

Dallas
CARDIOVASCULAR
INNOVATIONS 2013



Current Concepts In The Management of Hypertension

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Disclosures

Medtronic:

Local Primary Investigator for Symplicity HTN-3
(enrollment closed)

Hypertension Facts

76 Million Americans

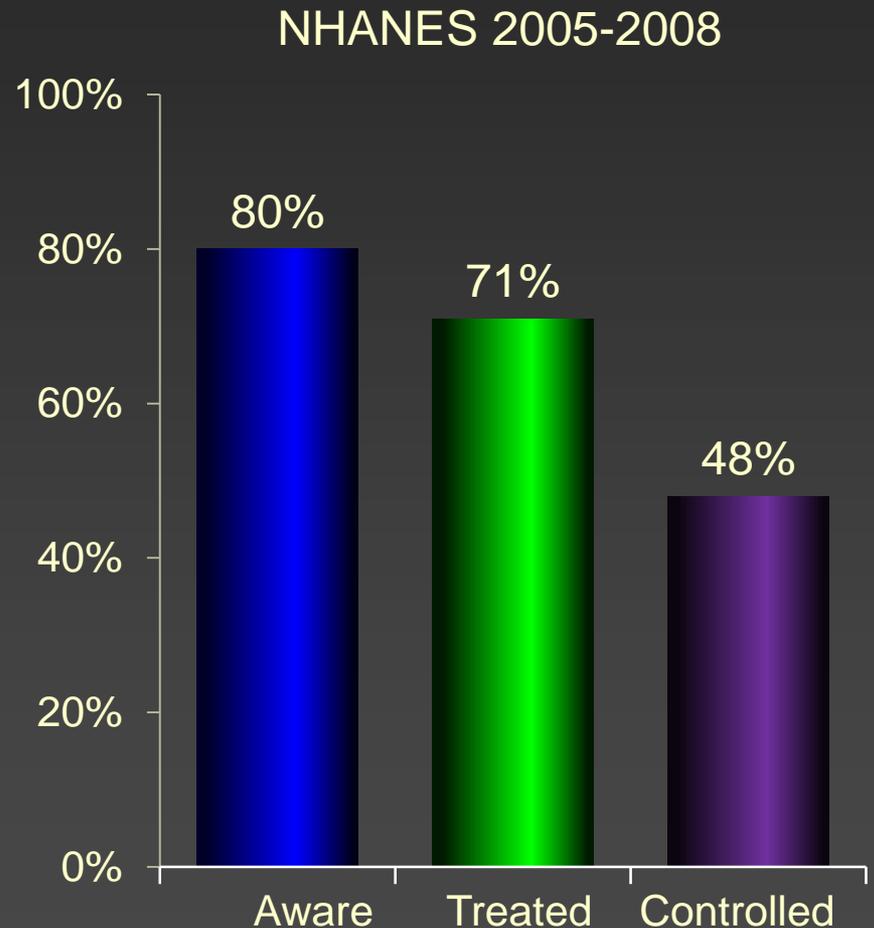
~34% adults

Prevalence

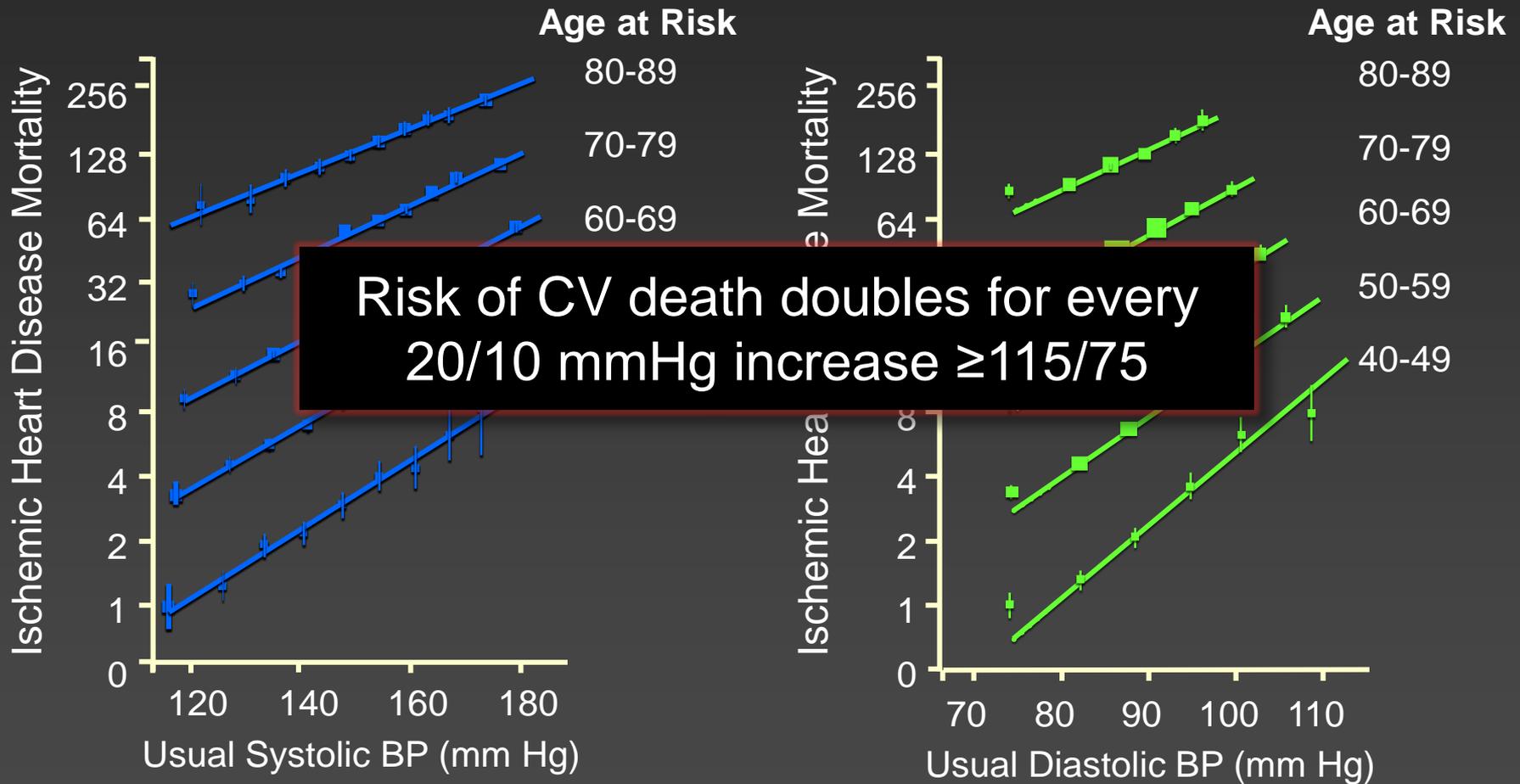
men \approx women

~40-50% of CAD patients

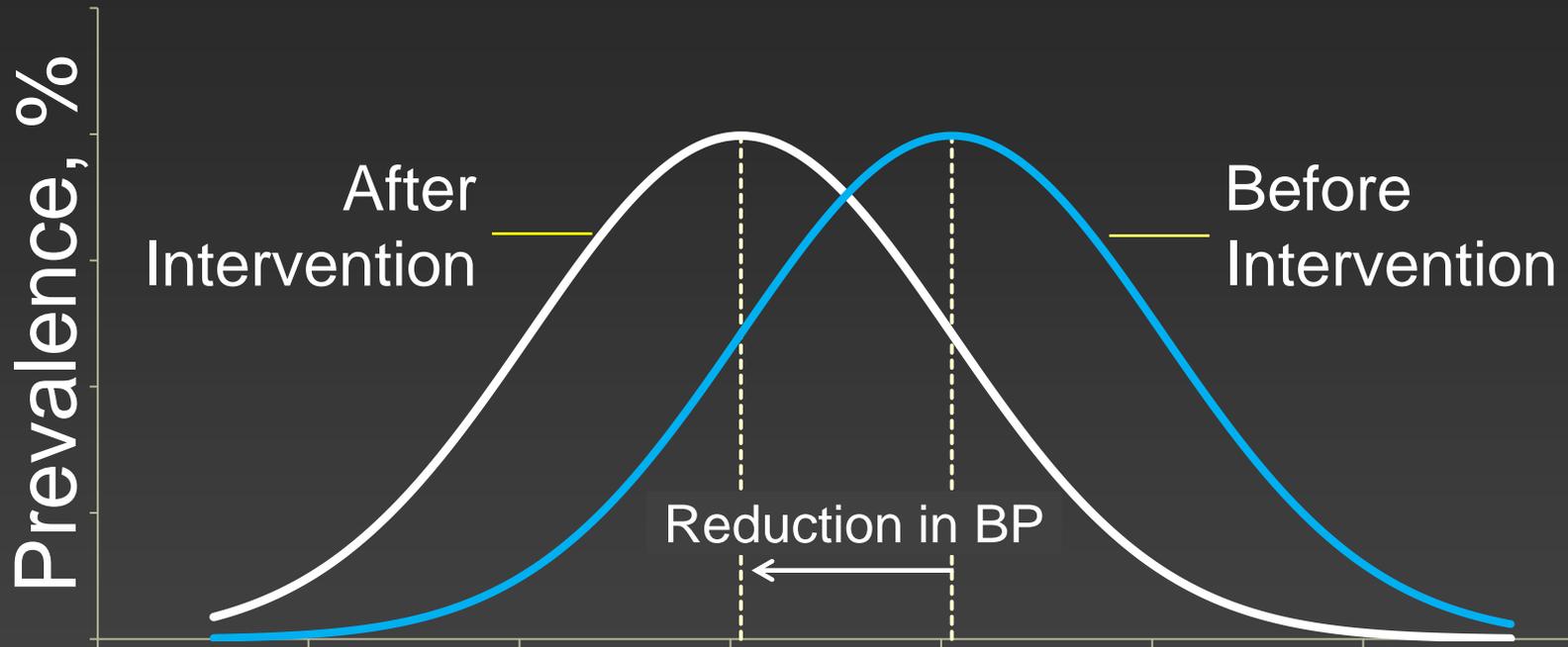
Poor Treatment rates



Blood Pressure and CHD Death:

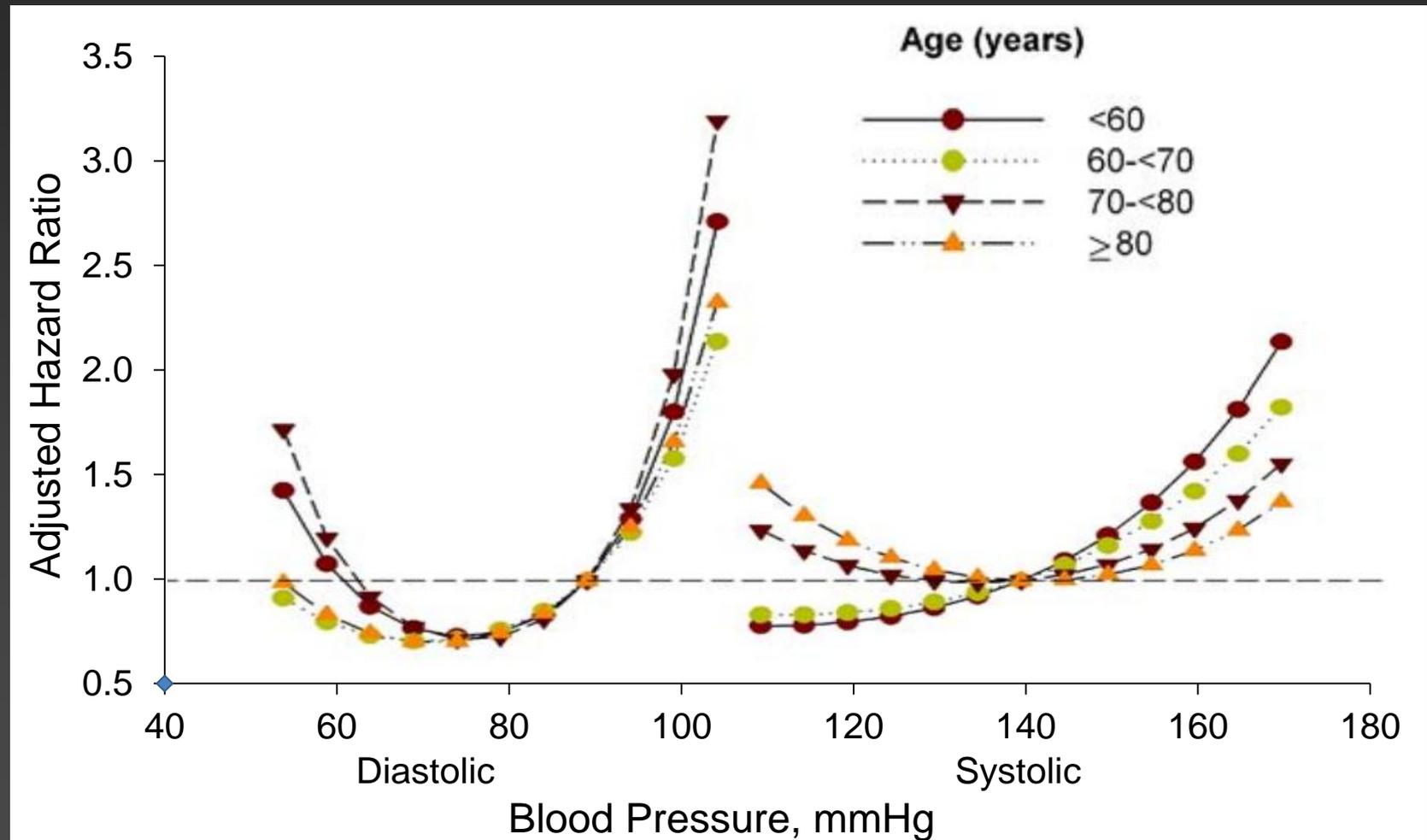


Reducing SBP Lowers Mortality



| Reduction in BP mmHg | % Reduction in Mortality | | |
|-------------------------|--------------------------|-----|-------|
| | Stroke | CHD | Total |
| 2 | -6 | -4 | -3 |
| 3 | -8 | -5 | -4 |
| 5 | -14 | -9 | -7 |

BP Reduction: Too much of a good thing?



JNC 7 Recommendations

| Stage | Blood Pressure | Treatment* |
|------------------------|------------------------|---|
| Normal | <120 / 80 | None |
| Prehypertension | 120-139 / 80-89 | Lifestyle modification |
| Stage I HTN | 140-159 / 90-99 | 1^o choice: Thiazide Consider ACE I, ARB, B-blocker, Ca⁺⁺ blocker |
| Stage II HTN | >160 / 100 | Dual Therapy: Thiazide + (ACE I, ARB, B-blocker, Ca⁺⁺ blocker) |

* If no compelling indication

JNC 8 Recommendations

| Patients | Recommendation |
|--|--|
| ≥60 years old | Treat if BP >150 / 90 |
| <60 years old | Treat if BP >140 / 90 |
| Chronic Kidney Disease Diabetes | Treat if BP >140 / 90 |
| Non-Blacks | Thiazide type, ACEI, ARB, Ca⁺⁺ blocker |
| Blacks | Thiazide type, Ca⁺⁺ blocker |

American Sodium Intake

- US average: 3,436 mg/day
- Worldwide: 2,622-4,830mg/day
- Up to 75% from processed foods
- CDC Goals: $\leq 2,300$ mg /day
HTN, AA, >51yo, DM, CKD
 $\leq 1,500$ mg /day



<http://www.ars.usda.gov/Services/docs.htm?docid=1379>

McCarron. Am J Hypertens. 2013; epub

Mattes. J Am Coll Nutr.1991 Aug;10(4):383-93.

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American Heart Association

1,500 mg / day

Whelton. Circulation. 2012; 126: 2880-2889

≤ 1,500 mg /day

<http://www.ars.usda.gov/Services/docs.htm?docid=1379>

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Low Sodium Diet Reduces BP

- Cochrane Review Meta-analysis of 167 studies

| | Hypertensive | | Normotensive | |
|------------------------------|---------------------|------|---------------------|------|
| Sodium Diet | High | Low | High | Low |
| Salt Intake, mg | 4506 | 1632 | 4620 | 1149 |
| Reduction in BP, mmHg | | | | |
| Whites | 5.18 | | 1.29 | |
| Blacks | 6.44 | | 4.02 | |
| Asians | 10.21 | | 1.27 | |
| Average % change | 3.5% | | 1.0% | |

Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial

ALLHAT (n=42,418)

- Doxazosin, Chlorthalidone, Amlodipine, Lisinopril
- Hypertension and 1 risk factor for CHD
- DSM stopped doxazosin arm (n=9061)

Due to increased risk of CVA, CVD; CHF doubled

1° : Fatal CHD or nonfatal MI. **(No Difference in Tx)**

2° : Mortality, CVA, combined CHD, combined CVD

5 yr: Chlorthalidone ↓ SBP / Amlodipine ↓ DBP

Multiple Risk Factor Intervention Trial

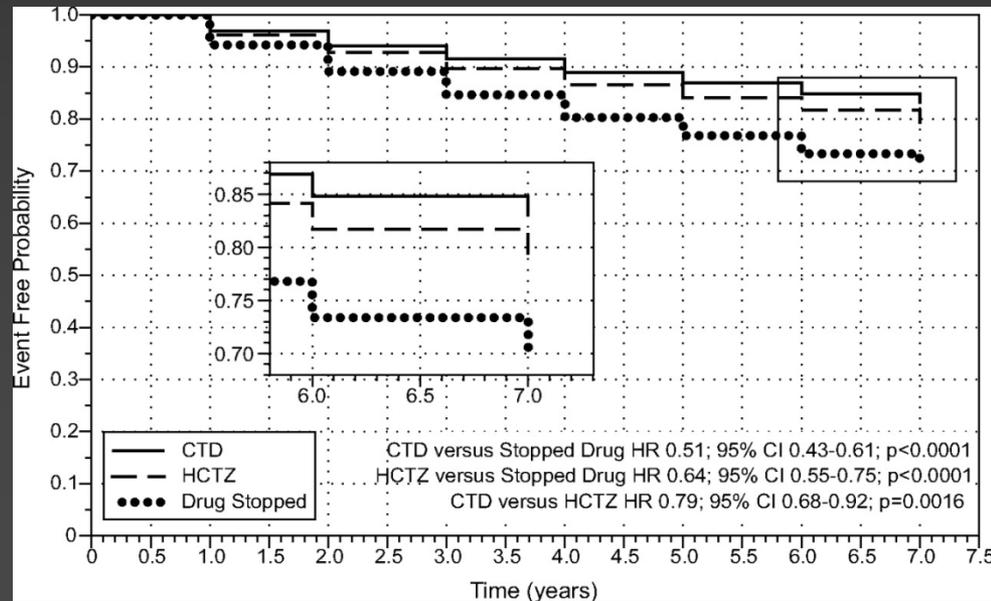
MRFIT (retrospective subanalysis on original study)

