

# **Challenging Cases of Hypertension: Confronting Evidence-Based Guidelines in Remote communities**

MSERS April 29, 2021  
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# Faculty/Presenter Disclosure

- Dr. Benjamin Thomson, Associate Professor, Queen's University
- Relationships with commercial interests:  
Grants/Research Support:
  - Old: CIP, POEM (Western University), Innovation Research Grant, CTAQ (Queen's University), CIHR (CONNECT, ACHIEVE), PDOPPS trial funding
  - Current: None

Speaking fees: Baxter Canada

## Mitigating Potential Bias

- No mitigation has been required. Content in this talk does not relate to either research grant topics, funding guidelines or funding organization objectives.

# Learning Objectives

1. Describe the approved methods of taking a blood pressure
2. Assess risk associated from hypertension in people with (and without) diabetes mellitus
3. Demonstrate knowledge of the blood pressure target in people with hypertension (with or without) diabetes mellitus)
4. Select treatment for people with hypertension based on comorbidities (first/second line)
5. Clinical pearls
6. Identify patients who may be non-adherent to anti-hypertensive therapy, and modify regimen to enhance adherence
7. Identify patients who may require consideration of secondary (not essential) hypertension
8. Identify patients who need referral to hypertension specialist
9. Lifestyle interventions in adults with hypertension
10. Cases

## How to measure

- **Gold standard:** 24 hour ambulatory blood pressure monitor, with 20 to 30 minute intervals throughout day and night



- Next best: Home blood pressure measurements

*“Recommended times for measurements 10:00 AM, 3:00- 4:00 PM. Try to measure your blood pressure at work.”*

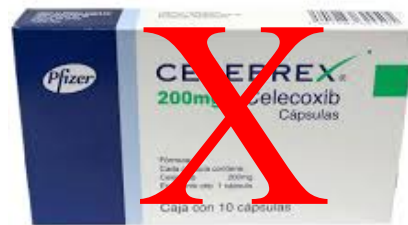


- Next best: office blood pressure measurement



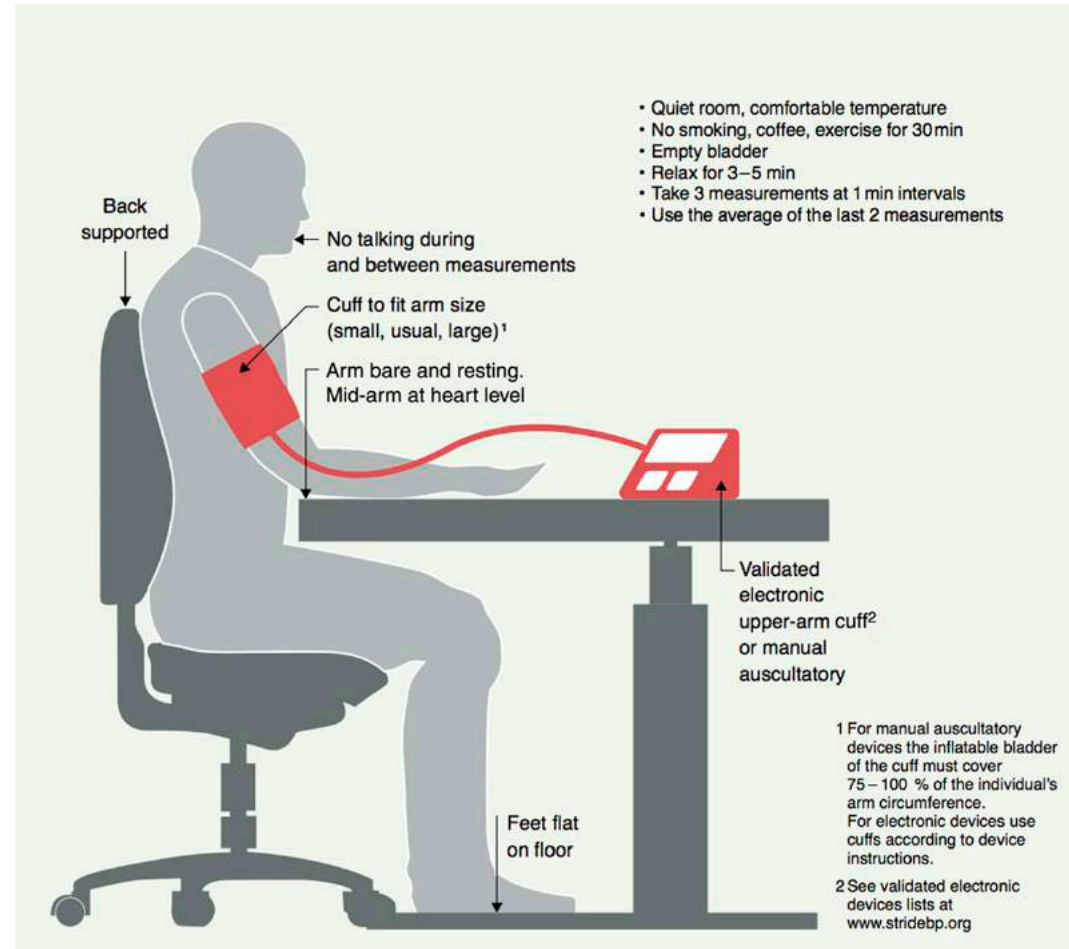
# How to measure: Need to Avoid

- Pain, cold, stress and anxiety
- Full bladder or bowel
- Smoking (wait a minimum of 30 minutes before taking readings)
- Coffee (wait a minimum of 30 minutes before taking readings)
- Showering or bathing (wait a minimum of 30 minutes before taking readings)
- NSAIDs such as Advil/Ibuprofen, Aleve/Naproxen and Celebrex



