

Why Central Blood Pressure?

Uscom BP+



What is BP+?

Uscom BP+ defines a new standard of clinical care.

Uscom's BP+ is the premium **dual blood pressure device** for management of hypertension and cardiovascular health. Uscom's BP+ provides rapid and **accurate non-invasive measures of central aortic blood pressure** (cBP: cSYS, cMAP, cDIA), regular upper arm **brachial blood pressure** (SYS, MAP, DIA, PR), **high-resolution pulse pressure rhythm strips** and various **Pulse Wave Analysis (PWA)** measures.

It's **one button operation** is as **familiar, quick, and easy** as current automatic upper arm cuff BP devices. For the same measurement process as a regular BP device, BP+ provides a wealth of clinical measures and pulse pressure waveforms.

Uscom's BP+ measurements **improve identification of hypertension, irregular rhythms** and **risk stratification** with new clinical indicators of cardiovascular health. The BP+ requires **no additional operator training** and performs the measurements in **less than a minute**.

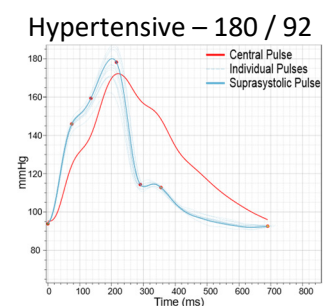
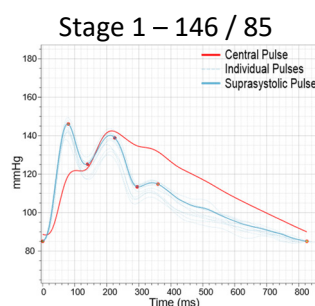
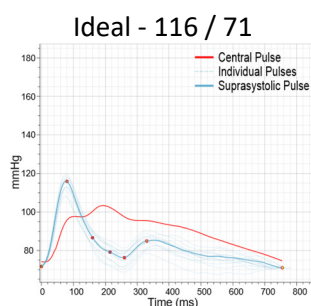
Uscom BP+ measurements improve clinical care and patient outcomes.



How can BP+ help you treat hypertensive patients and related CVD?

1. Central Blood Pressure (cBP) thresholds establish a better definition of normotension
Central BP normal 110/80, Central BP hypertension > 130/90. (Cheng H-M, 2013)
2. Central Blood Pressure provides new prognostic information (McEniery, 2014) useful to guide diagnosis of hypertension within 2020 ISH Guidelines (Unger, 2020)
3. High Central Pulse Pressure (cPP ≥ 50 mmHg) is independently associated with adverse cardiovascular outcome: The Strong Heart Study (Roman, 2009)
4. Central Blood Pressure offers a different treatment path with reduced total medication for hypertensive patients. Fewer people needing medication reduces costs. (James E. Sharman, 2013)
5. Association between Central Blood Pressure and Central Pulse Pressure and Subclinical Cerebrovascular Disease (Matsumoto, 2019) & (King, 2019)
6. Office central blood pressure is more valuable than office peripheral blood pressure in the prediction of all-cause and cardiovascular mortalities... central pulse pressure may better predict all-cause mortality than 24hr ambulatory BP. (Huang, 2011)
7. Current practice is not meeting the clinical need.

Measure, diagnose and manage patient's cardiovascular health with Uscom BP+, the only validated standalone dual Blood Pressure monitor using familiar upper arm BP cuffs.



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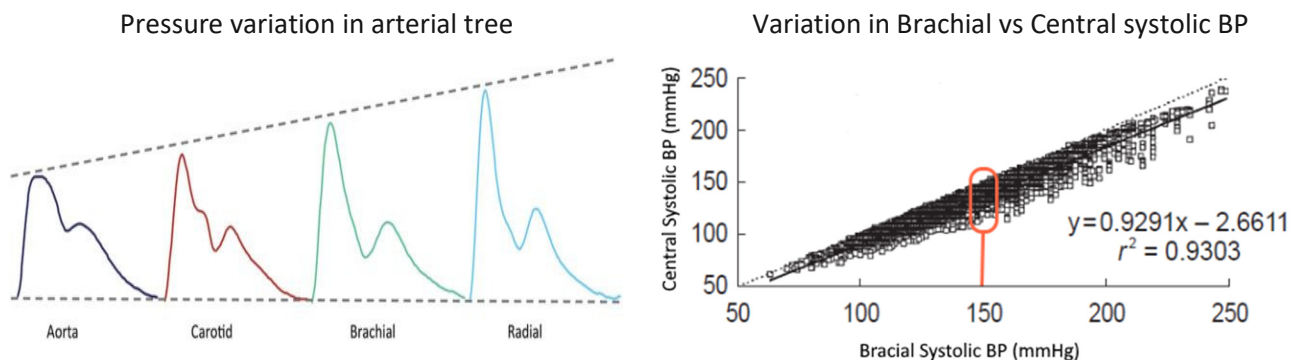
Central BP is a better definition for normotension