1973 with 12,866 men

CTD (N=2392) or HCTZ (N=4049)

1980, Advisory board recommended CTD > HCTZ

Chlorthalidone
21% lower risk of
CV Events

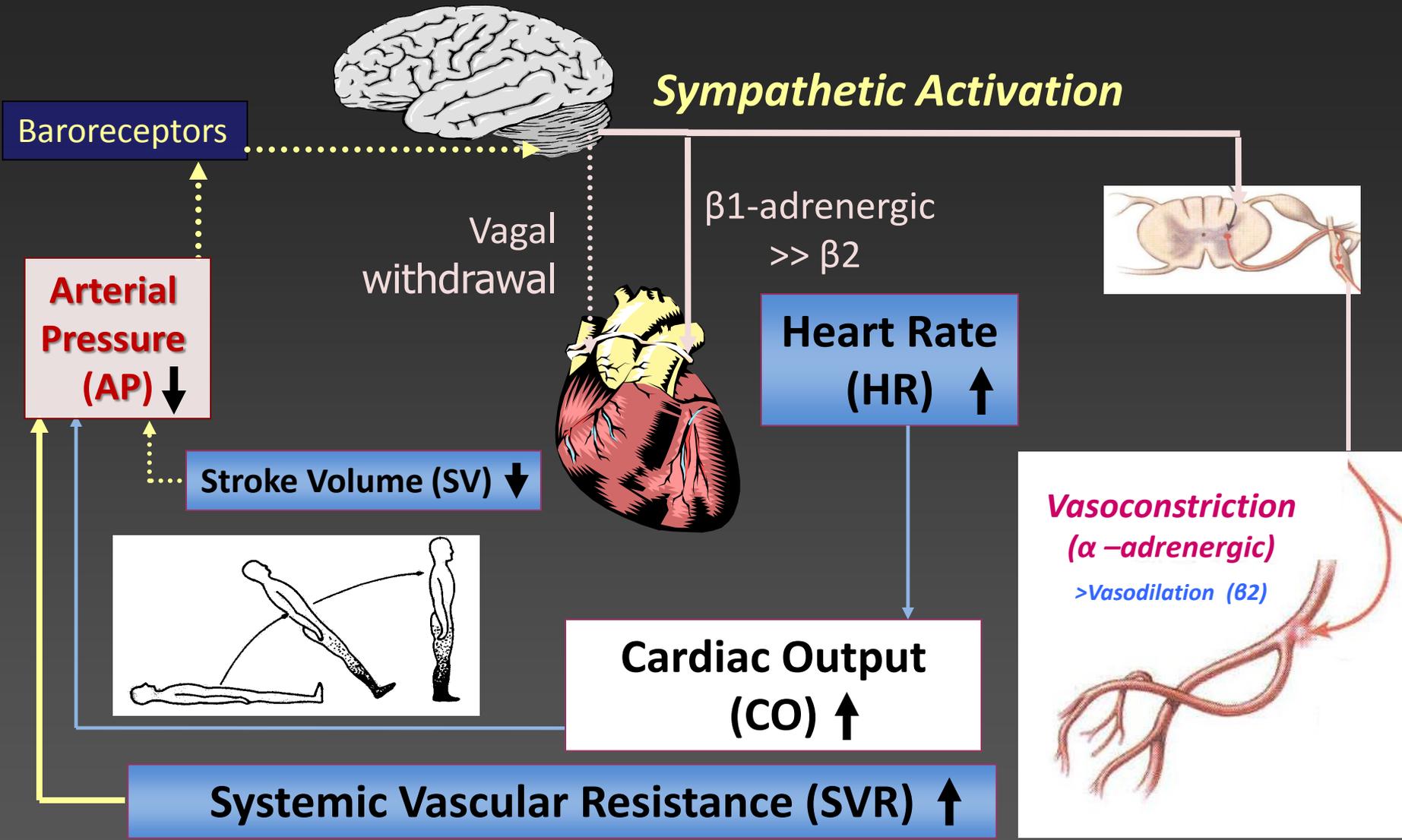


Avoiding Cardiovascular Events Through Combination Therapy in Patients Living With Systolic Hypertension Study

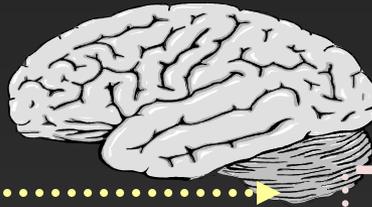
ACCOMPLISH (n=11,506)

- 2.5 year follow-up
- Combined fatal / nonfatal CVD, ACS, Revasc
- Benazepril / Amlodipine vs Benazepril / HCTZ
- **Events: 9.6 vs. 11.8%** HR 0.80 [95% CI 0.72-0.90] P<0.001
- ~1mmHg lower SBP with Benazepril/Amlodipine

Sympathetic Activation



$$MAP = CO \times SVR = HR \times SV \times SVR$$

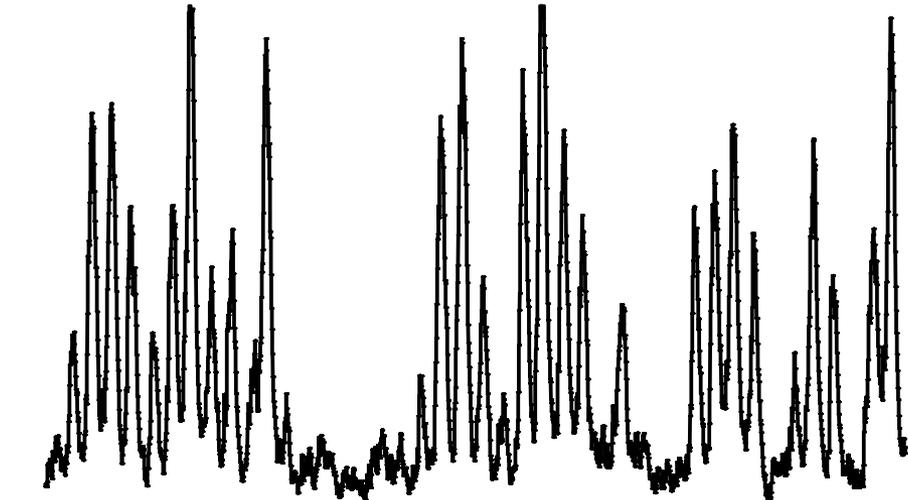


Sympathetic Activation

Baroreceptors

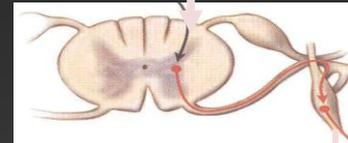
Arterial Pressure (AP)

