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Elevated Blood Pressure: A New Definition in Hypertension Guidelines and Its Impact on Cardiovascular Risk and Treatment

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Abstract

Purpose: Hypertension is the most common chronic cardiovascular disorder and a leading risk factor for morbidity and mortality. Early recognition and management are essential for prevention. The 2024 ESC Guidelines introduced "elevated blood pressure" (systolic BP 120–139 mmHg and/or diastolic BP 70–89 mmHg) as a new category. The new classification is just pronounced within ESC 2024 gave the totally new insight off approach some treatment.

Main: Elevated BP represents an intermediate stage between normal BP and hypertension, highlighting the continuum of cardiovascular risk. This category emphasizes risk stratification by integrating BP levels with global CVD risk prediction models (SCORE2, SCORE2-OP, SCORE2-Diabetes) and considering sex-specific and shared non-traditional risk modifiers. Treatment strategies vary according to risk: lifestyle measures are first-line for low-risk individuals, while pharmacological therapy is reserved for those with high-risk conditions, predicted 10-year CVD risk $\geq$10%, or borderline risk (5–10%) with additional modifiers or abnormal test results.

Finding: Evidence supports the benefit of lifestyle interventions in reducing long-term CVD risk among patients with elevated BP. Pharmacological treatment, when indicated, effectively reduces outcomes but should be initiated after a 3-month trial of lifestyle changes in most cases. Exceptions to intensive BP-lowering targets include very old or frail adults, those with symptomatic orthostatic hypotension, advanced CKD, or limited life expectancy, where individualized targets are required.

Conclusion: The concept of elevated BP shifts management from fixed thresholds to risk-based strategies, promoting early prevention, individualized assessment, and targeted treatment to improve outcomes while minimizing overtreatment.

Keywords: Elevated Blood Pressure, 2024 ESC Guidelines, Cardiovascular Risk Stratification, SCORE2 Risk Prediction, Hypertension, Lifestyle Interventions, Pharmacological Treatment

Introduction

Hypertension is the most common chronic disease in elderly population. Most patient has primary hypertension, which mean no exact cause is identified, why they are around 10% of secondary hypertension with an identified causes [1]. Early detection and appropriate management are therefore crucial to reduce morbidity and mortality. The recently updated 2024 ESC Guidelines introduced a new category of "elevated blood pressure" defined as office systolic BP of 120–139 mmHg and/or diastolic BP of 70–89 mmHg. This classification provides a fresh perspective on treatment, emphasizing the importance of early risk identification before the development of overt hypertension.

The concept of elevated BP highlights that CVD risk exists on a continuum, and even modest elevations in BP can contribute to long-term cardiovascular outcomes. However, the absolute risk within this category is heterogeneous, depending on age, sex, comorbidities, and additional risk modifiers. As such, the new definition shifts attention toward integrating BP levels with global CVD risk assessment in order to personalize treatment strategies.

This article reviews the implications of the elevated BP category in cardiovascular risk stratification and outlines its impact on treatment recommendations, ranging from lifestyle modification to pharmacological therapy in selected high-risk patients.

Classification of Blood Pressure

The diagnosis of hypertension and elevated BP requires confirmation using out-of-office measurements (HBPM or ABPM) or at least one additional subsequent office measurement. The 2024 Guidelines define hypertension as a confirmed office systolic BP of $\geq$ 140 mmHg or diastolic BP of $\geq$ 90 mmHg. For this diagnosis to be made, confirmation is recommended with out-of-office measurements (HBPM or ABPM) or at least one repeat office measurement at a subsequent visit.

Table 1: Blood pressure categories in ESC 2024 [2].

Method	Non-elevated blood pressure	Elevated blood pressure	Hypertension
Office BP	SBP $<$ 120 mmHg and DBP $<$ 70 mmHg	SBP 120–139 mmHg or DBP 70–89 mmHg	SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg
HBPM	SBP $<$ 120 mmHg and DBP $<$ 70 mmHg	SBP 120–134 mmHg or DBP 70–84 mmHg	SBP $\geq$ 135 mmHg or DBP $\geq$ 85 mmHg
ABPM *(Daytime)*	SBP $<$ 120 mmHg and DBP $<$ 70 mmHg	SBP 120–134 mmHg or DBP 70–84 mmHg	SBP $\geq$ 135 mmHg or DBP $\geq$ 85 mmHg
Note	Insufficient evidence confirming the efficacy and safety of BP pharmacological treatment	Risk stratify to identify individuals with high cardiovascular risk for BP pharmacological treatment	Cardiovascular risk is sufficiently high to merit BP pharmacological treatment initiation

ABPM: ambulatory blood pressure monitoring; BP: blood pressure; DBP: diastolic blood pressure; HBPM: home blood pressure monitoring; SBP: systolic blood pressure.