High brachial BP and low central BP risk profile is comparable to normotensives.

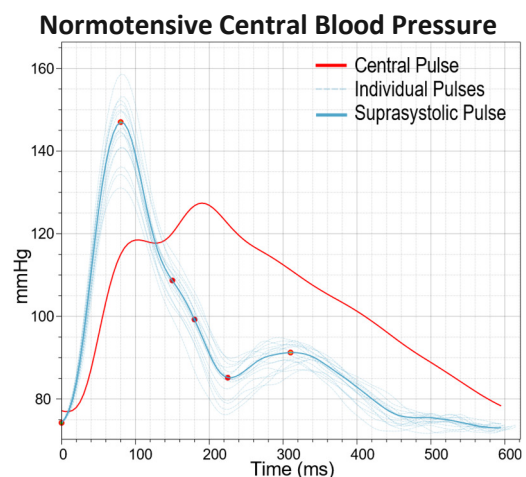
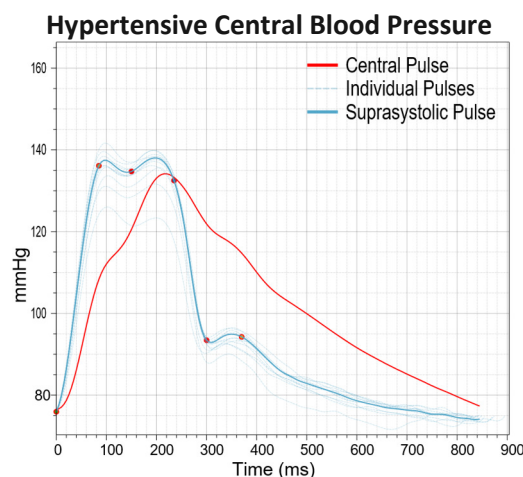
Spurious systolic hypertension is characterized by high brachial BP and low central BP. CV risk profiles of both groups (spurious systolic hypertension and normotensives) were found to be comparable in a population aged 26–31 years. This suggests central BP more accurately predicts normotension as well as hypertension. Cheng concludes **“cBP of 130/90 mmHg was determined to be the cutoff limit for normality and was characterized by a greater discriminatory power for long-term events in our validation cohort. This report represents an important step toward the application of the cBP concept in clinical practice.”** (Cheng H-M, 2013)

Central BP provides new prognostic information

Although pressure measured with a cuff in the brachial artery has been the standard of care for decades, it is well known **systolic pressure varies throughout the arterial tree** and aortic (central) systolic pressure is lower than corresponding brachial values, the difference varying by individual. (O'Rourke, Pauca, & Jiang, 2001)



“Emerging evidence now suggests that **central pressure is better** related to future cardiovascular events than is brachial pressure. Moreover, **anti-hypertensive drugs can exert different effects on brachial and central pressures.**” (McEniery, 2014) The following graphs demonstrate how Central BP as measured by **Uscom BP+** **provides new prognostic information** to aid an accurate diagnosis of hypertension as required in the **2020 ISH Guidelines** (Unger, 2020) for untreated or treated subjects with BP classified as high-normal BP or grade 1 hypertension (systolic 130–159 mmHg and/or diastolic 85–99 mmHg). **Without the Uscom BP+ an incorrect diagnosis is possible** when only brachial BP is used, the wrong person might be treated, with potential for negative long-term consequences for both subjects!



