# Hypertension Update

ACOI 2018

John Prior

# Disclosures

Nothing to declare

# Hypertension - Introduction

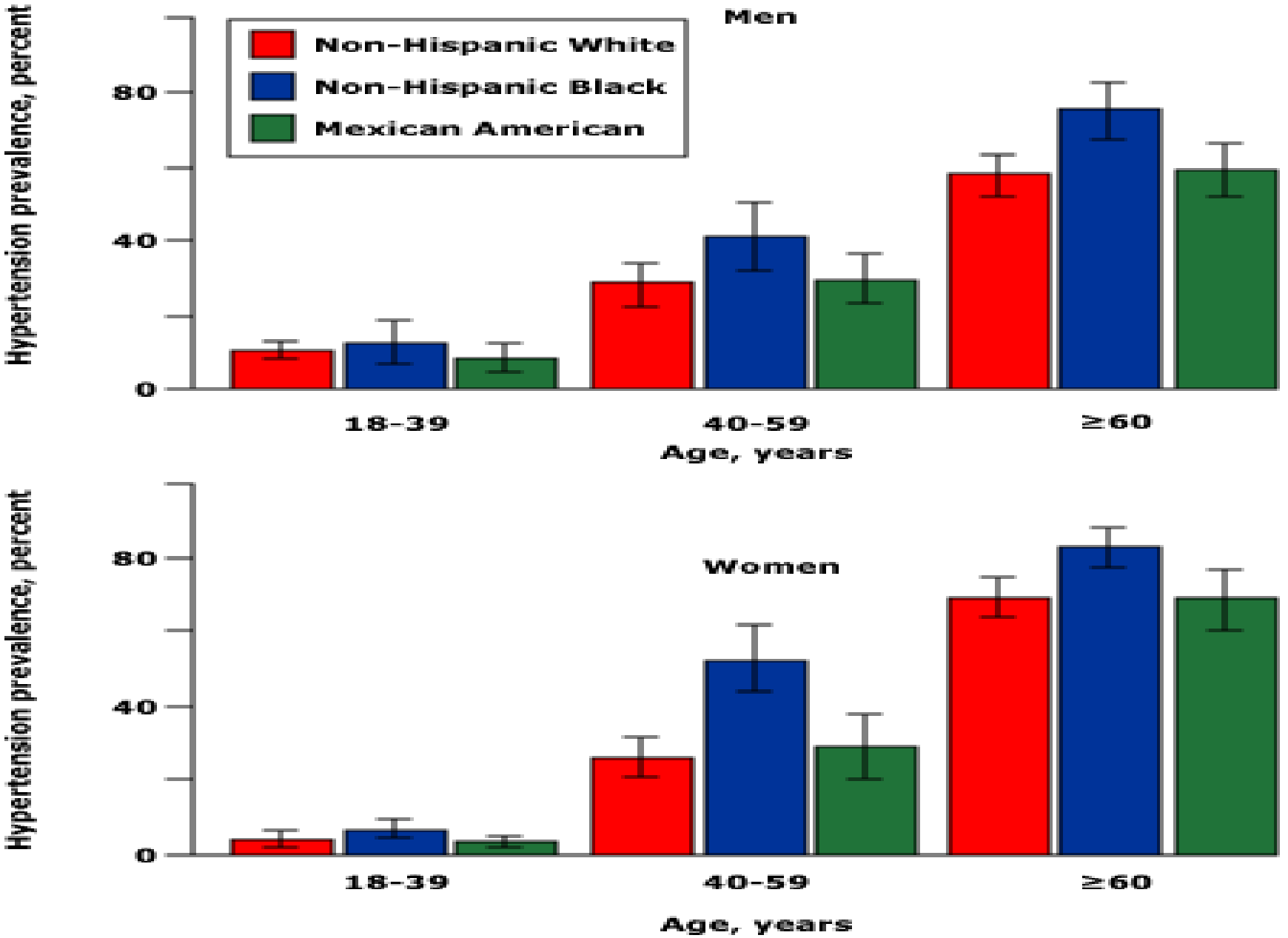
US population incidence – 30% and growing due to an aging and increasingly obese population

Poorly controlled

Most common risk for CVD

Global Burden of Disease Study 2010 – HTN is the leading risk factor for death and DALY

Despite poor control, treatment of HTN has positively influenced stroke, CVD and CHF


Men
Non-Hispanic White
Non-Hispanic Black
Mexican American
Hypertension prevalence, percent
80
40
0
18–39
40–59
≥60
Age, years
Women
Hypertension prevalence, percent
80
40
0
18–39
40–59
≥60
Age, years

# HTN - Definitions

**Primary HTN** – BP> 140/90 without secondary cause (Stg 1 140-159/90-99; Stg 2 > 160/100 (benign if criteria for malignant HTN not met)

**White Coat HTN** – BP > 140/90 in office and home BP < 135/85 at home

**Masked HTN** – BP normal in office but

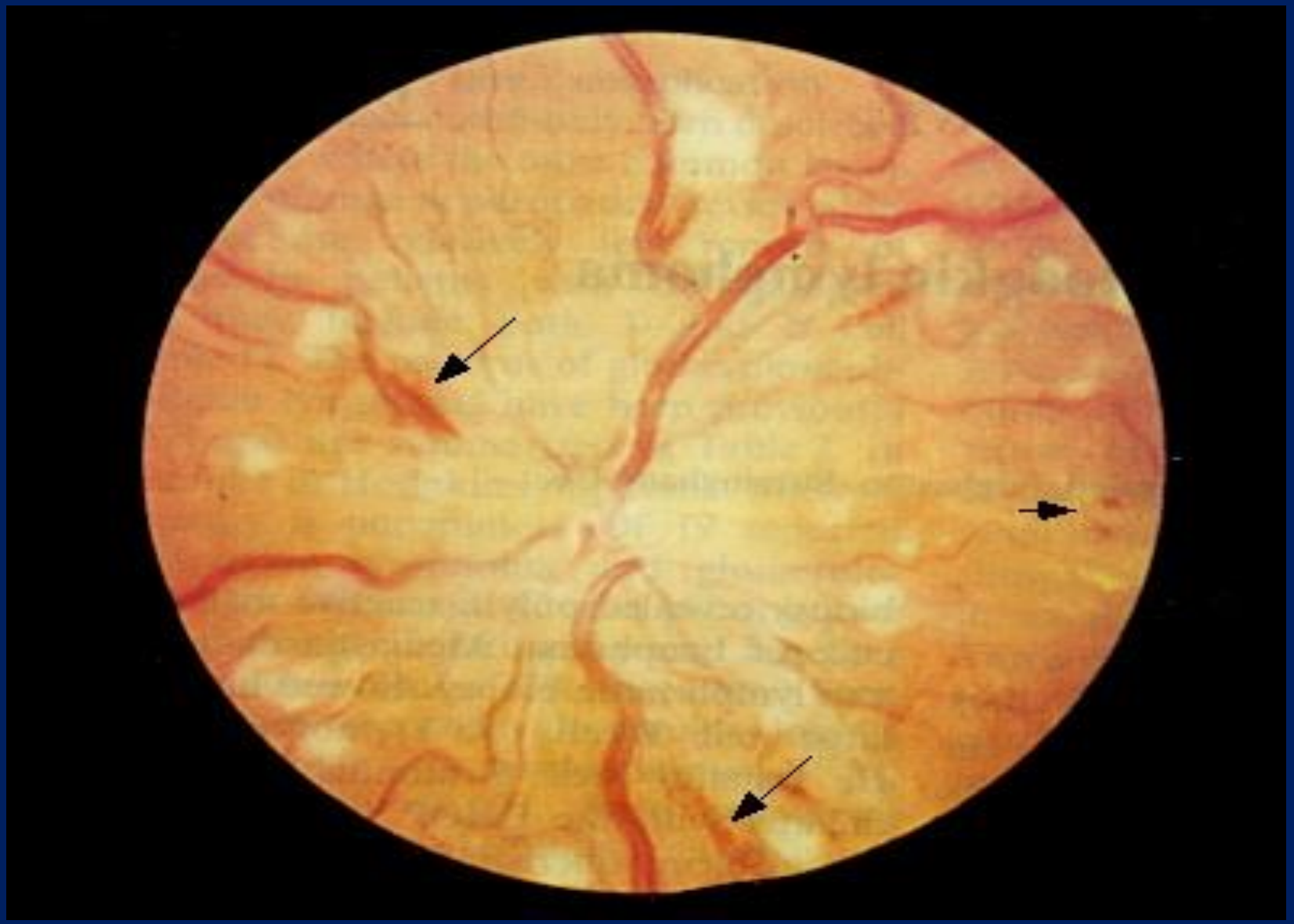
> 140/90 at home (end organ damage)

# HTN - Definitions

**Secondary HTN** – HTN with secondary cause such as renovascular HTN, ETOH etc

**Malignant/Accelerated HTN** – HTN associated with grade 3 or 4 hypertensive retinopathy with a thrombotic microangiopathy leading to acute tissue injury (brain, kidney, heart)

**Resistant HTN** - BP above goal (> 160/) despite 3 or more medications (including a diuretic)



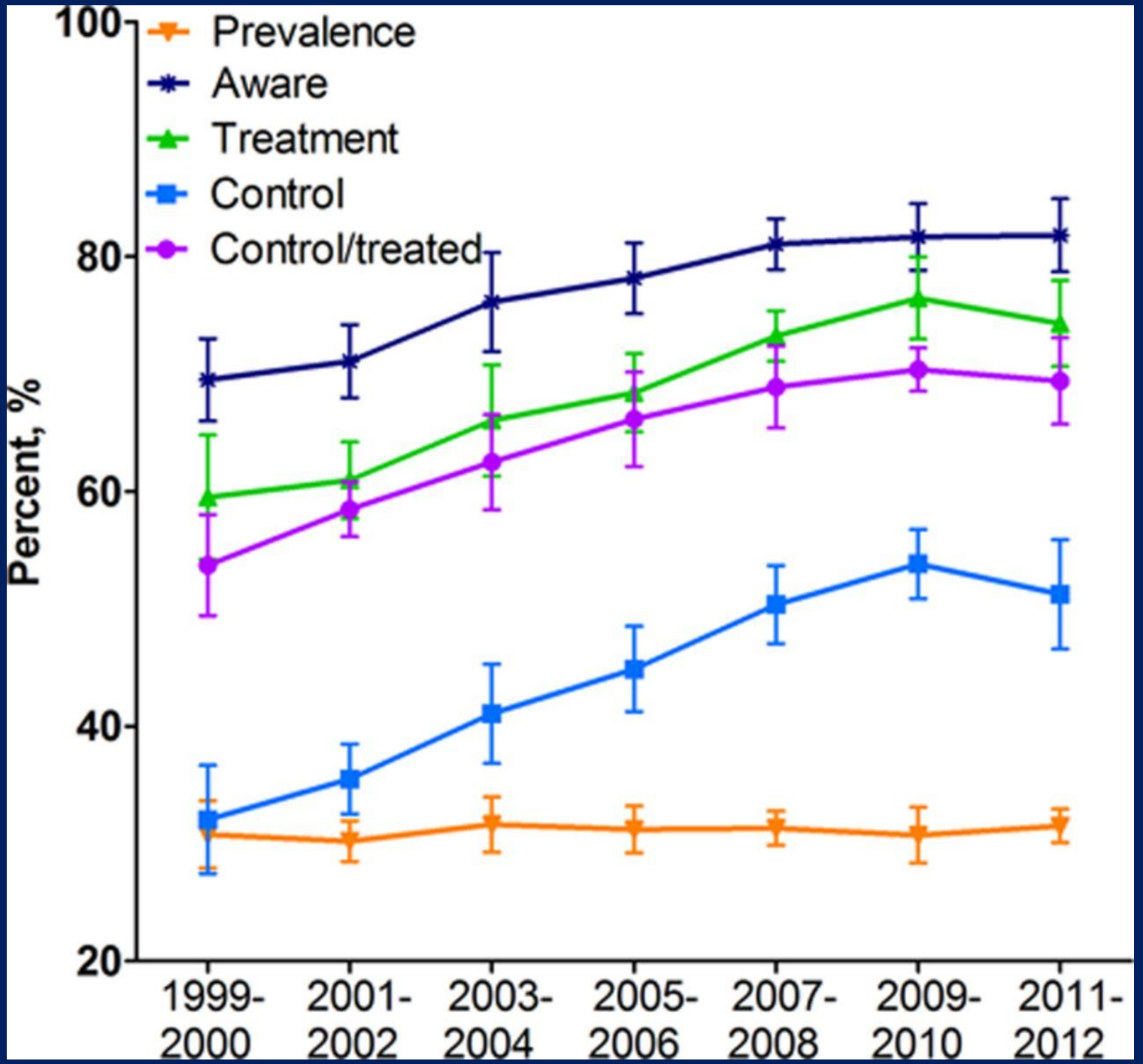
# HTN - Definitions

**HTN Emergencies** – HTN and acute end organ disease (malignant HTN etc)

**HTN Urgencies** – asymptomatic elevation of BP > 180/

**Non Dipper** – loss of normal BP decrease during sleep (predicts CV disease)

**Gestational HTN** – BP > 140/90 that occurs after the 20th week (chronic HTN occurs before and lacks proteinuria) (preeclampsia has proteinuria)


Prevalence
Aware
Treatment
Control
Control/treated
Percent, %
100
80
60
40
20
1999-2000
2001-2002
2003-2004
2005-2006
2007-2008
2009-2010
2011-2012

# Benefits of Lowering BP

| | Average Percent Reduction |
|---|---|
| Stroke incidence | 35–40% |
| Myocardial infarction | 20–25% |
| Heart failure | 50% |

# HTN Evaluation

History and physical along with directed lab evaluation serve to screen for secondary HTN, assess end organ damage as well as assess CV risk. These serve to determine further workup and to tailor therapy types and goals.

