

- The content of this Webinar presentation, in its enduring state, will expire on 05/21/2015 from this date on CNE's can no longer be awarded.
- Measures have been taken, by the Utah Department of Health, Bureau of Health Promotions, to ensure no conflict of interest in this activity.

HYPERTENSION 2014: IMPROVING CONTROL RATES

Barry Stults, M.D.
Division of General Medicine
University of Utah Medical Center
and
Salt Lake City, VA Medical Center

NEW HYPERTENSION GUIDELINES, 2014

- JNC-8 Panel: JAMA 2014; 311:507
- JNC-8 Minority Panelists: Ann Int Med 2014; 160:449
- AHA/ACC/CDC Advisory: J Am Coll Card 2014; 63:1230
- Am Society of Hypertension: J Clin Hypertens 2014; 16:14
- Canadian Hypertension Education Program: Can J Card 2014; 30:485
- Joint British Societies 3: Heart 2014; 100 (Suppl 2):1
- ESH/ESC: J Hypertens 2013; 31:1281
- Japanese Society of Hypertension: Hypertension Res 2014; 37:253
- KDIGO Blood Pressure Work Group: Kid Int 2012; Suppl 2
- American Diabetes Association: Diabetes Care 2014; 37 (Suppl 1):S4

THE MESSAGES ARE NOT CONSISTENT!

NEW HYPERTENSION GUIDELINES, 2014: GREATER CLARITY OR NEAR CHAOS?

“The multitude of guidelines from respected professional bodies and individuals have caused needless confusion bordering on chaos.”

C.V.S. Ram, M.D.

J Clin Hypertens 2014; 16:251

HYPERTENSION: UNBELIEVABLY COMMON!

- **Prevalence:**

- 33% of adult Americans
- 42% of adult black Americans
- 67% of Americans age ≥ 60 y
- 90% of Americans age ≥ 85 y
- CKD:
 - eGFR ≥ 60 : 67% < 30: 92%
 - Hemodialysis: 60% Peritoneal: 30%



78 million Americans with HTN!

Projected prevalence in 2030: 41% of adults

HYPERTENSION: THE DOMINANT CONTRIBUTOR TO GLOBAL CARDIOVASCULAR DISEASE AND DEATH

“Rampant cardiovascular disease exerts enormous health and economic burdens on the individual, family, society, and nation as a whole. In other words, the adverse impact of hypertension extends beyond the individual and should be viewed as a contagion.”

C.V.S. Ram, M.D.

J Clin Hypertens 2014; 16:251

HYPERTENSION: MORBID, LETHAL!

TOP RISK FOR GLOBAL MORTALITY/DISABILITY

Increases RR by 2.0-4.0 fold for:

- CAD, stroke, HF, PAD, AF, CKD
- Dementia: vascular, Alzheimers
- Mild cognitive deficits

Attributable risk for HTN:

- Stroke —————→62%
- CKD —————→56%
- HF —————→49%
- MI —————→25%
- Premature death—→24%

Aftermath:

- Shortens lifespan 5y – 16% of deaths
- \$46.4 billion/y in U.S. (\$94 billion/y, total)

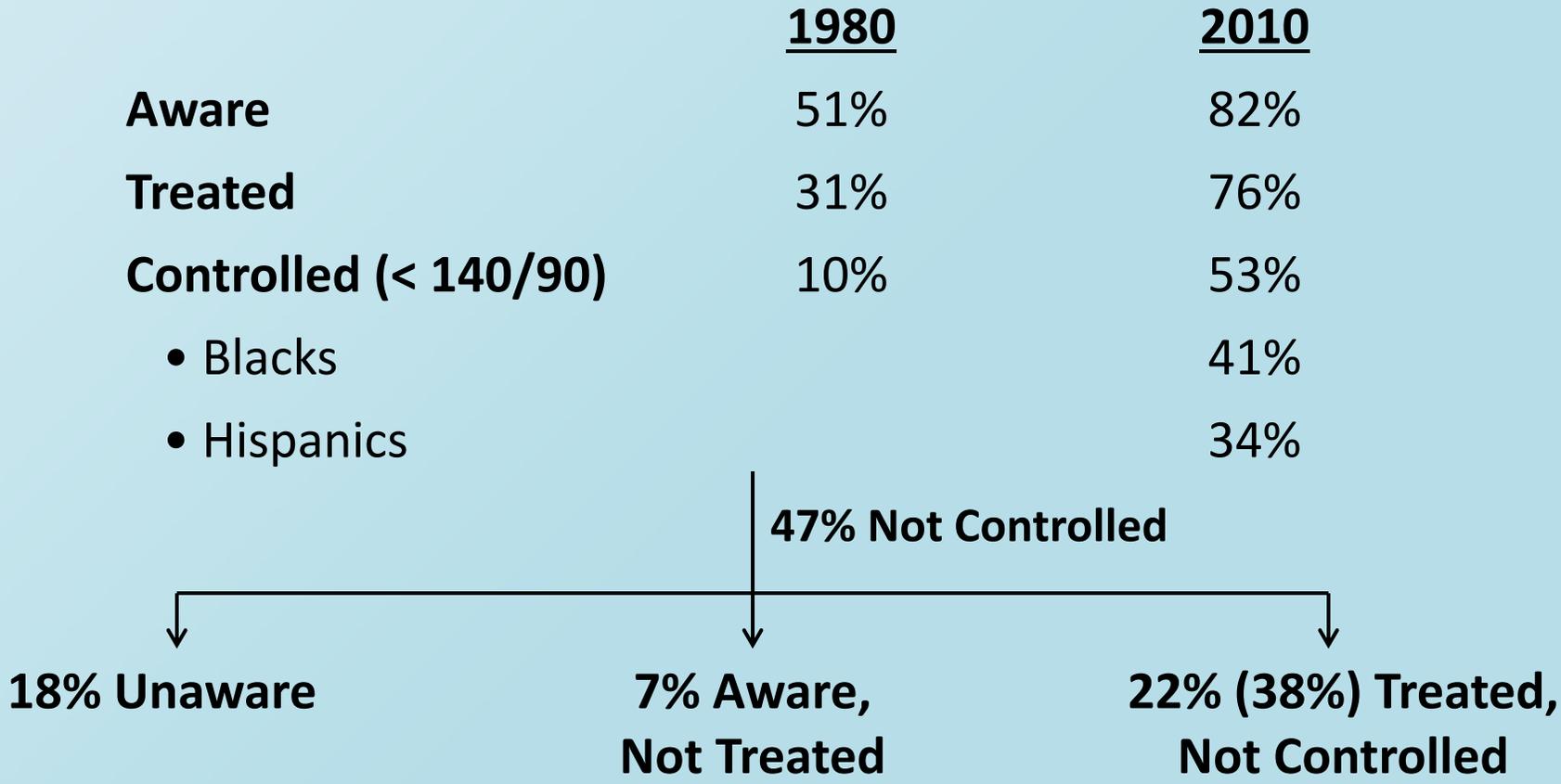
HYPERTENSION: VERY TREATABLE!

- ↓ 10/5 mm Hg at age 65 for 10y:

<u>Complication</u>	<u>Average % Reduction</u>
MI	25%
Stroke	40%
CHF	50%
Death	15%
Dementia	?