Heart Rate (HR) ↑

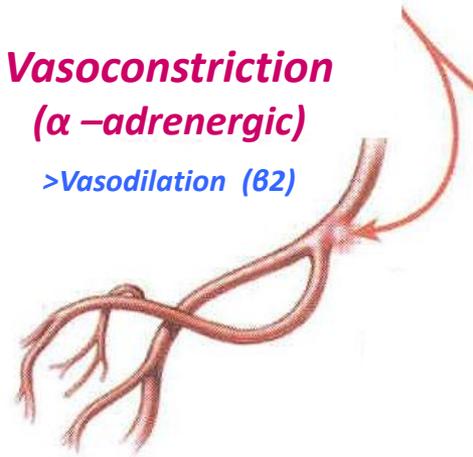


Muscle Sympathetic Nerve Activity (MSNA)

Systemic Vascular Resistance (SVR) ↑

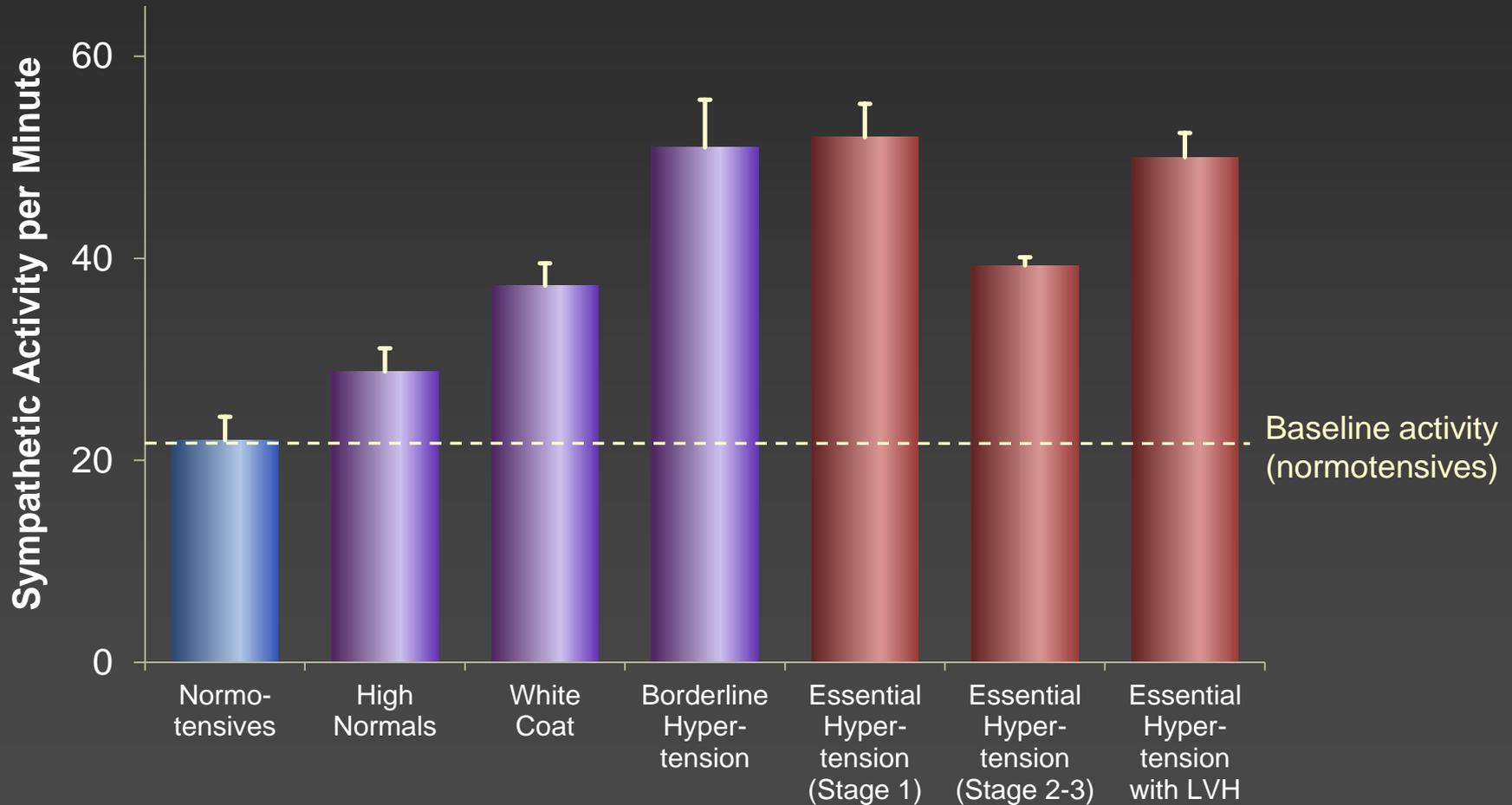


Vasoconstriction (α-adrenergic)
> Vasodilation (β2)