# Basic and Optional Laboratory Tests for Primary Hypertension

| | |
|---|---|
| **Basic testing** | Fasting blood glucose* |
| | Complete blood count |
| | Lipid profile |
| | Serum creatinine with eGFR* |
| | Serum sodium, potassium, calcium* |
| | Thyroid-stimulating hormone |
| | Urinalysis |
| | Electrocardiogram |
| **Optional testing** | Echocardiogram |
| | Uric acid |
| | Urinary albumin to creatinine ratio |

*May be included in a comprehensive metabolic panel.
eGFR indicates estimated glomerular filtration rate.

## Assess interarm difference when at first assessment of hypertension

Clark's meta-analysis included a number of published studies in hypertensive patients or subgroups of hypertensive patients, in which BPs were taken from both arms, plus some unpublished data from his own group.

**Differences in mortality between those with large differences in interarm SBP readings**

| Outcome | HR, ≥10-mm-Hg difference in SBP between arms[a] | Total subjects/deaths, n | p[a] | HR, ≥15-mm-Hg difference in SBP between arms[b] | Total subjects/deaths, n | p[b] |
|---|---|---|---|---|---|---|
| All-cause mortality | 1.60 | 1990/420 | 0.01 | 1.60 | 2231/456 | 0.008 |
| Cardiovascular mortality | 2.15 | 1516/151 | 0.007 | 1.34 | 2178/201 | 0.24 |

# Ambulatory BP Monitoring

ABPM is warranted for evaluation of “white-coat” HTN in the absence of target organ injury. Also dx of masked HTN

Ambulatory BP values are usually lower than clinic readings.

Awake, individuals with hypertension have an average BP of >135/85 mmHg and during sleep >120/75 mmHg.

BP drops by 10 to 20% during the night; if not, signals possible increased risk for cardiovascular events. Non dipper

BP highest 6-8 AM and 5-7 PM

# Self-Measurement of BP

Provides information on:

- Response to antihypertensive therapy
- Improving adherence with therapy
- Evaluating white-coat HTN
- BP variability

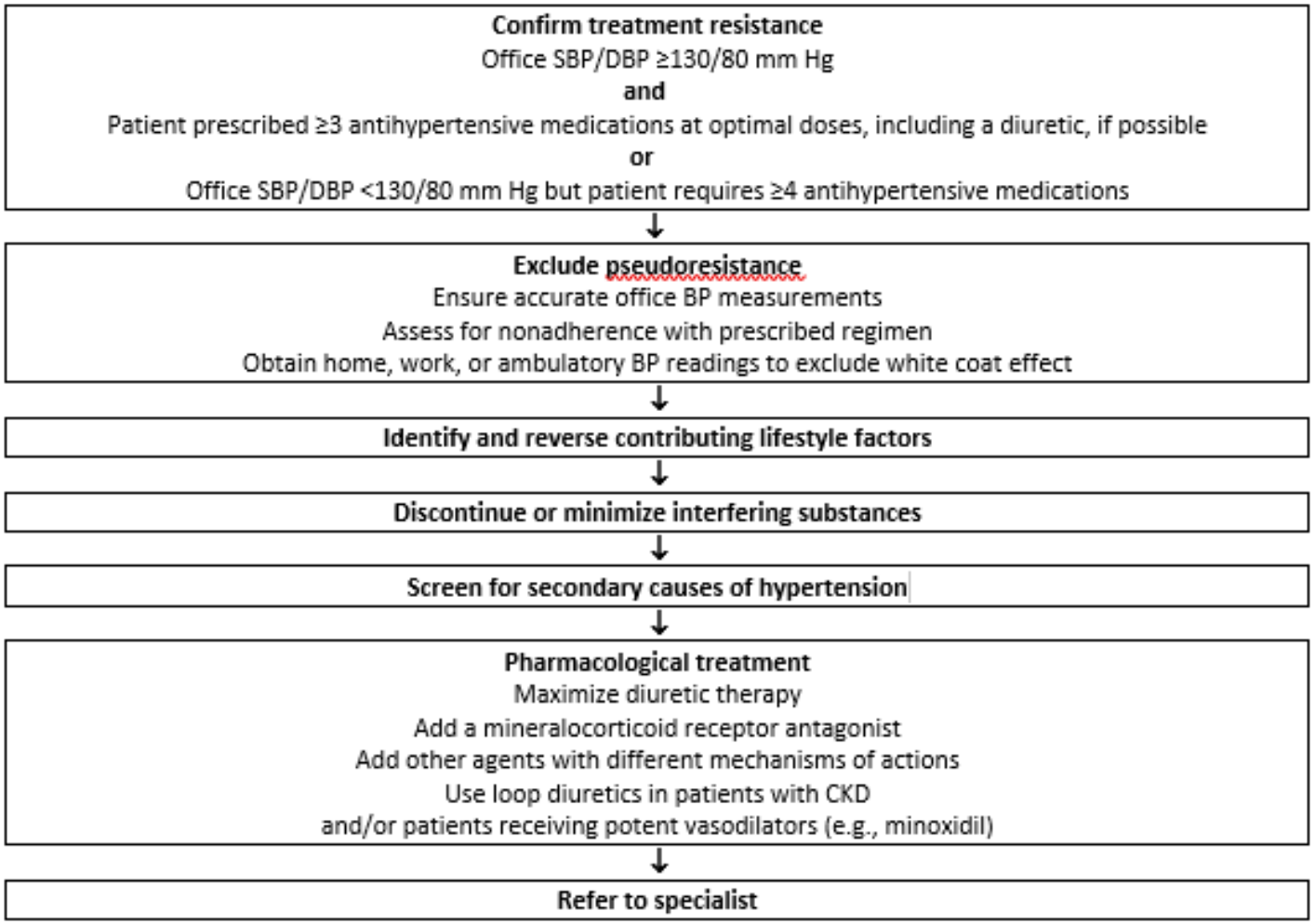
Home measurement of >135/85 mmHg is generally considered to be hypertensive.

Home measurement devices should be checked regularly.

**PREDICTS CV OUTCOMES BETTER THAN OFFICE BP**

# Resistant Hypertension: Diagnosis, Evaluation, and Treatment

**Figure 10. Resistant Hypertension: Diagnosis, Evaluation, and Treatment**

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BP indicates blood pressure; CKD, chronic kidney disease; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate; NSAIDs, nonsteroidal anti-inflammatory drugs; and SBP, systolic blood pressure.
Adapted with permission from Calhoun et al.

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# Causes of Resistant Hypertension

Improper BP measurement

Excess sodium intake

Inadequate diuretic therapy

Medication

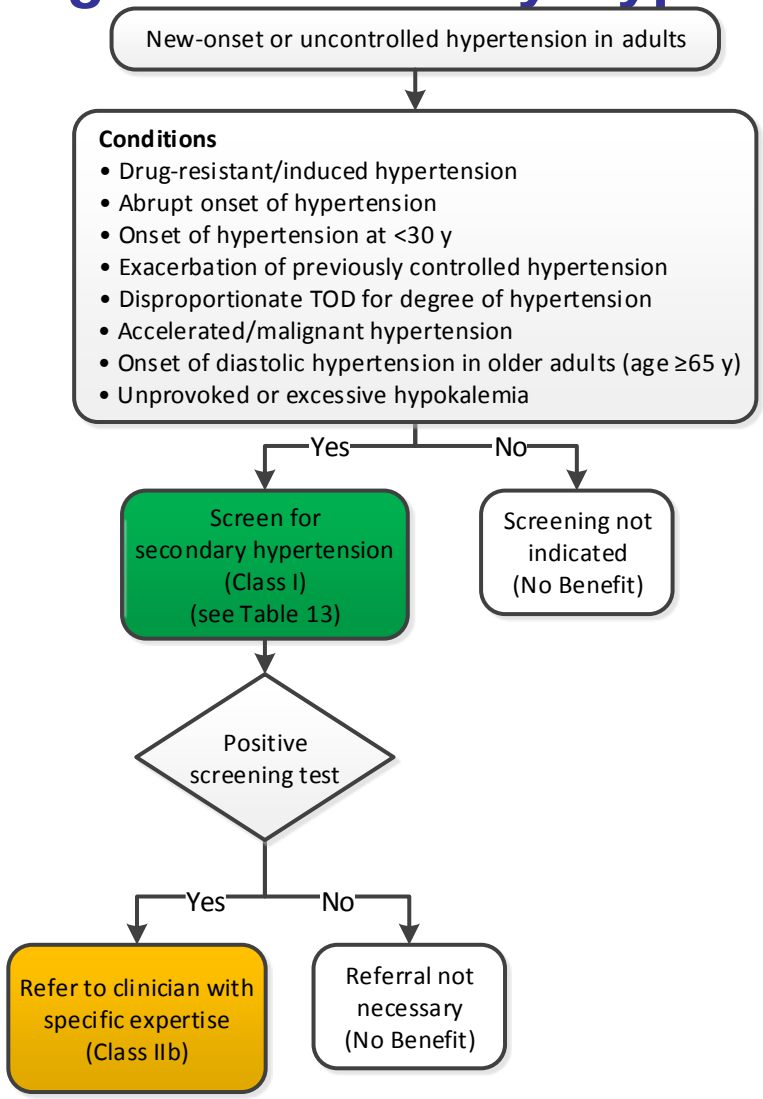
- Inadequate doses or timing
- Drug actions and interactions (e.g., NSAIDs, illicit drugs, sympathomimetics, oral contraceptives)
- Over-the-counter (OTC) drugs and herbal supplements