HTN CONTROL: IMPROVING, BUT STILL UNACCEPTABLE

NHANES:

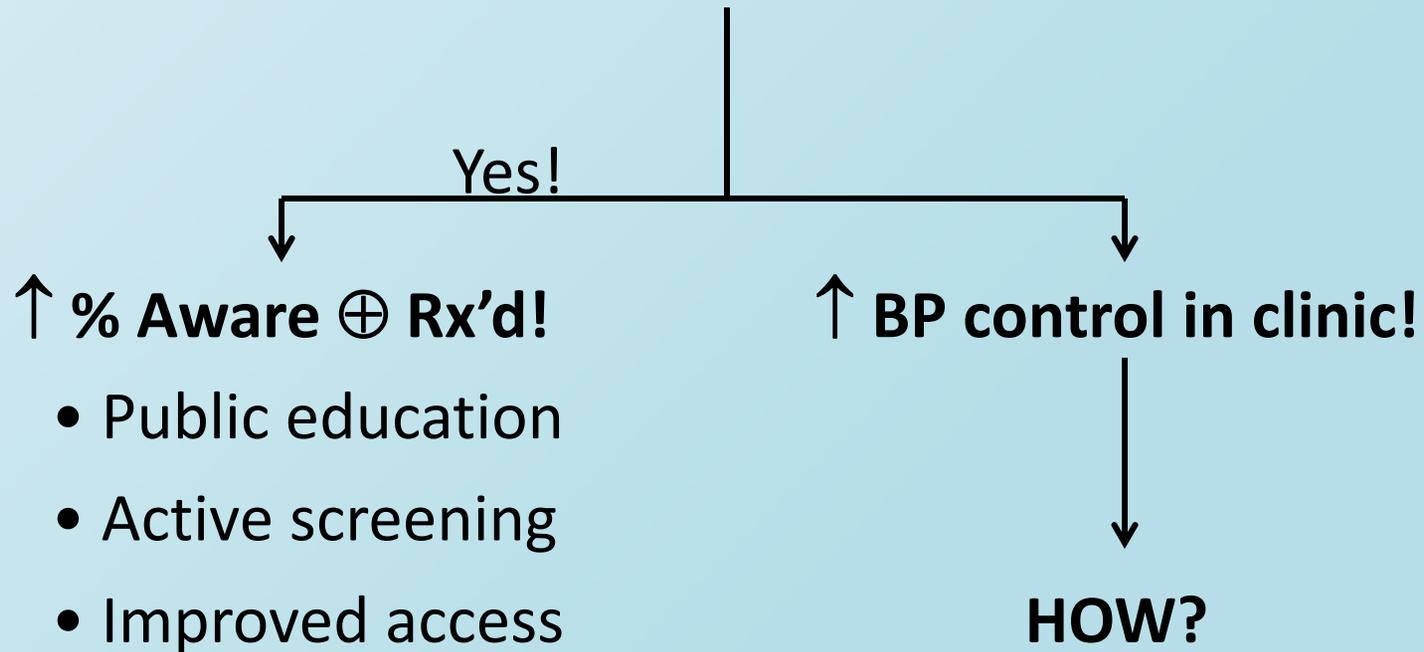


Circulation 2014; 129:e28

JACC 2012; 60:599

JAMA 2010; 303:204

HYPERTENSION CONTROL: CAN WE DO BETTER?



MMWR 2012; 61:703

MMWR 2011; 60:103

HOW TO IMPROVE OFFICE HTN CONTROL?

Measure office BP accurately!

- Usually measured inaccurately
- Facilitated by sequential automatic BP measurement

Detect/document white-coat hypertension

- **Out-of-office BP measurement**
 - Home BP monitoring – Standardized
 - 24-hour ambulatory BP measurement, if available
- **Sequential automatic BP measurement on patients isolated in exam room may detect WCH**

HOW TO IMPROVE OFFICE HTN CONTROL?

- Improve therapeutic efficiency:
 - Initial low-dose, 2-drug Rx for many
 - Optimal 2 → 4 drug algorithm use
 - Emphasize low cost generic drugs
 - Emphasize fixed-dose generic combination pills
 - Drug titration every 2-4 weeks:
 - Office visits:
 - Clinician vs MA/LPN/RN/PharmD
 - Home BP monitoring
 - Telephone vs Web-based monitoring

HOW TO IMPROVE OFFICE HTN CONTROL?

- Improve office systems:
 - **Registry of uncontrolled HTN patients:**
 - Regular feedback to team
 - Recall of patients
 - **Team care:**
 - BP follow-up:
 - Office visits to MA/LPN/RN/PharmD
 - Telephone/web-based home BP monitoring
 - Patient education/adherence assessment

IMPROVE HTN CONTROL: MEASURE BP ACCURATELY!

“Blood pressure reading does not seem to be done correctly in any clinic...It appears to be so simple that anyone can do it, but they can’t...”

JAMA 2008; 299:2842

- 9 studies with 9000 patients, 1995-2011:

**Routine clinical practice
BP measurement**

vs

**Research quality
BP measurement**

– Accurate BP measurement ↓ BP ≈ 10/7 mm Hg!

Can J Card 2012; 28:341

Hypertension 2010; 55:195

BP MEASUREMENT: KEY TECHNIQUES

△ BP (mm Hg) if not done

Rest ≥ 5 min, quiet

↑ **12/6**

Seated, back supported

↑ 6/8

Cuff at midsternal level

↑ ↓ 2/inch

Correct cuff size

↑ **6-18/4-13 if too small**

↓ 7/5 if too large

Bladder center over artery

↑ 3-5/2-3

Deflate 2 mm Hg/sec

↓ SBP/↑ DBP

No talking during measurement

↑ 17/13

If initial BP > goal BP:

1st reading higher

3 readings, 1 min apart

• “Alerting response”

Discard 1st, average last 2

• Reclassify 18-34% as normotensive

• **Requires 8-11 minutes!**

OFFICE BP MEASUREMENT: HOW TO DO IT?

- **Can we teach/implement accurate manual BP measurement?**
 - Doubtful: repetitive training/monitoring/time too difficult
 - **Automated electronic BP measurement favored by ASH, 2014:**
 - Only accurate devices validated by AAMI/BHS/IP protocols
 - www.bhsoc.org/bp-monitors/bp-monitors/
 - www.dableducational.org
 - Consider devices taking 3-6 measurements automatically
 - ↑ accuracy and reproducibility, and ↓ white-coat effect
 - BpTRU, Omron HEM-907, MicroLife Watch BP Office
- Federal Practitioner 2012; 29:35 J Hypertens 2014; 32:3 J Clin Hypertens 2014; 16:83

AUTOMATED OFFICE BP

3 validated devices automatically measure/average multiple BP's:

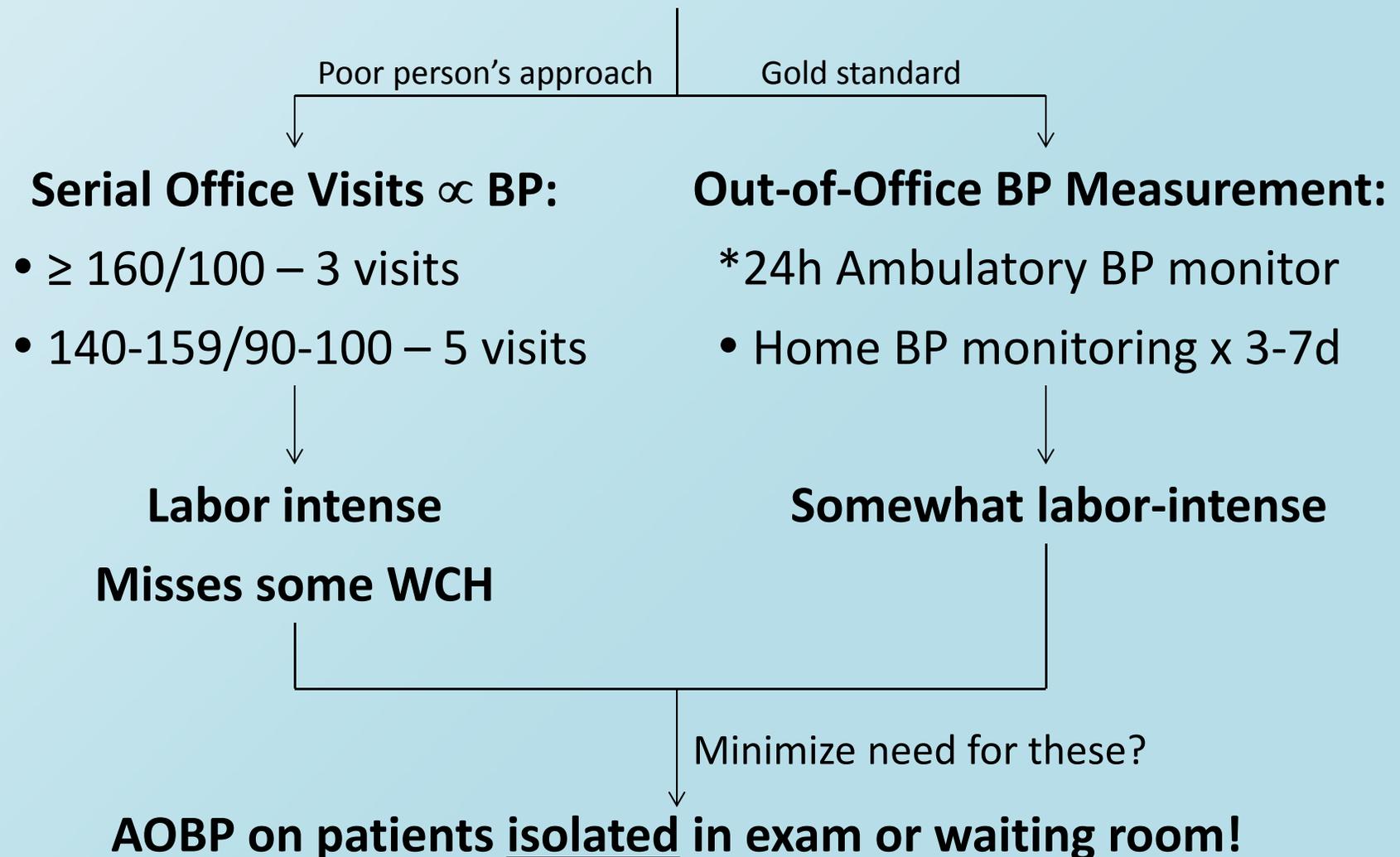
- | | | |
|--|---|--|
| BpTRU
(\$900-1100) | → | 6 readings – average last 5 <ul style="list-style-type: none">• q 1 min: start of one → start of next |
| Omron HEM-907
(\$520) | → | 3 readings – average all 3 <ul style="list-style-type: none">• q 1 min: end of one → start of next |
| Microlife Watch BP office
(\$1100) | → | 3 readings – average all 3 <ul style="list-style-type: none">• q 1 min: end of one → start of next• Additional auscultatory mode |

- Provide comparable mean readings
- 4-5 min to complete readings

IMPROVE HTN CONTROL: DETECT WHITE-COAT HTN!

- 20% of Office HTN = White-coat HTN (WCH), ie, office BP > out-of-office BP
 - **Benefits of detection of WCH:**
 - Avoid unnecessary Rx
 - Economic savings – visits and medications
 - Improve HTN control rates
 - J Clin Hypertens 2013; 15:55 BMJ 2011; 343:d5421
 - J Clin Hypertens 2014; 16:4

HOW TO DETECT WHITE-COAT HTN?



REDEFINE OFFICE BP MEASUREMENT: SEQUENTIAL, AUTOMATED BP: PATIENT ALONE

3 basic principles of AOBP:

- **Fully automated device** —————→ **Eliminates many technical errors**
 - More accurate
- **Multiple measurements taken** → **Controls for BP variability**
 - More reproducible
- **Performed in isolation** —————→ **Reduces white-coat effect**
 - Clinic room
 - Waiting room, apart
 - Equivalent to daytime ABPM

Can J Card 2012; 28:341

J Clin Hypertens 2014; 16:83

J Hypertens 2012; 30:1894

Blood Press Mon 2012; 17:137

SEQUENTIAL BpTRU READINGS IN 284 PATIENTS IN PRIMARY CARE

<u>Reading No.</u>	<u>AOBP</u>
1 (observer present)	147/82
2 (observer absent)	140/79
3 “	136/78
4 “	134/77
5 “	132/76
6 “	133/77
<hr/> Mean 2-6	<hr/> 136/78

What does this pattern mean?