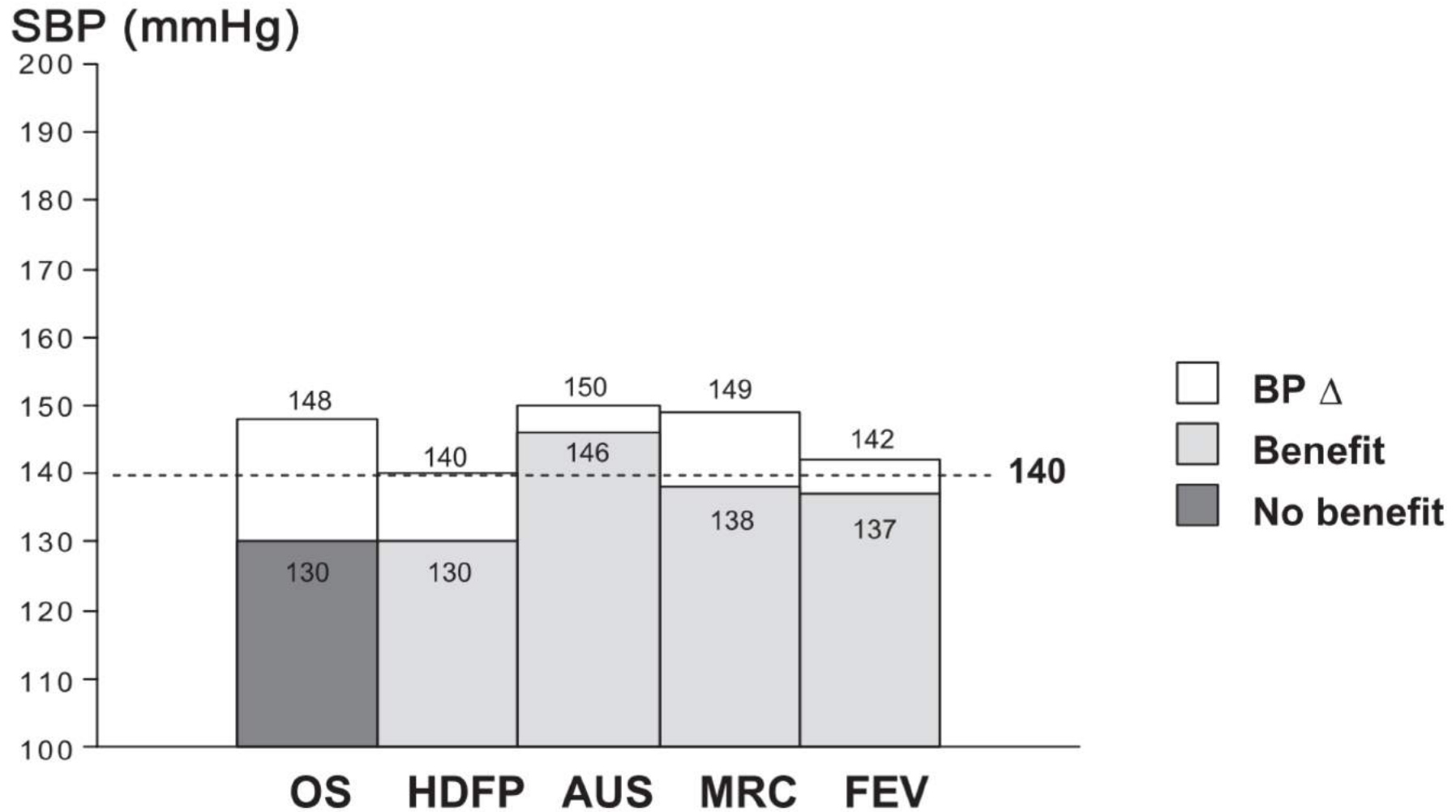
# How to measure

1. Sit in a quiet room alone with no distractions, back supported comfortably and feet flat on the floor
2. Three readings with one to two minutes between readings with arm supported at heart level on a table or a pillow
3. This should be done for several days. Bring list of second and third readings to appointment.