Excess alcohol intake - > 14/wk men, > 7/wk women

Identifiable causes of HTN – sleep apnea, RAS, primary aldosteronism etc

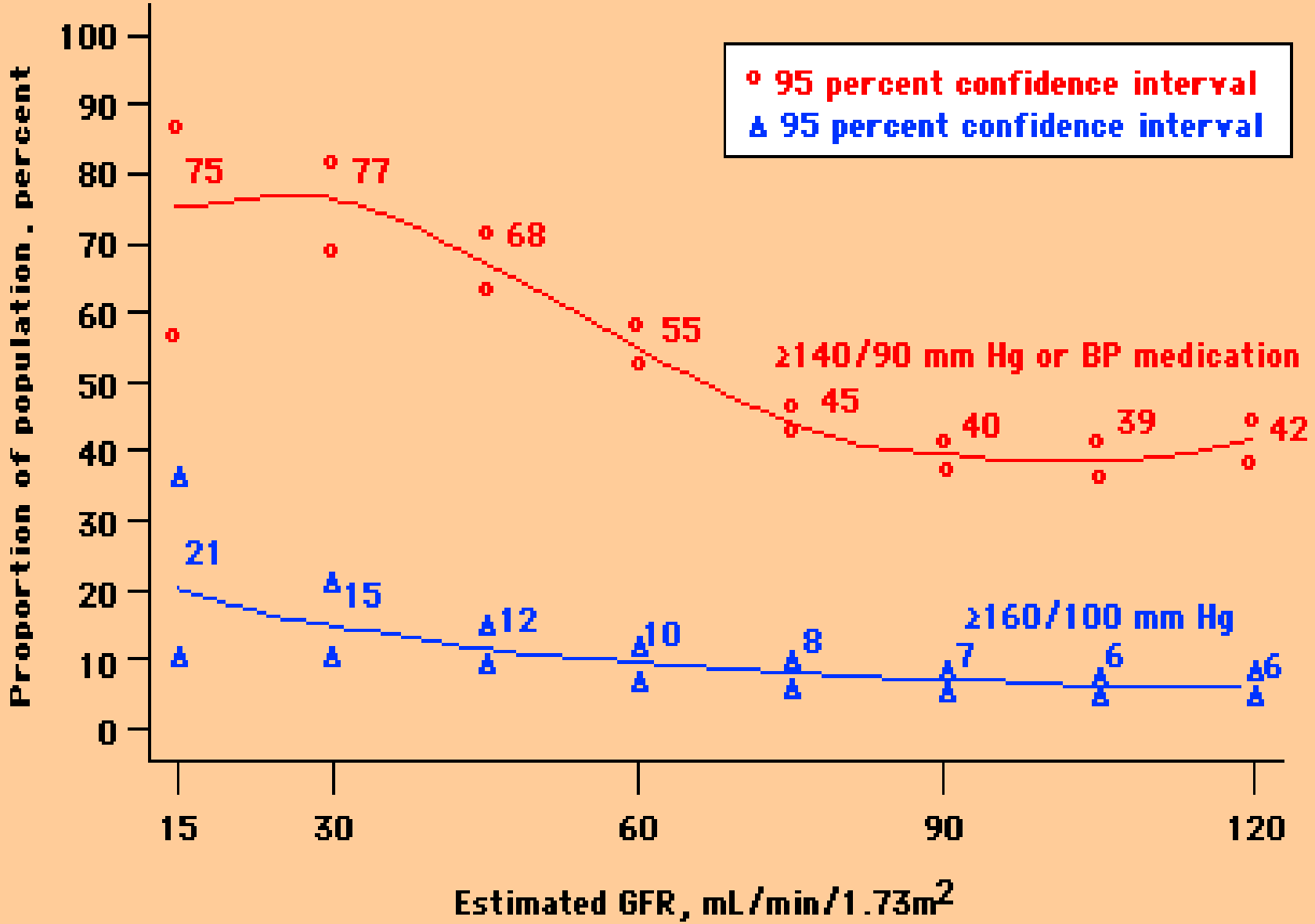
# Secondary HTN

# Screening for Secondary Hypertension

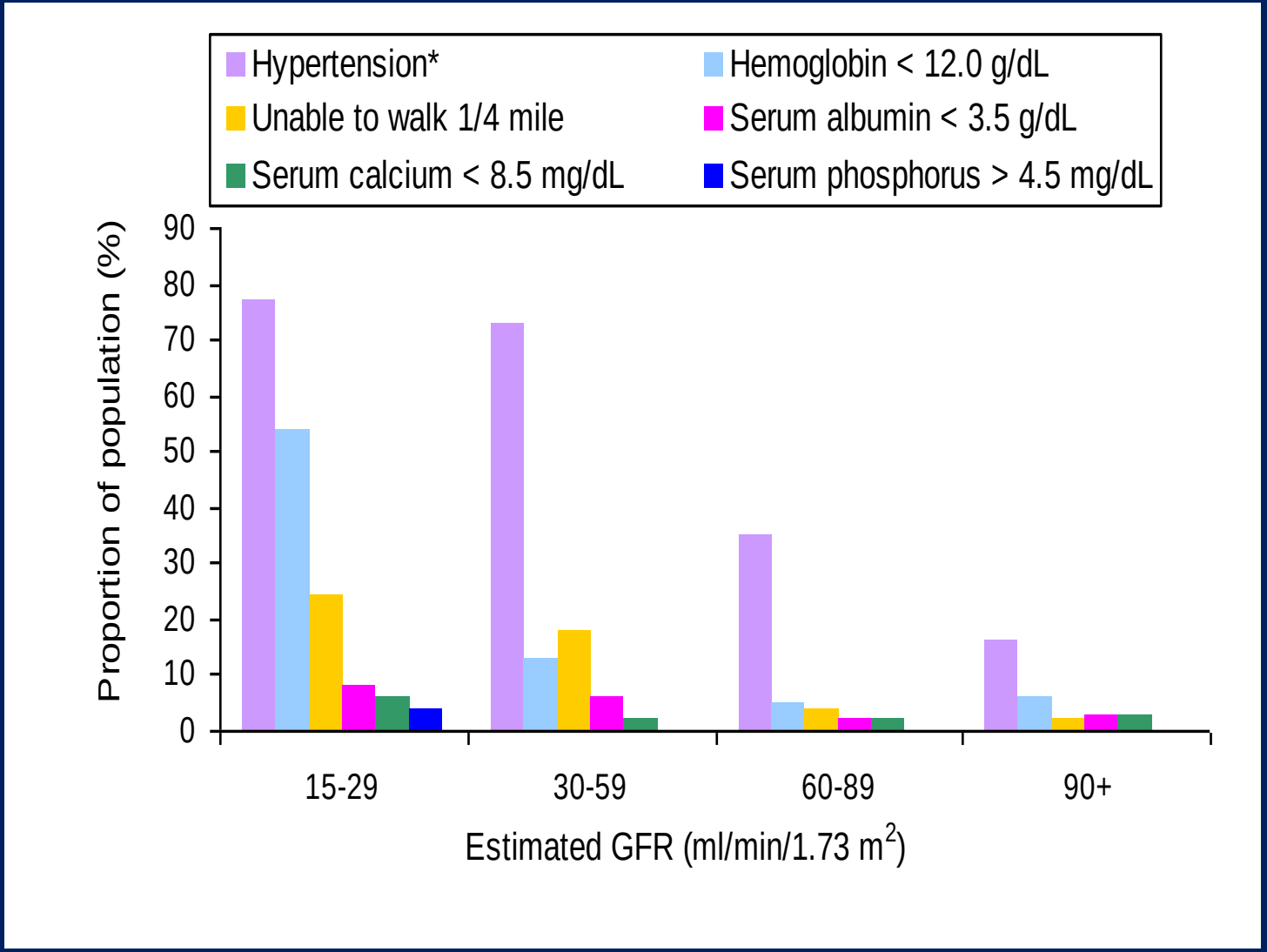



Colors correspond to Class of Recommendation in Table 1 .
TOD indicates target organ damage (e.g., cerebrovascular disease, hypertensive retinopathy, left ventricular hypertrophy, left ventricular dysfunction, heart failure, coronary artery disease, chronic kidney disease, albuminuria, peripheral artery disease).

# CKD and HTN


° 95 percent confidence interval
Δ 95 percent confidence interval
≥140/90 mm Hg or BP medication
≥160/100 mm Hg
75
77
68
55
45
40
39
42
21
15
12
10
8
7
6
6
100
90
80
70
60
50
40
30
20
10
0
15
30
60
90
120
Proportion of population, percent
Estimated GFR, mL/min/1.73m2

# Prevalence of Abnormalities at each level of GFR




*>140/90 or antihypertensive medication

p-trend < 0.001 for each abnormality

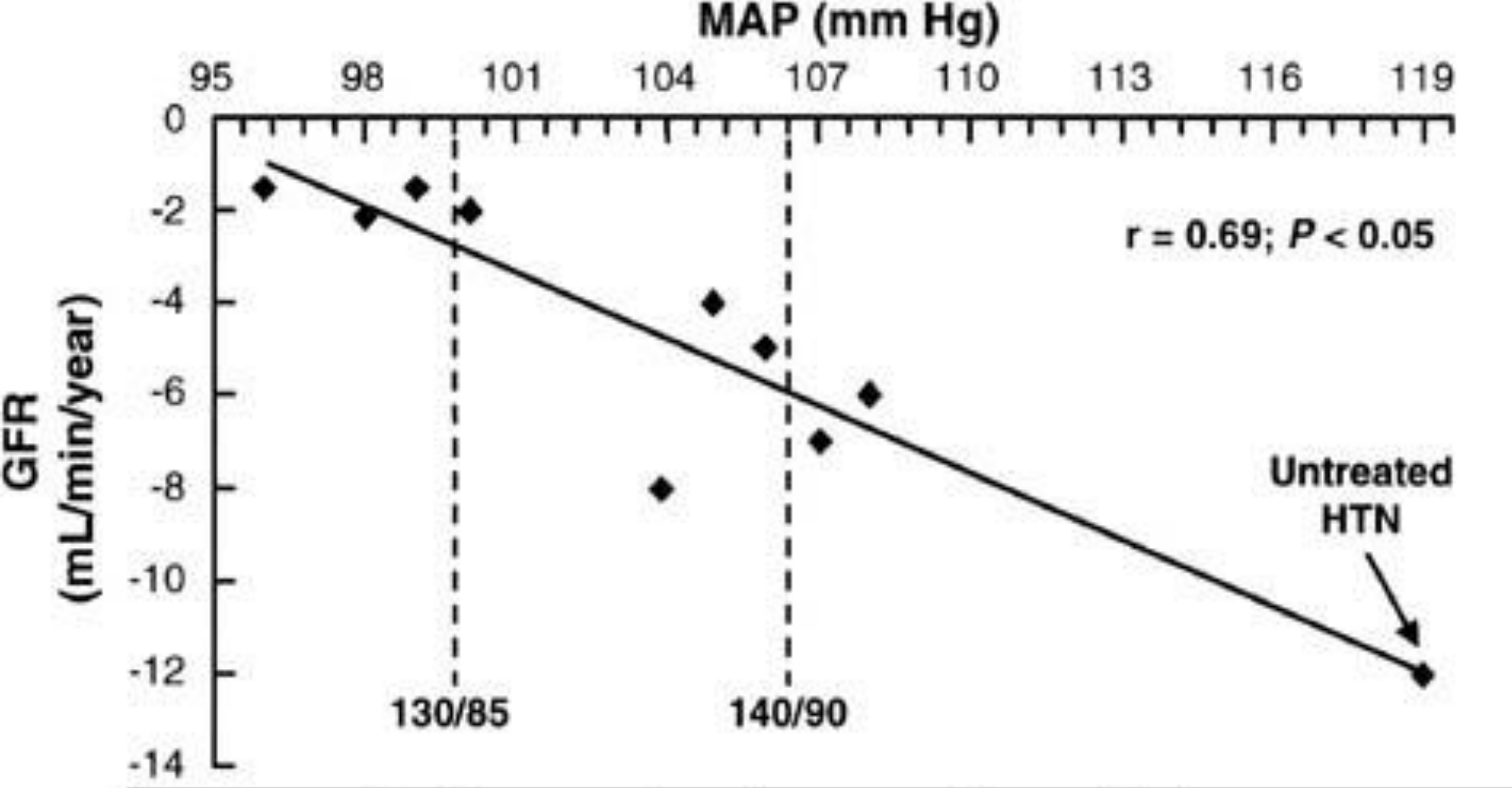
# Pathogenesis HTN – CKD
# Na Sensitive HTN

Volume-dependent HTN is the most common type of HTN seen in CKD

Incidence inversely proportional to GFR

Defined as low or normal renin and response to dietary Na restriction

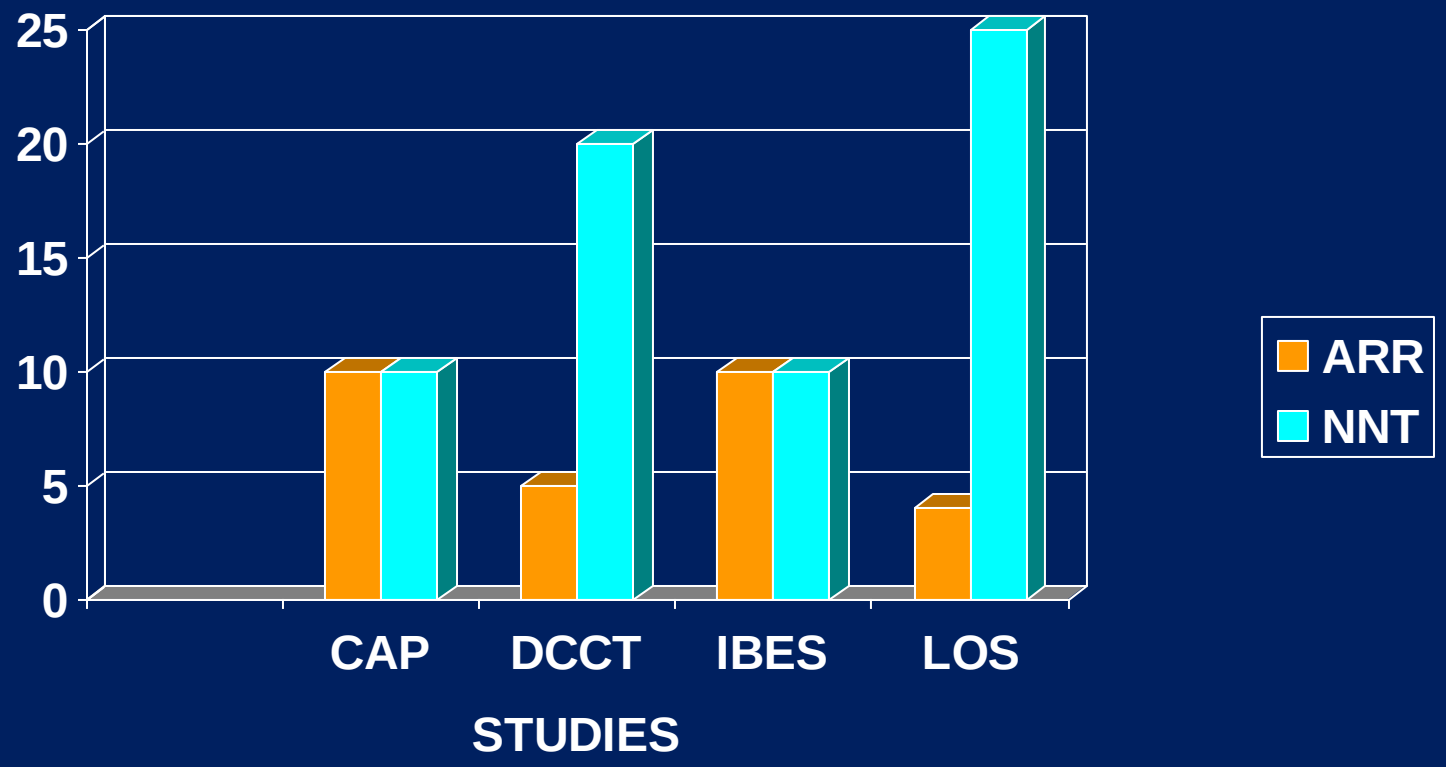
Always consider volume overload as a cause of poor HTN control (GFR < 30 and proteinuria)

