

# Blood Pressure Management

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# Overview

- Definition of Hypertension
- Classification of Hypertension
- Evidence-Based Lifestyle Interventions
- Summary and Conclusions

# Hypertension (HTN)

- An chronic elevation in the arterial blood pressure in excess of 130/80 mm Hg (AHA)
- Hypertension is the most prevalent modifiable risk factor
  - 1/3 of all Americans have HTN
  - 2/3 of individuals > 60 have HTN

Whelton PK, Carey RM, Aronow WS, et al. 2017 Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Journal of the American College of Cardiology*. 2017

# KNOW YOUR BLOOD PRESSURE

## —AND WHAT TO DO ABOUT IT

By AMERICAN HEART ASSOCIATION NEWS



The newest guidelines for hypertension:

### **NORMAL BLOOD PRESSURE**

\*Recommendations: Healthy lifestyle choices and yearly checks.

### **ELEVATED BLOOD PRESSURE**

\*Recommendations: Healthy lifestyle changes, reassessed in 3-6 months.

### **HIGH BLOOD PRESSURE / STAGE 1**

\*Recommendations: 10-year heart disease and stroke risk assessment. If less than 10% risk, lifestyle changes, reassessed in 3-6 months. If higher, lifestyle changes and medication with monthly follow-ups until BP controlled.

### **HIGH BLOOD PRESSURE / STAGE 2**

\*Recommendations: Lifestyle changes and 2 different classes of medicine, with monthly follow-ups until BP is controlled.

*\*Individual recommendations need to come from your doctor.*

*Source: American Heart Association's journal Hypertension  
Published Nov. 13, 2017*

# Assessment of Risk



AMERICAN  
COLLEGE of  
CARDIOLOGY

ASCVD Risk Estimator Plus



10-year risk for  
ASCVD  
categorized:

- Low-risk (<5%)
- Borderline risk (5% to 7.4%)
- Intermediate risk (7.5% to 19.9%)
- High risk ( $\geq 20\%$ )

Current Age  \*  
Age must be between 20-79

Sex  Male  Female

Race  White  African American  Other

Systolic Blood Pressure (mm Hg)  \*  
Value must be between 90-200

Diastolic Blood Pressure (mm Hg)  <sup>o</sup>  
Value must be between 60-130

Total Cholesterol (mg/dL)  \*  
Value must be between 130-320

HDL Cholesterol (mg/dL)  \*  
Value must be between 20-100

LDL Cholesterol (mg/dL)  <sup>o</sup>  
Value must be between 30-300

History of Diabetes?  Yes  No

Smoker?  Current  Former  Never

On Hypertension Treatment?  Yes  No

On a Statin?  Yes  No

On Aspirin Therapy?  Yes  No

Do you want to refine current risk estimation using data from a previous visit?  Yes  No

<http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/>

# SPRINT Trial NEJM 2015

- In patients at high risk for CVD but who do not have a history of stroke or diabetes, does intensive BP control (target SBP <120 mm Hg) yield superior CV outcomes compared to standard treatment (target SBP 135-139 mm Hg)?
- Multi-center Randomized Controlled Trial
- Included 9,361 non-diabetic patients  $\geq 50$  years of age without a history of prior stroke who were at elevated risk for CV events.
- Patients seen in the office:
  - 1 time per month for 3 months
  - 1 time every 3 months