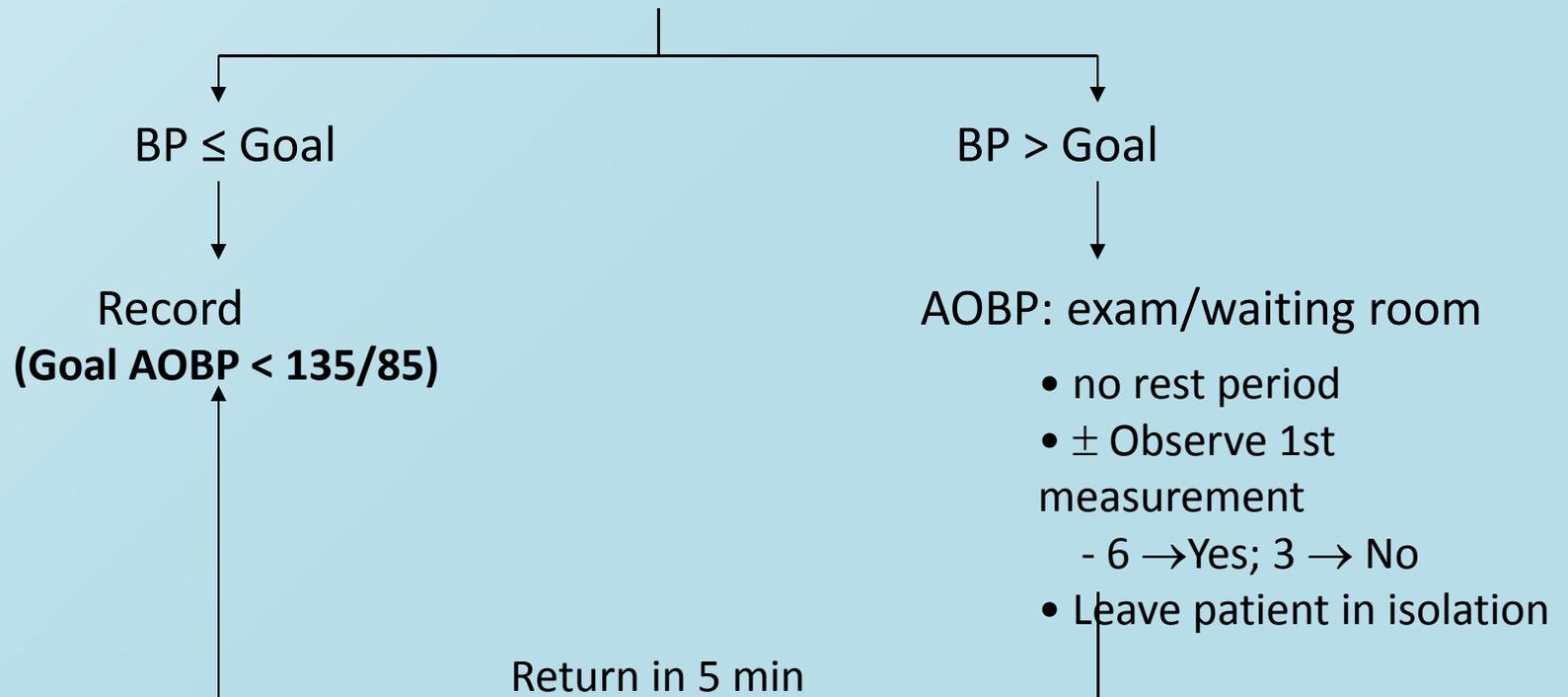
AOBP ON ISOLATED PATIENT IS LOWER THAN
MANUAL ACCURATE BP ON OBSERVED PATIENT

<u>Equivalent BPs to Dx HTN:</u>	<u>BP (mm/Hg)</u>
Research quality manual office BP	140/90
AOBP on isolated patient	135/85
Home BP, mean of 3-7 days	135/85
24 hour ABPM study:	
- Mean daytime awake	135/85
- Full 24 hour mean	130/80

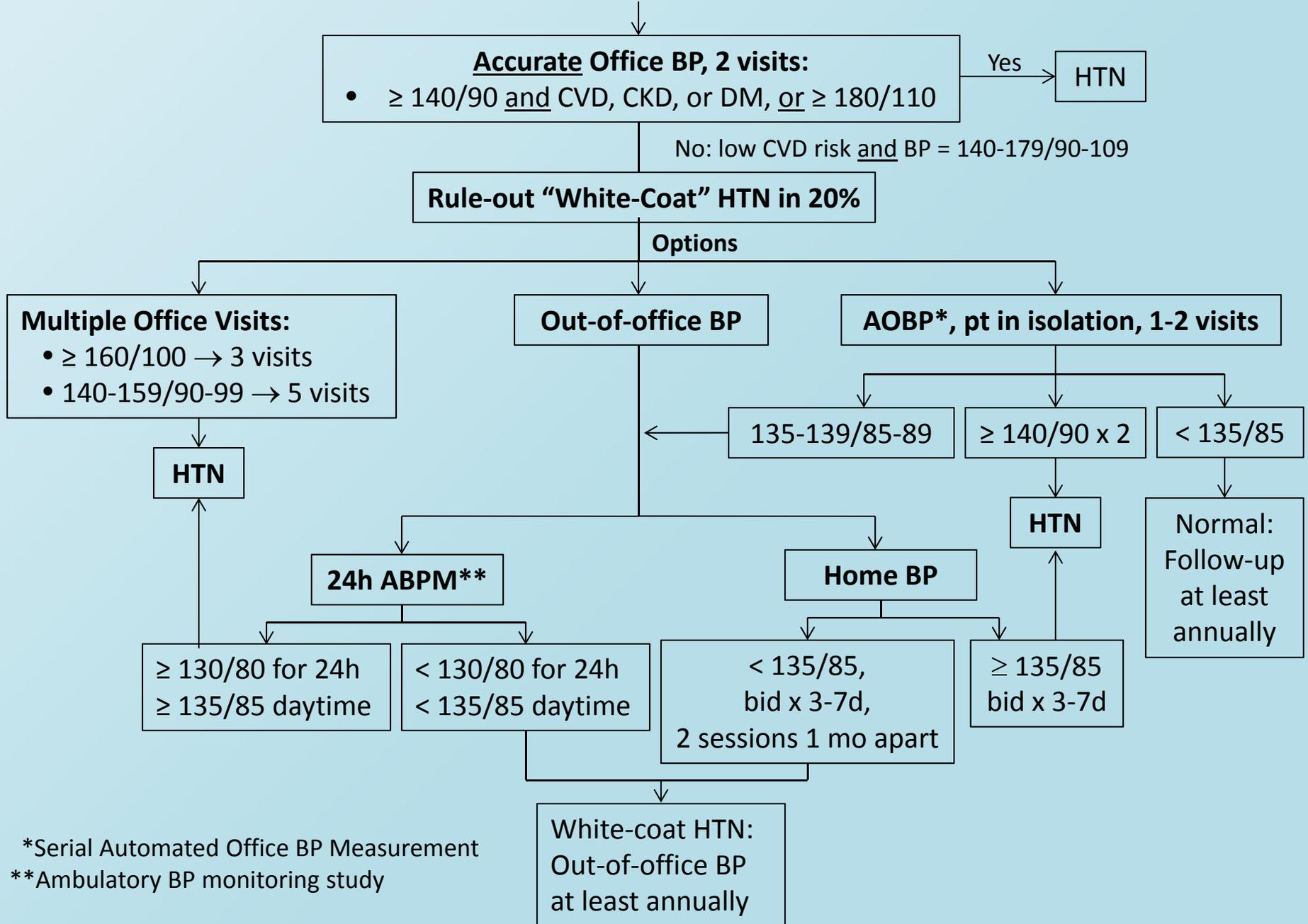
AOBP IN OFFICE PRACTICE: ALGORITHM

High quality manual or electronic 1st BP measurement

- Rest 5 min
- Correct cuff size
- Etc.