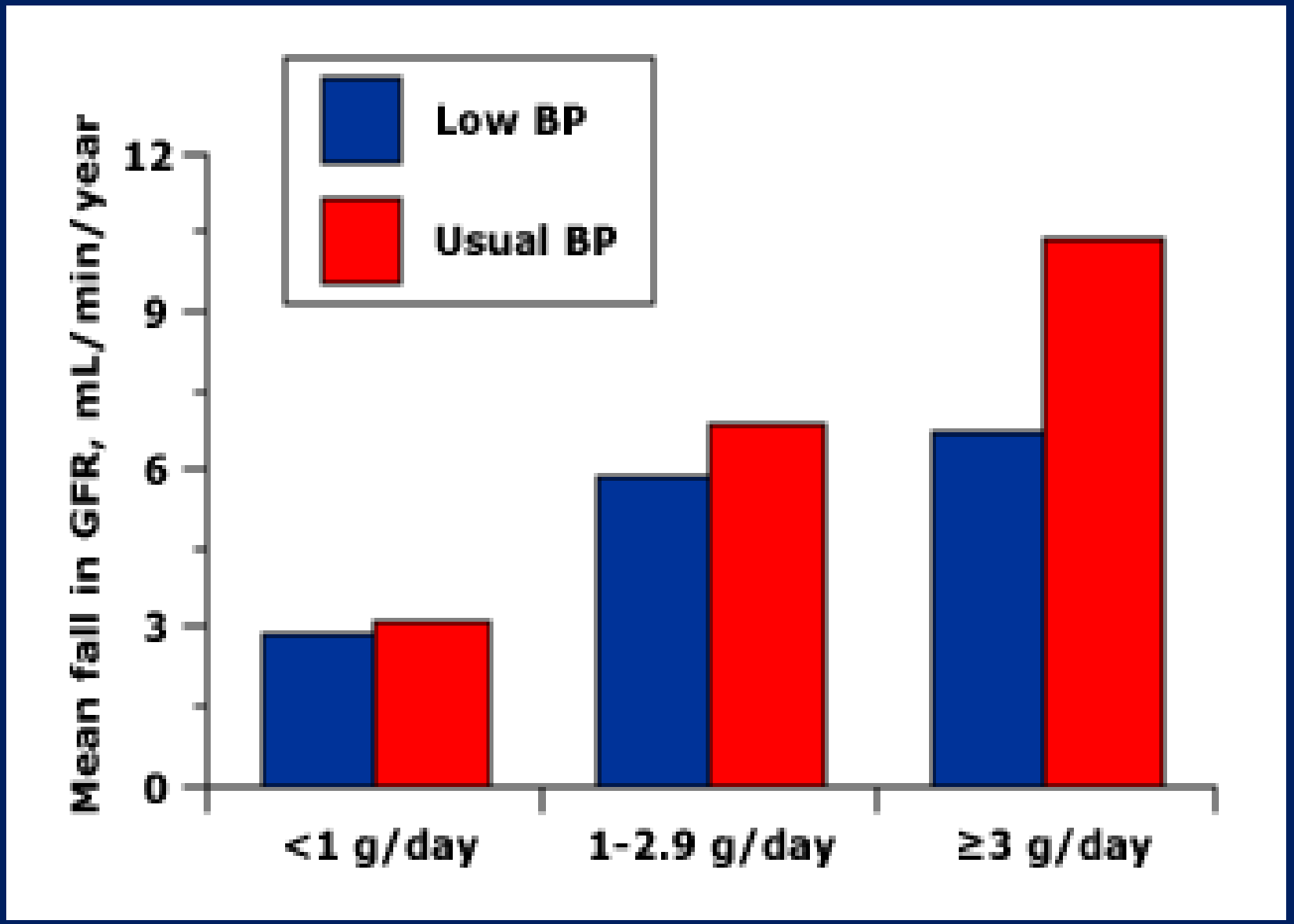



**Summary of studies on nephropathy progression used in figure**

- Parving HH et al. *Br Med J*, 1989
- Viberti GC et al. *JAMA*, 1993
- Klaur S et al. *N Eng J Med*, 1993*
- Hebert L et al. *Kidney Int*, 1994
- Lebovitz H et al. *Kidney Int*, 1994
- Moschio G et al. *N Engl J Med*, 1996*
- Bakris GL et al. *Kidney Int*, 1996
- Bakris GL. *Hypertension*, 1997
- GISEN Group, *Lancet*, 1997*

# Summary of ACE or ARBs in Diabetic CKD




Low BP
Usual BP
Mean fall in GFR, mL/min/year
12
9
6
3
0
<1 g/day
1-2.9 g/day
≥3 g/day

# Summary of ACEI/ARB in Stage 3-5 CKD – Non Diabetic

EFFICACY – proteinuric best

- Stage 3 – ARR 8-10%; NNT 10-11 for ACE or ARB (ARR 20%) (ARR 20%: NNT 5 if U P/C > 3)
- Stage 4 – ARR 20%; NNT 5 for ACE
- Stage 5D – ACE will preserve residual function even when on PD

The worse the kidney function, the worse the proteinuria - the better the response

ACE and ARBs should be continued at all stages of CKD

A trial of ACE and/or ARBs should be considered for proteinuric patients regardless of the stage of CKD

Stopping ACE in nonproteinuric CKD may delay RRT

# Initiation and Dose Escalation

**Summary of Recommended Intervals to Monitor for Side Effects after Initiation or Change in Dose of ACE Inhibitor or ARB Therapy According to Baseline Values**

| | | | | |
|---|---|---|---|---|
| **Baseline Value** | SBP (mm Hg) | ≥120* | 110-119 | <110 |
| | Baseline GFR (mL/min/1.73 m$^2$) | ≥60 | 30-59 | <30 |
| | Early GFR Decline (%) | <15 | 15-30 | >30 |
| | Serum Potassium (mEq/L) | ≤4.5 | 4.6-5.0 | >5.0 |
| **Interval (Weeks)** | | **4-12** | **2-4** | **≤2** |

# Renovascular HTN

# Clinical Clues Suggesting Renovascular Hypertension

- Onset of hypertension under age 25 or over age 55
- An abdominal bruit, particularly in diastole
- Refractory, accelerated, or malignant hypertension or worsening of previously controlled hypertension
- Undiagnosed renal failure, with or without hypertension (particularly with normal urine sediment)
- Acute renal failure precipitated by hypertension treatment, particularly with ACE inhibitors
- A unilateral small kidney (by any prior investigational procedure)
- “Flash” pulmonary edema

# Sensitivity and Specificity of Tests for Renovascular Hypertension

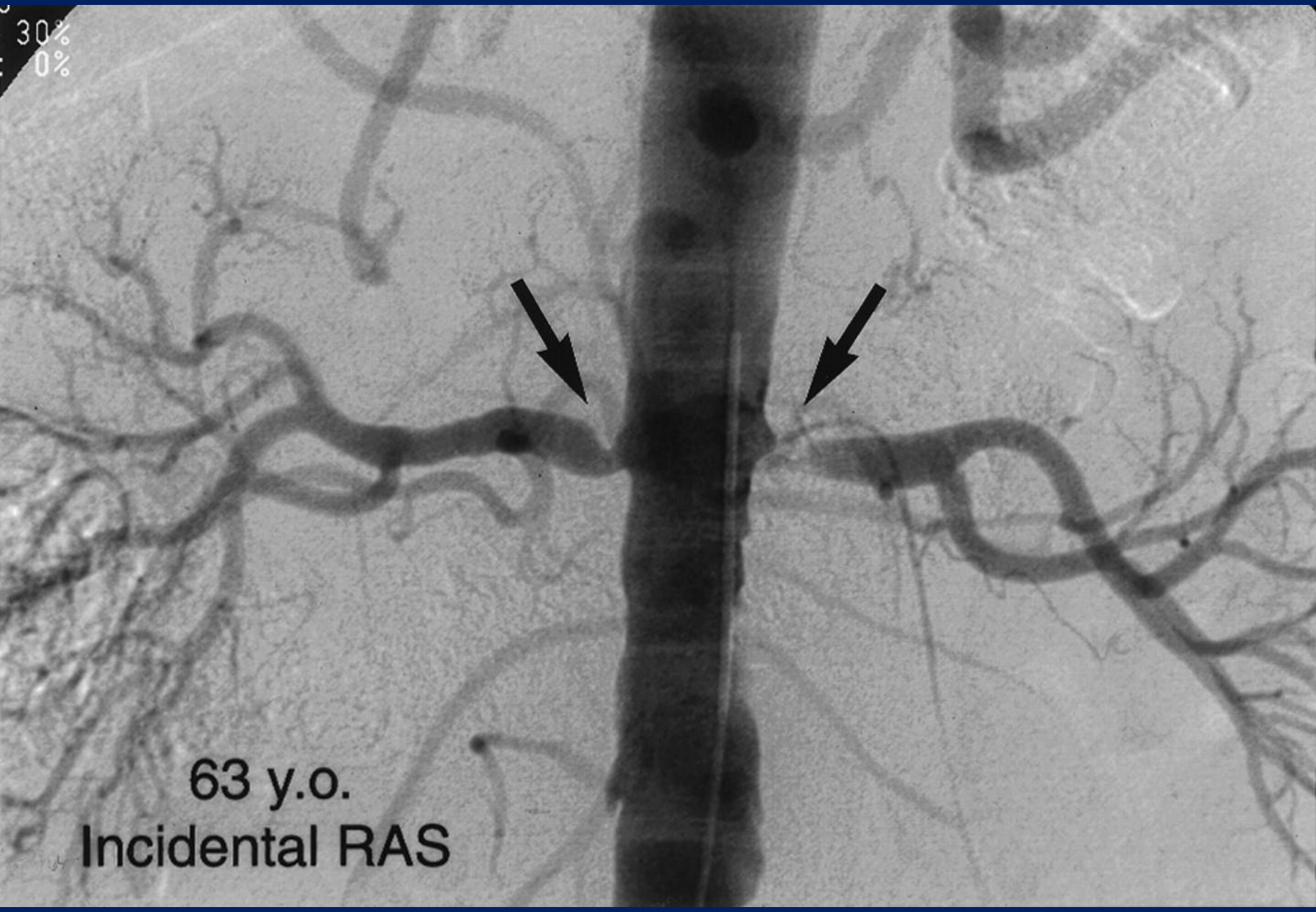
| Test | Sensitivity (%) | Specificity (%) |
|---|---|---|
| Doppler flow ultrasonography | 80 | 80 |
| Magnetic resonance angiography | 90 | 90 |
| CT Angio | 90 | 90 |

Anatomic Diagnosis not functional diagnosis

# Renovascular Disease

**Angiography, with or without digital subtraction, is the "gold standard" for diagnosis for renovascular disease**

**Drive by angio**


30%
0%
63 y.o.
Incidental RAS

# Renovascular HTN

Outcomes

- Patency Rate at 12 months > 80%
- Progression of CKD – medical = intervention
- HTN Control – intervention = medication

Controversy – patient selection is key and we don't have enough data to make recommendations

Recurrent flash pulm edema, refractory HTN and med intolerance

(7660 1996 to 35000 2005)

