

The Impact of the 2024 ESC Guidelines for the Management of Elevated Blood Pressure and Hypertension on a Population Sample with a Mean Age of 59 Years

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ABSTRACT

Introduction: Hypertension is a challenge for the global healthcare system due to its high prevalence and importance as a risk factor for the development of cardiovascular disease (CVD) and premature death. Its control remains unsatisfactory, despite the proven efficacy and good tolerance of pharmacological treatment. Clinical practice guidelines are extremely important for guiding the management of these patients. The 2024 European Society of Cardiology (ESC) guideline classified blood pressure (BP) $\geq 120/70$ and $< 140/90$ mmHg as elevated BP, indicating approach, and established a BP $< 130/80$ mmHg as the therapeutic target.

Objective: To evaluate the impact of the 2024 ESC Guidelines (ESC-2024) on blood pressure control rates and the prevalence of individuals requiring approach in a population sample, through a comparative analysis with the 2018 ESC Guidelines (ESC-2018).

Methods: This was a cross-sectional study involving adults aged ≥ 18 years. Sociodemographic data, history of cardiometabolic diseases, cardiovascular risk factors, anthropometric data, and BP were collected. The results were expressed as percentages, and comparisons were made using the McNemar test.

Results: 504 individuals were evaluated, with a mean age of 59.56 years; 50.59% were men, 40.68% obese, 21.63% diabetic, and 49.21% had a history of hypertension (HH). Under the ESC-2024 criteria, the therapeutic target was reached in 11.70% of hypertensive patients, a percentage 3.48 times lower than that observed when the ESC-2018 criteria were applied ($P < 0.001$). According to the ESC-2024 recommendations, 59.38% of individuals without HH had an indication for approach, a percentage 5 times higher than that obtained under the ESC-2018 criteria, characterizing a significant difference ($P < 0.001$).

Conclusion: In this population sample, ESC-2024 had a significant impact on the rate of hypertension control and on the prevalence of individuals with blood pressure levels indicative of approaches such as non-pharmacological measures and CVD risk stratification.

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Keywords: Hypertension; risk factors; risk stratification; cardiovascular diseases.

24 1. INTRODUCTION

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26 Systemic Arterial Hypertension (SAH), a chronic condition of multifactorial etiology
27 characterized by sustained elevation of blood pressure, has been related to an increased
28 incidence of heart failure, atrial fibrillation, chronic kidney disease, stroke, and early mortality
29 (De Simone et al., 2008), the risk of several cardiovascular outcomes, and significant loss of
30 years of healthy life (Rapsomaniki et al., 2014). Therefore, its correlation with cardiovascular
31 risk (CVR) is evident, demonstrating a linear and continuous growth from values such as
32 115/75 mmHg, with CVR doubling for every 20 mmHg increase in systolic pressure and 10
33 mmHg increase in diastolic pressure (Lewington et al., 2002; Vasan, 2021).

34 Hypertension is implicated in a wide variety of lethal outcomes, either directly or indirectly.
35 Globally, in 2019, hypertension was responsible for 18% of deaths in males and 20% in
36 females, 38% of whom were under 70 years of age (World Health Organization, 2023). In
37 2017, CVD caused 27.3% of deaths in Brazil, with hypertension present in 45% of total
38 cases and associated with 51% of deaths from cerebrovascular disease. Although only 13%
39 of deaths have hypertension as the basic cause, the condition is an underlying
40 pathophysiological component in most deaths of cardiovascular origin (World Health
41 Organization, 2008).

42 Age, ethnicity, sex, and clinical history significantly influence the epidemiological distribution;
43 however, the socioeconomic profile of the analyzed population also stands out in this
44 context. Globally, between 1990 and 2019, the prevalence of hypertension decreased from
45 38% to 32% in high-income countries, with the European continent showing a reduction from
46 45% to 37% (World Health Organization, 2023). Conversely, in 2010, it was estimated that
47 1.39 billion adults aged 20 and over had hypertension, with 75% of diagnosed individuals
48 residing in low- and middle-income countries (Mills et al., 2016), highlighting the relationship
49 between the socioeconomic disparity in today's world and the heterogeneous distribution of
50 the disease. In addition, in Brazil, the frequency of hypertension is inversely related to the
51 level of education, with a prevalence of 45.3% among individuals with up to 8 years of study,
52 24.2% among individuals aged 9 to 11, and 19% among those aged 12 or more (Ministério
53 da Saúde do Brasil, 2023).

