

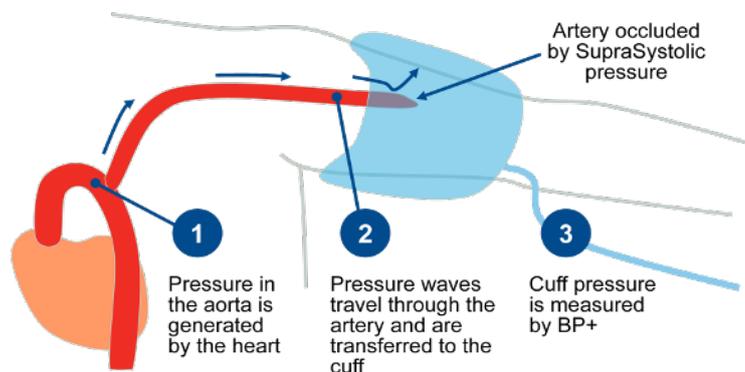
Portal and BP+ explained

Medi-stats BP+ and Portals non-invasive technology allows hypertension to be understood, patients to be engaged and treatment to be approached in a preventative manner. Encouraging patients to take charge of their own health with the benefit of monitoring progress.

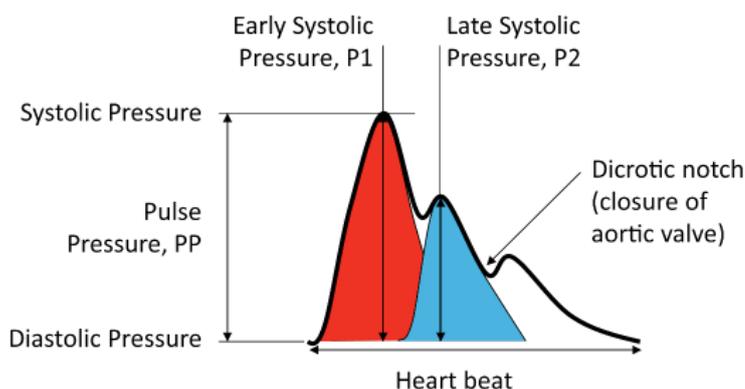


We measure Brachial (arm or traditional BP)

Central aortic BP

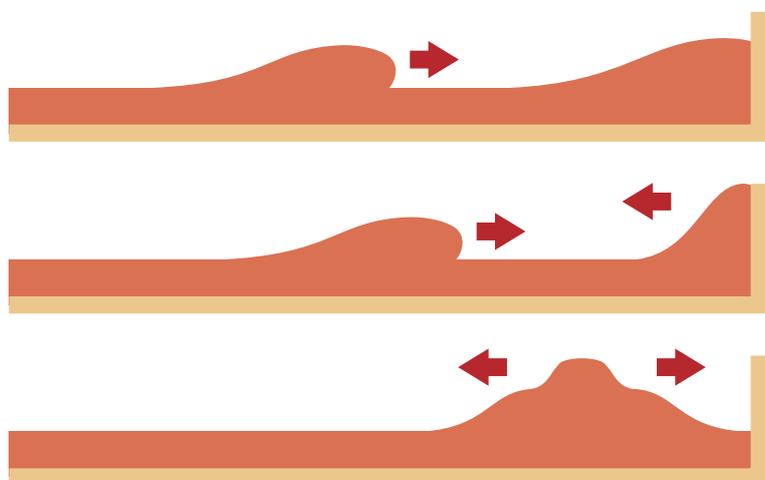


Arterial stiffness expressed as Augmentation Index (%)



$$AI = \frac{\text{Reflective wave}}{\text{Forward wave}} \times \frac{100}{1}$$

$$AI = \frac{P_2}{P_1} \times \frac{100}{1}$$



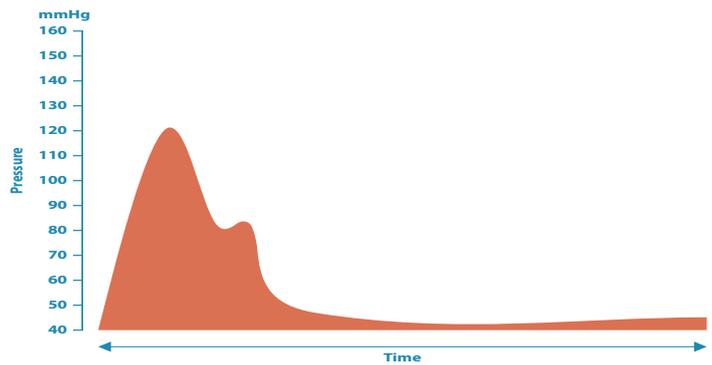
Pulse wave analysis (PVA)