Cardiology vs. Nephrology

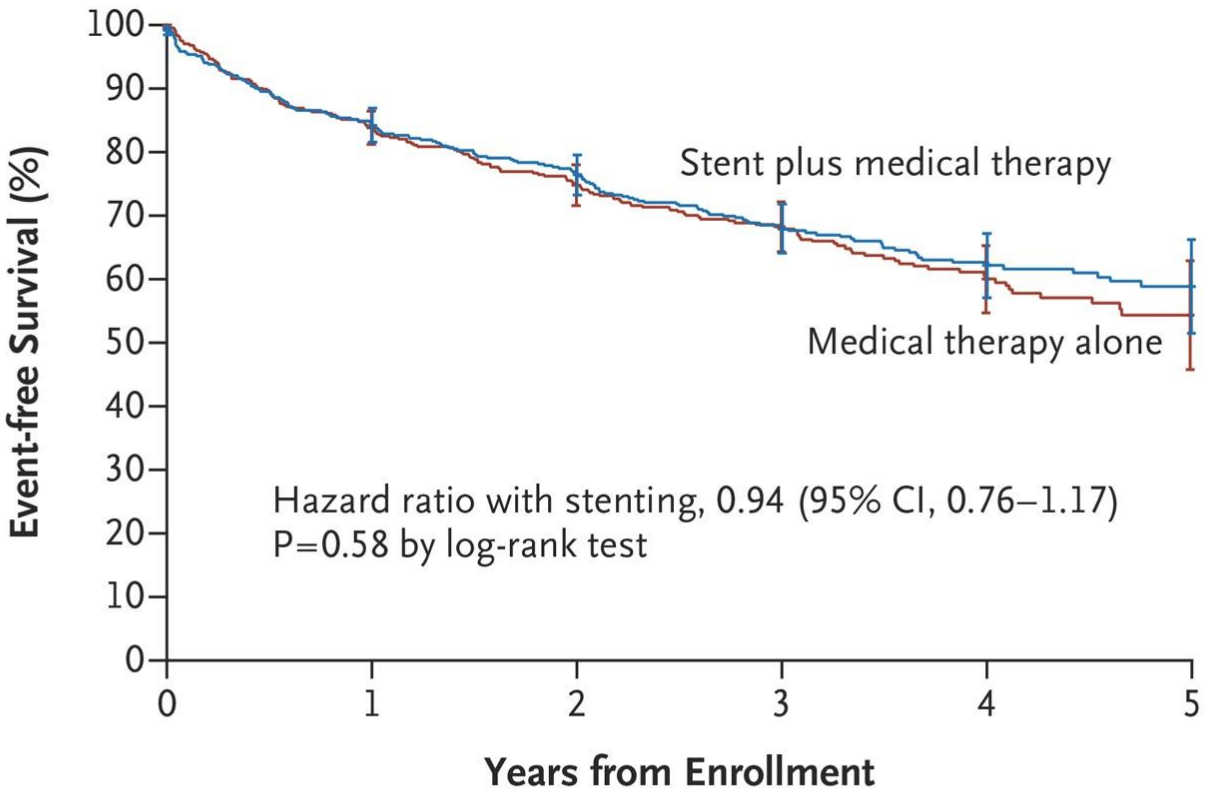
CORAL TRIAL

# CORAL Trial - Results

BP goal met with medical treatment:

- No DM or CKD – 93%
- DM or CKD – 80%
- 2 year follow up

# CORAL Kaplan–Meier Curves for the Primary Outcome.

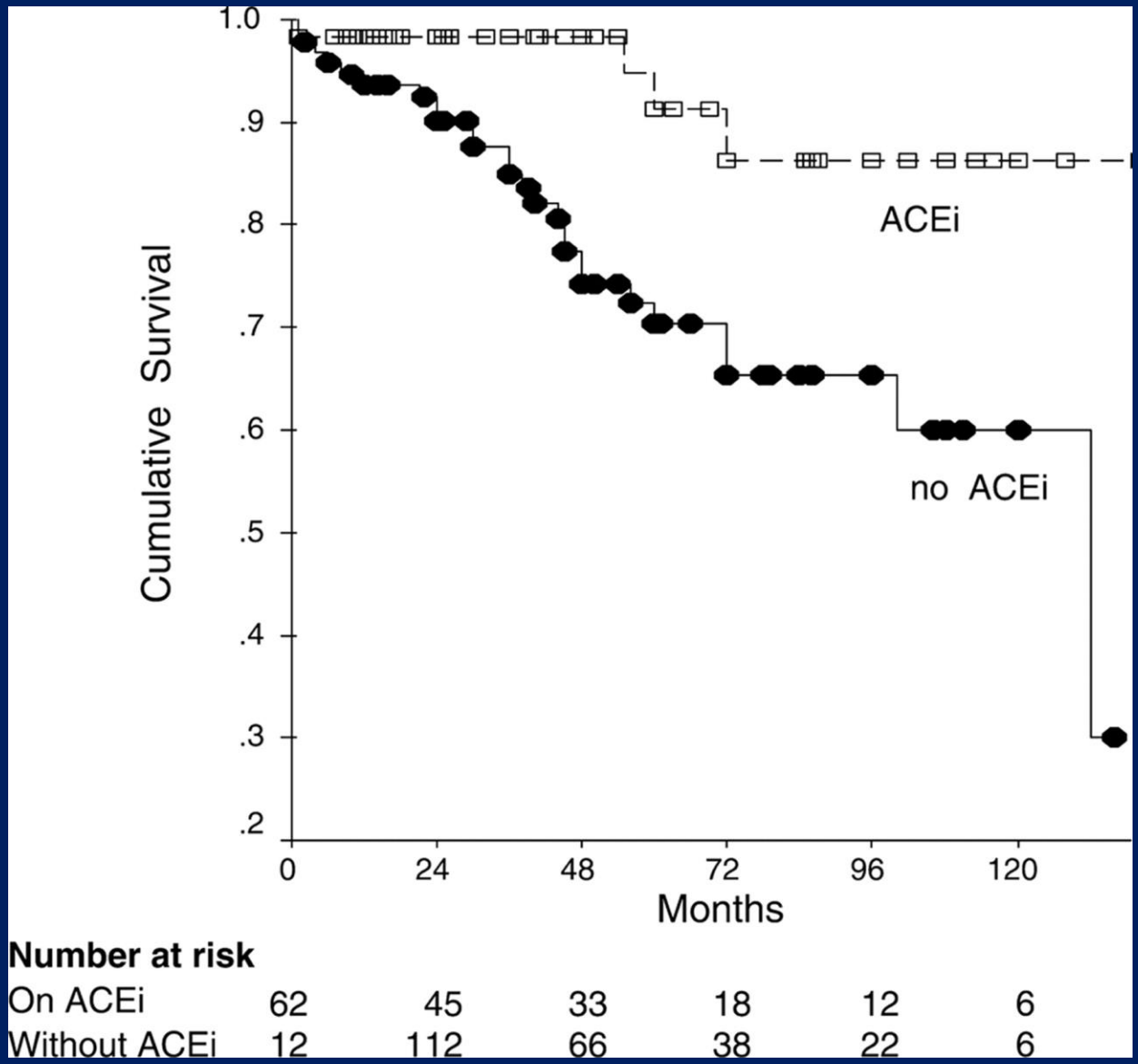



**No. at Risk**

| | | | | | | |
|---|---|---|---|---|---|---|
| Medical therapy alone | 472 | 371 | 314 | 214 | 115 | 40 |
| Stent plus medical therapy | 459 | 362 | 318 | 224 | 131 | 59 |

Cooper CJ et al. N Engl J Med 2014;370:13-22

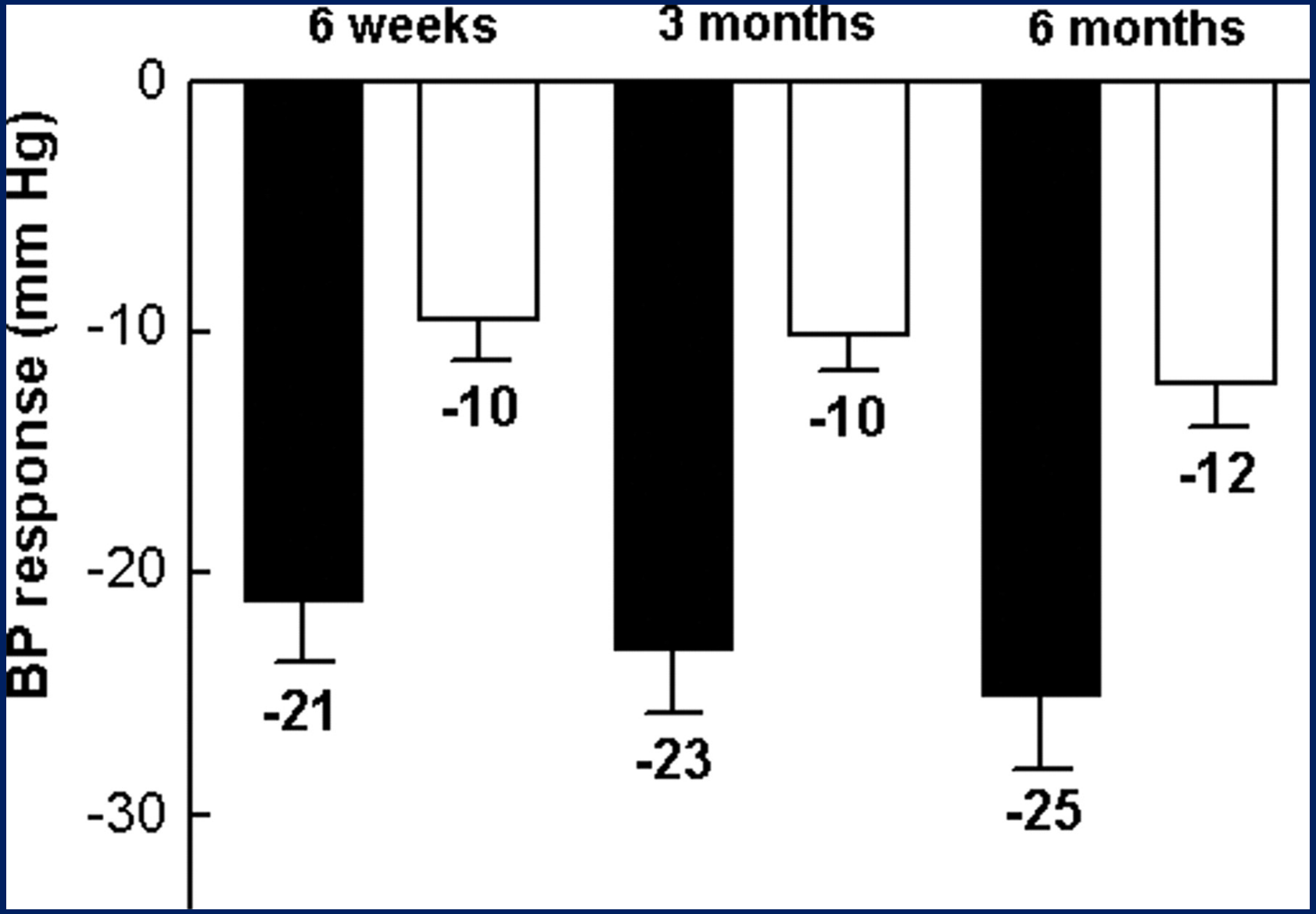
**Prospective observational cohort study comparing RAS patients treated (n=62) or not treated (n=133) with ACEs inhibitors (mean follow-up: 4.5 years)**




Hackam, D. G. et al. Hypertension 2007;50:998-1003

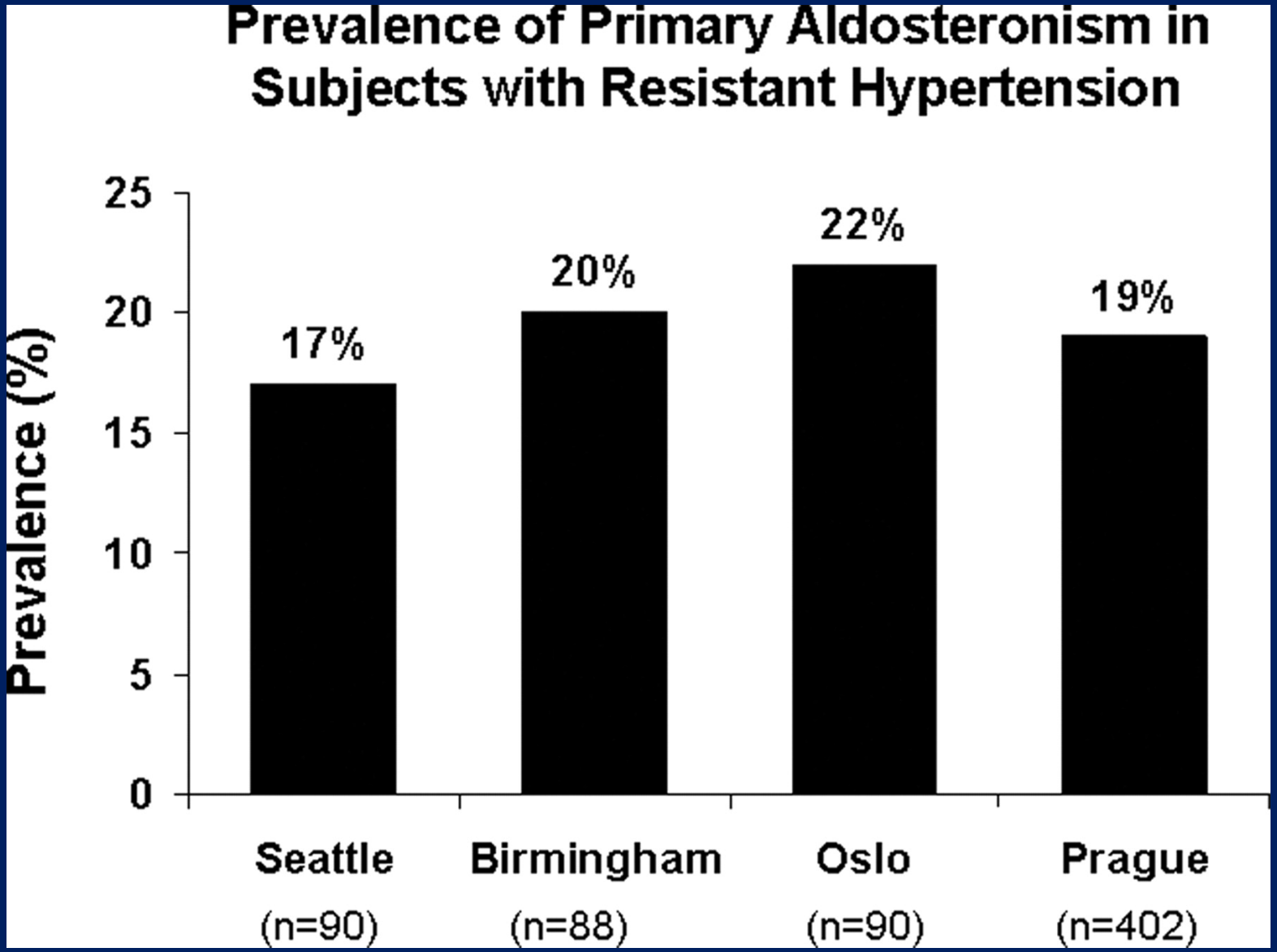
# Primary Aldosteronism

Spironolactone-induced reduction in systolic ({blacksquare}) and diastolic BP ({square}) at 6-wk, 3-mo, and 6-mo follow-up in patients with resistant hypertension