54 Despite the proven efficacy and good tolerance of pharmacological treatment, as well as the
55 variability of regional data, reported hypertension control rates are unsatisfactory worldwide.
56 In 2013, the estimated global control rates for women and men were 23% and 18%,
57 respectively (Burnier et al., 2013). According to data from the ELSI-Brazil cohort study,
58 51.1% of individuals aged 50 and over had controlled blood pressure (Firmo et al., 2018).
59 One of the main factors related to this scenario is the lack of adherence to treatment for
60 various reasons, such as high complexity of drug therapy (Schmieder et al., 2023);
61 inadequate development of the doctor-patient relationship; misperceptions regarding drug
62 use and its effects; and limited access to health education and the possibilities for lifestyle
63 change (Mazzaglia et al., 2009).

64 The proposed interventions to reverse this situation are grouped into three axes: patient,
65 treatment, and health system. The first encompasses home BP measurement, encouraging
66 family support, and health education, fostering patient self-care (Omboni et al., 2013); the
67 second, the organization of simplified dosing regimens with fewer adverse effects, as well as
68 easy-to-understand prescriptions (Gupta; Arshad; Poulter, 2009); and the third, strategies
69 aimed at expanding multidisciplinary teams in the health system, developing a good doctor-
70 patient and team-patient relationship, and improving the quality of home visits (Picon et al.,
71 2012).

72 In this context, clinical practice guidelines, which summarize current knowledge, benefits,
73 and risks of diagnostic and therapeutic approaches, and provide evidence-based
74 recommendations developed by experts, serve as an important resource to assist physicians
75 in patient management. Although there are criticisms pointing to guidelines as overly
76 academic, poorly implemented, subject to external influences, and sometimes contrary to
77 individualized physician-patient care (Shaneyfelt; Centor, 2009; Kaul, 2019), they are
78 certainly a valuable resource.

79 The impact of these compilations of information can be partly estimated by access and
80 citation data. The 2018 European Society of Cardiology (ESC) and European Society of
81 Hypertension (ESH) guidelines for the management of hypertension have been viewed
82 nearly 2 million times and have more than 14,000 citations (McCarthy et al., 2024). The
83 ESC, which has been developing guidelines on cardiovascular diseases for 30 years,
84 published new guidelines for the management of high blood pressure (BP) and hypertension
85 in 2024, proposing significant changes compared to the recommendations of the 2018
86 guidelines. Aiming to simplify clinical practice, the number of categories based on blood
87 pressure levels was reduced from 7 to 3, removing the concepts of optimal blood pressure,
88 normal blood pressure, and high-normal blood pressure. The classification of blood pressure
89 levels <120/70 mmHg as non-elevated BP, blood pressure levels \geq 120/70 and <140/90
90 mmHg as elevated BP, and \geq 140/90 mmHg as hypertension (McEvoy et al., 2024). This
91 categorization was supported by robust data from clinical trials, which demonstrated that the
92 effectiveness of reducing cardiovascular events related to blood pressure control extends to
93 levels below 120/70 mmHg (Rahimi et al., 2021; The SPRINT Research Group, 2015; Zhang
94 et al., 2021).

95 The 2018 ESC and ESH guidelines for the management of arterial hypertension
96 recommended a BP <140/90 mm Hg as the initial therapeutic target, with pharmacological
97 treatment generally reserved for high-risk patients or those who did not reach the
98 recommended therapeutic target with non-pharmacological measures (Williams et al., 2018).
99 However, the 2024 guidelines recommend pharmacological treatment for all hypertensive
100 patients and for those with elevated BP \geq 130/80 mm Hg, at high or moderate risk in the
101 presence of risk modifiers, who did not reach the therapeutic target after 3 months of non-
102 pharmacological measures, with the recommended therapeutic target being <130/80 mm
103 Hg. Individualization and a less stringent target (BP<140/90 mmHg) are recommended for
104 individuals who cannot tolerate lower BP levels, older adults with clinically significant frailty,
105 \geq 85 years, or with a life expectancy <3 Years (McEvoy JW, 2024).