DIAGNOSIS OF HYPERTENSION



*Serial Automated Office BP Measurement
 **Ambulatory BP monitoring study

OUT-OF-OFFICE BP MEASUREMENT

Still needed to accurately Dx HTN in some pts:

- **24-hour ambulatory BP monitor study**
 - Useful but less available
- **Home BP monitoring, standardized, for 3-7d**
 - More available
 - Multiple uses:
 - Dx HTN
 - Adjust Rx at home – improve control
 - Monitor serially

- J Hum Hypertens 2010; 24:779 J Hypertens 2013; 31:1281 Can J Card 2013;29:528

HBPM MONITORS

- **Must be validated: AAMI, BHS, and/or IP protocols**
 - Omron (www.omronhealthcare.com)
 - A&D – Lifesource (www.andmedical.com)
 - MicroLife (www.microlife.com)
 - www.hypertension.ca/devices-endorsed-by-hypertension-canada
 - www.bhsoc.org/bp-monitors/bp-monitors/
- **Arm cuffs only (unless massive obesity)**
- **Correct cuff size for mid-arm circumference**
 - < 33 cm —————> regular cuff
 - 33-43 cm —————> large adult or self-adjusting
 - > 43 cm —————> wrist cuff (if wrist < 22 cm)

HBPM MONITORS

- **Features \propto cost: \$50-\$110**

- Average last 3 readings \longrightarrow \$70.00
- 2-use mode \longrightarrow \$70.00
- Self-adjusting cuff \longrightarrow \$90.00
- **Automatic 3 readings \oplus average \longrightarrow \$100.00**
- AM/PM 8 wk averages \longrightarrow \$100.00
- Software manager \longrightarrow \$110.00

HBPM: PRECISE PREPARATION/MEASUREMENT TECHNIQUE

Same careful preparation/technique as required in office:

- **Home BP technique video from CHEP**
 - www.youtube.com/watch?v=eqajdX5XU9Y&feature=plcp
- **Home BP technique written instructions:**
 - UUMC/VAMC Home BP Measurement handouts
- **Check patient technique, cuff accuracy in office**
 - Pt R arm/Office L arm → Office R arm/Pt L arm
 - < 5 mm hg difference between averages

HBPM: RECOMMENDED MONITORING PROTOCOL

Morning

≤ 1h post-awaken

Post-micturition

Pre-breakfast

Pre-BP med

Rest quietly 3-5 min

Measure X 2, 1 min apart

Work

?

Evening

6-9 PM

Pre-supper (or pre-bed?)

Pre-BP med

Rest quietly 3-5 min

Measure X 2, 1 min apart

- 
- **For Dx or 2wk post-med Δ :** For 3-7 days (12-28 readings)
- \pm drop 1st day, average last 2-6 days
 - **Stable BP period:** For 3-7d, q 3-4 mo vs ongoing 3d/wk
 - **Goal home BP < 135/85 (< 130/80 for some)**

Home Blood Pressure Monitoring Data Sheet

Name: _____

Date This Sheet Started: ____/____/____

Date	Day 1		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Day 2		Day 3		Day 4		Day 5		Day 6		Day 7		Day 2		Day 3		Day 4		
	AM	PM																															
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Average BP last 6 days = ____ / ____

- After resting 5 minutes, take your morning BP twice, 1 minute apart, before your medications and breakfast. Repeat this same procedure in the evening (6-9PM) before any medications. Do this for either 3 or 7 days as instructed by your clinician.
- On the chart above, record the average AM and PM BP reading for the last six of the seven days. In each column, make an "x" as close as you can to your average systolic (top number) and a diastolic (bottom number) BP, as in the example on the far left side of the chart
- For patients with diabetes, your goal home BP is generally below 130/80 mm Hg (dotted lines). For all other patients, your goal home BP is below 135/85 mm Hg (solid lines).

TREATMENT OF HYPERTENSION

TARGET BP 2014: STILL NO CONSENSUS!

<u>Guideline</u>	<u>General Population</u>	<u>Age ≥ 80y</u>	<u>CKD</u>	<u>DM</u>
ASH 2014	< 140/90	< 150/90	< 140/90	< 140/90
ACC/AHA 2014	< 140/90	< 150/90	< 140/90	< 140/90
CHEP 2014, JBS3 2014	< 140/90*	< 150/90 (Rx if ≥ 160**)	< 140/90	< 130/80
JNC-8 2014				
• Majority:				
- Age < 60	< 140/90	---	< 140/90	< 140/90
- Age ≥ 60	< 150/90***	< 150/90		
• Minority:	< 140/90	< 150/90		
ADA 2014	---	---	---	< 140/80
NKF/KDIGO 2012	---	< 150/90?	< 140/90	< 140/90
• ACR ≥ 30	---	?	< 130/80	< 130/80

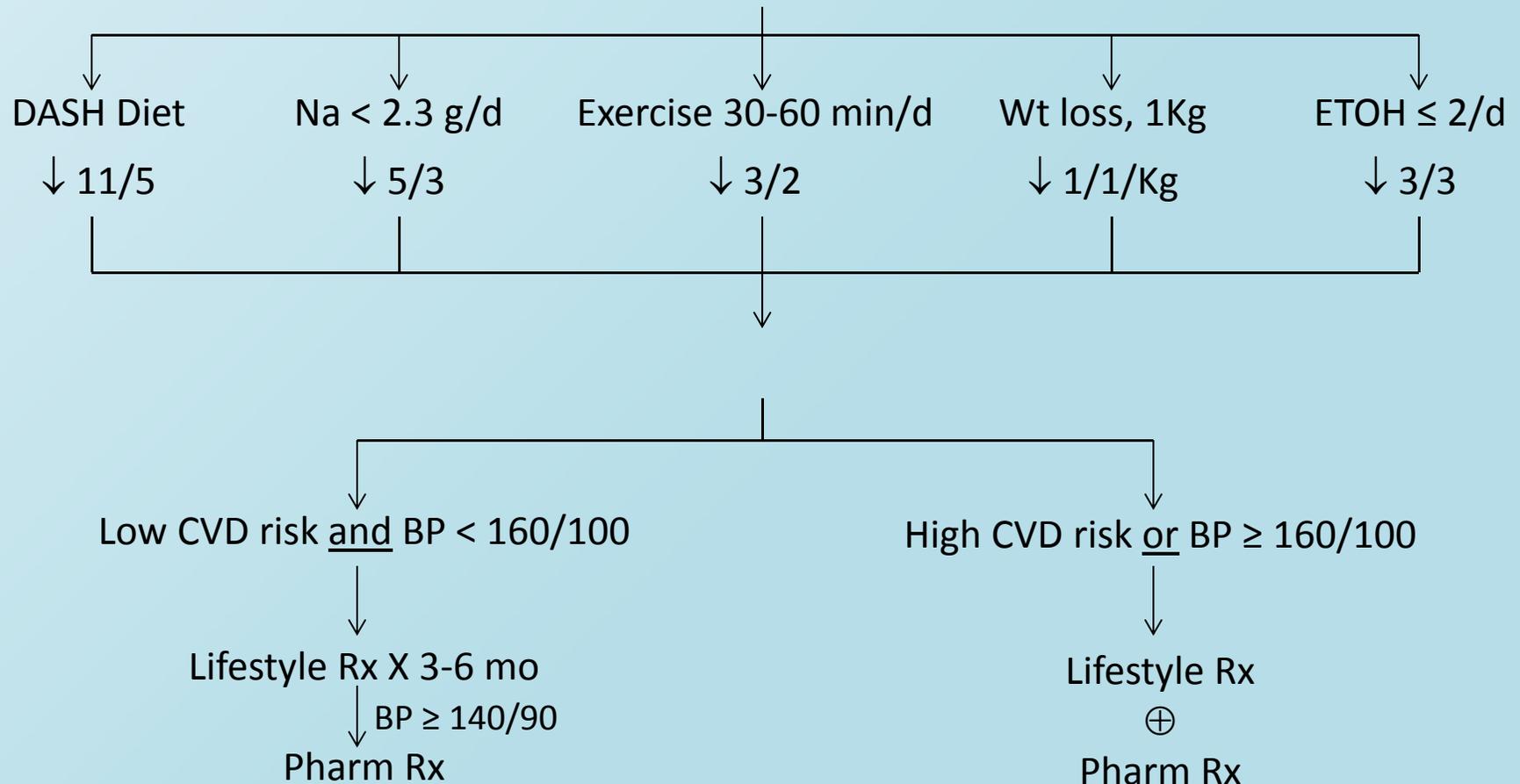
* < 160/100 if no TOD or CVD risk factors