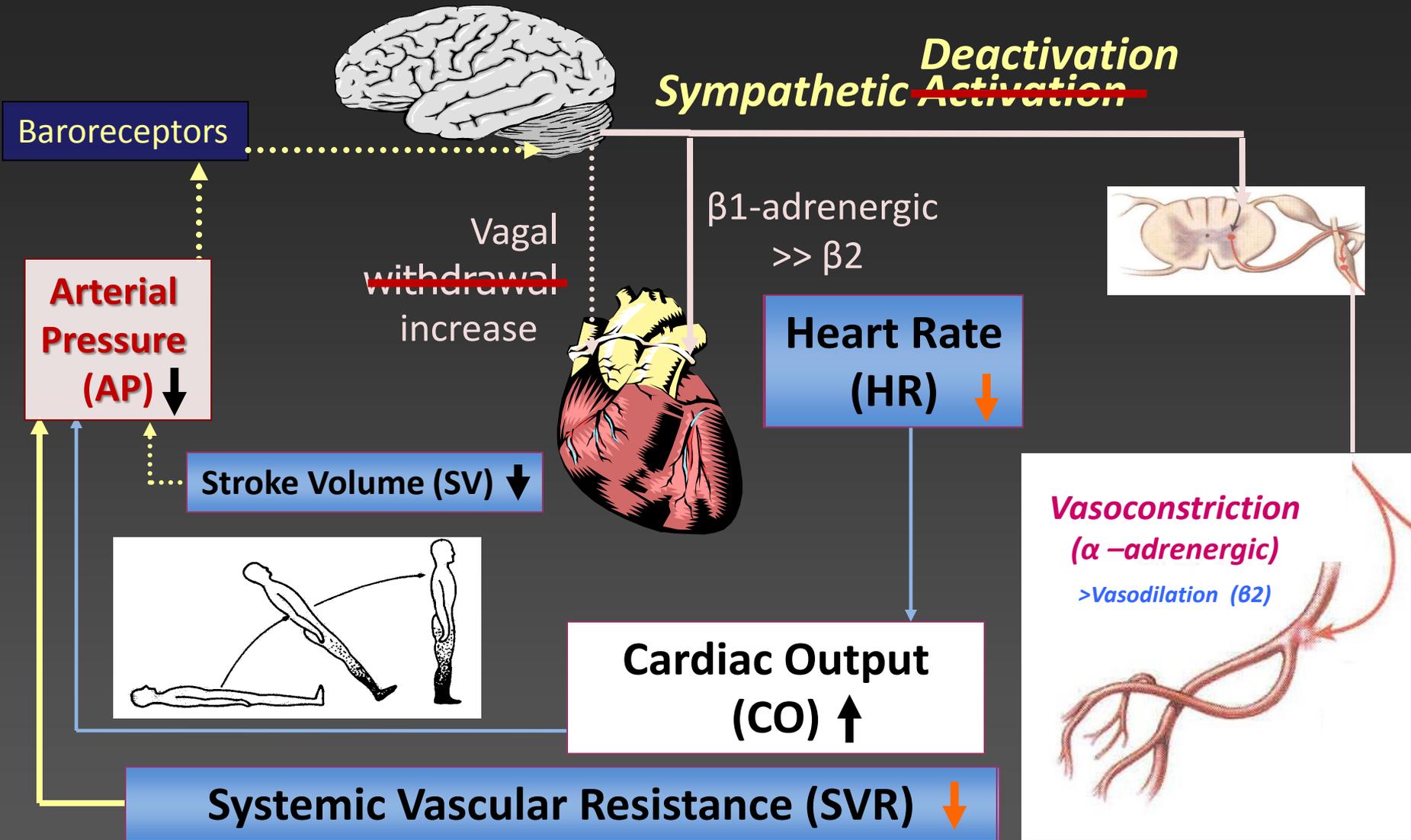


$$MAP = CO \times SVR = HR \times SV \times SVR$$

Sympathetic Nerve Activity in HTN



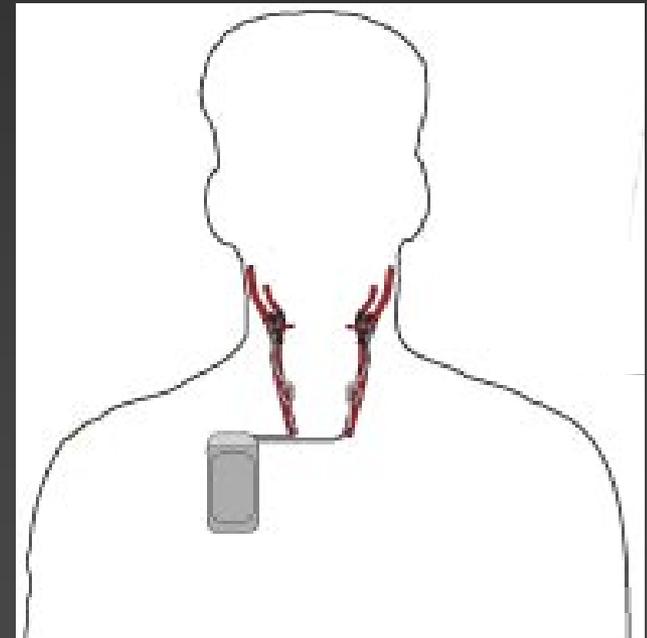
Deactivation
~~**Sympathetic Activation**~~



$$\text{MAP} = \text{CO} \times \text{SVR} = \text{HR} \times \text{SV} \times \text{SVR}$$

