Hypertension Update 2016

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Consulting: Medtronic, Valencia
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Royalties: UpToDate
Hypertension Update 2016

• Clinical epidemiology of hypertension

• Patient Adherence

• Case Presentation
  1. Evaluation
  2. Treatment
     a. Lifestyle
     b. Pharmacotherapy
  3. Follow-up

• Summary, ‘Take Home’ Points
Clinical Epidemiology of Hypertension in the U.S. 1999–2012

Key Message:
Clinicians and patients are doing a better job controlling hypertension than academicians and public health officials recognize.
From 1999 to 2012, BMI did not decrease and lifestyle patterns changed minimally. Most of the improvement in the BP distribution reflected better adherence with more intensive pharmacotherapy.
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- **Patient Adherence**

- Case Presentation
  1. Evaluation
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     a. Lifestyle
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- Summary, ‘Take Home’ Points
Adherence to long-term therapies: evidence for action. World Health Organization 2003

The Five Dimensions of Non-Adherence*

Social/Economic
- Age / race
- SES
- Literacy
- Med cost

Patient-related
- Forget
- Rx anxiety
- Don’t understand instructions
- Fear dependence

Therapy-related
- Complexity of regimen
- Rx Duration
- Side effects/ADR
- Changes in therapy

Condition-related
- Comorbid depression
- Level of disability
- Severity of symptoms
- Drug/alcohol abuse

HealthCare System
- Pt-provider relationship
- Overworked HCP
- Lack of incentives
- Lack of knowledge

Adapted from the Foundation for Managed Care Pharmacy
*Adherence to long-term therapies: evidence for action. World Health Organization 2003
HTN Control Uninsured and Insured (Public and Private)

Medication Adherence Falls as Out-of-Pocket Costs Rise


$$R^2 = -0.36$$
Profile of the Non-Adherent Patient

- Young, very elderly
- Complex regimen
- Missed appointments
- Low SES
- No regular primary care
- Multiple health problems
- Lack social support
- Side effects
- Money problems
- Drug, alcohol abuse
- Depression, anxiety
- BP not controlled

Adherence Patterns in Adults with Hypertension

4 patterns of patient adherence:

• Group A (39%): Adherent with meds and lifestyle, generally well-educated, non-obese, healthiest

• Group B (16%): Adherent with BP meds, not lifestyle

• Group C (22%): More women, overweight/obese, busy, forget meds, don’t sustain lifestyle change

• Group D (23%): More men, least concerned about hypertension and lack of treatment, most smokers.

Persistence with Single-Pill Combinations (SPC) vs Two Single Pills in Hypertension

• 12 month persistence in 1644 patients prescribed HCTZ and lisinopril separately was 57.8% vs. 68.7% in 644 patients prescribed a single-pill combination (SPC) with the same two medications.

• Similar results were observed for HCTZ and enalapril prescribed separately vs. SPC.

### Simplified Intervention to Control Hypertension (STITCH) in Primary Care

<table>
<thead>
<tr>
<th>Variable</th>
<th>Usual Care</th>
<th>STITCH</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td># of patients</td>
<td>1246</td>
<td>802</td>
<td></td>
</tr>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BP, mmHg</td>
<td>153/88</td>
<td>155/88</td>
<td>NS/NS</td>
</tr>
<tr>
<td>FDC, %</td>
<td>9</td>
<td>11</td>
<td>NS</td>
</tr>
<tr>
<td><strong>Final visit</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔBP, mmHg</td>
<td>−18/−8</td>
<td>−23/−10</td>
<td>&lt;.005/.05</td>
</tr>
<tr>
<td>FDC, %</td>
<td>15</td>
<td>85</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Med titration, %</td>
<td>70</td>
<td>83</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>BP control, %</td>
<td>53</td>
<td>65</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Single-Pill Antihypertensive Combinations Increase BP Control During the 1\textsuperscript{st} Rx Year

In >100,000 uncontrolled hypertensive adults who were untreated . . .

• Initial therapy with single-pill combinations (SPCs) increased the likelihood of attaining BP control during the 1\textsuperscript{st} treatment year by 53\% (HR, 1.53 [95\% CI, 1.47-1.58]) vs. starting a single BP medication.

• The benefit of SPCs was especially evident in African Americans with hypertension.

The Number of Pharmacy Visits May Impact Adherence

Study population: 1.8 million Pts prescribed a statin and 1.4 million 80,304 prescribed an ACEI or ARB.