The rationale for this new classification "**Elevated BP**" is to raise awareness of elevated blood pressure, since increase BP substantially increases cardiovascular disease (CVD) risk within 10 years. Acting early allows prevention before it is too late. Patients with "hypertension" generally have a markedly increased CVD risk, with 10-year risk estimates of $\geq$ 10% for fatal and non-fatal events [3–5]. In contrast, patients with "elevated BP" also show an increased risk of CVD; however, this risk is heterogeneous. Meta-analyses of randomized controlled trials have confirmed that BP-lowering therapy can be effective within this range, the overall average risk is not high enough to justify pharmacological treatment for all patients [3, 4, 6]. Instead, drug therapy is reserved for subgroups identified as having increased global CVD risk through formal risk stratification. Meanwhile, those with "non-elevated BP" rarely show increased CVD risk, and current evidence does not support the benefit of antihypertensive drug therapy in this category, largely due to the absence of clinical trial data [4].

The 2024 ESC guidelines introduce three categories: non-elevated BP, elevated BP, and hypertension. This new classification not only emphasizes early identification but also reshapes the prevention and treatment approach. In contrast, patients with "elevated BP" are recognized as having a heterogeneous but measurable increase in CVD risk, which means patients need careful risk assessment before starting drug treatment, instead of giving medication to everyone in this group. To better illustrate these differences, particularly in how "elevated BP" is defined, **Table 2** compares the 2024 ESC guideline with the 2017 ACC/AHA guideline. This comparison highlights how broadening the range of elevated BP in the ESC guideline significantly alters the population classified at risk.

Table 2: Comparison between 2024 ESC Guidelines and 2017 ACC/AHA Guideline [2, 6].

2024 ESC	2017 ACC/AHA
Non-elevated blood pressure: SBP $<$ 120 mmHg and DBP $<$ 70 mmHg	Normal: SBP $<$ 120 mmHg and DBP $<$ 80 mmHg
Elevated blood pressure: SBP 120–139 mmHg or DBP 70–89 mmHg	**Elevated blood pressure:** SBP 120–129 mmHg and DBP $<$ 80 mmHg
Hypertension: SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg	Hypertension: - *Stage 1:* SBP 130–139 mmHg or DBP 80–89 mmHg - *Stage 2:* SBP $\geq$ 140 mmHg or DBP $\geq$ 90 mmHg

Elevated Blood Pressure and Cardiovascular Disease (CVD) Risk Assessment

The CVD risk in patients with elevated BP is heterogeneous, largely because individuals in this group tend to be younger [3]. Therefore, the decision to initiate blood pressure–lowering therapy should depend on the overall patient profile and the presence of concomitant cardiovascular risk factors.

Certain **clinical conditions** are, by themselves, associated with a sufficiently high risk of cardiovascular disease (CVD). In patients with elevated BP, the coexistence of these conditions warrants consideration for BP-lowering therapy. Such conditions include moderate to severe chronic kidney disease (CKD) [7], established CVD (such as coronary heart disease, cerebrovascular disease, peripheral arterial disease, or heart failure) [8–12], concomitant hypertension-mediated organ damage (HMOD) [13], diabetes mellitus [14–16], and familial hypercholesterolemia [17].

Table 3: Sufficiently high cardiovascular risk conditions that warrant blood pressure-lowering treatment among adults with elevated BP [2].