106 In this sense, the present study, through comparative analysis with the 2018 ESC
107 hypertension management guideline, aims to evaluate the impact of the 2024 ESC
108 Guidelines on blood pressure control rates and the prevalence of individuals who require an
109 approach for adequate classification and stratification of cardiovascular risk in a population
110 sample of a municipality in the southern region of Brazil, with approximately 360,000
111 inhabitants, of which 72.6% are white, 24.2% are mixed race, 3.7% are black, 0.4% are
112 Asian, and 0.08% are indigenous (Instituto Brasileiro de Geografia e Estatística (IBGE),
113 2024).

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115 **2. METHODOLOGY**

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117 Cross-sectional, retrospective study conducted through the analysis of data collected at
118 outreach events linked to Outreach Project No. 00163.24.05353.03, which was conducted by
119 students and professors from the Department of Medicine at the State University of Ponta
120 Grossa, entitled "Informational and educational actions for better understanding and
121 adherence to medical treatment." The information collected at these events consisted of

122 basic sociodemographic data (age, sex, education, and occupation), targeted medical
 123 history taking to detect cardiovascular risk factors and cardiometabolic diseases, and
 124 records of blood pressure measurements (as recommended in the 2018 and 2024
 125 guidelines), waist circumference, and weight and height to calculate body mass index (BMI).
 126 Participants were volunteer adults aged 18 years or older, randomly approached in a
 127 location with high foot traffic. The results were expressed as percentages and percentage
 128 points. Comparisons were made using the McNemar test through the Jamovi computer
 129 program, version 2.6.26, with values of $p < 0.05$ considered significant.

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132 **3. RESULTS AND DISCUSSION**

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134 Five hundred four individuals were evaluated, with a mean age of 59.56 years, comprising
 135 50.59% men and 49.41% women, most having low levels of education. Regarding lifestyle
 136 habits, 46.24% were sedentary, 14.09% were active smokers, and 33.47% consumed
 137 alcoholic beverages, with more than moderate consumption reported by 25% of them.
 138 Regarding anthropometric data, 23.41% had a normal body mass index, 35.91% were
 139 overweight, and 40.68% were obese. A history of diabetes was reported by 21.63% and
 140 dyslipidemia by 33.67% of the sample. A previous history of hypertension (HH) was reported
 141 by 248 volunteers (49.21%) and denied by 256, corresponding to 50.79% of the sample
 142 (Table 1).

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144 **Table 1. Sample characterization**

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Variable		n	%
Gender	Male	255	50,5
	Female	250	49,5
Education	None	12	3,11
	Incomplete Elementary School	143	37,05
	Complete Elementary School	97	25,13
	High School	113	29,27
	Higher Education	21	5,44
Body Mass Index (BMI)	Normal	118	23,41
	Overweight	181	35,91
	Obesity	205	40,68
Medical history of hypertension	No	256	50,79
	Yes	248	49,21
Dyslipidemia	No	333	66,33
	Yes	169	33,67
Diabetes Mellitus	No	395	78,37
	Yes	109	21,63
Alcohol use disorder (AUD)	No	334	66,53
	Yes	168	33,47
	Moderate AUD	126	75
	Severe AUD	42	25
Tabagism	No	433	85,91
	Yes	71	14,09
Physical activity	No	222	53,75
	Yes	191	46,25

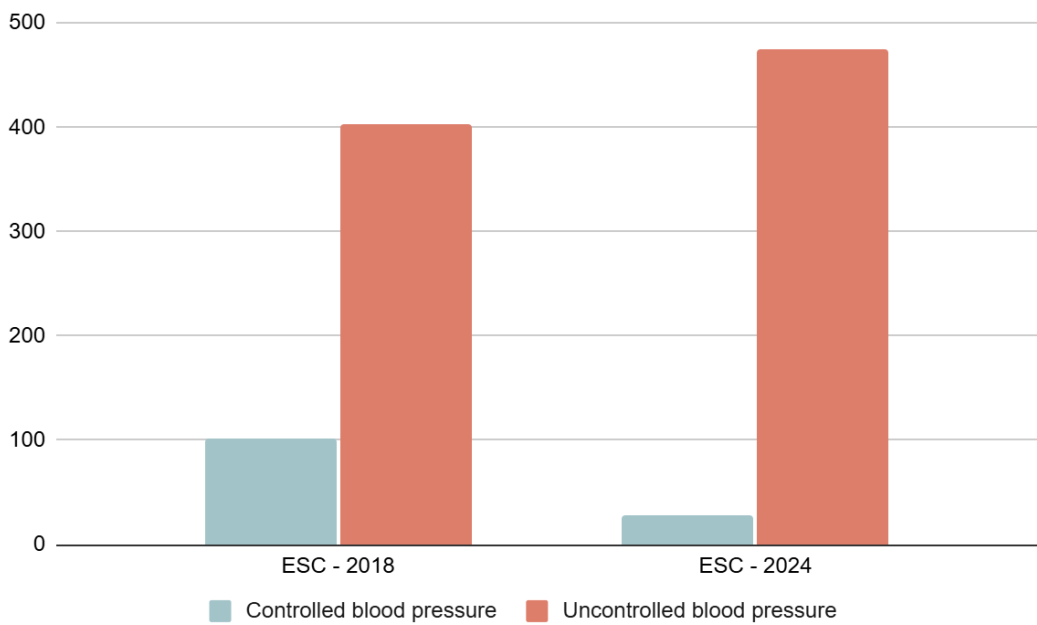
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Source: Prepared by the authors.

