## Nonpharmacologic Treatment of HTN







Khosravi Masoud Nephrologist 13990613 The <u>targeted approach</u> focuses on BP reduction in adults at greatest risk of developing <u>BP-related CVD</u>, including:

individuals with hypertension,

those at <u>increased risk of developing hypertension</u>, especially blacks and adults who are:

overweight,

consume excessive amounts of dietary sodium,

have a high intake of alcohol,

are physically inactive.

Whelton PK, et al. 2017 High Blood Pressure Clinical Practice Guideline

# IMAGE VIEWER

## The Cardiovascular Continuum: Hypertension to Heart Failure



Adapted from Dzau V, Braunwald E. Am Heart J. 1991;121:1244–1263.



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## IMAGE VIEWER

Granular arteriolosclerotic kidney typically found in essential hypertension



Kidneys in Hypertension

Cut surface of arteriolosclerotic kidney

Hyalinization of an afferent arteriole (A) in arteriolosclerosis of essential hypertension

Kidney in malignant phase of essential hypertension: numerous variegated hemorrhages



Characteristic "onionskin" lamination and deterioration of a renal arteriole in malignant phase of essential hypertension



Necrosis of a glomerulus (G) and of an afferent arteriole (A) in malignant hypertension

## **Nonpharmacological interventions**

weight loss

**DASH** (Dietary Approaches to Stop Hypertension) diet, eg; **Mediterranean diet** (consumption of legumes and monounsaturated fat, avoidance of red meats, and moderate intake of wine) has been effective in reducing BP, as well as improving lipid profile.

Sodium reduction

Potassium supplementation

Increased physical activity

Reduction in alcohol consumption

Other interventions ???:

Probiotics

## **increased intake of** : Protein Fiber Flaxseed or fish oil

Supplementation with calcium or magnesium

Low-carbohydrate

Vegetarian diets

Other interventions ???:

Stress reduction

<u>consumption of :</u> Garlic Dark Chocolate Tea or Coffee

Behavioral therapies, including : Guided breathing Yoga Meditation Biofeedback

#### Salt intake and blood pressure



**Comprehensive Clinical Nephrology** 

#### Renal effects of a low potassium diet

Salt retention: Na+/K+ ATPase levels increase in outer medullary collecting duct

Water loss/concentrating defect: nephrogenic diabetes insipidus

Renin release

Decreased urinary prostaglandins

Decreased urinary nitrites (suggestive of decreased nitric oxide generation)

Increased intrarenal endothelin -1

Renal hypertrophy

Tubulointerstitial fibrosis

Renal cysts

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## Lifestyle Modifications for Prevention and Management of Hypertension



JNC VI. Arch Intern Med. 1997;157:2413-2444.

#### Whelton PK, et al.

## 2017 High Blood Pressure Clinical Practice Guideline

	Nonpharmacological	Dose	Approximate Impact on SBP			
	Intervention		Hypertension	Normotension	Reference	
Weight loss	Weight/body fat	Best goal is ideal body weight, but aim for at least a 1-kg reduction in body weight for most adults who are overweight. Expect about 1 mm Hg for	-5 mm Hg	-2/3 mm Hg	(1)	
		in body weight.				
Healthy diet	DASH dietary pattern	Consume a diet rich in fruits, vegetables, whole grains, and low-fat dairy products, with reduced content of saturated and total fat.	-11 mm Hg	-3 mm Hg	(6, 7)	
Reduced intake of dietary sodium	Dietary sodium	Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.	-5/6 mm Hg Reduced dieta the BP-lower	-2/3 mm Hg ry sodium has ing effects of R	(9, 10) sociation been reported to AS blocker theraj	augi Py
Enhanced intake of dietary potassium	Dietary potassium	Aim for 3500–5000 mg/d, preferably by consumption of a diet rich in potassium.	-4/5 mm Hg The WHO re (3510 mg)/Da	-2 mm Hg commends a K y from food for	(13) intake of at leas adult patients	: 90 I
DI	A VIII I I		E /0	2/4	(40.00)	1