Baroreceptor Modification

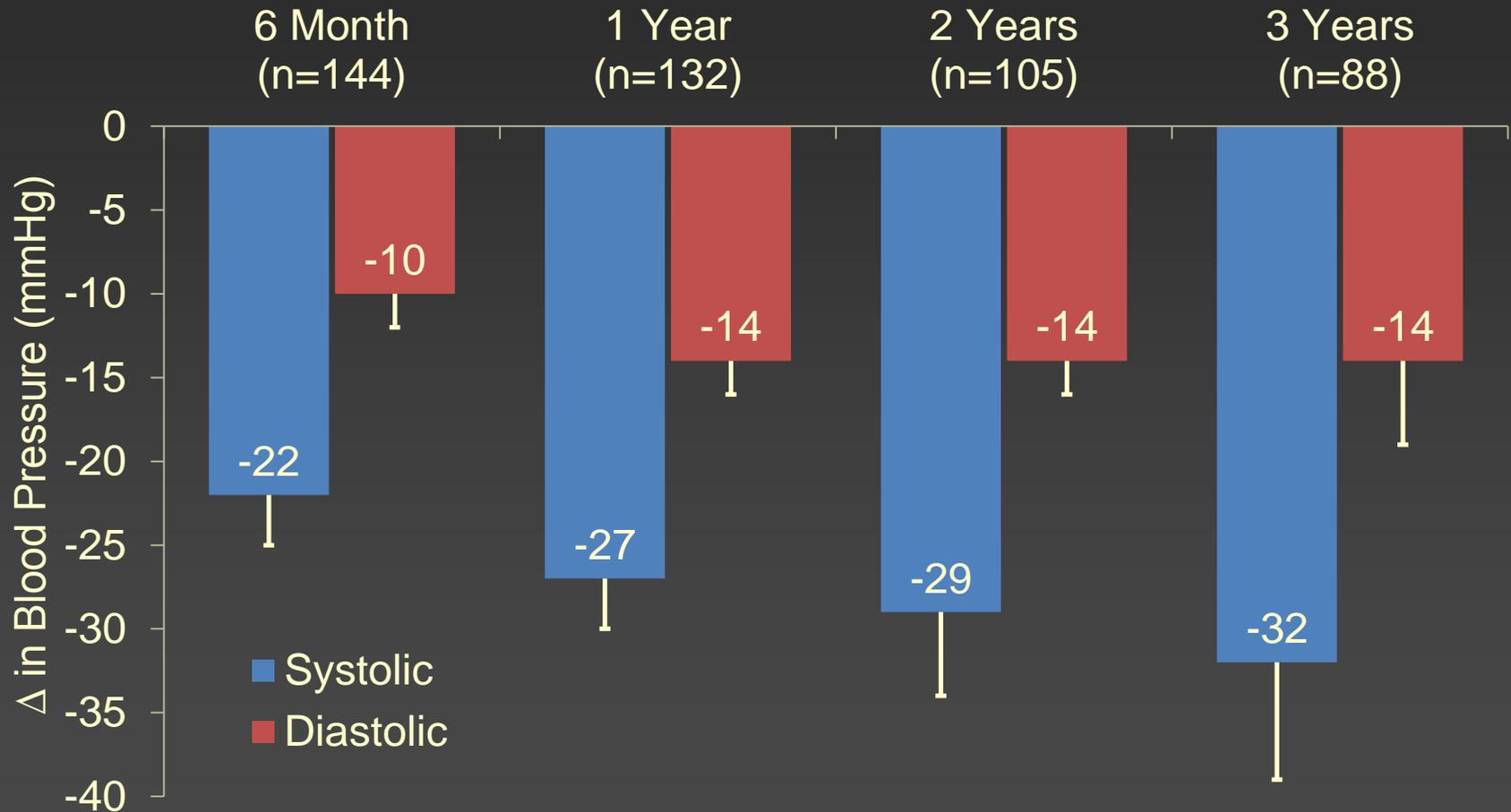
- Investigational device
- Electrical pulse to Carotid Sinus
- Mimicks elevated BP
- Phase III trial
 - 322 patients
 - 2:1 randomization for delayed activation
- DSMB concerns on outcomes