Established clinical CVD	Atherosclerotic cardiovascular disease (coronary heart disease, cerebrovascular disease, peripheral arterial disease) Heart failure
Moderate or severe CKD	eGFR < 60 mL/min/1.73 m^2 **OR** Albuminuria ≥ 30 mg/g (≥ 3 mg/mmol)
Other forms of hypertension-mediated organ damage (HMOD)	
Cardiac	**ECG**: *LVH*: Sokolow–Lyon: $SV_1 + RV_5 > 35$ mm RaVL ≥ 11 mm Cornell voltage: SV_3 + RaVL > 28 mm (men); > 20 mm (women) **Echocardiography**: *LVH*: LV mass/height$^{2.7}$ (g/m$^{2.7}$): > 50 (men); > 47 (women) LV mass/BSA (g/m^2): > 115 (men); > 95 (women) LV concentric geometry: RWT ≥ 0.43 *Diastolic dysfunction*: LA volume/height^2 (mL/m^2): > 18.5 (men); > 16.5 (women) LA volume index: 34 mL/m^2, e' < 7 cm, E/e' > 14 **Biomarkers**: hs-cTnT or I $>$ 99th percentile upper reference limit NT-proBNP > 125 pg/mL if age < 75 years or > 450 pg/mL if age ≥ 75 years
Vascular	**Carotid/femoral ultrasound**: plaque (focal wall thickening > 1.5 mm) **Pulse wave velocity (PWV)**: Carotid–femoral PWV > 10 m/s Brachial–ankle PWV > 14 m/s **Cardiac CT**: coronary artery calcium score > 100 Agatston units
Diabetes mellitus	Type 1 and type 2 diabetes mellitus *Note:* SCORE2-Diabetes should be considered to identify lower-risk individuals ($< 10\%$ 10-year CVD risk), who may not require BP-lowering medication, particularly in those < 60 years.
Familial hypercholesterolaemia	Probable or definite familial hypercholesterolaemia

For diabetes, it is important to note that some adults under 60 years of age with type 2 diabetes and elevated BP may still have a 10-year CVD risk of <10%. In these cases, the diabetes-specific SCORE2-Diabetes risk prediction model should be applied to determine whether the individual's risk meets the threshold of $\geq$10% [18].

In the absence of such high-risk conditions, general population risk-prediction models—such as SCORE2 and SCORE2-Older Persons (SCORE2-OP)—are recommended to estimate the 10-year risk of CVD in adults with elevated BP. SCORE2 should be applied for adults aged 40–69 years, whereas SCORE2-OP is used for individuals aged $\geq$70 years to estimate the 10-year global risk of fatal and non-fatal cardiovascular events, including stroke and myocardial infarction [19, 20]. These models provide more accurate guidance for treatment decisions compared with relying solely on clinical judgment or the simple addition of risk factors.

For patients with elevated blood pressure and a predicted 10-year cardiovascular disease (CVD) risk of **< 5%**, the recommendation is to reassess both blood pressure and overall CVD risk after one year (Class IIa).

In contrast, patients with a predicted 10-year CVD risk $\geq$ **10%** should be considered for pharmacological treatment if lifestyle measures to reduce blood pressure are unsuccessful after three months. In these high-risk patients, drug therapy is indicated when blood pressure remains $\geq$130/80 mmHg despite lifestyle modification.

In patients with elevated blood pressure and a predicted 10-year cardiovascular disease (CVD) risk of 5% to <10%, additional risk modifiers should be considered to refine risk assessment. Firstly, shared risk modifier (risk factors shared by both sexes) including high-CVD-risk race/ethnicity (e.g. South Asian) [21–23], family history of premature onset atherosclerotic CVD (CVD event in males aged <55 years and/or females <65 years) [24, 25], socio-economic deprivation [26], inflammatory conditions (e.g. systemic lupus erythematosus, rheumatoid arthritis, and psoriasis affecting 10% or more of body surface area or requiring systemic therapy) [27–36], HIV [37, 38], and severe mental illness (major depressive disorder, bipolar disorder, and schizophrenia) [38–40] are important. Secondly, sex-specific factors such as a history of pregnancy complications (gestational diabetes [41], gestational hypertension [42–44], pre-term delivery, pre-eclampsia, stillbirth, or recurrent miscarriage [45–49]) may up-classify risk in women. Considering these modifiers allows clinicians to better identify patients within the borderline-risk group who may benefit from earlier initiation of BP-lowering strategies. If uncertainty remains regarding BP-lowering treatment decisions in individuals with elevated BP, additional tests may be considered to refine risk stratification. These include coronary artery calcium (CAC) scoring [50–52], carotid or femoral plaque assessment by ultrasound [53–55], high-sensitivity cardiac troponin, B-type natriuretic peptide biomarkers, or arterial stiffness measured by pulse wave velocity [56–59]. Such investigations are particularly useful in patients with borderline 10-year CVD risk (5–10%) and should be applied within the context of shared decision-making and cost considerations after assessing 10-year predicted CVD risk and non-traditional CVD risk modifiers.