** If no TOD or DM; otherwise Rx if ≥ 140/90

*** No down-titration needed if tolerate < 140/90

LIFESTYLE MODIFICATION FOR HYPERTENSION

Select ≥ 1 Intervention \propto Motivation



LIFESTYLE MODIFICATION EDUCATION TOOLS

“Healthy Eating For Healthy Blood Pressure”

www.hypertension.ca/images/2012_HealthyEatingForHealthyBloodPressure_EN_P1017.pdf

“Sodium 101”

www.sodium101.ca

“Healthy Eating Tips For Healthy Blood Pressure”

www.hypertension.ca/eat-a-healthy-diet

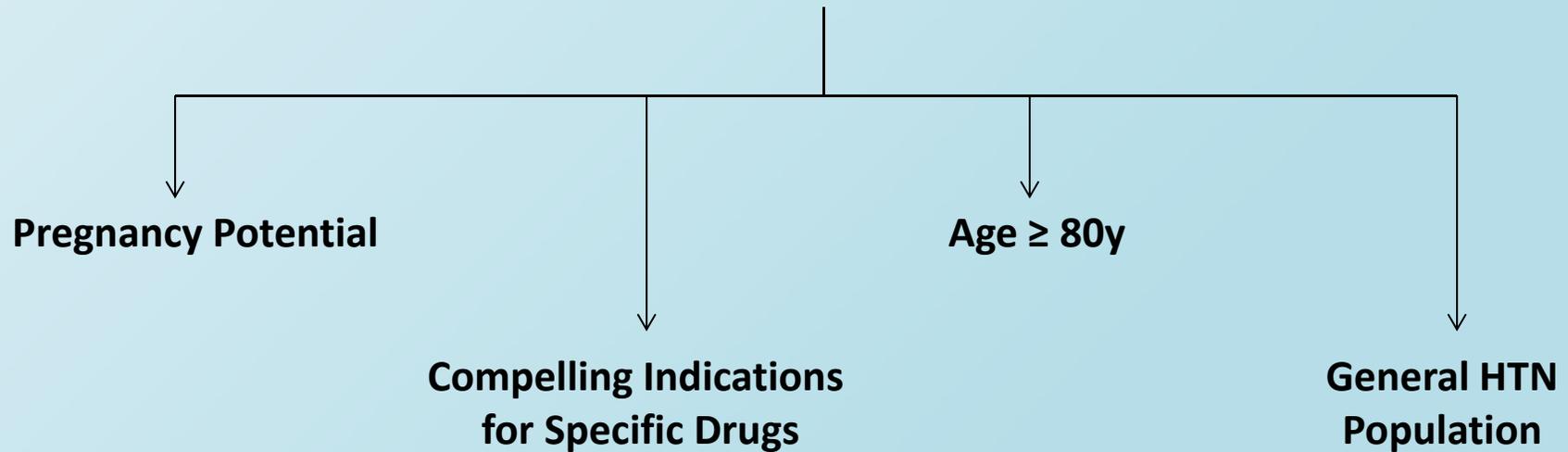
Mayo Clinic abbreviated DASH

<http://www.mayoclinic.com/health/dash-diet/H100047>

In Spanish:

<http://www.wellnessproposals.com/nutrition/handouts/dash-diet/DASH-diet-eating-plan-spanish-version.pdf>