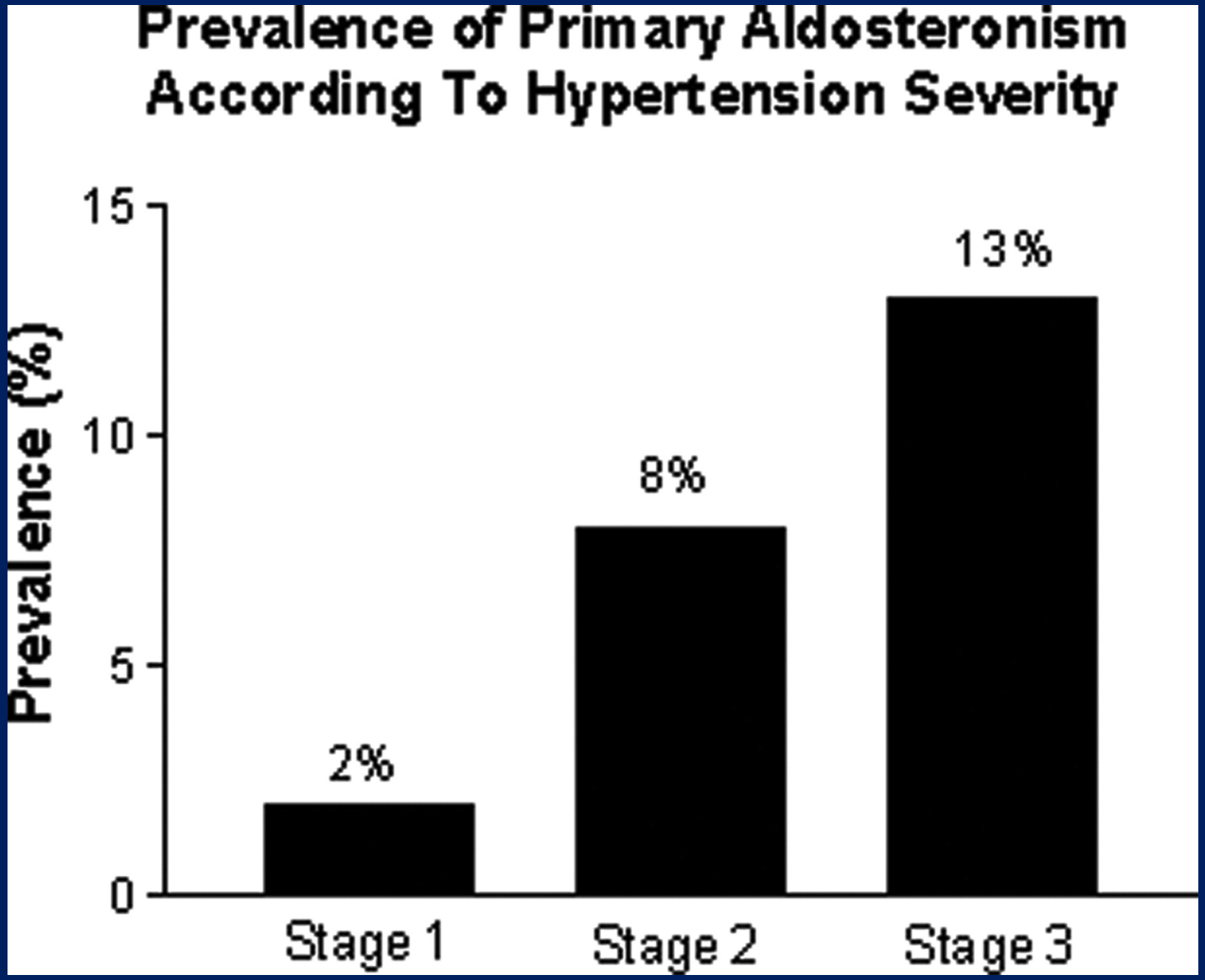

Calhoun, D. A. Clin J Am Soc Nephrol 2006;1:1039-1045

# Prevalence of primary aldosteronism in patients with resistant hypertension from multiple clinics worldwide




Calhoun, D. A. Clin J Am Soc Nephrol 2006;1:1039-1045

# Prevalence of primary aldosteronism in patients according to Sixth Joint National Committee (JNC VI) stages of severity of hypertension




Calhoun, D. A. Clin J Am Soc Nephrol 2006;1:1039-1045

# Diagnosis of Primary Aldosterone Excess

AM plasma aldosterone/ plasma renin ratio of >30 (esp. if aldo > 20) = 90% sens/spec

Confirmation

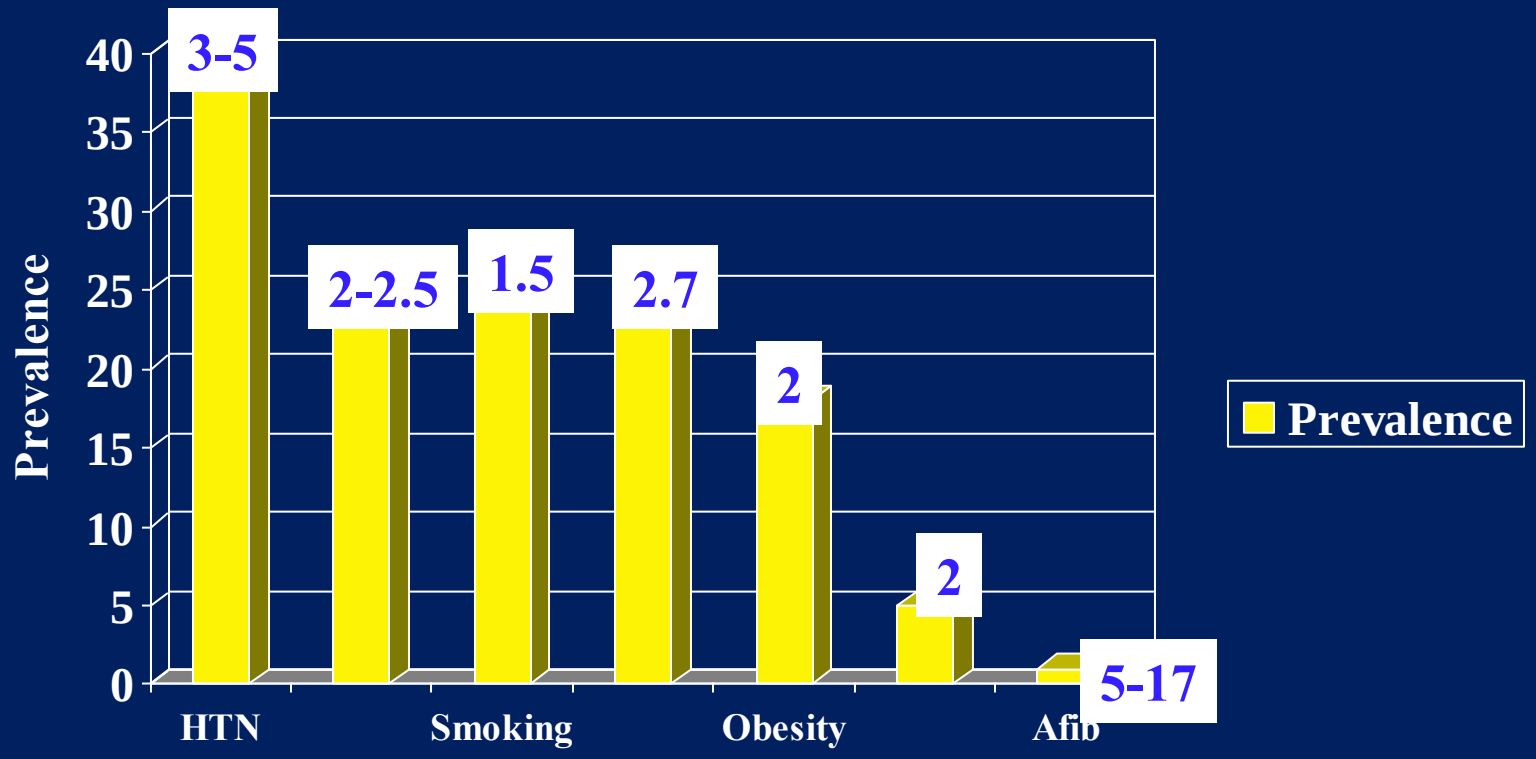
24 hr urine for aldosterone after 72 hrs of > 5 grams/day Na diet

plasma aldosterone after 2000 cc NSS

(<6 nl, > 10 primary aldo)

CT – hyperplasia more common than adenoma

# Importance of Stroke Risk Factors



# Primary Prevention

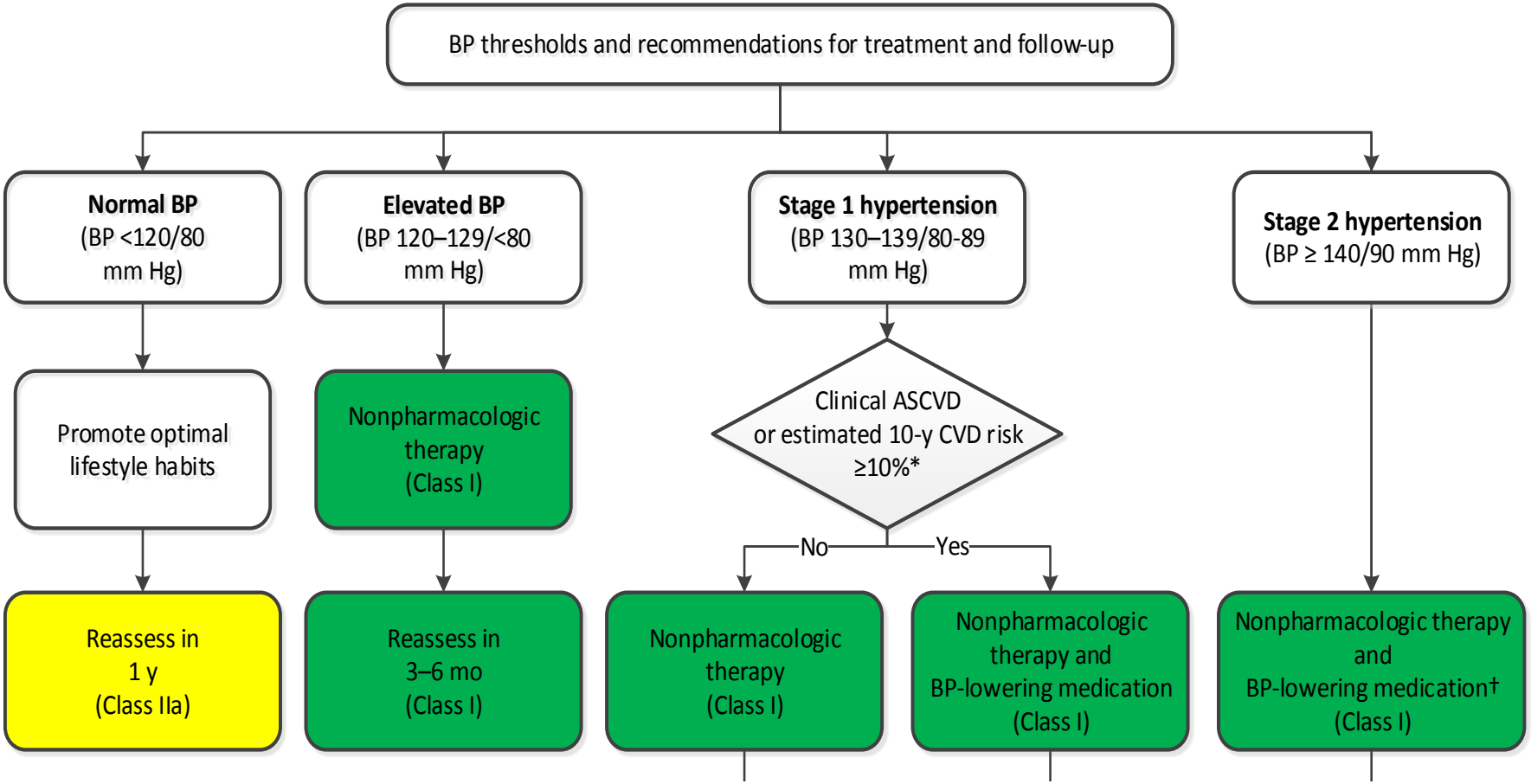
| Treatment | RRR | NNT (1 stroke/yr) |
|---|---|---|
| **HTN** | **42%** | **7937** |
| Statins | 25% | 13,333 |
| Aspirin | 7% increase | NA |
| ACE-I | 30% | 11,111 |

