

Mild Hypertension Not Correlated with Increased Likelihood of Stroke or Heart Attack in Patients Aged 75 to 84

Team A: Kersten Bartelt, RN; Eric Barkley

Team B: Blaine Franklin, PT, DPT; Alex Piff

Last updated 11 June 2024 • Check for updates at EpicResearch.org

Key Findings:

- Patients aged 75 to 84 with elevated blood pressure (systolic 120-129 mmHg and diastolic 70-79 mmHg) did not have an increased likelihood of ischemic stroke or heart attack (myocardial infarction) compared to those within the currently defined normal blood pressure range.
- However, for patients with systolic blood pressure greater than 140 mmHg or diastolic blood pressure greater than 90 mmHg, the likelihood of ischemic stroke and myocardial infarction is increased.

The American Heart Association defines a normal blood pressure (BP) as a systolic BP below 120 mmHg and a diastolic BP below 80 mmHg.¹ A previous study reported an increased risk of stroke among patients whose average systolic BP falls outside of 120 to 130 mmHg.² We grouped blood pressure readings into standard classifications then added stage 3 hypertension, lower stage 1, and lower stage 2 classifications to capture higher and lower readings for the purpose of this study, as seen in Figure 1.

We studied patients aged 75 to 84 to understand whether current practice guidelines for treating high blood pressure, or hypertension, for those over age 60 also apply to this older population.³ We identified 368,780 patients with no history of ischemic stroke and 374,805 patients with no history of myocardial infarction (MI) with an outpatient visit between October 2021 and December 2021. We adjusted for patient sex, race, ethnicity, social vulnerability index, BMI classification, existing cardiovascular disease diagnoses, history of diabetes, history of hyperlipidemia, smoking history, and frequency of prior care.

Likelihood of Ischemic Stroke by BP Classification

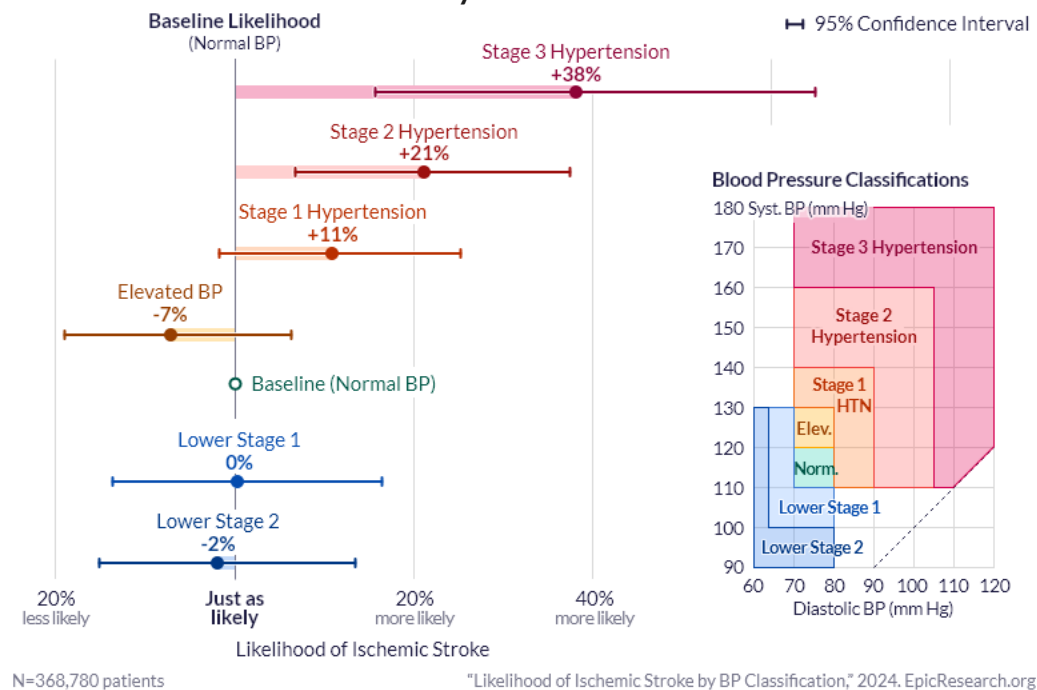


Figure 1. The likelihood of a patient experiencing an ischemic stroke by their BP classification.