SELECTING INITIAL PHARMACOLOGIC THERAPY



J Clin Hypertens 2013; 15:874

J Hypertens 2013; 31:1925

JAMA 2013; 310:1274

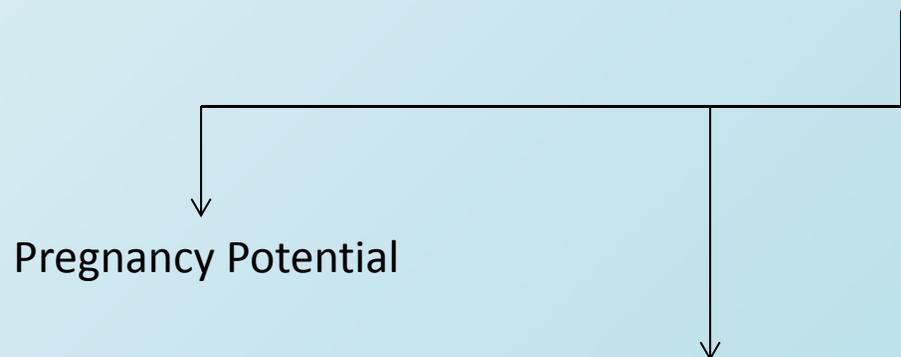
SELECTING INITIAL PHARMACOLOGIC THERAPY



Pregnancy Potential

- No ACE-I or ARB
- OK:
 - Thiazides
 - CCBs
 - BBs

SELECTING INITIAL PHARMACOLOGIC THERAPY



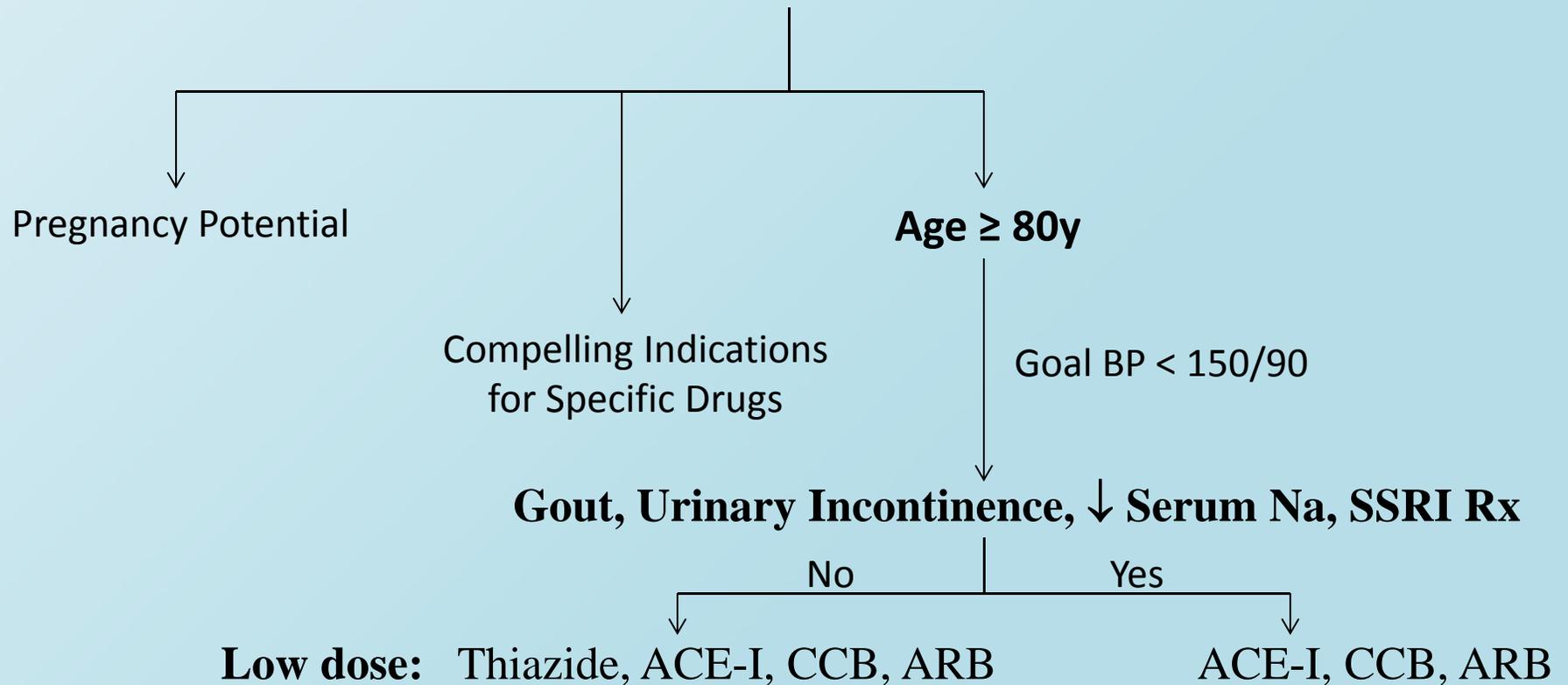
Pregnancy Potential

Compelling Indications for Specific Drugs

- **DM or CKD:**
 - Albuminuria → ACE-I or ARB
 - No albuminuria → ACE-I, ARB, CCB, Thiazide*
- **Recent MI or Systolic HF** → ACE-I (ARB) ⊕ BB
- **Stable CAD** → ACE-I (BB/CCB if angina)

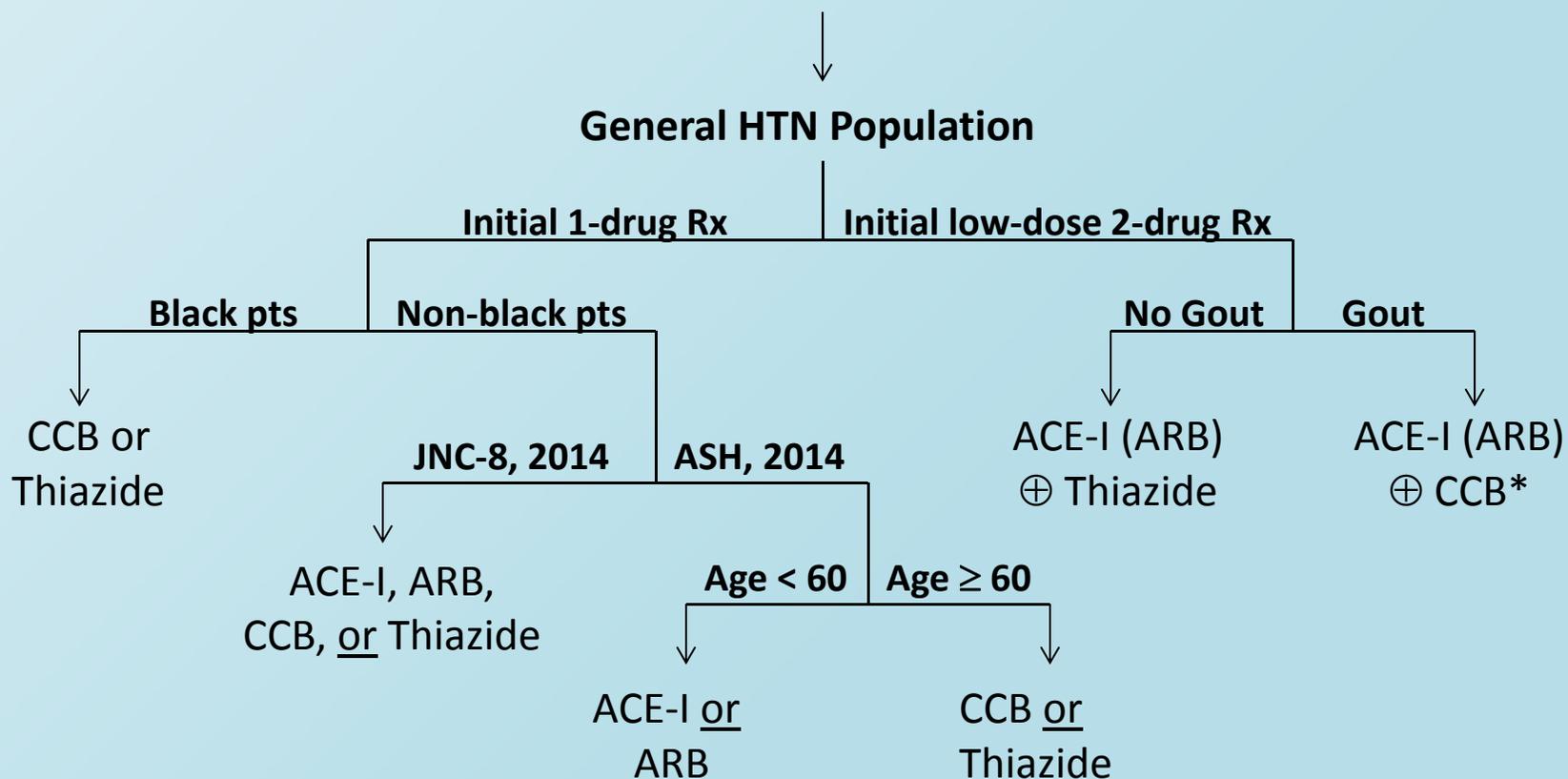
*JNC-8: ACE-I/ARB for all CKD

SELECTING INITIAL PHARMACOLOGIC THERAPY



*BBs may provide less stroke prevention age ≥ 60y

SELECTING INITIAL PHARMACOLOGIC THERAPY



*Consider this Rx if high CVD risk (ACCOMPLISH RCT, 2008)

WHY INITIAL LOW-DOSE, 2-DRUG RX?