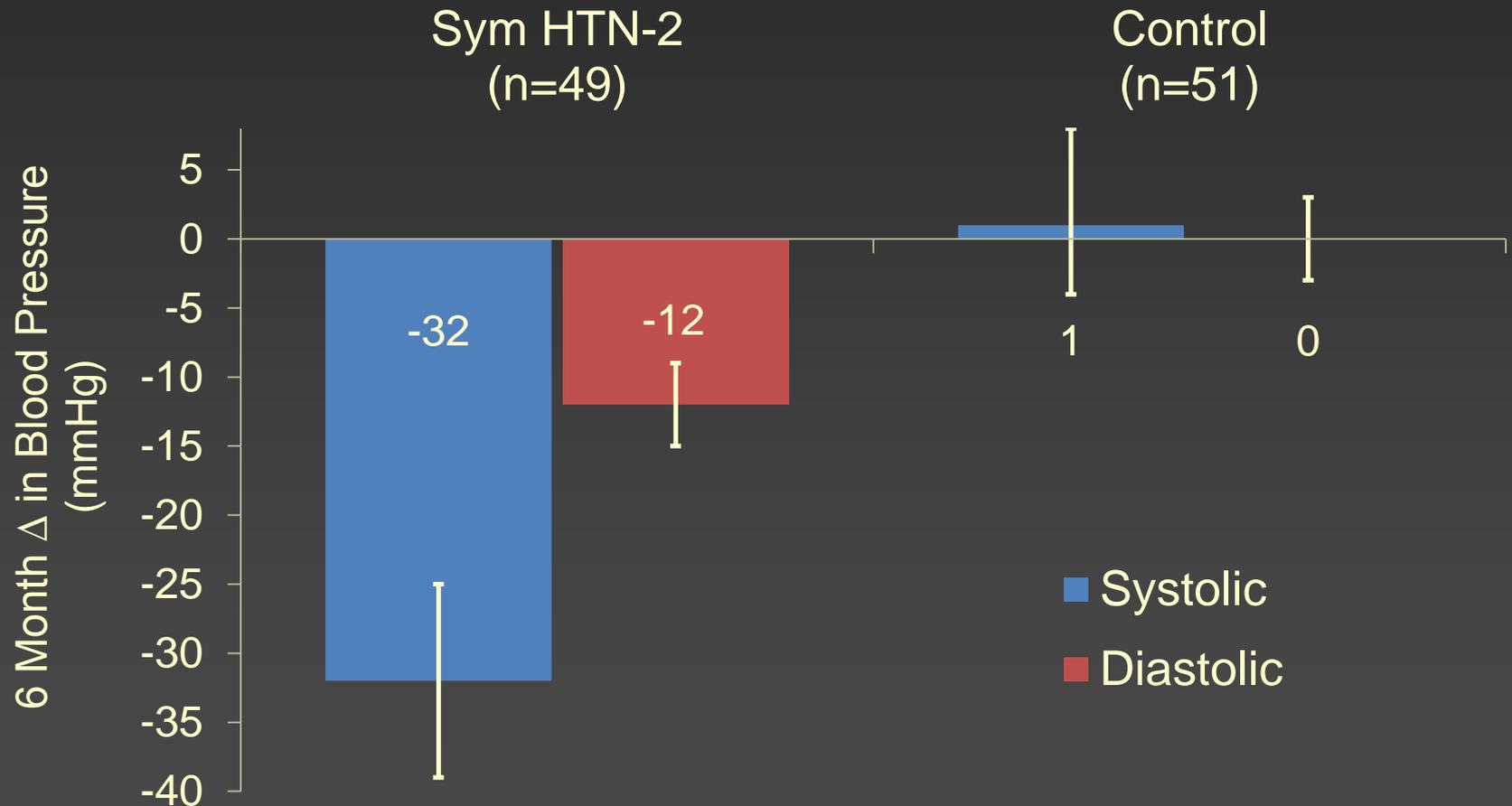
Investigational Renal Denervation



Symplicity HTN-1: Early Data is Promising



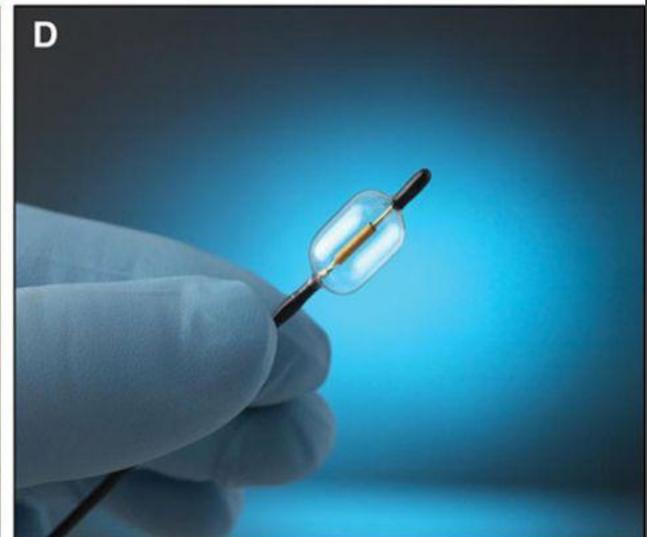
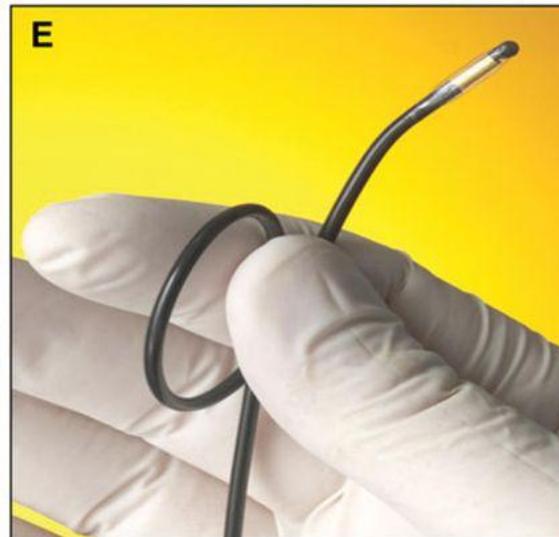
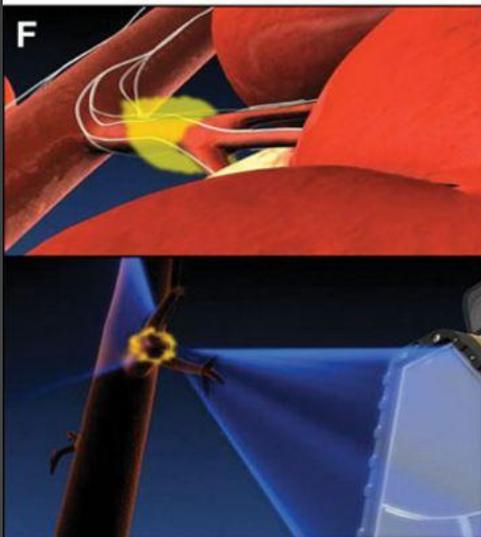
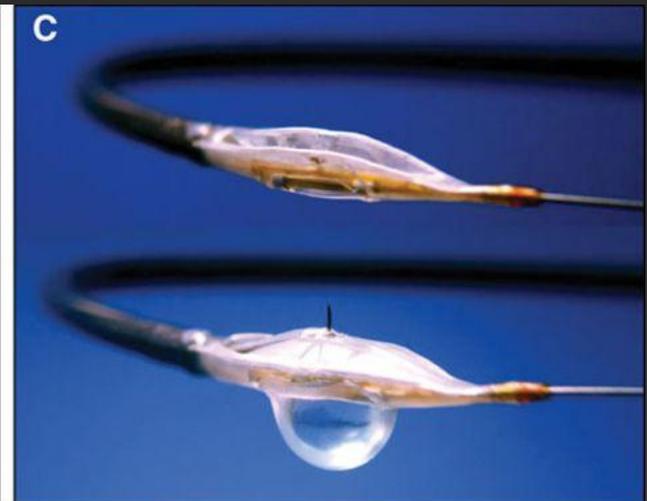
Symplicity HTN-2: Randomized Study



ACC 2013

Lancet. 2010;376:1903-1909.

Investigational Renal Denervation



Telemonitoring with a Pharmacist

- 450 patients identified from EMR
- Randomized: usual care vs. additional TeleHealth
- Intervention group met with Pharmacists
 - Every 2 weeks until at goal for 6 weeks
 - 2.2 medications vs 1.7 in usual care group

| Months | Greater Reduction in Systolic Blood Pressure | 95% CI | P Value |
|--------|--|---------------|---------|
| 6 | -10.7 mmHg | -14.3 to -7.3 | <0.001 |
| 12 | -9.7 mmHg | -13.4 to -6.0 | <0.001 |
| 18 | -6.6 mmHg | -10.7 to -2.5 | 0.004 |

New Intervention Trials

- ~~EnligHTN IV (NCT01903187)~~
 - 590 patients, SBP \geq 160 (Diabetes \geq 150)
 - Renal Denervation vs Sham
- ~~Symplivity HTN-4~~
 - SBP 140-160
- Acute Carotid Sinus Endovascular Stimulation II Study (NCT01458483)
 - Stimulation of Carotid Sinus via Internal Jugular Vein with EP catheter in 9 patients
- Rox Control HTN Study (NCT01642498)
 - Rox Coupler: Iliac artery to vein fistula

Future Directions?

- Sodium content in processed food
 - McDonalds menu changes
 - Plans to reduce sugars, fats, salt
 - 20% calorie reduction (Happy Meals)
- Telemedicine
- Group Therapy
- Future autonomic interventions

Take Home Points

- JNC 8 Guidelines recommend a goal of $<150/90$ mmHg for patients over 60 years old
- Reduction in sodium intake may reduce strokes, coronary heart disease, heart failure through reduction in blood pressure
- Autonomic system modification appeared a promising intervention in resistant hypertension, but may require further investigation



"I'm going to take your blood pressure, so try to relax and not think about what a high reading might mean for your chances of living a long, healthy life."