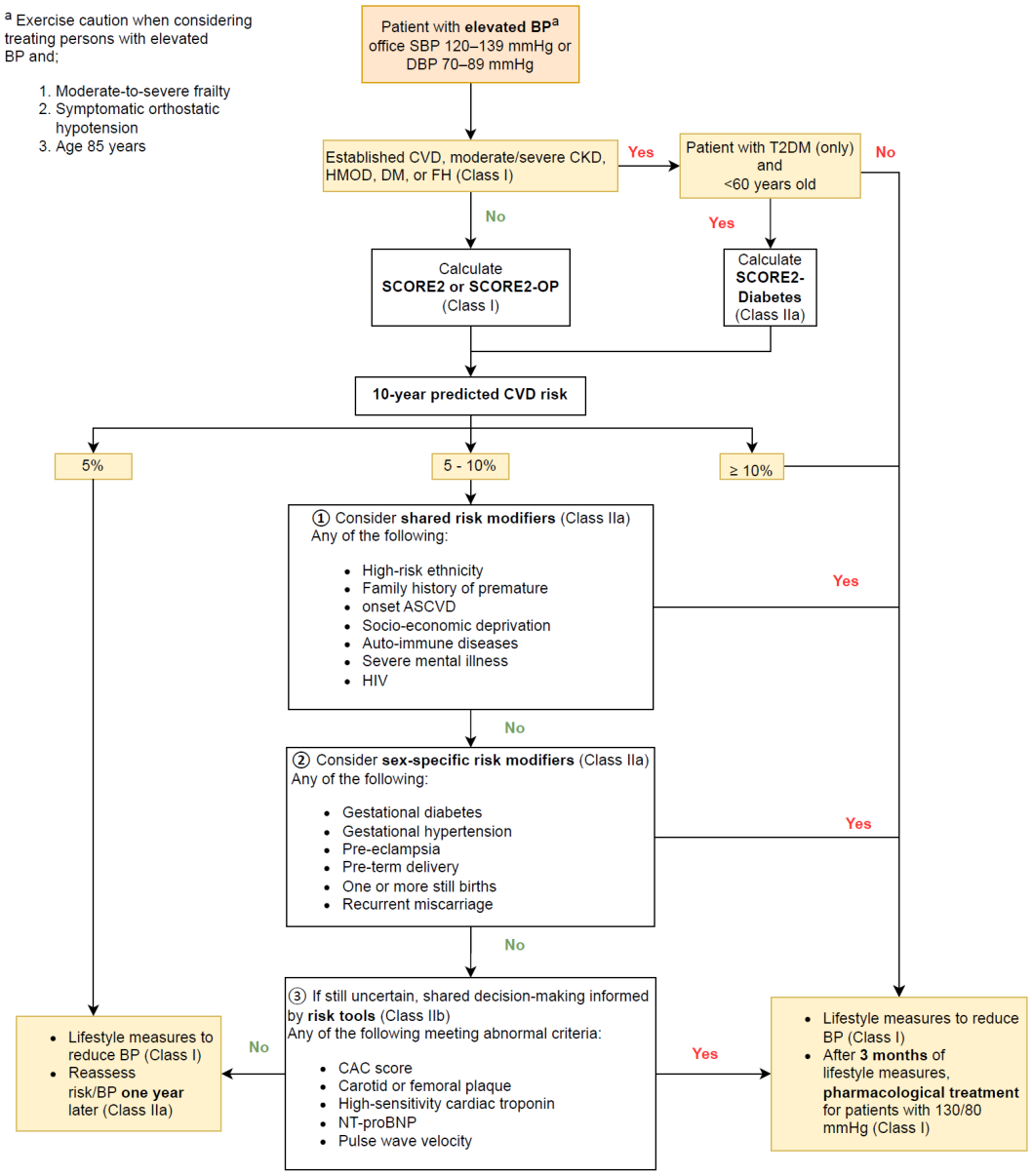

Figure 1: Summary of cardiovascular disease risk-stratification approach for blood pressure treatment in adults with elevated blood press. (Copyright 2024 ESC Guidelines for the management of elevated blood pressure and hypertension) [2].