Table 15. Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertensic	t Proven Nonpharmacological Interventions for Prevention and Treatment of Hype	rtension	*
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A Yanomamo Indian from southern Venezuela. This tribe of Indians ingests a low sodium (1 mmol/day) and high potassium (200–300 mmol/day) diet and has an almost *complete absence of hypertension* 



potassiani		ment in porabbianti.			
Physical	Aerobic	• 90–150 min/wk	-5/8 mm Hg	-2/4 mm Hg	(18, 22)
activity		• 65%–75% heart			
		rate reserve			
	Dynamic resistance	• 90–150 min/wk	-4 mm Hg	-2 mm Hg	(18)
		• 50%–80% 1 rep			
		maximum			
		<ul> <li>6 exercises, 3</li> </ul>			
		sets/exercise, 10			
		repetitions/set			
	Isometric resistance	<ul> <li>4 × 2 min (hand</li> </ul>	-5 mm Hg	-4 mm Hg	(19, 31)
		grip), 1 min rest			
		between exercises,			
		30%–40% maximum			
		voluntary			
		contraction, 3			
		sessions/wk			
		• 8–10 wk			
Moderation	Alcohol consumption	In individuals who	-4 mm Hg	-3 mm Hg	(22-24)
in alcohol		drink alcohol, reduce			
intake		alcohol† to:			
		<ul> <li>Men: ≤2 drinks</li> </ul>	• women	kı drink dail	V
		daily	women		Y

In the United States, 1 "standard" drink contains roughly 14 g of pure alcohol, which is typically found in 12 oz of regular beer (usually about 5% alcohol), 5 oz of wine (usually about 12% alcohol), and 1.5 oz of distilled spirits (usually about 40% alcohol)

Whelton PK, et al. 2017 High Blood Pressure Clinical Practice Guideline Recent analyses suggest *isometric exercise* may elicit BP reductions greater than those seen with dynamic aerobic and resistance exercise.

Currently, dynamic aerobic endurance activity is the preferred exercise modality for BP management.

Isometric exercise involves sustained contraction against an immovable load or resistance with no or minimal change in length of the involved muscle group.

Low- to moderate intensity isometric activity can be performed anywhere, requires relatively inexpensive equipment, and does not elicit the same level of cardiovascular stress (eg, rate-pressure product) as aerobic activity.

> Isometric Exercise Training for Blood Pressure Management: A Systematic Review andMeta-analysis Mayo Clin Proc. 2014;89(3):327-334

Table 1 Characteristics of included studies         IRT lasting 8 w				ng 8 weeks or longer appears to be optimal	
Study and         Duration         Arm IRT appears to be superior to leg IRT				Γ appears to be superior to leg IRT	
country	(weeks)	Participants	Withdrawal	Frequency	Exercise training characteristics
Badrov <i>et al.</i> <sup>18</sup> Canada	8	Women ( <i>n</i> =36) 16-32 years	3 controls 1 5x/week	3/5 Days per week	$4 \times 2$ min unilateral IHG contractions at 30% MVC, separated by 4 min of rest. All contractions in non-dominant hand. $3 \times$ per week group (n=12), $5 \times$ per week group (n=11), controls (n=9).
Badrov <i>et al.</i> <sup>19</sup> Canada	10	Men $(n = 13)$ Women $(n = 11)$ 51–74 years Hypertensive medicated	None	3 Days per week	$4 \times 2 \min$ IHG bilateral contractions at 30% MVC, separated by 1-min rest periods ( $n=12$ ) Non-exercising controls ( $n=12$ ), no intervention. Participants recorded any changes in exercise, diet and medication.
Baross <i>et al.</i> <sup>21</sup> UK	8	Men ( <i>n</i> = 30) 45–60 years	None	3 Days per week	<ul> <li>4 × 2 min double-leg extension isometric exercises at 14% MVC, separated by 2-min rest periods.</li> <li>14% MVC (n=10); 8% MVC (n=10).</li> <li>Controls remained sedentary (n=10).</li> </ul>
Baross <i>et al.</i> <sup>20</sup> UK	8	Men ( <i>n</i> = 20) 45-60 years	None	3 Days per week	$4 \times 2 \text{ min}$ double-leg extension isometric exercises at 85% HR <sub>peak</sub> , separated by 2-min rest periods ( $n=10$ ). Controls remained sedentary ( $n=10$ ).
Devereux <i>et al.</i> <sup>22</sup> UK	4	Men $(n = 13)$ 21.0 ± 2.4 years	Unknown	3 Days per week	Four × 2 min bilateral leg isometric exercise at 95% HR <sub>peak</sub> , separated by 3-min rest periods. No control group.
Gill <i>et al.<sup>23</sup></i> USA	3	Men $(n = 11)$ Women $(n = 29)$ 22.3 ± 3.4 years	5	3 Days per week	4 × 2 min bilateral leg isometric exercise, separated by 3-min rest periods. 20% EMGpeak–23% MVC (n=8); 30% EMGpeak–34% MVC (n=9). Controls (n = 18), no intervention.
	Isometric exercise training for blood pressure management: a systematic review and meta-analysis to optimize benefit Hypertension Research (2015), 1–7& 2015 The Japanese Society of Hypertension All rights reserved 0916-9636/15				