Straus et al, JAMA, 2002

# Secondary Prevention

| Treatment | RRR | NNT (1 stroke/yr) |
|---|---|---|
| **HTN** | **28%** | **51** |
| Statins | 25% | 57 |
| Aspirin | 28% | 77 |
| Thieno vs ASA | 13% | 64 |
| Smoking D/C | 33% | 43 |
| CEA | 44% | 26 |

# Blood Pressure (BP) Thresholds and Recommendations for Treatment and Follow-Up (continued on next slide)

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# Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension*

| | Nonpharmacologi-cal Intervention | Dose | Approximate Impact on SBP | |
|---|---|---|---|---|
| | | | Hypertension | Normotension |
| 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 every 1-kg reduction in body weight. | -5 mm Hg | -2/3 mm Hg |
| 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 |
| 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 | -2/3 mm Hg |
| 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 | -2 mm Hg |

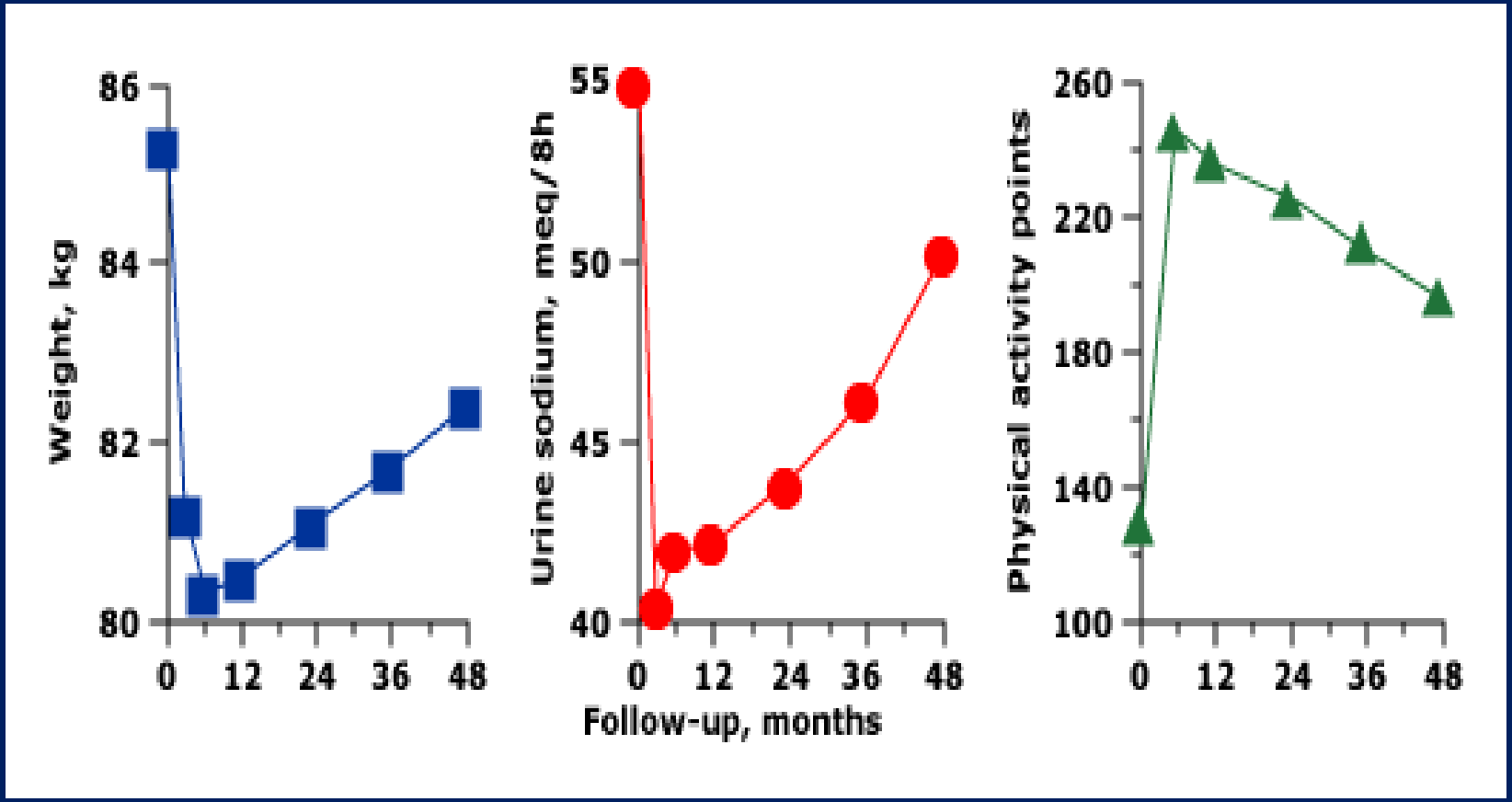
*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
DASH indicates Dietary Approaches to Stop Hypertension; and SBP, systolic blood pressure.
Resources: Your Guide to Lowering Your Blood Pressure With DASH—How Do I Make the DASH? Available at: https://www.nhlbi.nih.gov/health/resources/heart/hbp-dash-how-to.
Top 10 Dash Diet Tips. Available at: http://dashdiet.org/dash_diet_tips.asp

# Best Proven Nonpharmacological Interventions for Prevention and Treatment of Hypertension* (cont.)

| | Nonpharmacological Intervention | Dose | Approximate Impact on SBP | |
|---|---|---|---|---|
| | | | Hypertension | Normotension |
| Physical activity | Aerobic | ● 90–150 min/wk<br>● 65%–75% heart rate reserve | -5/8 mm Hg | -2/4 mm Hg |
| | Dynamic resistance | ● 90–150 min/wk<br>● 50%–80% 1 rep maximum<br>● 6 exercises, 3 sets/exercise, 10 repetitions/set | -4 mm Hg | -2 mm Hg |
| | Isometric resistance | ● 4 × 2 min (hand grip), 1 min rest between exercises, 30%–40% maximum voluntary contraction, 3 sessions/wk<br>● 8–10 wk | -5 mm Hg | -4 mm Hg |
| Moderation in alcohol intake | Alcohol consumption | In individuals who drink alcohol, reduce alcohol† to:<br>● Men: ≤2 drinks daily<br>● Women: ≤1 drink daily | -4 mm Hg | -3 mm |

*Type, dose, and expected impact on BP in adults with a normal BP and with hypertension.
†In the United States, one "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).

# Diet Durability



## Table 107. Summary of Number of Antihypertensive Agents To Reach Target Blood Pressure*

| Study, Year, Reference | Target SBP (mm Hg) | Achieved SBP (mm Hg) | Mean Number of Agents |
|---|---|---|---|
| IDNT, 2001[139] | <135 | 138 | 2.6 |
| RENAAL, 2001[338] | <140 | 141 | 2.7 |
| ABCD, 2000[407] | <75 or 80-89* | 128 and 137 | 2.4 |
| CSG Captopril Trial, 1993[329] | <140 | 136 | 1-3# |

* Includes studies of progression of diabetic kidney disease randomized by DBP.# no data given on SBP in reference; there were approximately 25% normotensive participants.

# HTN 2015-2017 Update

JNC 8

SPRINT

ACC 2017 Guidelines

# JNC 8 Etal. Summary

JNC 8 published in close temporal proximity with ASH/ISH and AHA/ACC/CDC guidelines

Confusion reigns supreme

All agree with:

1. Use of ACE/ARB, thiazides and CCB 1st
2. BB, aldactone etc used for pts who fail this
3. AA should use thiazides or CCB 1st
4. Avoid ACE/ARB combination
5. ACE for all CKD (JNC8)

# JNC 8 Etal. Summary

BP Goals

1. Age > 80 – SBP < 150/
2. Age 60 – 80 – SBP < 150/ (JNC8);
   SBP < 140/ (ASH)
3. Age < 60 – SBP < 140/ and DBP < 90
   (JNC8)(ASH)
4. CKD/Albuminuria - < 130/ (ASH)

# SPRINT Trial

High CV risk patients with HTN randomized to SBP < 140/ or < 120/ (9361 participants)

Inclusion – HTN and increased CV risk

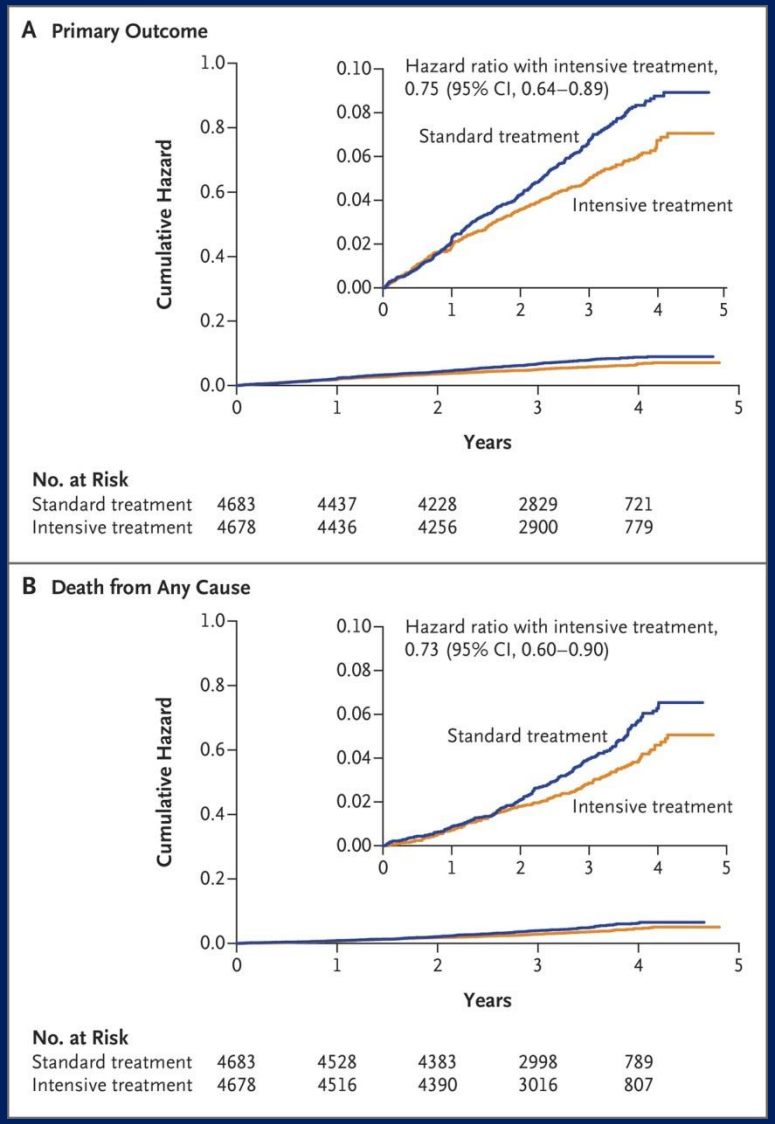
Exclusion =- DM , GFR < 20, ADPCKD, stroke

< 120/ resulted in a decrease in primary outcome (MI, ACS, CVA,HF or CV death) NNT 61

< 120/ resulted in a decrease in all cause mortality NNT 90

< 120/ resulted in decreased death from CV cause NNT 172

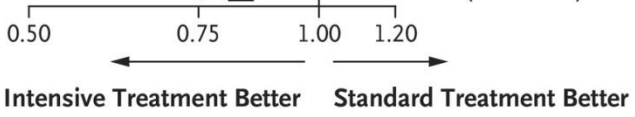
# Primary Outcome and Death from Any Cause.