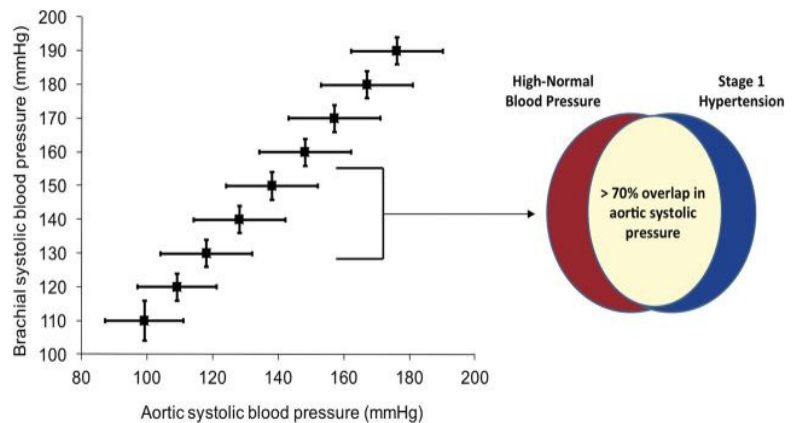
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A similar conclusion is apparent when considering the > 70% overlap in aortic (central) systolic blood pressure for people in stage-1 hypertension and high-normal BP, and a similar overlap between normotensive and high-normal groups shown in the figure on the right (McEniery, 2014).

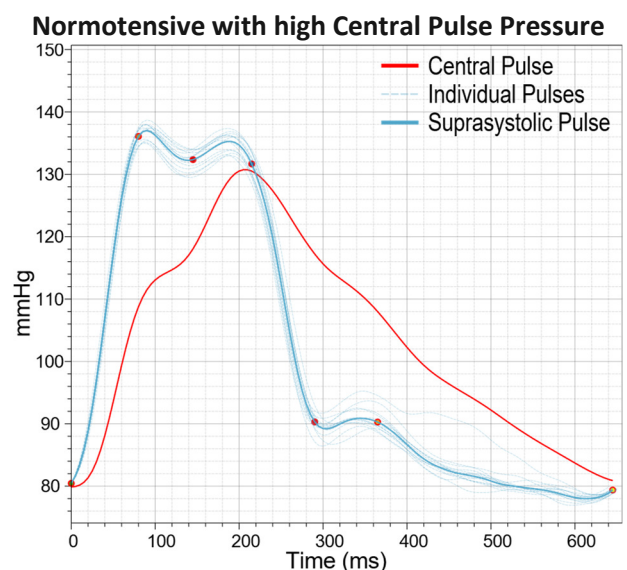
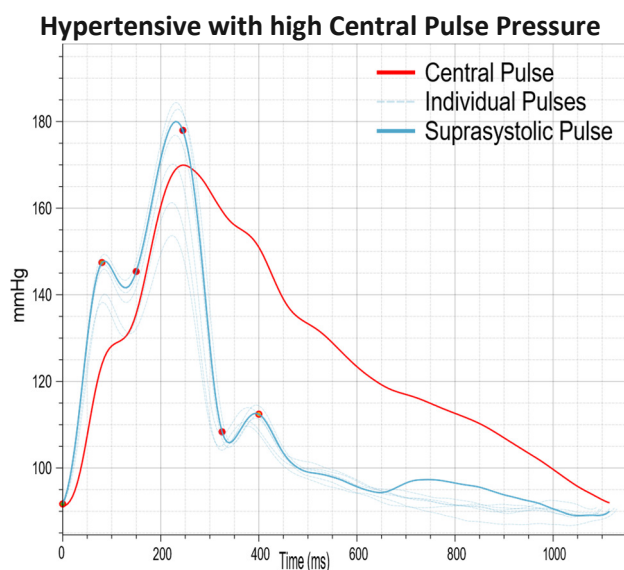
The overlap implies some **individuals will receive treatment they don't need** as their central BP is identical to normotensive individuals. Similarly, **others may not receive necessary treatment**, without considering they have a central blood pressure which is similar to hypertensive individuals.



cPP \geq 50 mmHg is independently associated with adverse cardiovascular events

The Strong Heart Study included 2405 participants free of clinical CVD at baseline of which 344 suffered fatal or nonfatal cardiovascular events during mean follow-up of 5.6 years. After adjustment for age, gender, current smoking, body mass index, cholesterol: HDL ratio, creatinine, fibrinogen, diabetes, and heart rate, noninvasively-determined Central Pulse Pressure (cPP) was more strongly related to vascular hypertrophy and extent of atherosclerosis than was systolic pressure (SYS) and cPP was more strongly related to these subclinical manifestations of CVD than was brachial PP. **Central Pulse Pressure \geq 50 mmHg** (compared with <50mmHg) **was significantly related to outcome** in both men and women, in participants with and without diabetes, and in individuals older and younger than the ages 60 and 65 years. (Roman, 2009)

The evidence suggests achieving a normal cBP may produce better outcomes than achieving normal brachial BP targets and may reduce morbidity, mortality, and target organ damage.