We recommend isometric handgrip exercise

may produce greatest

reduction in BP in hypertensive males aged  $\geq$ 45 years,

using unilateral arm IRT, 4 × 2min, three times weekly

at 30-50% MVC, for > 8 weeks.

IRT=Isometric Resistance Training MVC= Maximal Voluntary Contraction

> Isometric exercise training for blood pressure management: a systematic review and meta-analysis to optimize benefit Hypertension Research (2015), 1–7& 2015 The Japanese Society of Hypertension All rights reserved 0916-9636/15 www.nature.com/hr

The mechanisms responsible for these BP effects remain equivocal.

Similar to dynamic aerobic exercise training, the BP-lowering effects of isometric exercise training are most likely mediated through changes in: *systemic vascular resistance* [reduced vascular sympathetic modulation] {Neurohormonal}

increase endothelial dependent (eg, nitric oxide emediated) *vasodilation* in response to reactive hyperemia.

the shear stress mediated basal production of

endothelial-dependent vasodilators such as nitric oxide.

Isometric exercise training has also been reported to increase *antioxidant concentrations* 

Isometric Exercise Training for Blood Pressure Management: A Systematic Review andMeta-analysis Mayo Clin Proc. 2014;89(3):327-334 It is important to remember that isometric exercise (as with dynamic aerobic exercise) immediately increases BP.

However, as with dynamic resistance exercise, it is known that low- to moderate-intensity resistance exercise produces safe and minimal hemodynamic responses.

it is generally recommended that at low intensities (<40% of maximum), patients in whom dynamic aerobic exercise is considered appropriate should be permitted to complete equivalentintensity isometric exercise.

Physiologically, isometric exercise may be associated with reduced myocardial oxygen demand due to an attenuated increase in heart rate and increased DBP (ie, coronary perfusion pressure).

> Isometric Exercise Training for Blood Pressure Management: A Systematic Review andMeta-analysis Mayo Clin Proc. 2014;89(3):327-334

## 3 CHINESE REFLEXOLOGY AND Acupressure points for High blood pressure



www.ChineseFootReflexology.com/hypertension



## DEEP BREATHING HYPERTENSION





## 2018 ESC/ESH Guidelines for the management of arterial hypertension

lifestyle changes may be sufficient to delay or prevent the need for drug therapy in patients with grade 1 hypertension.

They can also augment the effects of BP lowering therapy, but they should never delay the initiation of drug therapy in patients with HMOD or at a high level of CV risk.

A major drawback of lifestyle modification is the poor persistence over time.



## 2018 ESC/ESH Guidelines for the management of arterial hypertension

 sodium consumption (>5 g sodium per day, e.g. one small teaspoon of salt per day) has been shown to have a pressor effect and be associated with an increased prevalence of hypertension and the rise in SBP with age.

 a reduction of 1.75 g sodium per day (4.4 g salt/day) was associated with a mean 4.2/2.1 mmHg reduction in SBP/DBP, with a more pronounced effect (-5.4/- 2.8 mmHg) in people with hypertension.