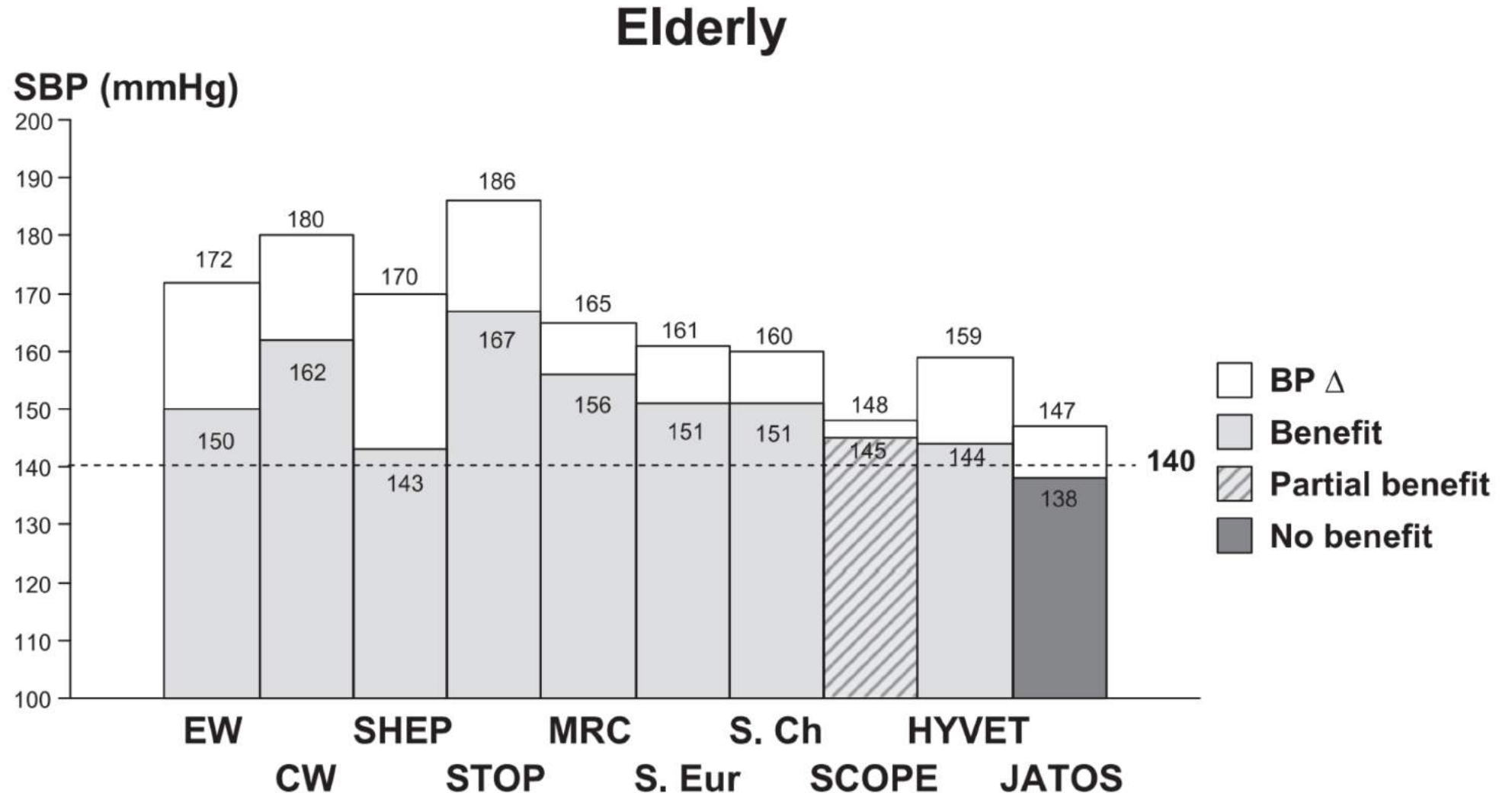


# Assess Risk Associated from Hypertension in People with/without Diabetes

## 'Uncomplicated' Hypertension

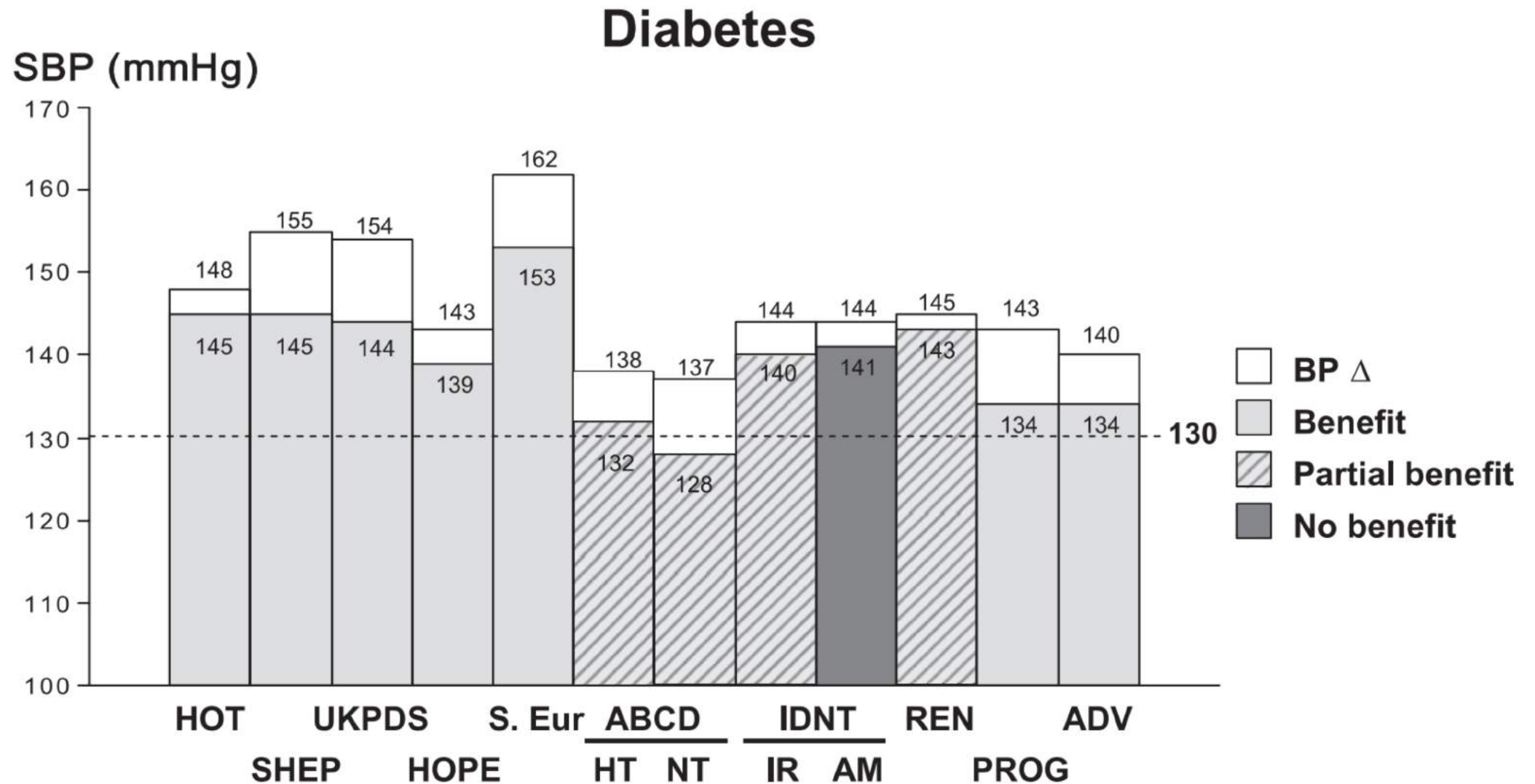


# Assess Risk Associated from Hypertension in People with/without Diabetes

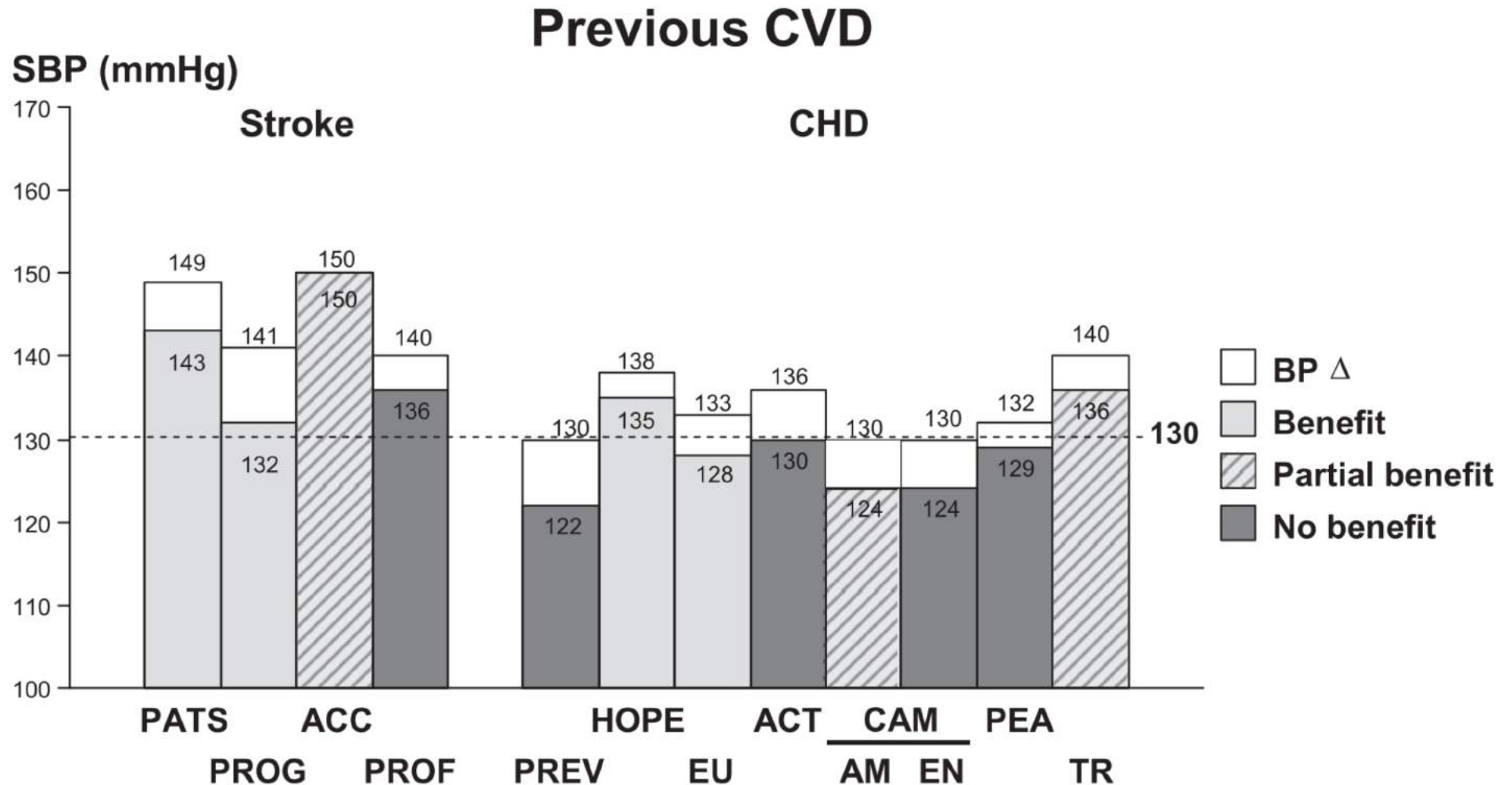




# Assess Risk Associated from Hypertension in People with/without Diabetes



# Assess Risk Associated from Hypertension in People with/without Diabetes



# Assess Risk Associated from Hypertension in People with/without Diabetes

## Prior to 2018:

1. Patients with uncomplicated hypertension target systolic  $< 140$  mm Hg, diastolic  $< 90$  mm Hg
2. Elderly patients can target  $< 140$  mm Hg systolic and  $< 90$  mm Hg diastolic, but some elderly patients may require more liberal/flexible targets
3. Hypertensive patients with diabetes, or prior cardiac event should target systolic  $< 130$  mm Hg and diastolic  $< 80$  mm Hg

