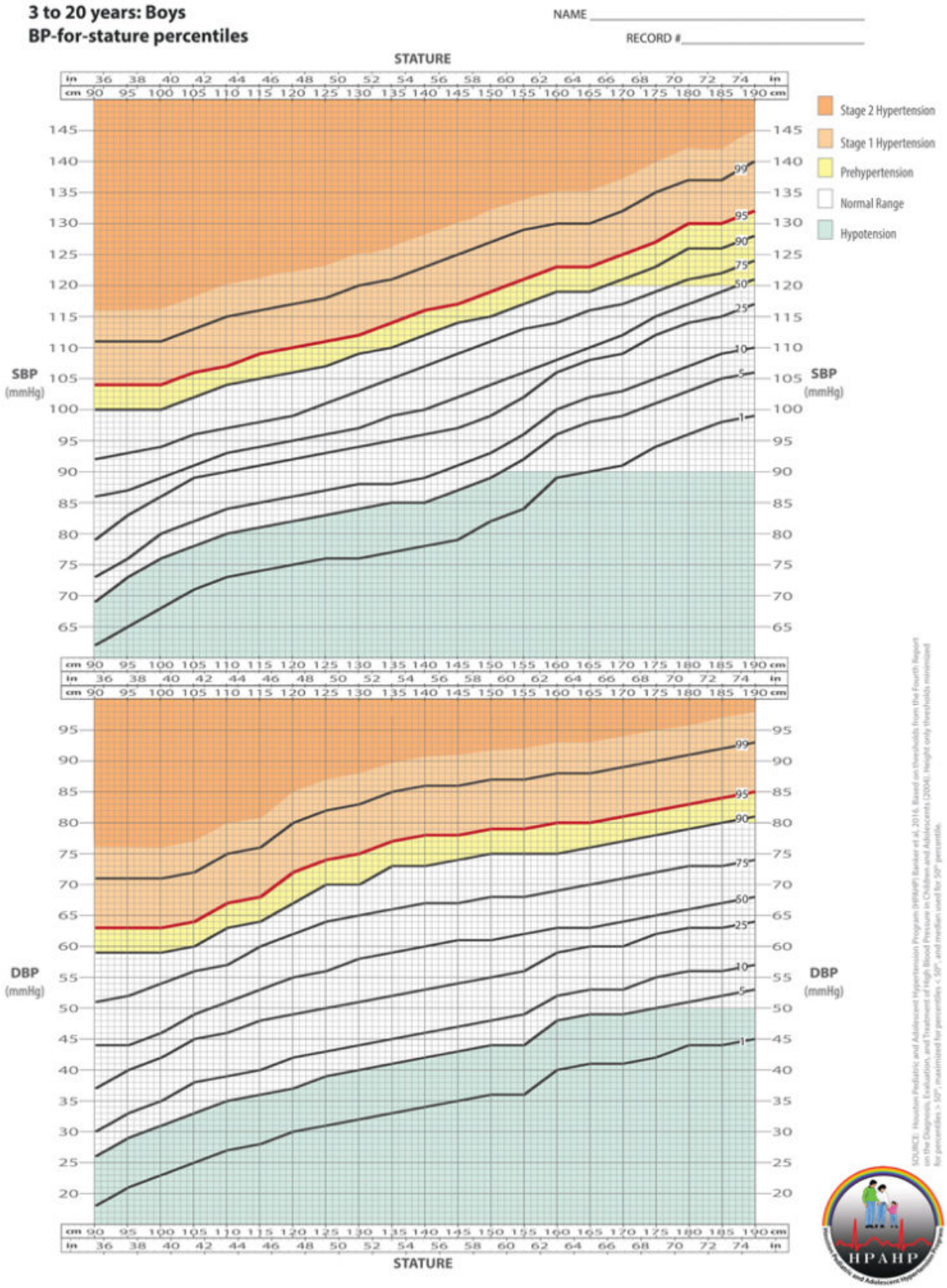
3 to 20 years: Boys
BP-for-stature percentiles
NAME
RECORD #
STATURE
Stage 2 Hypertension
Stage 1 Hypertension
Prehypertension
Normal Range
Hypotension
SBP (mmHg)
DBP (mmHg)
99
95
90
75
50
25
10
5
1
HPAHP

Fig. 1. BP-for-stature percentiles, Boys 3 to 20 years.

Current blood pressure thresholds for children are published in complex reference tables from the Fourth Report, the US gold standard reference for blood pressure thresholds in children and adolescents. Despite being recommended for all children over 3 years of age by the American Academy of Pediatrics, studies have shown that blood pressure measurement is rarely done in children. Moreover, when blood pressure is measured often the Fourth Report reference tables are used incorrectly or not at all.

We have published simple blood pressure charts for boys and girls displaying percentile curves in the style of CDC growth charts. These simple blood pressure charts are based directly on the gold standard Fourth Report thresholds and have been tested for accuracy in a sample of 1254 healthy children. Since height accounts for substantially more blood pressure variability than age in children, our charts require only the child's height and gender to assess blood pressure abnormalities. Furthermore, our charts avoid the additional step of determining height percentile by displaying height in centimeters and inches directly.