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Among individuals with HH, 70% received regular medical follow-up, and 84.6% used antihypertensive medication as prescribed. In this subgroup, blood pressure levels lower than 140/90 mmHg were observed in 40.73% and <130/80 mmHg in only 11.70%. Therefore, applying the criteria proposed by the 2018 ESC guideline for the management of arterial hypertension, initial blood pressure control was observed in 40.73% of the subgroup with HH. However, according to the criteria proposed by the 2024 ESC guideline for the management of high blood pressure and hypertension, the therapeutic target (<130/80 mmHg) was achieved in only 11.70% of this subgroup (Figure 1). Thus, using the criteria proposed by the 2024 ESC guideline, the hypertension control rate was significantly lower ($P<0.001$) 29.03 percentage points lower, or 3.48 times lower than that achieved using the 2018 ESC guideline criteria.



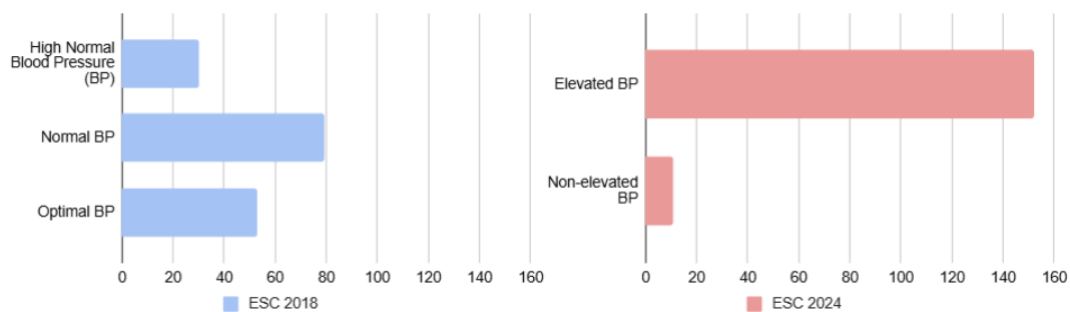
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Fig. 1. Blood pressure control in individuals with a history of hypertension, according to the 2018 and 2024 ESC guidelines
Source: Prepared by the authors.

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Regarding those who denied HH, 36.33% of them, corresponding to 93 individuals, had BP \geq 140/90 mmHg. According to the classification proposed by the 2018 ESC guideline for the management of arterial hypertension, blood pressure levels compatible with high-normal blood pressure (\geq 130/85 and <140/90 mmHg) were observed in 11.72%, with normal blood pressure (\geq 120/80 and <130/85) in 30.86% and optimal blood pressure (<120/80) in 20.70% of this subgroup (figure 2). Therefore, under these criteria, only 11.72% of the sample, classified as having high-normal blood pressure, would require an approach for diagnosis and risk stratification. However, applying the criteria from the 2024 ESC guideline for the management of high blood pressure and hypertension, 59.38% were classified as having elevated BP (\geq 120/70 and <140/90) and 4.29% as having non-elevated BP (<120/70) (Figure 2). Therefore, under these criteria, only 4.29% of this subgroup would not indicate diagnostic and risk stratification approaches. Thus, the percentage of individuals requiring additional risk stratification and specific care would be 47.66 percentage points higher, or 5