Summary of Risk Stratification and Treatment Approach for Elevated BP

Overall, allocation of BP-lowering therapy in patients with elevated BP should be guided by a combination of measured BP, 10-year CVD risk prediction models, and non-traditional risk modifiers. Patients with high risk should routinely receive BP-lowering therapy without further stratification.

1) **Step 1:** Identify high-risk conditions that by themselves justify BP-lowering therapy in patients with elevated BP. These include moderate-to-severe chronic kidney disease (CKD), established CVD (such as coronary heart disease, cerebrovascular disease, peripheral arterial disease, or heart failure), hypertension-mediated organ damage (HMOD), diabetes mellitus, and familial hypercholesterolemia.
   - **Special consideration for diabetes:** Some adults younger than 60 years with type 2 diabetes and elevated BP may still have a 10-year CVD risk <10%. In such cases, the SCORE2-Diabetes model should be applied to determine whether the patient reaches the high-risk threshold (≥10%) before initiating pharmacological therapy.
2) **Step 2:** If high-risk conditions are absent, calculate the 10-year CVD risk using SCORE2 (ages 40–69) or SCORE2-OP (≥70).
3) **Step 3:** If predicted 10-year CVD risk is <5%, initiate lifestyle modifications, and reassess blood pressure and overall risk after one year.
4) **Step 4:** If predicted 10-year CVD risk is ≥10%, initiate lifestyle modifications, and consider pharmacological treatment if blood pressure remains ≥130/80 mmHg after three months.
5) **Step 5:** For patients with borderline predicted CVD risk (5–10%), further refinement of risk is required. If any of the following factors are present,

Table 4: Cardiovascular disease risk modifiers to consider for up-classification of risk (10-year CVD risk 5–10%) [2].

Shared modifiers *(Class IIa)*	**Sex-specific modifiers** *(Class IIa)*
1. High risk ethnicity	1. Gestational diabetes
2. Family history of premature onset ASCVD	2. Gestational hypertension
3. Socio-economic deprivation	3. Pre-eclampsia
4. Auto-immune inflammatory diseases	4. Pre-term delivery
5. Severe mental illness	5. One or more stillbirth
6. HIV	6. Recurrent miscarriage

ASCVD: atherosclerotic cardiovascular disease; HIV: human immunodeficiency virus.

the patient should be reclassified as high risk (≥10%) and managed accordingly, with initiation of BP-lowering therapy if lifestyle measures fail to reduce BP below 130/80 mmHg after three months:

- **Sex-specific risk modifiers:** pregnancy complications such as gestational diabetes, gestational hypertension, pre-eclampsia, pre-term delivery, stillbirth, or recurrent miscarriage.
- **Shared non-traditional risk modifiers:** high-risk ethnicity (e.g., South Asian), family history of premature atherosclerotic CVD, socioeconomic deprivation, autoimmune inflammatory disorders, HIV infection, or severe mental illness.
- **Additional risk decision tests:** coronary artery calcium (CAC) score, carotid or femoral plaque imaging, high-sensitivity cardiac troponin, natriuretic peptide biomarkers, or arterial stiffness.

Elevated Blood Pressure – Change in Treatment

Elevated BP: Criteria for Treatment Initiation

When office BP is 120–139/70–89 mmHg, the patient is classified as having elevated BP, and further cardiovascular risk stratification is required to guide therapy (**Table 5**).

In patients with elevated BP who are not low cardiovascular risk (10-year predicted CVD risk <10%) and do not have other high-risk conditions or risk modifiers, lifestyle modification is the recommended first-line strategy. At present, there are insufficient outcome data to support routine pharmacological treatment in this lower-risk group. Nevertheless, evidence indicates that the relative benefits of BP lowering are consistent across a broad range of risk categories, including those with <10% risk. Therefore, although not a formal recommendation, if lifestyle measures fail after 6–12 months, initiation of drug therapy may be considered on an individual basis for lower-risk adults with BP in the range of 130/80 to <140/90 mmHg [60].