## SO WHAT CHANGED?

ORIGINAL ARTICLE

# A Randomized Trial of Intensive versus Standard Blood-Pressure Control

The SPRINT Research Group\*

# A Randomized Trial of Intensive versus Standard Blood-Pressure Control

The SPRINT Research Group\*

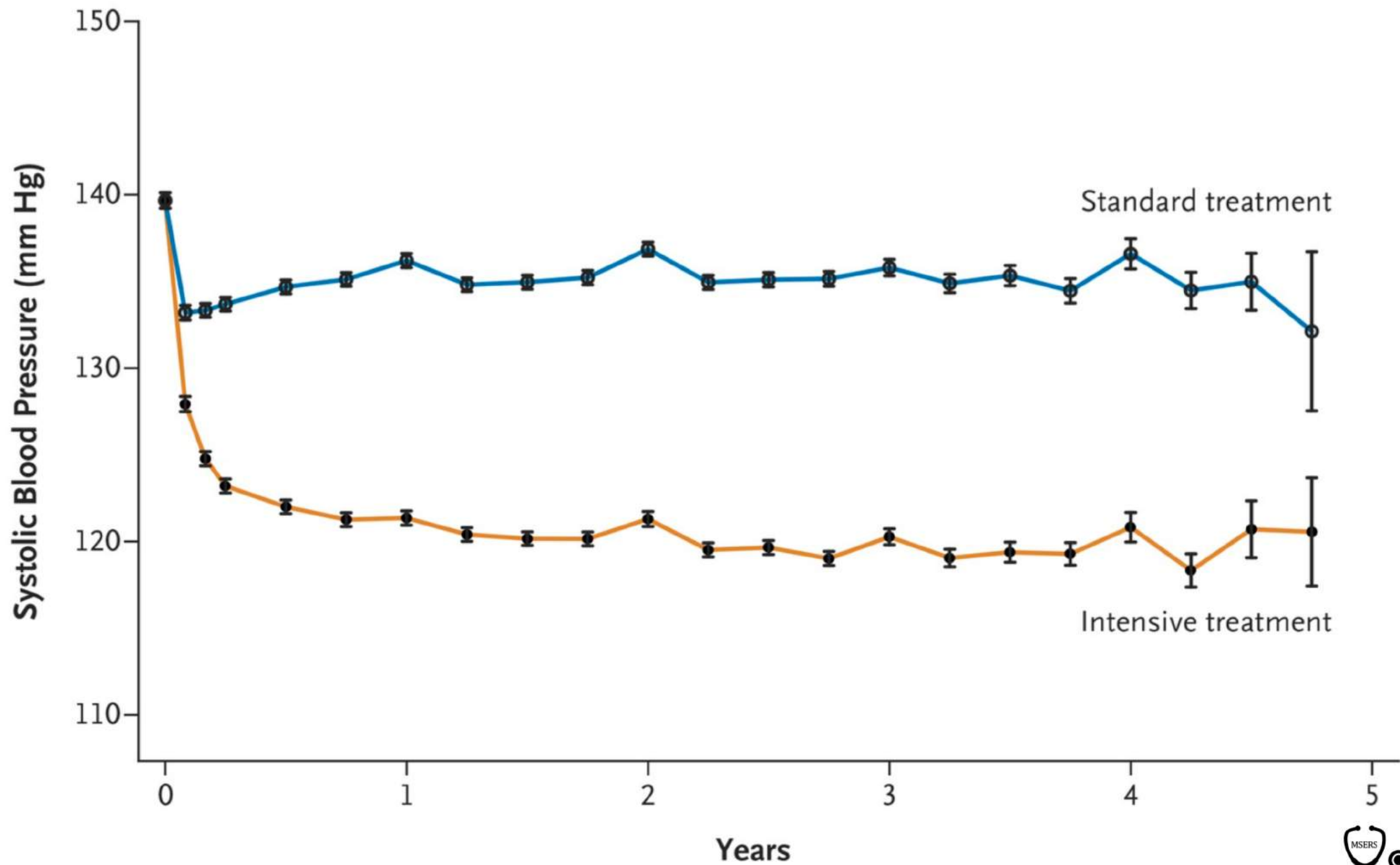
## **VALID CONCERNS regarding excessive BP lowering:**

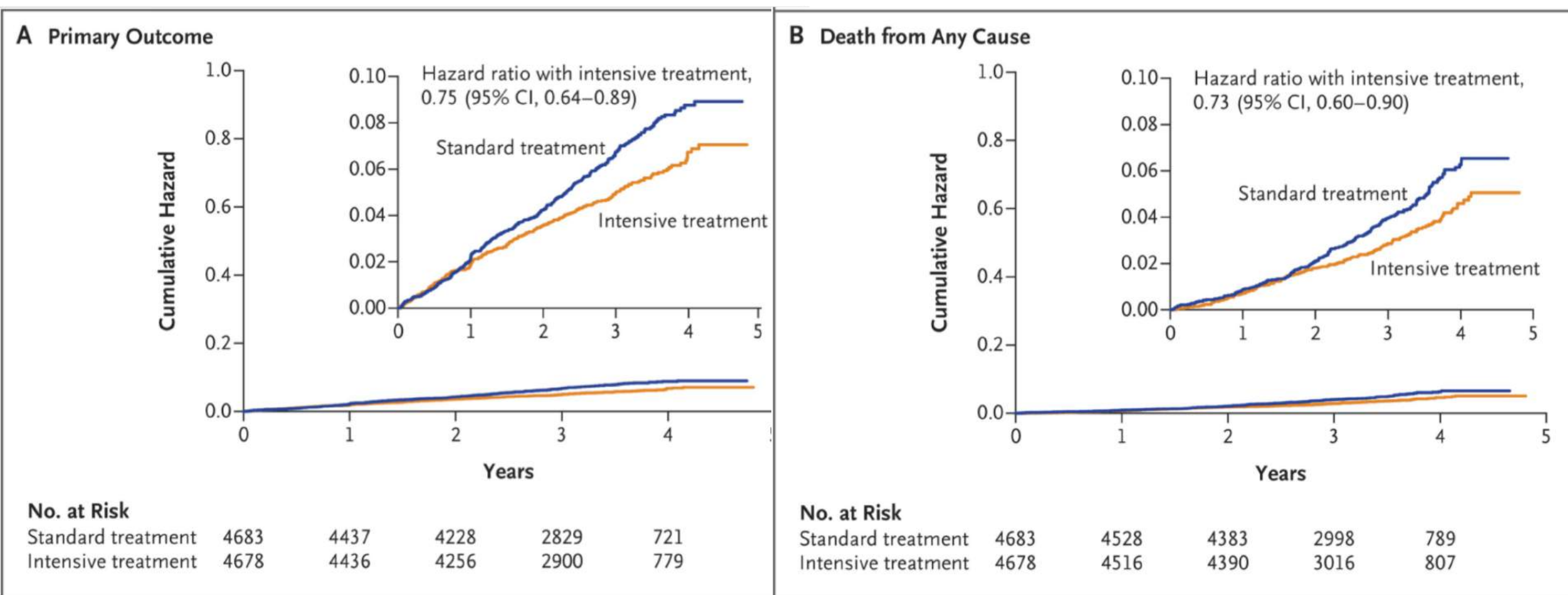
- Cost of unnecessary medications, medication side effects
- Increased clinic visits to control hypertension, increased monitoring
- Potentially increased risk of lower BP goals (orthostatic hypotension, acute kidney injury etc?)

