

'High-normal' blood pressure in young adults spells risk of heart failure in later life

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Mild elevations in blood pressure considered to be in the upper range of normal during young adulthood can lead to subclinical heart damage by middle age—a condition that sets the stage for full-blown heart failure, according to findings of a federally funded study led by scientists at Johns Hopkins.

A report on the findings of the multicenter study that followed 2,500 men and women over a period of 25 years is published online June 22 in the *Journal of the American College of Cardiology*.

Persistently elevated [blood pressure](#), or hypertension, is one that tops 140/90, a reading that measures the force of pressure in the [heart](#) as it contracts (top number) and as it relaxes between contractions (bottom number). Hypertension has been long implicated as a risk factor in a range of cardiovascular diseases. But the new study suggest that pressure just below that threshold—or high normal pressure—begins to fuel heart damage in people as young as 20 and can lead to changes in heart muscle function in as little as 25 years.

Investigators say their findings of abnormalities in the heart's capacity to contract and relax are especially troubling because they stemmed from a group of patients, the vast majority of whom had no hypertension. Such abnormalities, the researchers say, are forerunners of two forms of heart failure, a condition marked by the progressive weakening heart muscle and the organ's gradual loss of blood-pumping ability.

'Our results suggest the [heart muscle](#) may be more exquisitely sensitive to the effects of even subtle elevations in blood pressure than we thought,' says principal investigator João Lima, M.D., M.B.A., a professor of medicine and radiology at the Johns Hopkins University School of Medicine and director of cardiovascular imaging at its Heart and Vascular Institute.

The latest clinical guidelines issued by the Joint National Committee in 2014 define hypertension as blood pressure above 140/90, but they call on clinicians and patients to aim for a pressure below 150/90. However, results of the new study suggest that a single cutoff measurement does not apply to all ages, and what constitutes 'normal' should probably change with age.

In healthy people, blood pressure tends to rise slightly as they grow old, researchers say, so while 150/90 may be a reasonable target for a 60-year-old, it may be too high for a 28-year-old.

'A number of patients in our study had 'high-normal' blood pressure in their 20s and 30s but by the time they were 45, they had the heart function of a 75-year-old even if they never met the clinical definition of hypertension,' Lima says.

The study followed nearly 2,500 men and women ages 18 to 30 from Alabama, California, Illinois and Minnesota, tracking their health over 25 years and over the span of seven clinical visits. The researchers measured each participant's cumulative blood pressure exposure over time and divided people into groups defined by how high or low their cumulative readings were. Only a small fraction, about 3 percent, had blood pressures that met the definition of hypertension at the beginning of the study. In addition to blood pressure and lifestyle habits, researchers monitored the participants' cholesterol, blood sugar and body mass, all known to affect heart health. The investigators eliminated the

influence of these factors from their analysis.

At the end of the 25-year period that ended in 2011, participants underwent standard ultrasound heart imaging to assess how well their hearts were pumping and a more sophisticated ultrasound that visualized how the heart behaved during contraction and relaxation.

A handful of people, 135 of the 2,479, had evidence of clinical heart failure on simple ultrasound, but overall, mildly elevated pressure produced no appreciable effects on the heart's pumping ability as measured by standard echocardiogram. However, once researchers shifted their focus from how well the heart was pumping to how well it handled pressure during contraction and relaxation, stark differences emerged.

Compared with people with the lowest diastolic pressure—the bottom number in a reading—those with highest diastolic pressure were 70 percent more likely to show signs of abnormal relaxation, a harbinger of a particularly pernicious, treatment-resistant form of heart failure in which the muscle contracts normally but is incapable of relaxing.

Those with persistent elevations in their top readings, or [systolic blood pressure](#), were 46 percent more likely have abnormal contraction, which typically leads to a form of heart failure marked by the organ's inability to contract and pump out blood. Systolic pressure signals the pressure in the arteries during contraction as the heart pumps out blood. The bottom number, or diastolic pressure, indicates the pressure during relaxation, or between contractions.

'Our results suggest that 'high-normal' blood pressure may be too high and far from normal for some people,' says lead author Satoru Kishi, M.D., a cardiologist at Mitsui Memorial Hospital in Tokyo who worked on the study as a research fellow at the Johns Hopkins University School

of Medicine. 'A concerning number of young adults with pressures in the high-normal range develop insipient heart dysfunction in middle age.'

Heart failure caused by [high blood pressure](#) is a common but highly preventable condition with the use of lifestyle changes, diet and, if needed, medication. The results of the study highlight an opportunity to intervene and halt damage, the research team says.

'Our findings speak to the importance of regular blood pressure checks that begin early in life,' Lima says. 'People with borderline pressures require frequent follow-ups to ensure they get treatment as soon as hypertension is diagnosed.'

Researchers say their study is ongoing and will follow participants for several more years, tracking how many progress to overt [heart failure](#). The disease affects more 23 million people worldwide, but public health experts believe the number will rise precipitously over the next few decades as more people live into old age.

Provided by Johns Hopkins University School of Medicine

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