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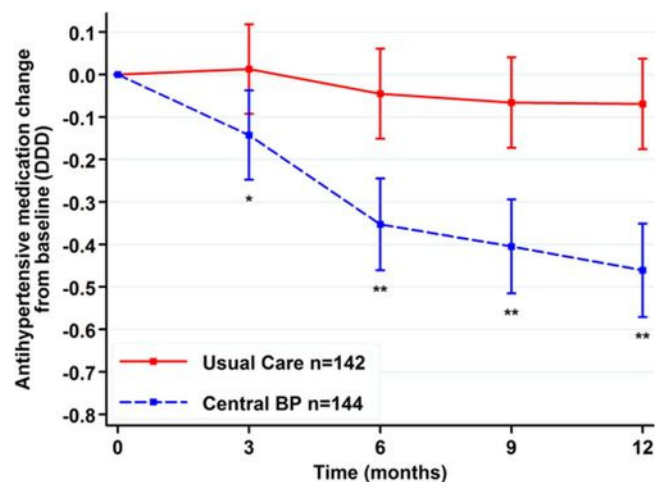
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Significantly less medication needed – Principal Findings of the BP GUIDE Study

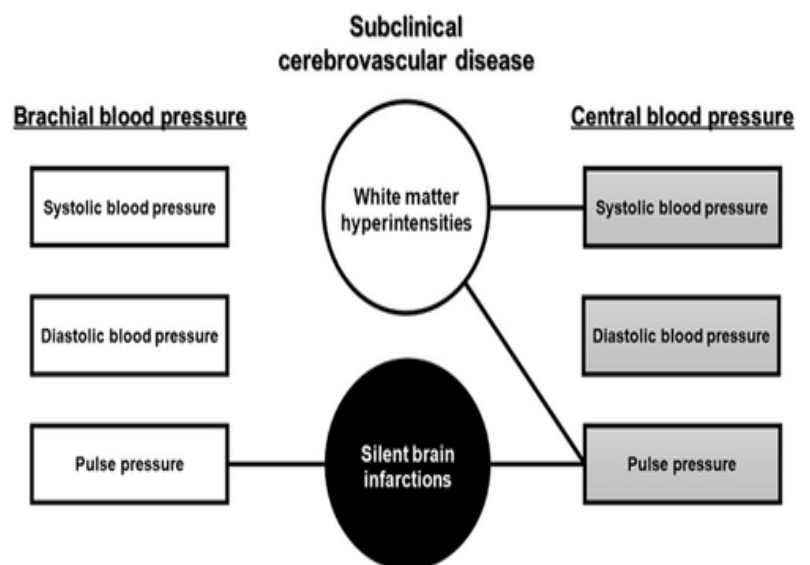
*“Central blood pressure is considered to be a more accurate indicator of the pressure the heart and other vital organs experience. This is the first-time central blood pressure has been used to guide decisions on blood pressure treatment. The main finding was significantly less medication needed to achieve healthy blood pressure levels when treatment decisions were based on central blood pressure. **Sixteen per cent of the participants came off medication altogether.** These are important findings because people taking these medications can experience unwanted side effects that impact on quality of life, but these adverse effects are less likely with lower doses. **We are very excited by the results which provide the framework for a better way to care for people with high blood pressure,**” Associate Professor Sharman, 26 Sep 2013.*

BP GUIDE was a twelve-month RCT of 286 hypertensive patients being treated with 1-3 medications and 1:1 randomization between best-practice brachial BP management and central aortic pressure assessment as an adjunct. The study showed patients reached their brachial BP goal sooner and with less use of medication when using Central BP to guide treatment choices. In addition, 16% of the people had all hypertension medication stopped in the central BP group compared to 2% in usual care. **“We conclude that guidance of hypertension management with central BP results in a significantly different therapeutic pathway than conventional cuff BP, with less use of medication to achieve BP control and no adverse effects on left ventricular mass (LVM), aortic stiffness, or quality of life.”** cBP guided hypertension treatment requires significantly reduced medication to achieve healthy BP than if treatment decisions were based on brachial blood pressure. (James E. Sharman, 2013).