180 times higher, when the criteria adopted are those defined by the 2024 ESC guideline,
 181 representing a significant difference between the criteria recommended by the two
 182 guidelines ($P<0.001$).
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 186 **Fig. 2. Classification according to blood pressure levels of individuals without a**
 187 **history of hypertension according to the 2018 and 2024 ESC Guidelines**
 188 *Source: Prepared by the authors.*
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190 **4. DISCUSSION**

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 192 Hypertension is a significant challenge for the global healthcare system due to its high
 193 prevalence and its importance as a risk factor for the development of cardiovascular disease
 194 (CVD) and chronic kidney disease (CKD) (Mills et al., 2016). In 2010, more than 60% of
 195 deaths caused by CVD, CKD, and diabetes mellitus (DM) were attributed to four modifiable
 196 cardiometabolic risk factors, with hypertension having the most significant impact,
 197 characterizing it as the leading modifiable risk factor for premature death globally (Mills et al.,
 198 2016; The Global Burden of Metabolic Risk Factors for Chronic Diseases Collaboration,
 199 2014). Worldwide, more than one billion people have hypertension, which contributes to
 200 more than 20% of CVD (Malik et al., 2021).

201 In the present study, 35.91% of the population sample was overweight, 40.68% were obese,
 202 21.63% had diabetes, and 33.67% had dyslipidemia. According to data reported by the
 203 WHO, in 2022, 43% of those over 18 years of age worldwide were overweight, 16% were
 204 obese, 14% were diabetic (World Health Organization, 2024; World Health Organization,
 205 2020; WHO, 2024), and in 2008, 39% had hypercholesterolemia (WHO global health
 206 observatory data, 2008). Therefore, the prevalence of overweight individuals was
 207 approximately 7 percentage points lower, obesity 24 percentage points higher, diabetes 8
 208 percentage points higher, and dyslipidemia 5 percentage points lower. These differences are
 209 likely primarily related to the average age of the sample.

210 The prevalence of hypertension in the sample evaluated in this study was 49.21%,
 211 approximately 12 percentage points above the European estimate of 37% (WHO, 2023) and
 212 17 percentage points above the prevalence estimate in the United States (32%) when using
 213 the cut-off value $\geq 140/90$ mm Hg or reported current use of antihypertensives (Whelton et
 214 al., 2018). However, the mean age of the sample in question was 59.56 years; therefore,
 215 similar to the prevalence of other comorbidities mentioned above, the age of the participants
 216 may, at least in part, justify the difference between the estimated prevalences. Results of a
 217 meta-analysis of 48 randomized trials published between 1972 and 2013 demonstrated that
 218 the reduction in the risk of major cardiovascular events was proportional to the reduction in
 219 systolic BP, regardless of the presence of CVD or baseline systolic BP, with the benefit
 220 observed even at baseline systolic BP levels <120 mmHg. Overall, a 5 mmHg reduction in

221 systolic BP reduced the risk of major cardiovascular events by approximately 10%. The
222 corresponding proportional reductions in the risk of stroke, heart failure, ischemic heart
223 disease, and cardiovascular death were 13%, 13%, 8%, and 5%, respectively (Rahimi et al.,
224 2021).

225 The aforementioned meta-analysis reflects the scenario that motivated the ESC to
226 implement the substantial changes that culminated in the 2024 guideline recommendations,
227 and subsequently in the recommendations of the American College of Cardiology/American
228 Heart Association (ACC/AHA) and the Brazilian Society of Cardiology (SBC) guidelines. In
229 general, there is consensus among the 2024 ESC, 2025 ACC/AHA, and 2025 SBC
230 guidelines regarding the decision to initiate pharmacological treatment based on BP level
231 and CV risk, and regarding the benefit of achieving the therapeutic target of BP <130/80
232 mmHg. Similarly, there is also agreement among the cited guidelines regarding the need to
233 introduce non-pharmacological measures and risk stratification when systolic blood pressure
234 levels are ≥ 120 and/or ≤ 80 mmHg, although there is slight disagreement regarding the
235 diastolic level adopted as a parameter (McEvoy et al., 2024; Jones et al, 2025; Brandão et
236 al., 2025).