## **SPRINT Trial**

- Patients 50 or over
- Systolic BP 130-180 on 0 or 1, 130-170 on 2 or less, 130-160 on 3 or less, 130-150 on 4 or less medications
- One high risk factor:
  - Cardiac risk
  - CKD (eGFR 20-59 mL/min)
  - age 75 or more,
  - Framingham risk >15 %

- Randomized** to either:
- systolic BP < 120 mm Hg, or
  - control (Intensify if >160 one visit, or >140 two visits)





In nondiabetic patients 50 or over with 1 additional risk factor, targeting a BP systolic less than 120 (compared to 140) led to  
Less cardiac events, better survival



Variable	Intensive Treatment (N=4678)	Standard Treatment (N=4683)	Hazard Ratio	P Value
	<i>no. of patients (%)</i>			
Serious adverse event*	1793 (38.3)	1736 (37.1)	1.04	0.25
Conditions of interest				
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
Monitored clinical events				
Adverse laboratory measure§				
Serum sodium <130 mmol/liter	180 (3.8)	100 (2.1)	1.76	<0.001
Serum sodium >150 mmol/liter	6 (0.1)	0		0.02
Serum potassium <3.0 mmol/liter	114 (2.4)	74 (1.6)	1.50	0.006
Serum potassium >5.5 mmol/liter	176 (3.8)	171 (3.7)	1.00	0.97
Orthostatic hypotension¶				
Alone	777 (16.6)	857 (18.3)	0.88	0.01
With dizziness	62 (1.3)	71 (1.5)	0.85	0.35

Patient population	BP threshold for initiation of antihypertensive therapy		BP treatment target	
	SBP mmHg	DBP mmHg	SBP mmHg	DBP mmHg
Hypertension Canada High-Risk Patient*	$\geq 130$	N/A	$< 120$	N/A
Diabetes mellitus**	$\geq 130$	$\geq 80$	$< 130$	$< 80$
Low Risk (No TOD or CV risk factors)**	$\geq 160$	$\geq 100$	$< 140$	$< 90$

\* BP treatment threshold and target based on AOBP measurements

\*\*BP treatment thresholds and targets based on OBPM.

Qualifies for SPRINT? Aim for 120 systolic

Diabetic? Aim for 130 systolic and 80 diastolic

Low risk? No diabetes or cardiovascular risk factors? Aim for 140/90



# Hypertension Treatment – Where to start

COMORBIDITY	First Line Anti-hypertensive	Second Line Anti-hypertensive
HTN without other comorbidities	ACEi or ARB, BB, Thiazide	Combine first line drugs
DM2 with any complications	ACEi or ARB	CCB, then thiazide
DM2 with no complications	ACEi or ARB, CCB, Thiazide	Combine first line drugs
Coronary artery disease	ACEi or ARB, BB or CCB if angina	Combine first line drugs
Recent myocardial infarction	BB and ACEi (ARB if ACEi intolerant)	Long-acting CCB if BB not effective
CHF (systolic)	ACEi or ARB, BB, Aldost Antag	Hydralazine/Isosorbide if ACEi or ARB intolerant Thiazide or loop diuretic Combined ARB/Neprilysin inhibitor (Entresto)
LVH	ACEi or ARB, CCB, Thiazide	Combine first line drugs
Past Stroke or TIA	ACEi, thiazide	Combine first line drugs
CKD with proteinuria	ACEi or ARB, diuretic	Combine first line drugs

# Clinical Pearls

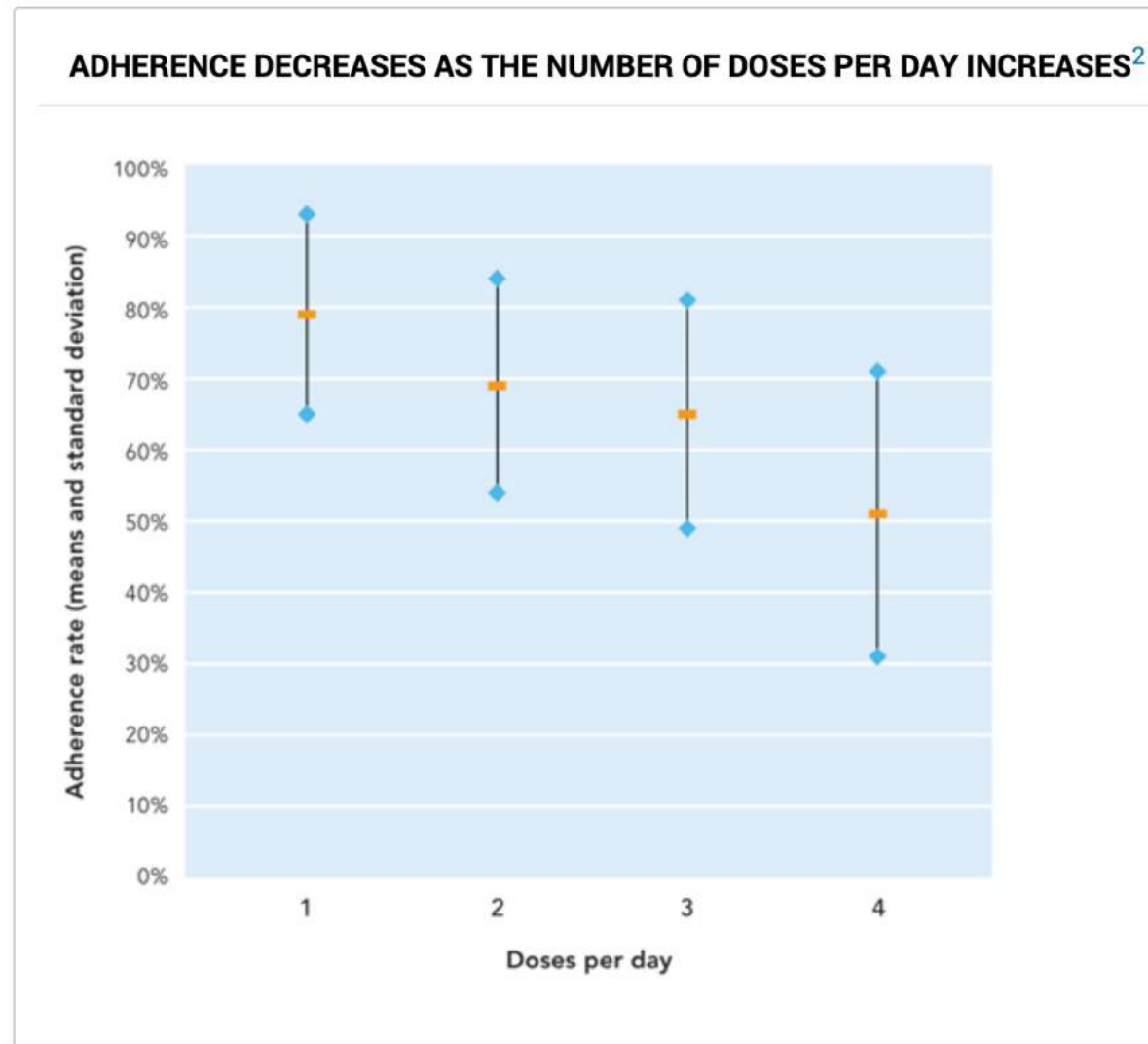
1. Avoid alpha-blockers whenever possible, especially in elderly
2. Avoid short-acting nifedipine
3. If hyperkalemia is a concern, add thiazide diuretic or SGLT2 inhibitor
4. Do not combine ACE inhibitors with ARB drugs