In patients with elevated BP (office BP 120–139/70–89 mmHg) who are at sufficiently high risk for CVD (e.g., 10-year CVD risk ≥10%), or in those with borderline risk (5 — <10%) combined with risk modifiers or abnormal risk test results, lifestyle modification should be initiated for 3 months. If BP remains ≥130/80 mmHg after this period, or if lifestyle measures are not adequately implemented, pharmacological therapy is recommended. Prompt initiation of drug treatment, when indicated, should be emphasized to avoid therapeutic inertia [61]. For individuals with BP in the range of 120–129/70–79 mmHg, continued and intensified lifestyle intervention remains the preferred strategy.

Several important exceptions should be noted when considering BP-lowering therapy in patients with elevated BP. Because the benefit of reducing CVD outcomes is uncertain in certain settings, BP-lowering drug treatment should generally be deferred until BP is ≥140/90 mmHg. This applies to patients with pre-treatment symptomatic orthostatic hypotension, those aged ≥85 years, individuals with clinically significant moderate-to-severe frailty, or those with a limited predicted lifespan (<3 years), particularly when competing risks such as advanced CKD (eGFR <30 mL/min/1.73 m^2) are present. In these groups, patients are less likely to gain sufficient net benefit from pharmacological therapy or to tolerate intensive drug treatment.

Elevated Blood Pressure: Treatment Thresholds and Targets

The **BP threshold** is defined as the level at which antihypertensive treatment should be initiated, whereas the **BP target** refers to the desired goal once therapy is started. Importantly, the threshold for treatment initiation does not necessarily equal the treatment target. For instance, drug therapy is recommended for patients with baseline BP ≥140/90 mmHg, with a **treatment target of 120–129/70–79 mmHg** if well tolerated. Similarly, patients with elevated BP (130–139/80–89 mmHg) and high CVD risk are now considered for pharmacologic therapy, with the same recommended target of 120–129/70–79 mmHg. Thus, the 2024 ESC Guidelines endorse a consistent treatment target of 120–129/70–79 mmHg (if tolerated) [62, 63], while thresholds for initiating therapy may vary depending on the patient's CVD risk profile, particularly in the elevated BP category. This treatment target reduces CVD events in older adults, with proven efficacy up to age 85 years [64].

This recommendation was made for several reasons: to provide flexibility for patients and clinicians; to incorporate feedback from external peer review; to reflect patient perspectives that lifestyle modification is preferred to medication unless BP is in the hypertensive range; to acknowledge that contemporary intensive treat-to-target trials enrolled

Table 5: Initiation of blood pressure-lowering treatment based on confirmed blood pressure category and cardiovascular disease risk [2].

BP (mmHg)	**Non-elevated BP** (< 120/70)	**Elevated BP (120/70 to 139/89)**		**Hypertension** (≥ 140/90)
Risk		a. All adults with SBP 120–129 mmHg b. SBP 130–139 **AND** 10-year estimated CVD risk < 10% **AND** no high-risk conditions or risk modifiers or abnormal risk tool tests	a. SBP 130–139 **AND** high-risk conditions (e.g. established CVD, diabetes mellitus, CKD, FH or HMOD) b. SBP 130–139 **AND** 10-year estimated CVD risk ≥ 10% c. SBP 130–139 **AND** 10-year estimated CVD risk 5% – < 10% **AND** risk modifiers or abnormal risk tool tests	Assumed all at sufficiently high risk to benefit from pharmacological treatment
Treatment	– Lifestyle measures for prevention – Screen BP and CVD risk opportunistically	– Lifestyle measures for treatment – Monitor BP and CVD risk yearly	– Lifestyle measures and pharmacological treatment (after 3-month delay). – Monitor BP yearly once treatment control is established	– Lifestyle measures and pharmacological treatment (immediate) – Monitor BP yearly once treatment control is established
Target (mmHg)	Maintain BP < 120/70	Aim BP 120–129/70–79 mmHg[a]		

BP: blood pressure; CKD: chronic kidney disease; CVD: cardiovascular disease; DBP: diastolic blood pressure; FH: familial hypercholesterolaemia; HMOD: hypertension-mediated organ damage; SBP: systolic blood pressure.
[a] Caution in adults with orthostatic hypotension, moderate-to-severe frailty, limited life expectancy, and older patients (aged ≥ 85 years).