Normal curve: 120/80

O₂ is used during systolic phase = time heart (ventricular) muscle contracts to pump

Oxygen rich blood perfuses ventricular muscle during diastolic phase = rest phase

With normal arterial stiffness, the process is potentiated, and blood perfusion through the ventricular muscle is enhanced



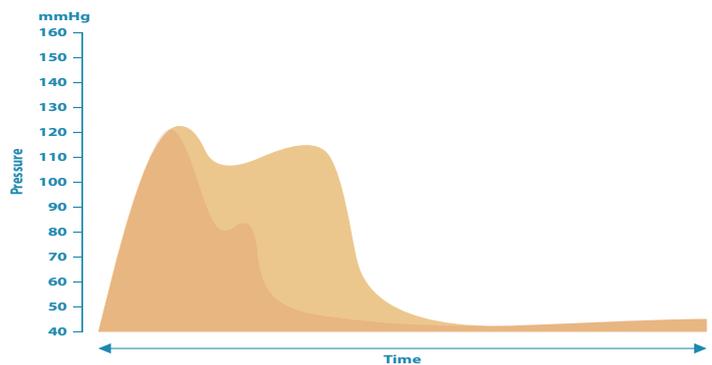
Increased arterial stiffness

The reflected wave is more or less the same size as the forward wave or smaller (AI ≤ 100%)

The pulse curve is extended to accommodate the increase in pressure

Pump time is extended, and rest time is shortened – more O₂ is used and less replenishment

The heart muscle is being exhausted



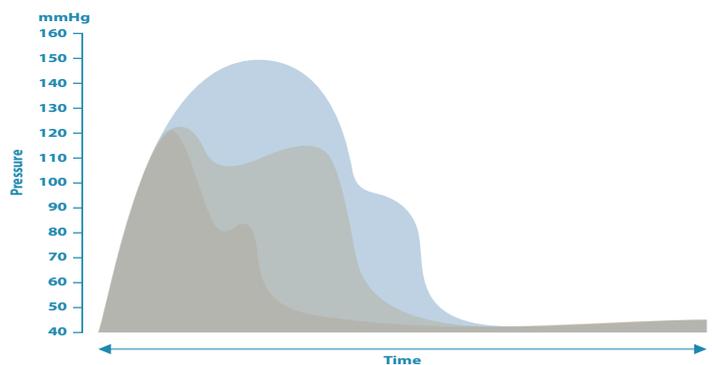
Arterial stiffness increased more

Reflected wave is larger than forward wave (AI ≥ 100%)

Pulse curve is extended PLUS load on ventricular muscle is increased

The ventricular muscle enlarges, and heart attack could follow

For increased BP and increased AI, variable exercise is required or vasodilating medication



How does exercise help?

When the heart rate is challenged and it increases and it is allowed to come down to normal and challenged again, nitric oxide (NO) is formed in the endothelium and the arterial stiffness decreases (arteries relax)

Do these five times per week starting with 20-30 minutes

This process could last for two hours where load on the heart is decreased and it relaxes

Blood perfusion through all the end-organs is increased

In older people the residual effect becomes apparent after three months and the variable exercise becomes easier

People under stress who do not allow time for relaxation or workout, often see an improvement after two to four weeks in AI and BP

Excercise and Blood Pressure (BP)

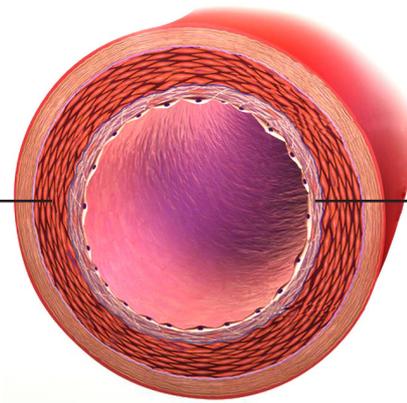


click here

Cut through artery wall

Muscle in arterial wall gets damaged, collagen is formed (scar tissue) and calcification follows. Artery becomes stiff and affects BP and heart function.