Association between Central BP & PP and Subclinical Cerebrovascular Disease

Higher Central Systolic BP (cSYS) and Central Pulse Pressure (cPP), but not brachial BP, were significantly associated with white matter hyperintensity volume (WMH). WMH is associated with cognitive decline, dementia, depression and with increased risk of stroke. Because of the significance of stroke as a leading cause of disability and the second-leading cause of death worldwide, identifying individuals at increased risk of subclinical cerebrovascular disease may allow for earlier and more-effective stroke prevention strategies (Matsumoto, 2019).



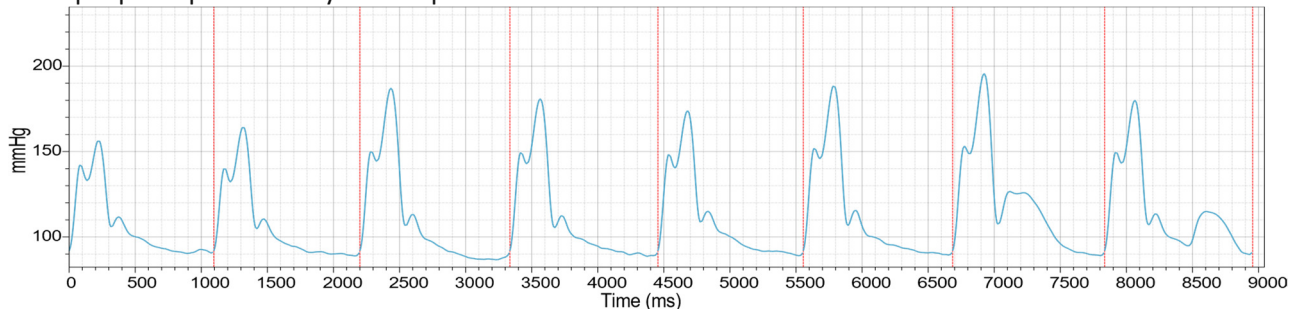
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Determining that only Central BP assessments were linked with increased WMH hyperintensity burden may have important clinical implications for management of blood pressures among the elderly to promote healthy brain aging. As dementia primarily affects the aged, merely postponing dementia onset by 5 years could reduce prevalence by half. It is noted mid-life hypertension contributes up to 30% of dementia cases and treatment has demonstrated a subsequent reduction in risk of dementia later in life. Treatment of late-life hypertension does not show the same benefit. Brachial blood pressures may have limited associations with brain cognitive health in old age due to alterations in the transmission of pulsatile blood pressures from an aorta which has undergone stiffening with age (King, 2019).

Example pulse pressure rhythm strip in an individual with elevated arterial stiffness.



Office central BP is more valuable than office peripheral BP, may outperform ABMP

Chi-Ming Huang et al concluded *“Office central blood pressure is more valuable than office peripheral blood pressure in the prediction of all-cause and cardiovascular mortalities.”* They also showed that office central pulse pressure *“was significantly predictive of all-cause mortality after adjustment for other cardiovascular risk factors”* and *“may better predict all-cause mortality than SBP-24h or PP-24h”*. (Huang, 2011)

Current practice is not meeting the clinical need

Hypertension occurs in more than 26% of the world’s adult population (Wolf-Maier, 2003). WHO August 2021: <https://www.who.int/news-room/fact-sheets/detail/hypertension>

- An estimated 1.28 billion adults aged 30-79 years worldwide have hypertension (brachial)
- An estimated 46% of adults with hypertension are unaware they have the condition
- Less than half of adults (42%) with hypertension are diagnosed and treated
- Approximately 1 in 5 adults (21%) with hypertension have it under control
- Hypertension is a major cause of premature death worldwide

As described above: ISH2020 guidelines identify a requirement for additional prognostic information to diagnose hypertension; Mid-life hypertension contributes up to 30% of dementia cases; Treatment of late-life hypertension doesn’t show the same benefit; Earlier correct diagnosis reduces prevalence of this debilitating condition; Clinical guidance without central BP may result in over or under treatment of individuals; Increased risk of developing chronic kidney disease when Central Pulse Pressure ≥ 50 mmHg; Without treatment vascular remodeling from a breakdown of elastin in the aorta provides positive feedback and further progression of the CVD; Titration & selection of medication improved when waveforms available.



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