# SPRINT NEJM 2015 Results

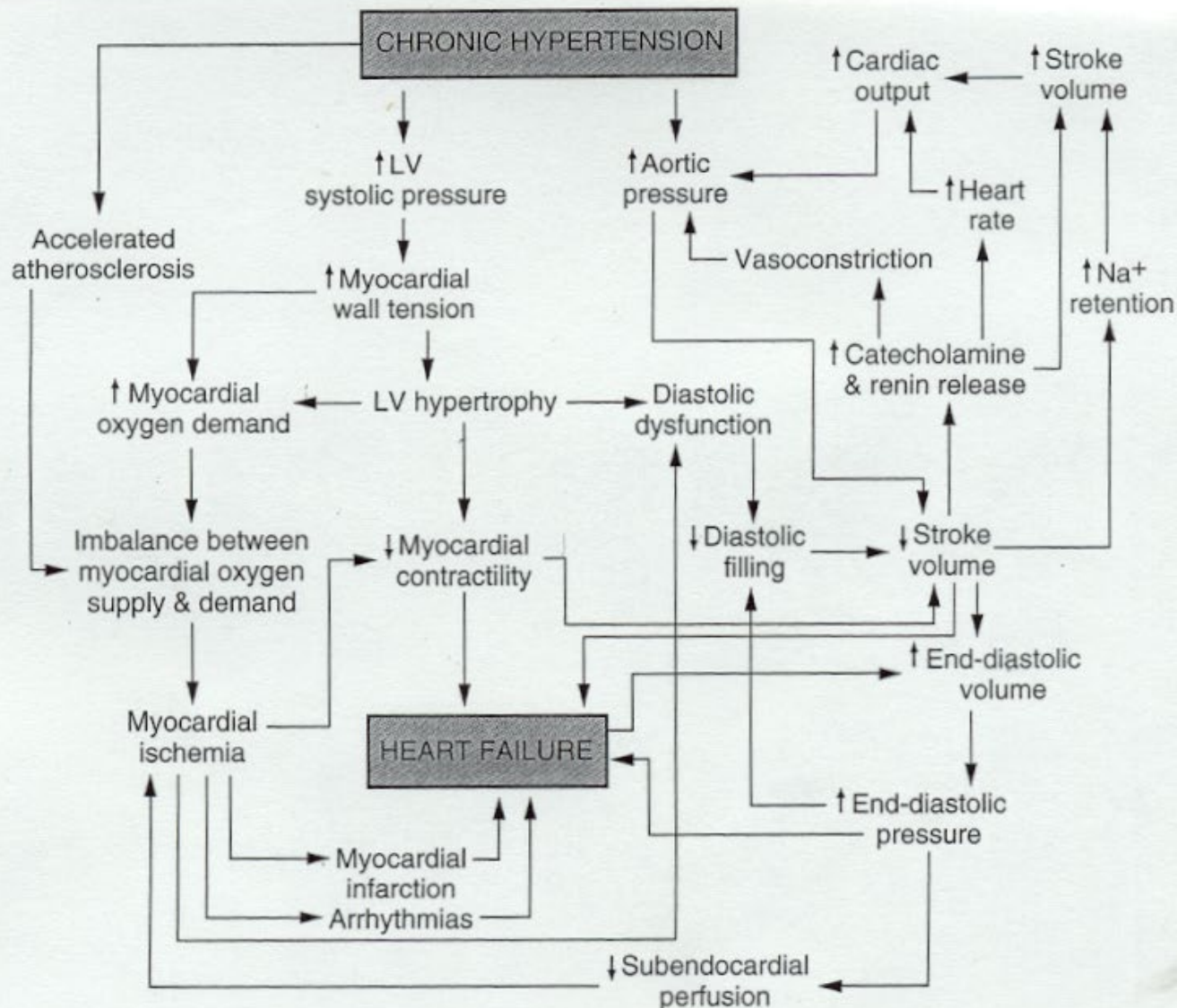
- Despite the planned follow-up of 5 years, the trial was stopped short after just 3 years due to superiority of intensive therapy compared to the standard of care.
- Primary Outcome: First occurrence of a composite endpoint (MI, ACS, HF, CVA, Death)
- Secondary Outcome: All cause mortality
- 25% fewer primary outcome events
  - (5.2% vs. 6.8%;  $P < 0.001$ )
- 27% reduction in all-cause mortality
  - (3.3% vs. 4.5%;  $P = 0.003$ ).
- Intensive therapy arm was associated with more syncope, electrolyte abnormalities, and AKI.