Muscle in artery wall under stress during strenuous exercise – damaged, collagen formed – calcification – leads to high BP and heart attack



Nitric Oxide (NO) formed in the endothelium – artery wall relaxes

Pulse rate variability (PRV) and AF

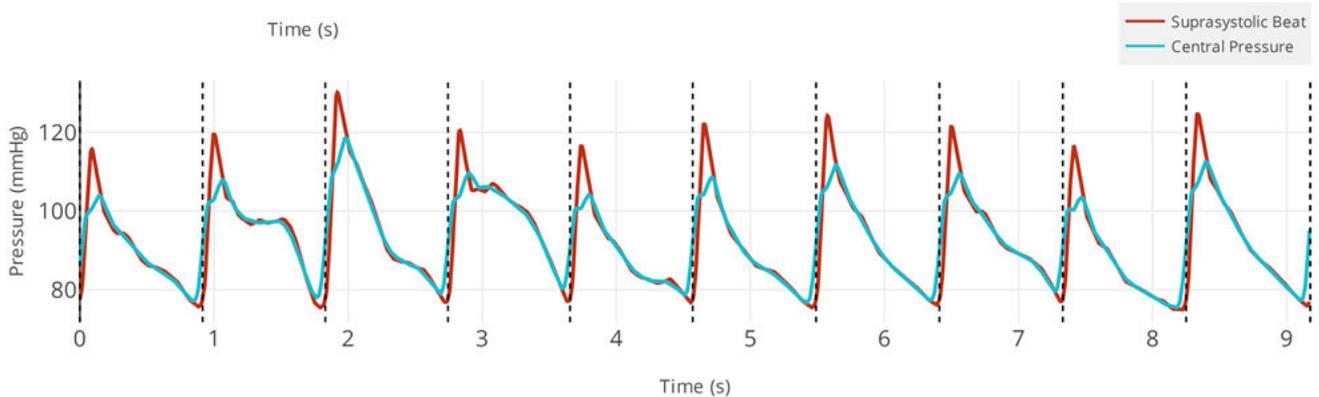
A rhythm strip (10 second snapshot of pulse action – not electrical like ECG but how the heart pumps) is produced (Pulse rate variability differs from heart rate variability, which is electrical and refers to the change in heart rate between inhaling and exhaling – difference between sympathetic and parasympathetic activity)

The Rhythm strip is a 10 second snapshot of the pump action of the heart.

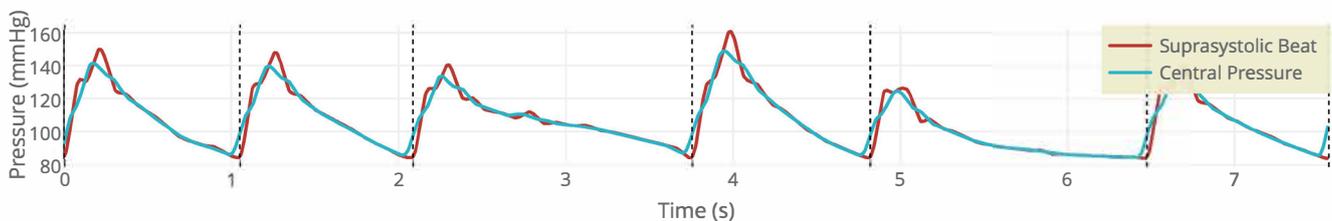
It is highly sensitive to detect irregularities and 96% sensitive to detect AF

A regular pulse will have regular intervals (Figure 1)

The pulse rate variability will be from 0 – 70/80



Pulse rate variability 100 and above should initiate a GP referral for further investigation to rule out AF – see below example of irregular pulse as illustrated by the rhythm strip.



What does the screen result tell us?

Brachial blood pressure (Sys) and (DIA)

This is the same as for regular BP devices and is indicated by the red line on the pulse curve.

Central systolic blood pressure (C.SYS and C.DIA)

This is the blood pressure at the aorta (at the heart) indicated by the blue line on the pulse curve. Central BP is a new parameter to monitor BP especially the effect of medication or exercise wants to be monitored. (Medication could affect central and brachial BP differentially.) Central BP is the pressure that affects the vascular system and the end-organs and is a better indicator of future cardiovascular events. Central BP cannot be calculated from the brachial BP (confirmed by a study of 10,000 individuals).