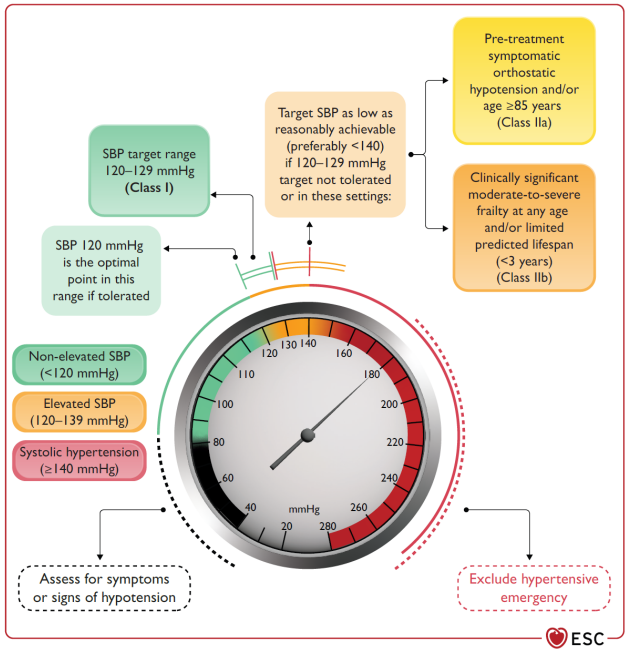

Figure 2: Systolic blood pressure categories and treatment target range.

only individuals with baseline systolic BP ≥130 mmHg; and to recognize that BP values obtained under research conditions with standardized measurement techniques—although strongly recommended in these guidelines—are not always comparable to those recorded in routine clinical practice, which may be 5–10 mmHg higher [65, 66].

Trial data supporting the efficacy of a BP target of 120–129/70–79 mmHg largely excluded moderately or severely frail adults and therefore cannot be directly applied to this population. Evidence for this target in adults aged >85 years is also inconclusive. Because frailty can occur at different ages and tolerability of therapy varies, personalized treatment is recommended for individuals aged ≥85 years and/or those with significant frailty [64]. Moreover, this BP target may not be appropriate for patients with pre-treatment symptomatic orthostatic hypotension, limited predicted lifespan (e.g., <3 years), or high competing risks for non-CVD mortality, such as advanced CKD with eGFR <30 mL/min/1.73 m^2.

The task force acknowledges the 2021 ESC Guidelines on cardiovascular disease prevention, which adopted a stepwise strategy for BP-lowering treatment. In that framework, the initial goal was an on-treatment systolic BP of 130–139 mmHg, with further reduction to <130 mmHg considered in a second step depending on patient preferences, risk, and frailty [67]. While this two-step approach may remain practical for some clinicians, the 2024 ESC Guidelines emphasize a single on-treatment target of 120–129/70–79 mmHg, provided treatment is tolerated. This one-step approach reflects current evidence and is intended to discourage therapeutic inertia in BP management. For example, although a systolic BP of 135 mmHg might have been viewed as acceptable under the 2021 prevention guidelines, it should no longer be considered optimal

in light of the updated 2024 recommendations, which highlight the superiority of more intensive control. This represents an important shift in treatment philosophy, underscoring the priority of intensive yet individualized BP control in contemporary practice.

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Competing interests

None of the authors have conflicts of interest to declare

List of Abbreviations

ABPM	Ambulatory blood pressure monitoring
ASCVD	Atherosclerotic cardiovascular disease
BP	Blood pressure
CKD	Chronic kidney disease
CVD	Cardiovascular disease
DBP	Diastolic blood pressure
eGFR	Estimated glomerular filtration rate
HBPM	Home blood pressure monitoring
HIV	Human immunodeficiency virus
HMOD	Hypertension-mediated organ damage
hs-cTnT	High-sensitivity cardiac troponin T
LA	Left atrial
LV	Left ventricular
LVH	Left ventricular hypertrophy
NT-proBNP	N-terminal pro-brain natriuretic peptide
PWV	Pulse wave velocity
RWT	Relative wall thickness
SBP	Systolic blood pressure
SCORE2	Systematic COronary Risk Evaluation 2
SCORE2-OP	Systematic COronary Risk Evaluation 2–Older Persons

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