# **SPRINT Clinical Considerations**



# SPRINT –MIND Trial 2019

- Study looked at 454 participants in the SPRINT trial who received follow-up MRIs at a median of 3.98 years post-randomization.
- Results showed treating to a systolic BP target less than 120 mmHg revealed:
  - a "significantly lower rate" of adjudicated incident mild cognitive impairments.
  - Reduction in the increases in cerebral white matter lesion (WML) on MRI scans, with some reduction in total brain volume.



**Figure 7-2.** Some of the mechanisms and interrelationships in hypertension that may lead to the development of left ventricle (LV) failure. Repeating cycles tend to aggravate the problem. ↑, Increased; ↓, decreased.

# Risk Factors

Modifiable Risk Factors	Relatively Fixed Risk Factors
Smoking	Male Gender
Diabetes	Age
High Lipids, High Cholesterol	Low Socioeconomic/ Education
Diet	Family History
Overweight/ Obesity	Obstructive Sleep Apnea
Lack of Exercise	Chronic Kidney Disease

# Life Style Changes

## ■ Weight Loss:

- 1-kg reduction in body weight for most adults who are overweight.

## ■ DASH Diet:

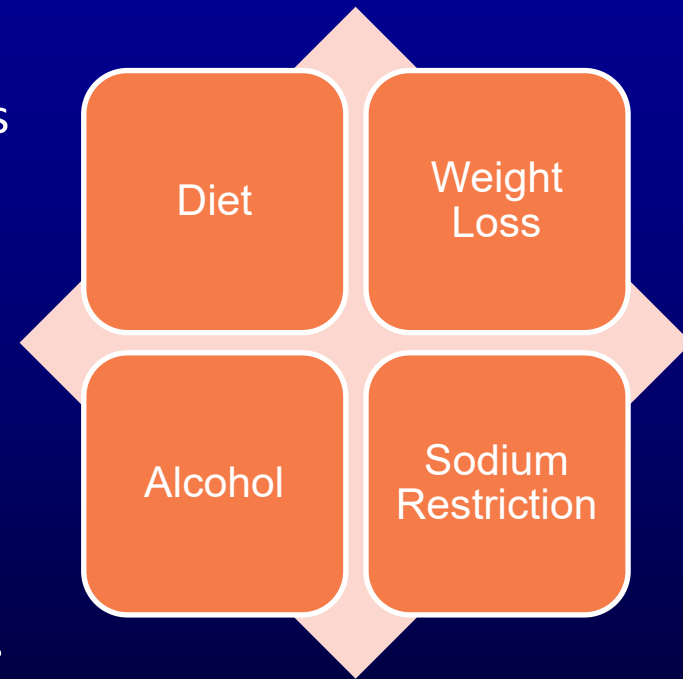
- Rich in fruits, vegetables, whole grains, low-fat dairy products, low saturated & total fat.

## ■ Sodium Restriction

- Optimal goal is <1500 mg/d, but aim for at least a 1000-mg/d reduction in most adults.