# Who is non-adherent and how to enhance adherence?

Assessment of Adherence:

- 30% of patients are nonadherent (meaning take less than 80% of prescribed medications)
- Pill counting, Prescription follow-up (with pharmacy),
- Supportive patient interviewing
  - “ When you feel like your blood pressure is under control, do you sometimes stop taking your medicine?”
  - “How often do you have difficulty remembering to take all your blood pressure medication?”
  - “Taking medication every day is a big inconvenience. Do you ever feel hassled about sticking to your blood pressure treatment plan?”

# Who is non-adherent and how to enhance adherence?



# How to Enhance adherence?

1. Use single dose daily regimens whenever possible.
2. Use pillboxes or blister packs
3. Use a team-based approach (physician, nurse, pharmacist, etc)
4. Educate patient regarding the benefits and side effects
5. Lower economic barriers
6. Use E-prescription rather than paper prescriptions



*Cramer JA et al. Psychiatr Serv 1998; 49(2): 196-201*  
*Checchi KD et al. JAMA 2014; 312: 1237-1247*  
*Ho PM et al. JAMA Intern Med 2014; 174: 186-193*

*Ruppar TM et al. Eur J Cardiovasc Nurs 20`15: 14; 395-404*  
*Lambert-Kerzner A et al. Patient Prefer Adherence 2015; 9:1053-9.*  
*Choudry NK et al. Health Aff (Millwood) 2010; 29: 1995-2001*

# Identify Patients who Require Consideration of Secondary Hypertension

- 5 to 10% of hypertensive patients have hypertension secondary to a potentially treatable condition
- This may include rare endocrinopathies (phaeochromocytoma) or common conditions (obstructive sleep apnea, hyperthyroidism).
- Consideration in:
  1. Acute rise in blood pressure with previously stable readings
  2. Early onset hypertension (age < 30)
  3. Resistant hypertension (HTN despite 3 maximal dose antihypertensives including diuretic)
  4. Presenting with hypertensive urgency or emergency.
  5. Those presenting with high probability secondary hypertension based on strong clinical clues  
(eg. Signs of Cushings or hypothyroidism)

# Identify Patients who need referral to Hypertension Specialist

- If secondary hypertension is suspected
- Suspected white-coat hypertension or masked hypertension
- Resistant hypertension



# Lifestyle Interventions in Adults with Hypertension

Intervention	Target
Reduce foods with added sodium	<2000 mg /day
Weight loss	BMI <25 kg/m <sup>2</sup>
Alcohol restriction	≤2 drinks/day
Physical activity	30-60 minutes 4-7 days/week
Dietary patterns	DASH diet
Smoking cessation	Smoke free environment
Waist circumference	Men <102 cm      Women <88 cm

ORIGINAL ARTICLE

## Effects on Blood Pressure of Reduced Dietary Sodium and the Dietary Approaches to Stop Hypertension (DASH) Diet

Frank M. Sacks, M.D., Laura P. Svetkey, M.D., William M. Vollmer, Ph.D., Lawrence J. Appel, M.D., George A. Bray, M.D., David Harsha, Ph.D., Eva Obarzanek, Ph.D., Paul R. Conlin, M.D., Edgar R. Miller, M.D., Ph.D., Denise G. Simons-Morton, M.D., Ph.D., Njeri Karanja, Ph.D., Pao-Hwa Lin, Ph.D., [et al.](#), for the DASH–Sodium Collaborative Research Group



# Case 1: Judy Nakogee

→ 54 year old woman living in Attawapiskat

## Comorbidities

Diabetes mellitus type 2 (with retinopathy), most recent HbA1C 9.2%  
Hypertension, Dyslipidemia, Coronary artery disease (with MI 2017)  
Obesity, COPD, Ongoing smoking 1 ppd, Osteoarthritis (knees)

Normal kidney and liver function

## Medications

Atorvastatin 40 mg PO daily  
ASA 81 mg PO daily  
Ibuprofen 2 tabs PO daily  
Metformin 1000 mg PO bid

## Examination

Average Office BP 152/93, hr 81, weight 109 kg, height 140 cm, BMI 55.6  
No edema.  
Remainder of exam normal.

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No edema.  
Remainder of exam normal.