Heart Rate (HR)

This is the pulse rate

Pulse Rate Variability (PRV)

The pulse rate variability indicates any rhythm abnormalities such as Atrial Fibrillation (AF). A value of 95 and above gives reason for referral to rule out possible AF by means of ECG. The Rhythm strip will also illustrate variance in size of the beats as confirmation of arrhythmia (see education on Medi-stats.com).

Pulse Pressure (PP)

The pulse pressure is a new risk factor for cardiovascular disease. PP is the difference between systolic and diastolic pressures and indicates the force of each pulse on the organs or vascular system. 40 mmHg is optimal (120-80)

Central Pulse Pressure (C.PP)

C.PP is the difference in central systolic and diastolic pressures and indicates the force of the pulse at the aorta.

Rhythm Strip

The rhythm strip is a 10 second snapshot of the pulse action of the heart. Please note that it is NOT electrical similar to ECG but represent the pressure curves in the brachial arteries (red line) and the aorta (blue line). Irregular pulses will be accompanied by a PRV value of 100 and more.

The PDF

All the screen results appear on the PDF

Your screen results

All the cardiovascular results as described above

Signal quality should be above 10. It refers to the screen being excellent, good or poor on the BP+ device. If the results is "poor", delete the screen results an repeat. (Delete by click on the coq and click "delete". Move the cuff around the arm to place the arrow over the brachial artery.

Cardiovascular risk factors

All the CV risk factors as collected from the screen results and the history are listed in RAG format for easy identification and comparison with previous PDF's. Red needs investigating and improves to amber and eventually to green. The risk factors are also applied in the calculation of the QRisk 3 score.

Medical Questionnaire

The results are populated from the history taking questions

Referral guidelines

Systolic	Diastolic	Blood pressure	Advice on results
90 or below	60 or below	Low blood pressure	Live a healthy lifestyle. Only see your GP if you're experiencing low blood pressure symptoms, such as fainting or dizziness
90 to 120	60 to 80	Ideal blood pressure	Live a healthy lifestyle
120 to 140	80 to 90	At risk of high blood pressure	Live a healthy lifestyle and come back for a re-test as advised by our healthcare team. Also try getting a better idea of your day to day blood pressure by monitoring and recording it at home for 7 days
140 or higher	90 or higher	High blood pressure	Visit your GP and get checked out

Normal to high < 140/90 mmHg - clinic < 135/85 mmHg - home } **Give exercise advice and make an appointment to see the patient again after 7-14 days**

Does exercise improve blood pressure?

Importance of nitric oxide and exercise.



[click here](#)