Complexity was assessed by # of meds, prescribers, pharmacies, pharmacy visits, and refill consolidation during the 3 mo from the first prescription. Adherence was assessed over the next year.

Results: During the 3-mo assessment, statin users filled 11.4 scripts for 6.3 different meds, had scripts written by 2 prescribers, and made 5.0 pharmacy visits. Results were similar for ACEI/ARB. Patients with the least vs. greatest refill consolidation had 8% lower adherence.

Conclusion: Med use and prescription filling for CVD is complex. Strategies to simplify prescription refills may improve med adherence.

## Comorbid Conditions in Medicare Beneficiaries

<table>
<thead>
<tr>
<th>Comorbidity</th>
<th>CHD</th>
<th>HF</th>
<th>A-Fib</th>
<th>Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Pts</td>
<td>8,678,060</td>
<td>4,366,489</td>
<td>2,556,839</td>
<td>1,145,719</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1 (81%)</td>
<td>1 (86%)</td>
<td>1 (84%‰)</td>
<td>1 (89%)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>2 (69%)</td>
<td>3 (63%)</td>
<td>2 (64%)</td>
<td>2 (70%)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3 (42%)</td>
<td>5 (47%)</td>
<td>7 (37%)</td>
<td>6 (42%)</td>
</tr>
<tr>
<td>Arthritis</td>
<td>4 (41%)</td>
<td>6 (46%)</td>
<td>6 (42%)</td>
<td>5 (44%)</td>
</tr>
<tr>
<td>Anemia</td>
<td>5 (39%)</td>
<td>4 (51%)</td>
<td>5 (43%)</td>
<td>4 (47%)</td>
</tr>
<tr>
<td>HF</td>
<td>6 (36%)</td>
<td>Index</td>
<td>4 (51%)</td>
<td>7 (37%)</td>
</tr>
<tr>
<td>CAD</td>
<td>Index</td>
<td>2 (72%)</td>
<td>3 (64%)</td>
<td>3 (58%)</td>
</tr>
<tr>
<td>CKD</td>
<td>7 (30%)</td>
<td>4 (44%)</td>
<td>8 (34%)</td>
<td>8 (35%)</td>
</tr>
<tr>
<td>COPD</td>
<td>9 (21%)</td>
<td>8 (31%)</td>
<td>9 (24%)</td>
<td>†</td>
</tr>
<tr>
<td>AF</td>
<td>10 (19%)</td>
<td>9 (29%)</td>
<td>Index</td>
<td>†</td>
</tr>
<tr>
<td>Alzheimer’s</td>
<td>†</td>
<td>10 (26%)</td>
<td>†</td>
<td>9 (34%)</td>
</tr>
</tbody>
</table>

Improved Outcomes in HBP after Physician Tutorials

Study Design:
MDs at Johns Hopkins GIM Clinic taught about patient compliance & BP control in a 1–2 hr session. Control and intervention group of providers.

Outcomes:
More patients took >75% of meds (61% vs 32%, p<.01) and had BP controlled (60% vs 36%, p<.05) at 6 months in the intervention than control group.
Trained MDs spent more time (p<.05) on patient education and less on history & exam than controls.

Tomm’s Questioning Styles and Therapeutic Alliance

Medical therapists ask 4 types of questions:
Lineal: Do you get short of breath when walking?
Strategic: Why don’t you restrict salt?
Circular: How have your activities changed?
Reflexive: How would a low salt diet affect you?

Findings:
Circular and reflexive questions led to better therapeutic alliance than strategic and lineal.

Motivational Interviewing, Med Adherence & BP

METHODS—Randomized trial of a practice-based motivational interviewing (MINT) vs usual care (UC) on medication adherence and BP; 190 hypertensive African Americans (88% women) were recruited from 2 community-based primary care practices in NYC.

RESULTS—Baseline adherence was similar (56.2% vs. 56.6% for MINT and UC, \( p = 0.94 \)). Post-treatment was 43% and 57% in the UC and MINT groups, \( (p = 0.03) \). The between-group difference in systolic BP was \(-6.1\) mm Hg \( (p = .065) \) in favor of MINT.

CONCLUSIONS—A practice-based MINT counseling led to steady maintenance of medication adherence over time vs. a decline with UC. This effect was associated with a clinically meaningful net reduction in systolic BP favoring MINT.