1. $\geq 75\%$ of HTN patients require ≥ 2 drugs
2. Vs maximal dose of single drug:
 \uparrow BP reduction \oplus \downarrow drug titrations \oplus \downarrow side effects

Meta-analysis of 354 RCTs:

<u>Dose</u>	<u>Mean \downarrow BP</u>
$\frac{1}{2}$ Standard	7/4
Standard	10/5
2X Standard	12/7
2 drugs, $\frac{1}{2}$ Standard	14/8
4 drugs, $\frac{1}{4}$ Standard	24/11

Side effects \propto Dose (except ACE-I/ARB)

STANDARD DOSES OF ANTI-HTN DRUGS

Mean reduction in BP = 10/5 mm Hg:

HCTZ → 25 mg

Chlorthalidone → 12.5 mg

Lisinopril → 10 mg

Benazepril → 20 mg

Losartan → 50 mg

Valsartan → 80 mg

Telmisartan → 40 mg

Amlodipine → 5 mg

Diltiazem → 240mg

Verapamil → 240 mg

Metoprolol → 100 mg (bid)

Carvedilol → 25 mg (bid)

WHY INITIAL LOW-DOSE, 2-DRUG RX?

3. **Improved HTN and possibly CVD outcomes!**
 - **20% ↑ HTN control rates at 6-12 mo in RCTs**
 - ↓ Clinician therapeutic inertia ⊕ ↑ pt adherence
 - **10-12% ↓ CVD events at 1-2 y in obs. studies**
4. **Decreased cost: ↑ \$10 → 30% ↓ adherence**
 - **Inexpensive single-pill generic combinations**
 - Lisinopril 20 mg/HCTZ 25 mg: \$10 for 90d
 - **Fewer co-pays with insurance programs**
5. **Single pill combinations ↑ adherence**

Still, 2014 guidelines: only if BP \geq 160/100

“OPTIMAL” 3-DRUG RX: GENERAL HTN POPULATION



- Effectively ↓ BP, ↓ CVD events, ↓ side effects



Less evidence

- **ACE-I (ARB) ⊕ CCB ⊕ Thiazide diuretic**

- ↓ BP additively in several studies
- ↓ side effects of Δ potassium, CCB-induced edema
- ? ↓ CVD events: post-hoc analysis of ADVANCE

Hypertension 2009; 54:19; 32 Hypertension 2014; 63:220; 259

J Hypertens 2014; 32:3

Diabetes Care 2013; 36:S4

General HTN Population: Control BP in < 8-12 wks

Older, no gout, not high CVD risk or DM-prone

Lisinopril 20 mg/HCTZ 25 mg tabs:

$\frac{1}{2} \xrightarrow{2-4 \text{ wk}} 1 \xrightarrow{2-4 \text{ wk}} 2 \text{ tabs, } \underline{\text{prn}}$
↓ Not controlled, 2-4 wk

Add Amlodipine 5 mg tabs:

$\frac{1}{2} \xrightarrow{2-4 \text{ wk}} 1 \text{ tab, } \underline{\text{prn}}$
↓ Not controlled, 2-4 wk

Increase amlodipine to 10 mg tab qd

Younger, gout, high CVD risk, or DM-prone

Lisinopril 20 mg tabs ⊕ Amlodipine 5 mg tabs:

$\frac{1}{2} \text{ tab each} \xrightarrow{2-4 \text{ wk}} 1 \text{ tab each, } \underline{\text{prn}}$
↓ Not controlled, 2-4 wk

2 tab Lisinopril ⊕ 10 mg amlodipine tab

↓ Not controlled, 2-4 wk

1 tab Lisinopril 20 mg/HCTZ 25 mg

⊕ Amlodipine 10 mg

↓ Not controlled, 2-4 wk

2 tab Lisinopril 20 mg/HCTZ 25 mg

⊕ Amlodipine 10 mg

***Monitor potassium/sodium/creatinine with dose changes**

HOW TO IMPROVE HYPERTENSION CONTROL?

Improve office systems: team-based care (TBC)

- **Kaiser Permanente model**
 - HTN control: 54%, 2004 → 85%, 2012 → ↓ CVD events
- Meta-analyses of 67 studies:
 - TBC ↓ BP by 5.4-9.7/1.8-4.2 mm Hg
- Intervention components:
 - **Standardized, high quality BP measurement**
 - **HTN Rx algorithm for general population:**
 - Simple, easy to follow
 - RN/clinical pharmacist follow-up
 - Initial 2-drug, fixed-combination Rx (**Lis 20/HCTZ 25**)
 - Evidence-based

JAMA 2013; 310:699 J Hum Hypertens 2014; 28:44

www.thecommunitiyguide.org/cvd/RRteambasedcare.html

Can J Card 2014; on-line 1/6, Sim JJ

HOW TO IMPROVE HYPERTENSION CONTROL?

- **Kaiser Permanente model**
 - **Registry of HTN patients: EMR/paper-based**
 - **Continuous performance measurement**
HTN control rates: baseline → goal
 - **Identify uncontrolled HTN patients**
 - Letter re- inadequate HTN control
 - Schedule follow-up/✓ missed appts
 - Performance feedback q 1-3 mo to team meetings
 - Document other HTN process measures (education, etc.)

HOW TO IMPROVE HYPERTENSION CARE?

- **Kaiser Permanente model:**
 - **Team Care: shared responsibility for HTN care**
 - **Team structure: involvement of all staff**
 - Team leader (“HTN champion”)
 - Facilitate communication among team
 - Delineated responsibilities for team members
 - Regular meetings to plan/document progress
 - **Potential team member responsibilities**

HOW TO IMPROVE HYPERTENSION CARE?

- **Kaiser Permanente model (and others):**
 - **Potential team care responsibilities**
 - **Front desk: facilitate patient follow-up**
 - Registry maintenance
 - Appts: scheduled, FU missed, walk-in BP ✓
 - Patient data collection, education hand-outs
 - **Medical assistants**
 - Walk-in BP ✓'s (no copay) – **IMPROVE ACCESS!**
 - Accurate BP measurement
 - Home BP monitor training
 - Medication reviews
 - Post-visit phone/email FU

HOW TO IMPROVE HYPERTENSION CARE?

- **Kaiser Permanente model (and others):**
 - **Potential team care responsibilities**
 - **Nursing/Pharmacists/± MAs**
 - **Algorithm medication adjustment (clinician guidance)**
 - Visit/phone/EMR (home BP monitoring)
 - Telemonitoring: www.heart360.org patient portal
 - May be most effective part of TBC
 - **Patient activation: promote self-management**
 - Home BP monitoring
 - Patient education: medication, lifestyle modification
 - Adherence assessment/support

HOW TO IMPROVE HYPERTENSION CARE?

- **Kaiser Permanente model (and others):**
 - **Potential team care responsibilities**
 - **Clinicians**
 - Algorithm selection/modification
 - Oversee RN/pharmacist medication titration visits
 - Clinical tool design/modification
 - Data collection sheets → chart documentation
 - End-of-visit instruction sheets

HOW TO IMPROVE HYPERTENSION CARE?

Quality Improvement Models:

“Hypertension Control”; 2012

U.S. Dept HHS, Health Resources and Service Administration

www.hrsa.gov/quality/toolbox/508pdfs/hypertnesioncontrol.pdf

“Hypertension Collaborative Care Pathway at HHC: Summary”; 2013

NYC Health and Hospitals Corporation

http://millionhearts.hhs.gov/Docs/NYC_HHC_Hypertension_Protocol.pdf

(scroll to very end of document)

“Hypertension Control: Action Steps for Clinicians”; 2013

Centers for Disease Control

http://millionhearts.hhs.gov/Docs/MH_HTN_Clinician_Guide.PDF