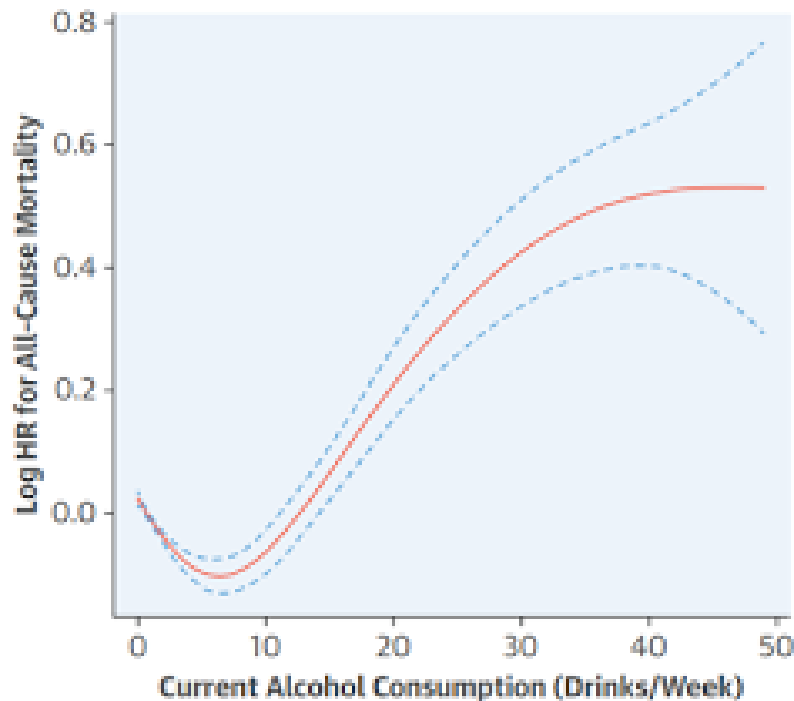
## ■ Alcohol Consumption

- Men:  $\leq 2$  drinks daily, Women:  $\leq 1$  drink daily



# Alcohol Consumption and All Cause Mortality

**CENTRAL ILLUSTRATION** Alcohol Consumption and All-Cause Mortality Risk in U.S. Adults



Xi, B. et al. *J Am Coll Cardiol.* 2017;70(8):810-22.

This study examined the association between alcohol consumption and mortality risk in U.S. adults, using data from the National Health Interview Surveys of 131,247 participants  $\geq 18$  years of age and categorizing participants according to self-reported alcohol consumption patterns. Median follow-up was 8.2 years. Compared with lifetime abstainers, individuals who were light or moderate consumers were at a reduced risk of all-cause mortality, but that risk increased significantly with heavy alcohol consumption, as seen in this J-shaped curve. HR = hazard ratio. Blue lines = 95% confidence interval.

## What is a Standard Drink?

12 fl oz of  
regular beer



about 5%  
alcohol

8-9 fl oz of  
malt liquor  
(shown in a  
12 oz glass)



about 7%  
alcohol

5 fl oz of  
table wine



about 12%  
alcohol

1.5 fl oz shot of  
distilled spirits  
(gin, rum, tequila,  
vodka, whiskey, etc.)



about 40%  
alcohol

# Exercise in Hypertension

- A combination of aerobic and resistance training exercise has the potential to decrease SBP and DBP values by 4 to 6 mmHg and 3 mmHg respectively independent of weight loss.
- In general, studies have demonstrated a reduction in blood pressure when prescribed at a frequency of three to four sessions per week of moderate-intensity with a duration of approximately 40 minutes for a period of 12 weeks.
- Meta-analysis of 28 trials that enrolled 1012 participants found that resting BP significantly decreased by 4/4 mmHg with moderate-intensity resistance training.
- The physiological factors responsible for a drop in BP values with aerobic exercise related to a reduction in sympathetic activity and an overall improvement in endothelial function.

**Martinez DG, Nicolau JC, Lage RL, et al. *Hypertension* 2011;58(6):1049-1056.**  
**Cornelissen VA, Fagard RH, Coeckelberghs E, Vanhees L. *Hypertension* 2011;58(5):950-958.**

# Dance Rx 2016 Systematic Review

- Meta-analysis investigated the effects of dance therapy in hypertensive patients.
- included four studies
- Dance therapy resulted in a significant reduction in BP values of 12/3 mmHg compared to the control group.
- Significant improvements in overall exercise capacity.

**Conceicao LS, Neto MG, do Amaral MA, Martins-Filho PR, Oliveira Carvalho V. Effect of dance therapy on blood pressure and exercise capacity of individuals with hypertension: A systematic review and meta-analysis. International journal of cardiology. 2016;220:553-557.**

# Dance Therapy and QOL

- Systematic review of dance therapy in patients with chronic heart failure.
- Results indicated significant improvements in  $VO_2$ max as well as QOL.
- Pooled homogenous effect size (CI) for QOL was 2.09 (1.65-2.54).
- Subjects were much happy after dance therapy!