The blood pressure threshold values in our charts are direct summary measures of the thresholds calculated in the Fourth Report such that minimum thresholds across ages are used to define hypertension and maximum thresholds across ages are used to define hypotension. This strategy makes these simple blood pressure charts a 100 % sensitive tool for screening. To ease diagnostic utility, different shaded colors represent prehypertension, stage 1 hypertension and stage 2 hypertension, as well as hypotension. Using data from our Houston area school-based blood pressure screening program, the blood pressure chart classifications for elevated BP were compared to those in the Fourth Report. For elevated blood pressure, the charts had 100% sensitivity with specificity over 94%. In other words, the use of these blood pressure charts will result in some false positives, however all children with elevated blood pressure will be identified.

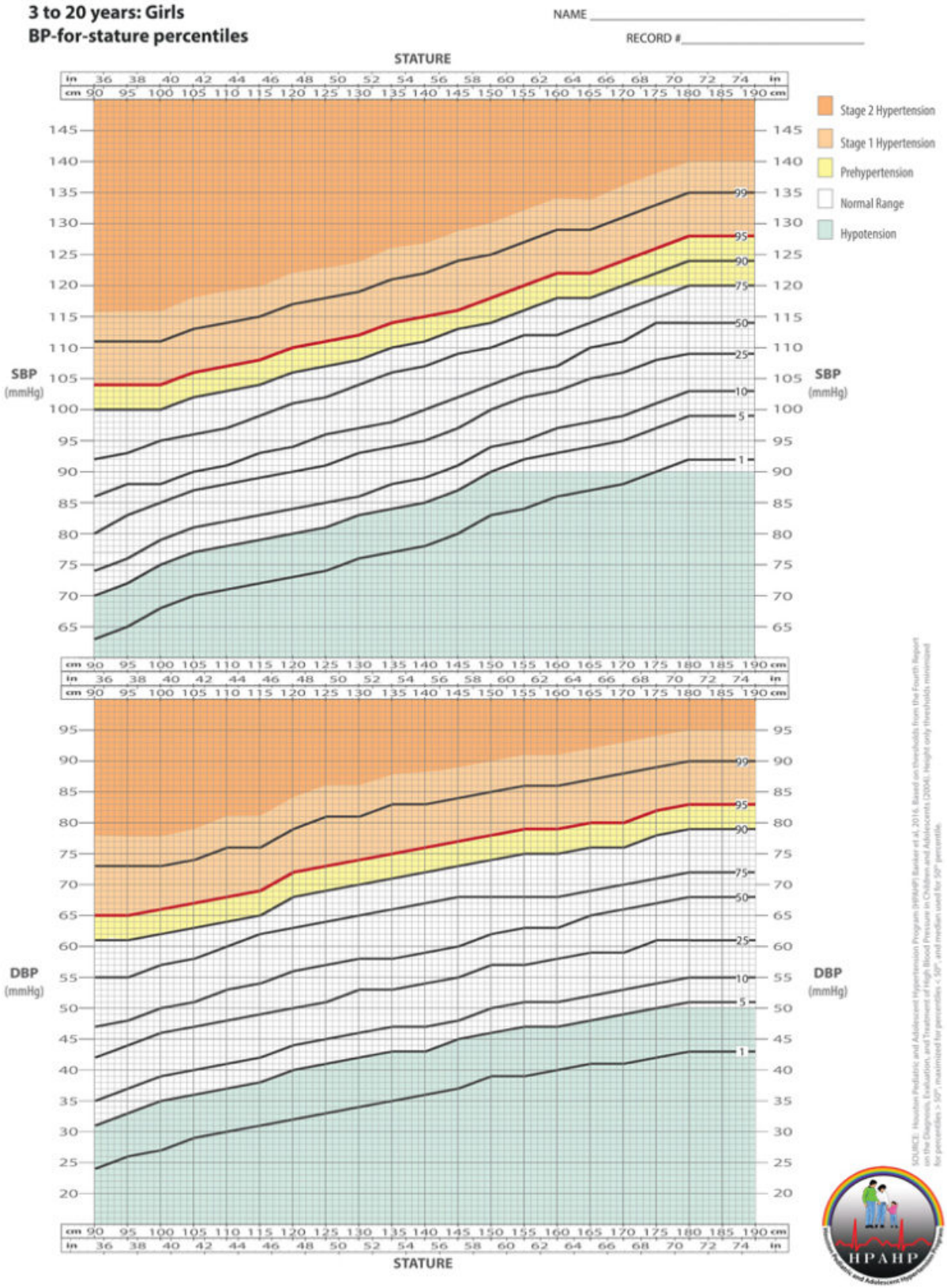
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Fig. 2. BP-for-stature percentiles, Girls 3 to 20 years.

Aimed at optimizing utility in a busy clinical setting, our BP charts can be used for the rapid identification both low and high abnormal blood pressure. Additionally, the charts can be used to visually track blood pressure percentile changes over time in the same child, as done with CDC growth charts. Our goal for the simple blood pressure charts is to help increase the frequency and accuracy of screening for blood pressure abnormalities in pediatrics.

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