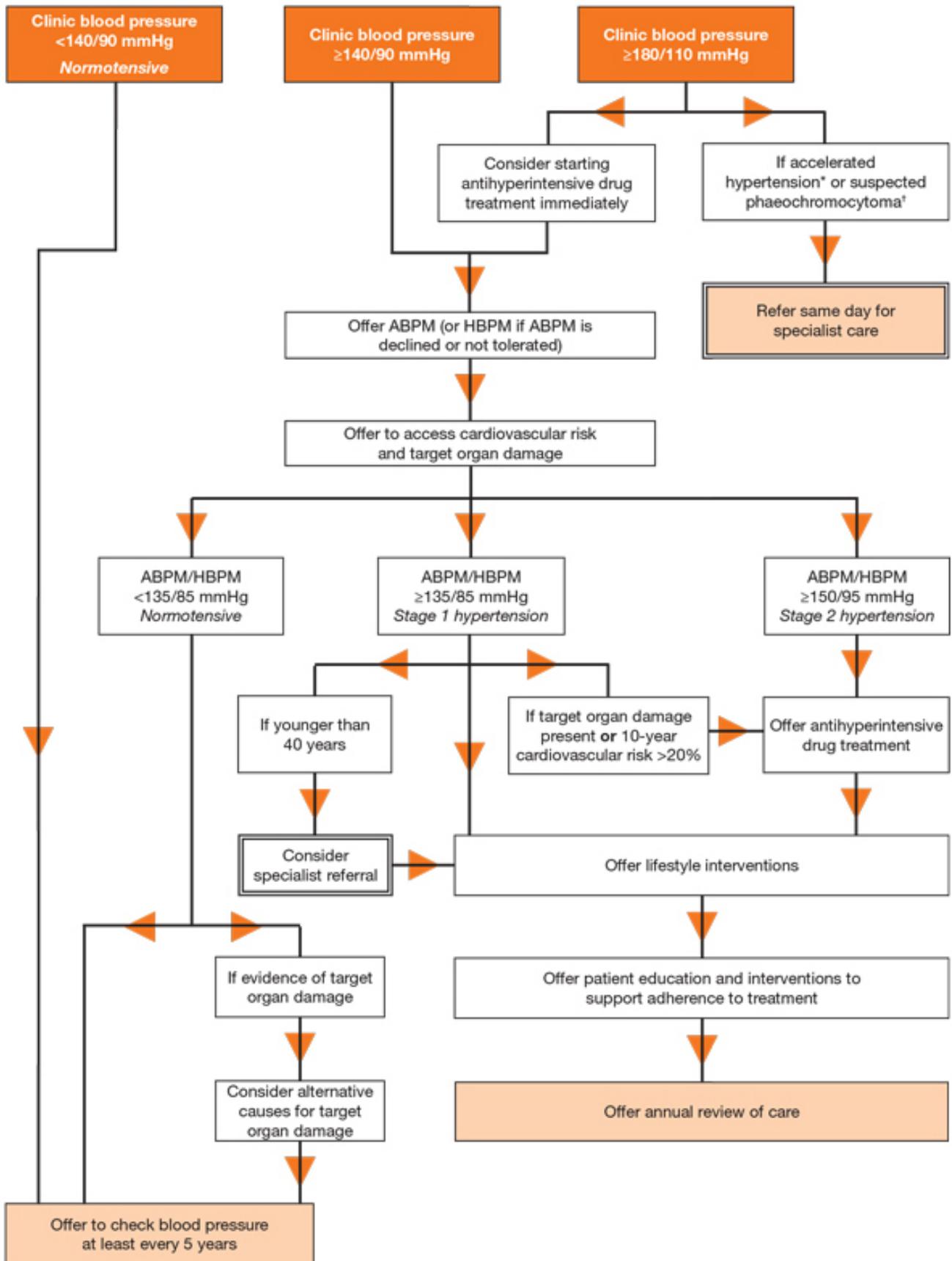
High ≥ 140/90 mmHg - clinic ≥ 135/85 mmHg - home } **Advise home monitoring for at least 5 days**
(Provide or sell a BP monitor for home use)
Record readings at rest at 11am and 5pm
Patient should be seated for at least 5 minutes before BP check
Do 2-3 readings every time. Record all the readings
Bring records to pharmacy for evaluation and refer to GP if appropriate
Advise variable pace exercise *(Link to exercise and BP document)*
Exercise could be walk, jog or even just a stress ball or hand exerciser if walking is impossible