## Lifestyle interventions for patients with hypertension or high-normal BP

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Salt restriction to <5 g per day is recommended. <sup>248,250,255,258</sup>	I.	4
It is recommended to restrict alcohol con- sumption to: • Less than 14 units per week for men. • Less than 8 units per week for women. <sup>35</sup>	I	۲
It is recommended to avoid binge drinking.	ш	C
Increased consumption of vegetables, fresh fruits, fish, nuts, and unsaturated fatty acids (olive oil); low consumption of red meat; and consumption of low-fat dairy products are recommended. <sup>262,265</sup>	I	۲
Body-weight control is indicated to avoid obesity (BMI > 30 kg/m <sup>2</sup> or waist circumfer- ence > 102 cm in men and >88 cm in women), as is aiming at healthy BMI (about 20–25 kg/m <sup>2</sup> ) and waist circumference val- ues (<94 cm in men and <80 cm in women) to reduce BP and CV risk. <sup>262,271,273,290</sup>	I	4
Regular aerobic exercise (e.g. at least 30 min of moderate dynamic exercise on 5–7 days per week) is recommended. <sup>262,278,279</sup>	1	A
Smoking cessation, supportive care, and referral to smoking cessation programs are recommended. <sup>286,288,291</sup>	I	в

BMI = body mass index; BP = blood pressure; CV = cardiovascular.

<sup>b</sup>Level of evidence mostly based on the effect on BP and/or CV risk profile.

\*Class of recommendation.

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9 201 arterial  $\mathbf{\infty}$ **ESC/ESH** hypertension Guidelines for the management

**ESC/ESH GUIDELINES** 

ESC European Heart Journal (2018) 39, 3021–3104 European Society doi:10.1093/eurheartij/ehy339 of Cardiology

C

## Isotonic Exercises



- Isoconic: Plusdes maintain the same tension divolutions the exercise.
  - Examples includs squars, stair cleating, beep carts and pash-ape.









## Isometric Exercises













## Isometric And Isotonic Exercise

Concentric Muscle shortens Eccent

## Isotonic Contractions

- Concentric muscle shortens and does work
- Eccentric muscle generates force as it lengthens

### Isometric Contractions

- Tension builds but muscle neither shortens or lengthens
- Maintains posture



# HEART Blood pressure is

TACK

DISEASE

**STROKE** 

Blood pressure is the measurement of force applied to artery walls.







## Blood pressure Diagnosis, Grading and Management

Other risk factors, asymp- tomatic organ damage or	Blood pressure (mmHg)	Blood pressure (mmHg)	Blood pressure (mmHg)	Blood pressure (mmHg)
disease	High normal SBP 130-139 or DBP 85-89	Grade 1 hypertension SBP 140-159 or DBP 90-99	Grade 2 hypertension SBP 160-179 or DBP 100-109	Grade 3 hypertension SBP ≥ 180 or DBP ≥ 110
No other risk factors	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>No BP drug intervention</li> </ul>	<ul> <li>Lifestyle changes<sup>(1)</sup> for several months</li> <li>Then add BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup> for several weeks</li> <li>Then add BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>Immediate BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>
1-2 risk factors	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>No BP drug intervention</li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup> for several weeks</li> <li>Then add BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup> for several weeks</li> <li>Then add BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>Immediate BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>
≥ 3 risk factors	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>i.e. no BP drug intervention</li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup> for several weeks</li> <li>Then add BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>BP drugs targeting</li> <li>130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>Immediate BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>
Organ damage, CKD stage 3 or diabetes	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>Consider blood pressure drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(1)</sup></li> <li>BP drugs targeting</li> <li>130/80<sup>(a)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>BP drugs targeting</li> <li>130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(i)</sup></li> <li>Immediate BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>
Symptomatic CVD, CKD stage ≥ 4 or diabetes with organ damage/risk factors	<ul> <li>Lifestyle changes<sup>(1)</sup></li> <li>Consider blood pressure drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(1)</sup></li> <li>BP drugs targeting</li> <li>130/80<sup>(a)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(1)</sup></li> <li>BP drugs targeting</li> <li>&lt; 130/80<sup>(ii)</sup></li> </ul>	<ul> <li>Lifestyle changes<sup>(I)</sup></li> <li>Immediate BP drugs targeting &lt; 130/80<sup>(ii)</sup></li> </ul>
BP blood pressure DBP diastolic blood pressure				

SBP systolic blood pressure

#### Notes:

i.Recommended lifestyle interventions, see <u>Lifestyle Interventions</u> ii.Age 18-65: 120-129. Age 65+: Target 130-139