237 In our study, among the 256 individuals who denied HH, 93 (36.33%) had BP $\geq 140/90$
238 mmHg at the time of treatment and were therefore unaware of this condition. Among
239 individuals with HH (49.21% of the sample), 40.73% were within the initial treatment target,
240 according to the criteria proposed by the 2018 ESC guideline (BP < 140/90 mmHg).
241 However, according to the criteria proposed by the 2024 ESC guideline, the therapeutic
242 target (<130/80 mmHg) was reached in only 11.70% of this subgroup (Figure 1). Thus,
243 comparing control rates under the criteria of the two aforementioned guidelines, a
244 significantly lower control percentage (3.48 times, p value < 0.001) is observed when the
245 criteria of the 2024 guideline are applied.

246 The scenario worldwide is similar. According to data from the 2013 Prospective Rural Urban
247 Epidemiology (PURE) study, which evaluated more than 150,000 adults aged 35 to 70 from
248 various regions of the world, 46.5% of hypertensive individuals were aware of their
249 diagnosis, and only 32.5% of those treated had controlled blood pressure levels (Chow et
250 al., 2013). In 2019, a year in which the global prevalence of hypertension among adults aged
251 30 to 79 was 32% for women and 34% for men, the blood pressure control rate was
252 estimated at 23% for women and 18% for men (Zhou et al., 2021). In the United States,
253 these rates were estimated at 55.2% and 49.3%, respectively (National Center for Health
254 Statistics (U.S.), 2014), with a prevalence of hypertension of 46% (Whelton et al., 2018). In
255 Europe, the control rate was estimated at 48.4% (Reuter; Jordan, 2019) and the prevalence
256 of hypertension at 37% (WHO, 2023).

257 Prevalence data and control rates may vary by region, as they depend on the criteria
258 adopted. The 2017 ACC/AHA Guideline cites the discrepancy in the prevalence of
259 hypertension observed when using the criteria adopted in 2017 (hypertension is defined as
260 BP $\geq 130/80$ mm Hg or reported current use of antihypertensive medications) compared to
261 the criteria adopted by the previous guideline from the same entity (BP $\geq 140/90$ mm Hg) and
262 maintained by other guidelines such as the 2024 ESC and the 2025 SBC (Whelton et al.,
263 2018). Since 2024, initiated by the 2024 ESC guideline and similarly reinforced by the
264 ACC/AHA and SBC guideline in 2025, an approach with non-pharmacological measures and
265 CV risk stratification has been recommended in patients with BP ≥ 120 and/or ≤ 80 mmHg,
266 with the 2024 ESC recommendation being slightly more stringent in relation to BP, defining
267 patients with BP $\geq 120/70$ mmHg (elevated BP) as eligible for the aforementioned approach.
268 In the present study, using the criteria of the 2024 ESC guideline, 59.38% of the subgroup
269 without HH was classified as having elevated BP ($\geq 120/70$ and <140/90 mmHg) and 4.29%

270 as non-elevated BP (<120/70 mmHg). Therefore, 59.38% of the aforementioned subgroup
271 would be indicated for non-pharmacological measures and CV risk stratification. On the
272 other hand, applying the criteria of the 2018 ESC guideline, only 11.72% of these individuals
273 would be classified as having high-normal blood pressure ($\geq 130/85$ and $< 140/90$ mmHg),
274 meaning they would be indicated for the same approach. Hence, the percentage of these
275 individuals would be five times higher if the criteria adopted were those defined by the 2024
276 ESC guideline, which, in this context, characterizes a significant difference between the two
277 guidelines ($P < 0.001$).

278 Thus, it can be inferred that the new paradigm initially proposed by this guideline will
279 contribute to the reduction of apparent therapeutic inertia, through the awareness of health
280 professionals, the sensitization of public body managers, and the guidance of the population,
281 which together can contribute to the reversal of this bleak global panorama related to
282 hypertension and CVD in general.

283

284 **5. CONCLUSION**

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286 The adoption of lower cutoff values, proposed by the 2024 ESC guideline, to guide patient
287 management significantly increased the percentage of individuals with this condition. The
288 more rigorous therapeutic target significantly reduced the percentage of individuals with
289 blood pressure levels considered controlled. A significant portion of the sample (36.33%)
290 lacked knowledge of individual health conditions related to blood pressure levels. The
291 sample's blood pressure control rate was poor and disproportionate to the percentage of
292 adherence to pharmacological treatment, which may characterize therapeutic inertia.

307

308 **CONSENT**

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310 It is not applicable.

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312 **ETHICAL APPROVAL**

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314 It is not applicable.

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