We found that patients with blood pressures in the hypertensive range (systolic BP greater than 130 mmHg or diastolic BP greater than 80 mmHg) had an increased likelihood of ischemic stroke with an 11% increase for stage 1, a 21% increase for stage 2, and a 38% for stage 3 compared to those with normal blood pressure. However, those in the elevated or lower-than-normal BP categories are no more likely to experience an ischemic stroke. This indicates that for patients aged 75 and 84 having a blood pressure in the elevated BP category does not increase the likelihood of stroke.

Next, we explored the relationship between BP and the likelihood of experiencing an MI. We found that patients with stage 2 or stage 3 hypertension were slightly more likely to have an MI compared to those with normal blood pressure, though the increase for stage 3 was not statistically significant. Patients with blood pressures in the elevated, lower stage 1, or lower stage 2 categories were no more likely than a patient with a normal BP to have an MI.

Likelihood of Myocardial Infarction by BP Classification

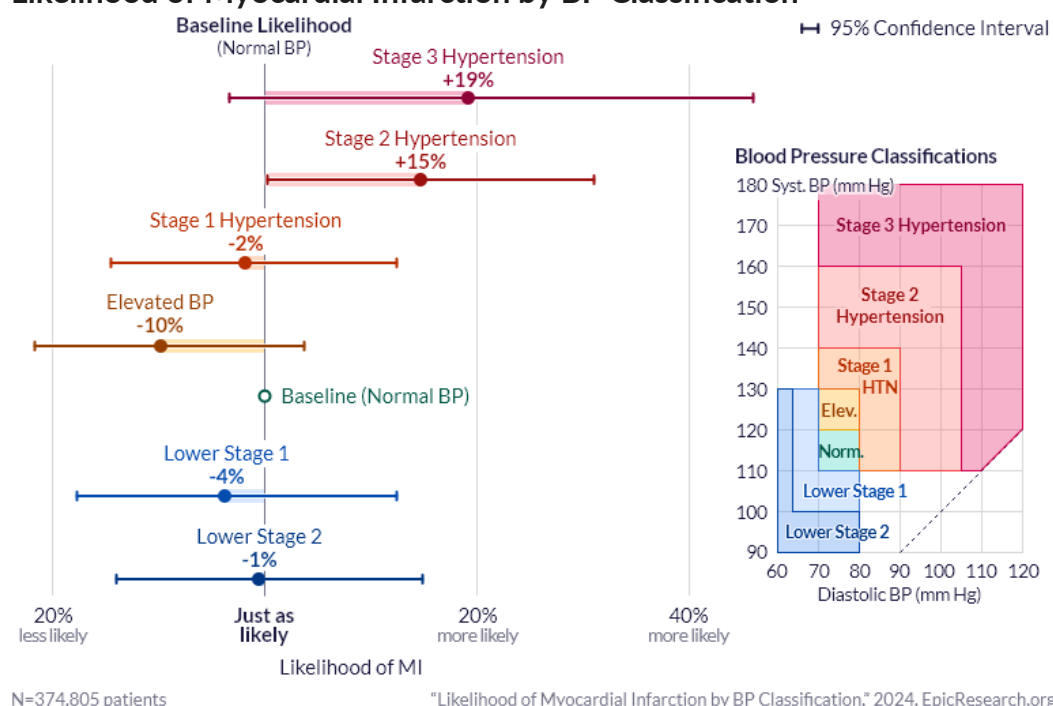


Figure 2. The likelihood of a patient experiencing a myocardial infarction by their BP classification.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 246 million patient records from 1,400 hospitals and more than 32,500 clinics from all 50 states and Lebanon. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