1. What is the target blood pressure?
2. What antihypertensive first /second choice?
3. How to improve adherence?
4. Lifestyle interventions?
5. Blood work to order?

## Case 1: Judy Nakogee: Target BP

Patient population	BP threshold for initiation of antihypertensive therapy		BP treatment target	
	SBP mmHg	DBP mmHg	SBP mmHg	DBP mmHg
Hypertension Canada High-Risk Patient*	$\geq 130$	N/A	$< 120$	N/A
Diabetes mellitus**	$\geq 130$	$\geq 80$	$< 130$	$< 80$
Moderate-to-high Risk (TOD or CV risk factors)**	$\geq 140$	$\geq 90$	$< 140$	$< 90$
Low Risk (No TOD or CV risk factors)**	$\geq 160$	$\geq 100$	$< 140$	$< 90$

Qualifies for SPRINT? (NO- she's diabetic)

Diabetic? Aim for 130 systolic and 80 diastolic

1. What is the target blood pressure?
2. What antihypertensive first /second choice?
3. How to improve adherence?
4. Lifestyle interventions?

# Case 1: Judy Nakogee: Is she high risk patient?

HIGH RISK adult candidates for intensive management:

- **Clinical or subclinical cardiovascular disease**
- CKD (eGFR 20-59 mL/min)
- Framingham risk  $\geq 15\%$
- Age  $\geq 75$

**Consider target  $< 120$  mm Hg for High risk, or  $< 130/80$  for Diabetes mellitus type 2**



# Case 1: Judy Nakogee: What drug should we choose?

Diabetes with complications

Coronary artery disease

COMORBIDITY	First Line Anti-hypertensive	Second Line Anti-hypertensive
HTN without other comorbidities	ACEi or ARB, BB, Thiazide	Combine first line drugs
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# Case 1: Judy Nakogee: How to Enhance Adherence

- Ramipril 2.5 mg PO daily (or) Perindopril 4 mg PO daily
- Add on Bisoprolol 2.5 mg Po daily, or Indapamide/HCTZ
- Bubble pack
- Involve pharmacist
- Educate
- Complete prescription and fax to pharmacy (or E-prescription)



## Case 1: Judy Nakogee: Lifestyle Interventions in Adults with Hypertension

Intervention	Target
Reduce foods with added sodium	<2000 mg /day
Weight loss	BMI <25 kg/m <sup>2</sup>
Alcohol restriction	≤2 drinks/day
Physical activity	30-60 minutes 4-7 days/week
Dietary patterns	DASH diet
Smoking cessation	Smoke free environment
Waist circumference	Men <102 cm      Women <88 cm



# Case 1: Judy Nakogee: Medications that can Worsen Hypertension

- NSAIDs (eg. Aleve, Ibuprofen) or COX-2 inhibitors (eg. Celebrex)
- Cough and Cold medications (contain decongestant Pseudoephedrine)
- Weight loss pills (contain ephedra)
- Corticosteroids (eg. Prednisone)
- Tricyclic antidepressants, Fluoxetine (Prozac)
- Caffeine (energy drinks)
- Immunosuppressants (cyclosporine, tacrolimus)
- Illicit (Anabolic steroids/Cocaine/Amphetamine)





# Case 1: Judy Nakogee: Blood work to order?

1. Urinalysis
  2. Blood chemistry (potassium, sodium and creatinine)
  3. Fasting glucose
  4. Fasting Lipid Panel
  5. Standard 12-lead ECG
- Currently there is insufficient evidence to recommend routine testing of microalbuminuria in people with hypertension who do not have diabetes

## Case 2: Dakota Bushy

→ 29 year old man in Red Lake

→ No medications and no medication allergies

→ No significant past medical or surgical history

→ No diabetes, no kidney or liver disease, no cardiac disease.

→ No symptoms- feels great

→ Exam: BP 191/112, hr 84

Abdominal/cardiac/respiratory exam unremarkable



1. What is Dakota's target blood pressure?
2. What antihypertensive first /second choice?
3. Does he require a workup for secondary hypertension?
4. Does he require referral to a hypertension specialist?

## Case 2: Dakota Bushy- What is the target?

Patient population	BP threshold for initiation of antihypertensive therapy		BP treatment target	
	SBP mmHg	DBP mmHg	SBP mmHg	DBP mmHg
Hypertension Canada High-Risk Patient*	$\geq 130$	N/A	$< 120$	N/A
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Low Risk (No TOD or CV risk factors)**	$\geq 160$	$\geq 100$	$< 140$	$< 90$

\* BP treatment threshold and target based on AOBP measurements

\*\*BP treatment thresholds and targets based on OBPM.

## Case 2: Dakota Bushy: What is first (and second) choice Anti-hypertensive?

COMORBIDITY	First Line Anti-hypertensive	Second Line Anti-hypertensive
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## Case 2: Dakota Bushy: Workup for secondary Hypertension?

- 1. Acute rise in blood pressure with previously stable readings**
- 2. Early onset hypertension (age < 30)**
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- 4. Presenting with hypertensive urgency or emergency.**
5. Those presenting with high probability secondary hypertension based on clinical clues  
(eg. Signs of Cushings or hypothyroidism)



## Case 2: Dakota Bushy: Refer to hypertension specialist?

- **If secondary hypertension is suspected**
- Suspected white-coat hypertension or masked hypertension
- Resistant hypertension



**Thank you**

# Multi-Subspecialty Education for low-Resource Settings (MSERS) Series

- NEED MORE TOPICS!  
August 26 (2021) to June (2022) will need 20 topics. Send to [ben@benthomson.org](mailto:ben@benthomson.org)
- Recorded sessions available online  
<https://apil.ca/multi-subspecialty-education-for-low-resource-settings-msers/>
- Due to your feedback from evaluations, slides will be available the evening prior to the session
- Please complete evaluations:  
→ Evaluation for THIS session please click on link in chat box:
- For Certificate of Attendance, complete the Evaluation of the session and it will be emailed to you





**Thank you**