# Cochrane Review and QOL

- Cochrane review of exercise based therapy in patients with heart failure.
- Pooled effect size (CI) in QOL was 0.56 (0.30-0.82)

Sagar VA, Davies EJ, Briscoe S. et al. Exercise based rehabilitation for heart failure: Systematic review and meta-analysis. *Open Heart*. 2015;2(1):e0000163.

# Hypotension

- Mean Arterial Pressure
- $MAP = DBP + 1/3 (SBP - DBP)$
- Normal MAP = 93 mm Hg
- Hypotension < 60 mm Hg

# Orthostatic Hypotension

Position	Blood Pressure	Heart Rate
Supine		
Standing 1 minute		
Standing – 3 minutes		
Standing- 5 minutes		
Seated?		

- Drop is SBP by 20 Drop in DBP by 10 Possible inc. in HR
- Smaller depressor responses because of reduced gravitational stress if seated first.
- Physiology
  - $BP = CO \times TPR$
  - $CO = HR \times SV$

**TABLE 1. Classifications of Orthostatic Hypotension<sup>a</sup>**

1. Classifications of orthostatic hypotension

- Sustained reduction in SBP  $\geq$  20 mm Hg or DBP  $\geq$  10 mm Hg
- In patients with supine hypertension (supine SBP  $\geq$  160 mm Hg), a drop in SBP  $\geq$  30 mm Hg
- Absolute standing SBP  $<$  90 mm Hg in patients with low baseline SBP ( $<$ 110 mm Hg)

2. Subclassifications of orthostatic hypotension

Classic orthostatic hypotension	Initial orthostatic hypotension	Delayed orthostatic hypotension
<ul style="list-style-type: none"> <li>• Sustained reduction in BP as described above that occurs <i>within 3 min of standing</i></li> </ul>	<ul style="list-style-type: none"> <li>• Rapid and temporary reduction in SBP <math>\geq</math> 40 mm Hg and/or DBP <math>\geq</math> 20 mm HG <i>within the first 15 s</i> followed by spontaneous and rapid BP normalization</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in BP as described above that occurs <i>&gt;3 min after standing</i></li> </ul>

3. Pathophysiological classification of orthostatic hypotension

Neurogenic		Nonneurogenic	
Central nervous system disorders	Primary <ul style="list-style-type: none"> <li>• Pure autonomic failure</li> <li>• Multiple systems atrophy</li> <li>• Parkinson disease</li> <li>• Dementia with Lewy bodies</li> </ul>	Medications	<ul style="list-style-type: none"> <li>• Antihypertensives</li> <li>• Antidepressants</li> <li>• Antiparkinsonian</li> </ul>
	Secondary <ul style="list-style-type: none"> <li>• Brain or spinal tumors</li> <li>• Multiple sclerosis</li> <li>• Spinal cord lesions</li> </ul>	Medical conditions	<ul style="list-style-type: none"> <li>• Sepsis</li> <li>• Heart failure</li> <li>• Adrenal insufficiency</li> </ul>
Peripheral nervous system disorders	Autonomic neuropathies <ul style="list-style-type: none"> <li>• Diabetes</li> </ul>	Predisposing conditions	<ul style="list-style-type: none"> <li>• Dehydration</li> <li>• Deconditioning</li> <li>• Aging</li> </ul>

BP, blood pressure; DBP, diastolic blood pressure; SBP, systolic blood pressure.

<sup>a</sup>From Freeman et al<sup>7</sup> and Kuritzky et al.<sup>8</sup>

# Management of OH

- Address potentially deleterious medications and comorbidities.
  - volume depletion and anemia
  - diuretics, antihypertensives, nitrates, and tricyclic antidepressants.
- Nonpharmacologic interventions:
  - water intake, elevating the head of the bed, compression and salt intake.
- 2 approved drugs : the alpha-1 agonist midodrine and the norepinephrine prodrug droxidopa.

Thank  
you