The SPRINT Research Group. N Engl J Med 2015;373:2103-2116

# Forest Plot of Primary Outcome According to Subgroups.

| Subgroup | Intensive Treatment | Standard Treatment | Hazard Ratio (95% CI) | P Value for Interaction |
|---|---|---|---|---|
| | *no. of patients with primary outcome/total no. (%)* | | | |
| Overall | 243/4678 (5.2) | 319/4683 (6.8) | 0.75 (0.64–0.89) | |
| Previous CKD | | | | 0.36 |
| No | 135/3348 (4.0) | 193/3367 (5.7) | 0.70 (0.56–0.87) | |
| Yes | 108/1330 (8.1) | 126/1316 (9.6) | 0.82 (0.63–1.07) | |
| Age | | | | 0.32 |
| <75 yr | 142/3361 (4.2) | 175/3364 (5.2) | 0.80 (0.64–1.00) | |
| ≥75 yr | 101/1317 (7.7) | 144/1319 (10.9) | 0.67 (0.51–0.86) | |
| Sex | | | | 0.45 |
| Female | 77/1684 (4.6) | 89/1648 (5.4) | 0.84 (0.62–1.14) | |
| Male | 166/2994 (5.5) | 230/3035 (7.6) | 0.72 (0.59–0.88) | |
| Race | | | | 0.83 |
| Black | 62/1454 (4.3) | 85/1493 (5.7) | 0.77 (0.55–1.06) | |
| Nonblack | 181/3224 (5.6) | 234/3190 (7.3) | 0.74 (0.61–0.90) | |
| Previous cardiovascular disease | | | | 0.39 |
| No | 149/3738 (4.0) | 208/3746 (5.6) | 0.71 (0.57–0.88) | |
| Yes | 94/940 (10.0) | 111/937 (11.8) | 0.83 (0.62–1.09) | |
| Systolic blood pressure | | | | 0.77 |
| ≤132 mm Hg | 71/1583 (4.5) | 98/1553 (6.3) | 0.70 (0.51–0.95) | |
| >132 to <145 mm Hg | 77/1489 (5.2) | 106/1549 (6.8) | 0.77 (0.57–1.03) | |
| ≥145 mm Hg | 95/1606 (5.9) | 115/1581 (7.3) | 0.83 (0.63–1.09) | |




The SPRINT Research Group. N Engl J Med 2015;373:2103-2116

| | | | | |
|---|---|---|---|---|
| Serious adverse event only | | | | |
| Hypotension | 110 (2.4) | 66 (1.4) | 1.67 | 0.001 |
| Syncope | 107 (2.3) | 80 (1.7) | 1.33 | 0.05 |
| Bradycardia | 87 (1.9) | 73 (1.6) | 1.19 | 0.28 |
| Electrolyte abnormality | 144 (3.1) | 107 (2.3) | 1.35 | 0.02 |
| Injurious fall† | 105 (2.2) | 110 (2.3) | 0.95 | 0.71 |
| Acute kidney injury or acute renal failure‡ | 193 (4.1) | 117 (2.5) | 1.66 | <0.001 |
| Emergency department visit or serious adverse event | | | | |
| Hypotension | 158 (3.4) | 93 (2.0) | 1.70 | <0.001 |
| Syncope | 163 (3.5) | 113 (2.4) | 1.44 | 0.003 |
| Bradycardia | 104 (2.2) | 83 (1.8) | 1.25 | 0.13 |
| Electrolyte abnormality | 177 (3.8) | 129 (2.8) | 1.38 | 0.006 |
| Injurious fall† | 334 (7.1) | 332 (7.1) | 1.00 | 0.97 |
| Acute kidney injury or acute renal failure‡ | 204 (4.4) | 120 (2.6) | 1.71 | <0.001 |

# 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults



AMERICAN COLLEGE of CARDIOLOGY

American Heart Association®

life is why™

# Categories of BP in Adults*

| BP Category | SBP | | DBP |
|---|---|---|---|
| **Normal** | <120 mm Hg | and | <80 mm Hg |
| **Elevated** | 120–129 mm Hg | and | <80 mm Hg |
| **Hypertension** | | | |
| Stage 1 | 130–139 mm Hg | or | 80–89 mm Hg |
| Stage 2 | ≥140 mm Hg | or | ≥90 mm Hg |

*Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.
BP indicates blood pressure (based on an average of ≥2 careful readings obtained on ≥2 occasions, as detailed in DBP, diastolic blood pressure; and SBP systolic blood pressure.

# BP Treatment Threshold and the Use of CVD Risk Estimation to Guide Drug Treatment of Hypertension

| COR | LOE | Recommendations for BP Treatment Threshold and Use of Risk Estimation* to Guide Drug Treatment of Hypertension |
|---|---|---|
| I | SBP: A | Use of BP-lowering medications is recommended for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher or an average DBP of 80 mm Hg or higher, and for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher. |
| | DBP: C-EO | |
| I | C-LD | Use of BP-lowering medication is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-year ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher. |

*ACC/AHA Pooled Cohort Equations (http://tools.acc.org/ASCVD-Risk-Estimator/) to estimate 10-year risk of atherosclerotic CVD.

# BP Goal for Patients With Hypertension

| COR | LOE | Recommendations for BP Goal for Patients With Hypertension |
|---|---|---|
| I | SBP: B-R$^{SR}$ | For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher a BP target of less than 130/80 mm Hg is recommended. |
| | DBP: C-EO | |
| IIb | SBP: B-NR | For adults with confirmed hypertension, without additional markers of increased CVD risk, a BP target of less than 130/80 mm Hg may be reasonable. |
| | DBP: C-EO | |

SR indicates systematic review.

# BP Thresholds for and Goals of Pharmacological Therapy in Patients With Hypertension According to Clinical Conditions

| Clinical Condition(s) | BP Threshold, mm Hg | BP Goal, mm Hg |
|---|---|---|
| **General** | | |
| Clinical CVD or 10-year ASCVD risk ≥10% | ≥130/80 | <130/80 |
| No clinical CVD and 10-year ASCVD risk <10% | ≥140/90 | <130/80 |
| Older persons (≥65 years of age; noninstitutionalized, ambulatory, community-living adults) | ≥130 (SBP) | <130 (SBP) |
| **Specific comorbidities** | | |
| Diabetes mellitus | ≥130/80 | <130/80 |
| Chronic kidney disease | ≥130/80 | <130/80 |
| Chronic kidney disease after renal transplantation | ≥130/80 | <130/80 |
| Heart failure | ≥130/80 | <130/80 |
| Stable ischemic heart disease | ≥130/80 | <130/80 |
| Secondary stroke prevention | ≥140/90 | <130/80 |
| Secondary stroke prevention (lacunar) | ≥130/80 | <130/80 |
| Peripheral arterial disease | ≥130/80 | <130/80 |

ASCVD indicates atherosclerotic cardiovascular disease; BP, blood pressure; CVD, cardiovascular disease; and SBP, systolic blood pressure.

# HTN Treatment Summary

BP Goals - <140/90 in all but elderly (<150/80).
  GFR < 60 ml + proteinuria goals < 130/80
  JNC 8 Lifestyle modification effective but not durable

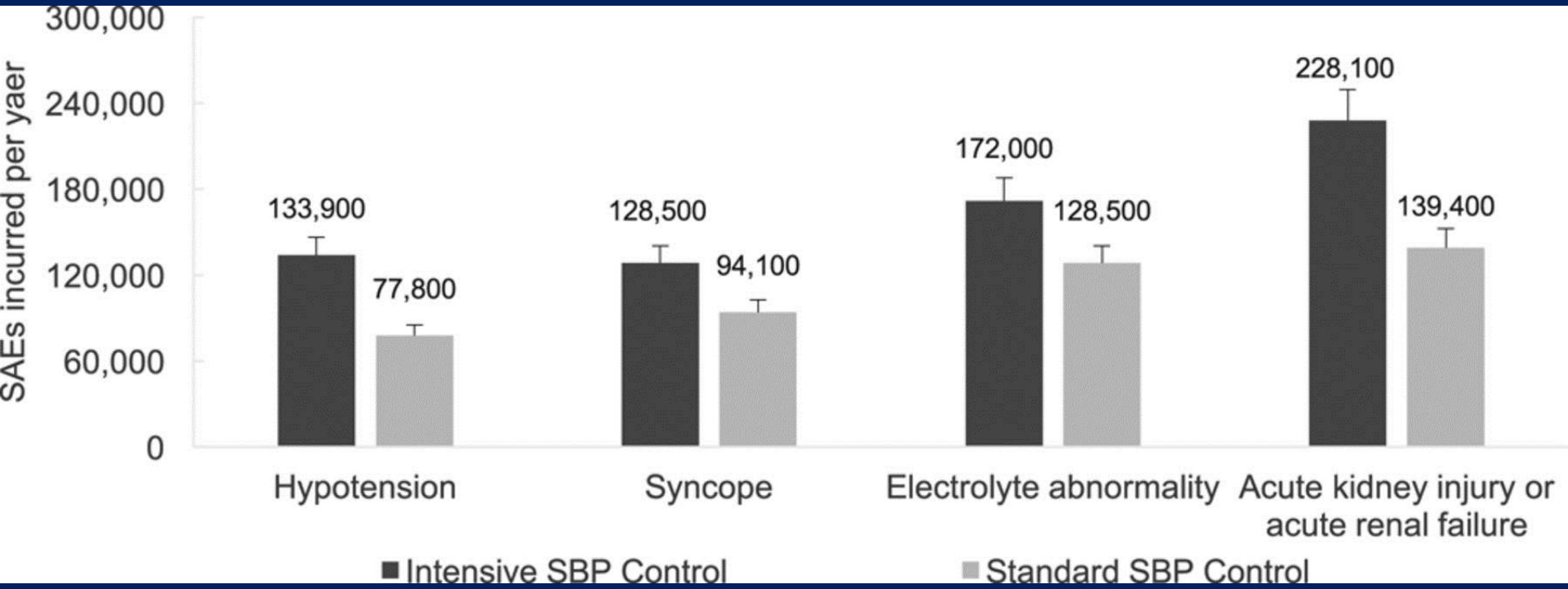
Expect to use 2-3 drugs to achieve goals

Nocturnal dosing better than AM dosing

ACE/ARB combination should not be used

Spironolactone effective for resistant HTN

ACC Guidelineline - more aggressive based on CV RisK (high risk only)


300,000
240,000
180,000
120,000
60,000
0
SAEs incurred per yaer
133,900
77,800
128,500
94,100
172,000
128,500
228,100
139,400
Hypotension
Syncope
Electrolyte abnormality
Acute kidney injury or acute renal failure
Intensive SBP Control
Standard SBP Control

**People who don’t think too good should not think too much**

Ted Williams

# Nephrolithiasis - Facts

The lifetime incidence of kidney stones is approximately 13 percent for men and 7 percent for women.

Among adults with kidney stones, approximately 80 percent consist predominately of calcium oxalate and/or calcium phosphate stones.

Following an initial stone event, the 5-year recurrence rate in the absence of specific treatment is 35 to 50 percent.

# Nephrolithiasis - Facts

Genetic factors are thought to account for about half the risk of developing kidney stones.

Environmental risk factors include low fluid intake, low calcium intake, and high fructose intake.

- The evidence for a role for increased animal protein intake, high sodium intake, increased sucrose intake, and low magnesium intake as risk factors for kidney stones is mixed.

Risk of kidney stones may be increased by medical conditions such as obesity, diabetes, primary hyperparathyroidism, gout, paralysis, and anatomic abnormalities of the kidney and bowel

# Nephrolithiasis - Workup

Standard workup for stones is comprehensive metabolic panel, UA, PTH, and Vitamin D

24 HR urine for volume, Na, UA, Ca, PO4, oxalate, citrate, and Mg

Limited evidence to support that therapy directed by workup is better than empiric tx alone (exception serum and urine uric acid)

# Nephrolithiasis - Treatment

Fluid intake to maintain urine excretion of > 2 liters per day may provide a clinically significant reduction in risk of stone recurrence.

Abstaining from soft drinks or eliminating soft drinks acidified solely with phosphoric acid but not by citric acid (based on a single study in men) reduces risk of stone recurrence in frequent consumers.

A normal-calcium, low-sodium, low-animal protein diet may reduce the risk for stone recurrence, but the independent effect of increasing dietary calcium has not been determined.

High-fiber and reduced-animal protein diets may or may not help prevent stone recurrence.

The effectiveness of other dietary interventions is not clear.

# Nephrolithiasis - Treatment

- Thiazide diuretics (any) reduce the risk of calcium stone recurrence (ARR = 29 percent; (NNT) = 3
- Citrate reduces the risk of calcium stone recurrence ARR = 41 percent; NNT = 3
- Allopurinol reduces the risk of calcium stone recurrence in patients with elevated blood and urine UA levels ARR = 22 percent; NNT = 5
- Treatment with magnesium did not reduce the risk of stone recurrence