High blood pressure and patient is under 40 – refer

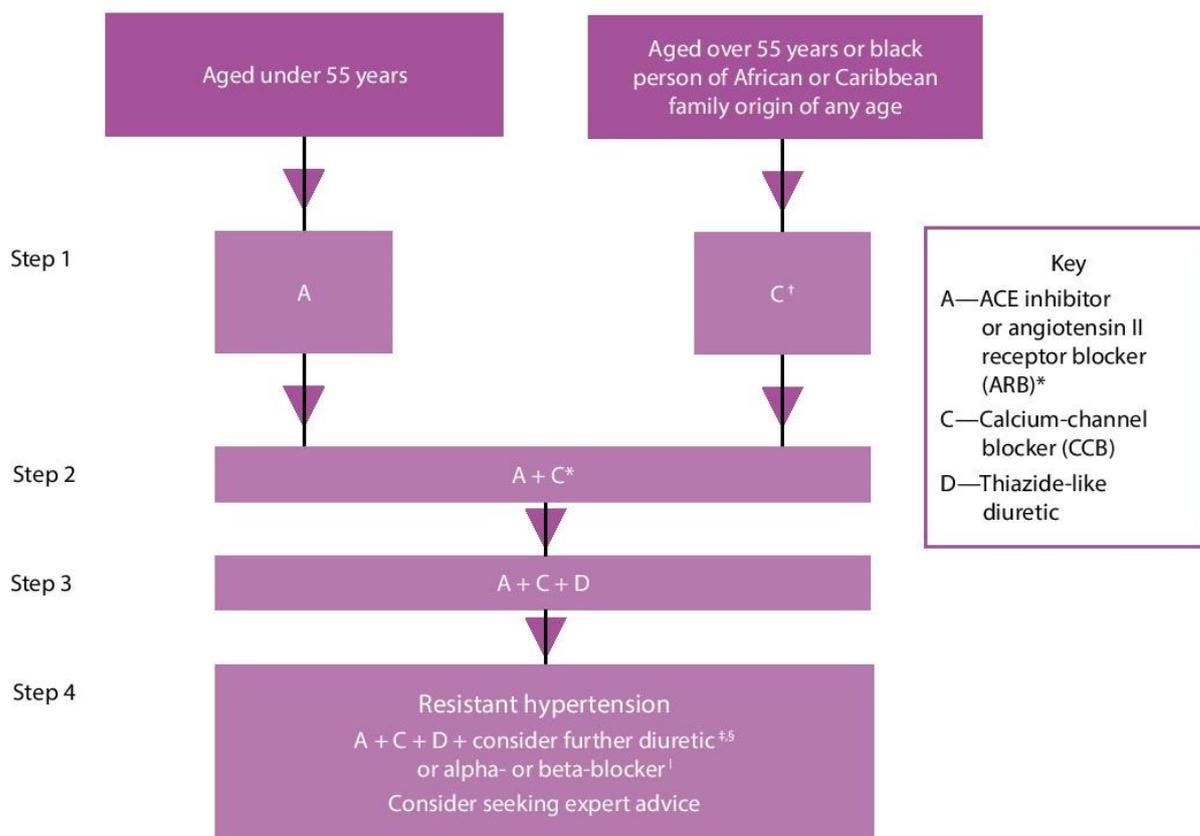
Very high : **Your clinic blood pressure is 160/100 mmHg or above and your average ambulatory or home blood pressure is 150/95 mmHg or above.**

Follow NICE guidelines for referral on the following page

NICE Referral Guidelines



NICE hypertension treatment guidelines



* Choose a low-cost ARB.

[†] A CCB is preferred but consider a thiazide-like diuretic if a CCB is not tolerated or the person has oedema, evidence of heart failure or a high risk of heart failure.

[‡] Consider a low dose of spironolactone[§] or higher doses of a thiazide-like diuretic.

[§] At the time of publication (August 2011), spironolactone did not have a UK marketing authorisation for this indication. Informed consent should be obtained and documented.

[†] Consider an alpha or beta blocker if further diuretic therapy is not tolerated, or is contraindicated or ineffective.

EU 2018 guidelines

It is recommended that the first objective of treatments should be to lower BP to < 140/90 mmHg in all patients and, provided that the treatment is well tolerated, treated BP values should be targeted to 130/80 mmHg or lower in most patients.

In patients <65 it is recommended that systolic BP should be lowered to a BP range of 120-129 mmHg in most patients.

Central systolic BP is regarded as a more accurate predictor of cardiovascular events and the target should be 10mmHg less than brachial targets (110-130mmHg). Central BP is currently used as an additional guide to brachial BP to monitor BP to target with hypertension treatment and exercise.

Blood pressure during exercise (EU guidelines 2018)

It is important to recognise that BP increases during dynamic and static exercise, and that

the increase is more pronounced for systolic BP (SBP) than for diastolic BP (DBP), although only SBP can be measured reliably with non-invasive methods.

There is currently no consensus on normal BP response during exercise. The increase in SBP during exercise is related to pre-exercise resting BP, age, arterial stiffness, and abdominal obesity, and is somewhat greater in women than in men and in unfit individuals. There is some evidence that an excessive rise in BP during exercise predicts the development of hypertension, independently from BP at rest. Nevertheless, exercise testing is not recommended as part of the routine evaluation of hypertension because of various limitations, including a lack of standardization of methodology and definitions. Importantly, except in the presence of very high BP values (grade 3 hypertension), patients, or athletes, with treated or untreated hypertension should not be discouraged from regular exercise, especially aerobic exercise, which is considered beneficial as part of lifestyle changes to reduce BP (see section 7.4.1). (EU 2018 guidelines 4.11)

2018 ESC/ESH Guidelines
for the management of arterial hypertension



[click here](#)

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