1. Understanding blood pressure readings. [www.heart.org. https://www.heart.org/en/health-topics/high-blood-pressure/understanding-blood-pressure-readings](https://www.heart.org/en/health-topics/high-blood-pressure/understanding-blood-pressure-readings). Accessed April 12, 2024.
2. Fan F, Yuan Z, Qin X, et al. Optimal systolic blood pressure levels for primary prevention of stroke in general hypertensive adults: Findings from the CSPPT (China Stroke Primary Prevention Trial). *Hypertension*. 2017;69(4):697-704. doi:10.1161/hypertensionaha.116.08499
3. Qaseem A, Wilt TJ, Rich R, et al. Pharmacologic treatment of hypertension in adults aged 60 years or older to higher versus lower blood pressure targets: A clinical practice guideline from the American college of physicians and the American academy of family physicians. *Ann Intern Med*. 2017;166(6):430. doi:10.7326/m16-1785

Data Definitions

Term	Definition
Study period	10/1/2021 – 12/31/2021
Study population	Patients with blood pressure taken during an outpatient face-to-face encounter when the patient was between 75 and 84 years old with no history of the outcome being studied. We required that the patient also have another outpatient face-to-face encounter more than a year prior to the encounter during blood pressure was taken to assure that we have a longitudinal history.

	Patients with a hypertensive crisis BP reading (>180/120) or a diagnosis of hypertensive crisis (ICD-10-CM code I16*) in the year prior to the encounter were excluded. If a patient had multiple qualifying encounters, only the first was included.
Exposures	Classification for blood pressure based on AHA classifications as well as additional groupings for the study's purpose (indicated with an *): *Lower stage 2 BP – SBP 90-99 or DBP 60-64 *Lower stage 1 BP – SBP 100-109 or DBP 65-69 - Normal – SBP 110-119 and DBP 70-79 - Elevated BP – SBP 120-129 and DBP 70-79 - Stage 1 hypertension – SBP 130-139 or DBP 80-89 - Stage 2 hypertension – SBP 140-159 or DBP 90-104 *Stage 3 hypertension – SBP 160-180 or DBP 105-120 Patients with the following blood pressures were excluded: SBP 90-109 and DBP 80-120 SBP 130-180 and DBP 60-69
Outcomes	Myocardial infarction: I21.* & I23.* Patients were censored for the MI outcome at their first evidence of I22.* . Ischemic stroke: I63.*
Confounders	Sex Race/ethnicity SVI quartile Smoking status: • Current/former smoker ○ Tobacco use status of one of the following: ▪ Current every day smoker ▪ Current some day smoker ▪ Every day ▪ Former ▪ Former smoker ▪ Heavy smoker ▪ Heavy tobacco smoker ▪ Light smoker ▪ Light tobacco smoker ▪ Smoker, current status unknown ▪ Some days ○ Smoking pack years greater than 0 ○ Smoking packs per day greater than 0 • Never smoker ○ Tobacco use status of one of the following: ▪ Never ▪ Never Smoker Prior cardiovascular disease • ICD-10-CM code I24*-I26*, I30*-I49*, I51*, or I70*-I79* Prior diabetes • ICD-10-CM code E10*-E11* Prior hyperlipidemia • ICD-10-CM code E78.2*-E78.5* Visits in prior year (30-day deduplication): • Outpatient

- ED
 - Admissions
- BMI classification
- Underweight (Under 18.5)
 - Healthy weight (18.5-25)
 - Overweight (25-30)
 - Obese (30+)

Table 1: Likelihood of Ischemic Stroke by BP Classification

BP Group	Odds Ratio	Low CI	High CI
Stage 3 HTN	1.38	1.16	1.65
Stage 2 HTN	1.21	1.07	1.37
Stage 1 HTN	1.11	0.98	1.25
Elevated	0.93	0.81	1.06
Lower Stage 1	1.00	0.86	1.16
Lower Stage 2	0.98	0.85	1.14

Table 2: Likelihood of Myocardial Infarction by BP Classification

BP Group	Ratio	Low CI	High CI
Stage 3 HTN	1.19	0.98	1.45
Stage 2 HTN	1.15	1.00	1.31
Stage 1 HTN	0.98	0.86	1.12
Elevated	0.90	0.78	1.04
Lower Stage 1	0.96	0.82	1.13
Lower Stage 2	0.99	0.85	1.16