Patient-Centered [PC] Approaches, e.g., Medical Home [MH], Decision Making [DM], Technology-Aided [TA]

- Patient-centered approaches are useful
- Once a PCMH is past implementation pains, patient satisfaction, adherence and outcomes can improve
- PC decision making is associated with better BP med adherence
- Effectively functioning healthcare teams are more effective in patient adherence and outcomes than MD-centered care; teams are happier!
- Addressing reasons for ‘contextual red flags’, e.g., missed appt. and prescription refills improves adherence with visits/meds and outcomes
- $$ incentives can improve outcomes but may have collateral damage
- Technology can improve adherence and outcomes

Techniques and Tools for Improving Adherence to Blood Pressure Medications

Improving adherence

1. Fewer pills, pharmacies, prescribers, refills, pharmacy visits
2. Less out-of-pocket cost
3. Patient BP self-monitoring with facilitated relay and advice
4. Patient education +++ behavioral, nursing, pharmacist, care manager), e.g., team-based care
5. Patient-centered medical home, patient-centered decision making
6. Telephone, text message, pill organizers/dispensers, blister pack
7. Motivational interviewing
Techniques and Tools for Improving Adherence to Blood Pressure Medications

• The clinical epidemiology of hypertension and implications for adherence to antihypertensive meds

• The 5 Dimensions of Adherence as Points for Improvement:
  1. Social & economic **(healthcare insurance)**
  2. Patient-related **(future discount rates)**
  3. Treatment-related **(simplify treatment, reduce patient cost)**
  4. Condition-related (multiple conditions, depression)
  5. Healthcare System (well-functioning teams, patient-centered approaches, technology aided)
Hypertension Update 2016

- Clinical epidemiology of hypertension
- Patient Adherence

**Case Presentation**

1. Evaluation
2. Treatment
   a. Lifestyle
   b. Pharmacotherapy
3. Follow-up

- Summary, ‘Take Home’ Points
Blood Pressure and Dx of Hypertension

**History**: Mrs. LC is a 56 y/o teacher seen for annual exam. General health good. Walks 20 minutes daily, DASH-like diet, never smoked. She takes ranitidine 300 mg HS for GERD and naproxen 250 mg twice daily for pain in her knees. Her father had HTN and died from CHF age 74. Mother 78 yrs has HTN and T2D, no complications. Older sister has HTN and T2D.

At your suggestion last year, LC monitors home BP 2X /d 1 wk / mo. Home BP higher past 6 mo avg 137/86.

**Exam**: Healthy middle-aged women

BP 136/78  HR 74  Wt 178  Ht 66

BMI 28.7  Abd girth: 35”

Lungs clear: Heart:  RRR with murmurs, S3 or S4

Both knees mild tenderness, crepitus with motion
Blood Pressure and Dx of Hypertension

**Lab:**
- FBS 104
- K⁺ 4.3
- Creat 1.2
- eGFR 50
- Chol 194
- TG 127
- HDL 49
- LDL 120
- Liver enzymes Nl
- Ca++ 9.2
- TSH 8.2
- Urine alb/creat 14
- A1c 6.0%

**ECG:**
- HR 72 NSR; Normal (R-wave 14 mm II)

**10-year ASCVD Risk:** 2.7%

**Dx:**
1. Pre-diabetes (FBS 104, HbA1c 6%, ⊕ FH DM)
2. Metabolic syndrome (waist, BP, HDL, pre-DM)
3. Stage 3A CKD
4. Osteoarthritis
5. Hypothyroidism
Blood Pressure and Dx of Hypertension

Masked hypertension

• Home BP or daytime ABPM ≥135/>85 is hypertensive
• Masked Htn carries a prognosis similar to comparable BP elevations in and out of the office

Mrs. LC does have pre-hypertensive range office BP readings. However, her prognosis, in this case, is more closely related to her masked hypertension.

Evidence suggests that masked hypertension in patients with pre-hypertensive office readings unmasks quickly with >80% developing high office readings in 4 years.

Prognostic Significance of Home BP

Patients: 4939 treated hypertensives age 70 ± 6 yr

Data: Baseline office and 4-day (2 readings / day) home BP taken with Omron 705 CP

Follow-up: mean 3.2 yrs

(O=office; H=home; (-) = normal; (+) = high).

<table>
<thead>
<tr>
<th></th>
<th>O-/H-</th>
<th>O+/H+</th>
<th>O-/H+</th>
<th>O+/H-</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>1.00</td>
<td>1.96</td>
<td>2.06</td>
<td>1.18</td>
</tr>
</tbody>
</table>

Home BP is more strongly related to target organ damage and CV outcomes than office BP.
### Prospective Studies on Home BP and Office and Cardiovascular Outcomes

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Population</th>
<th>n</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohasama¹</td>
<td>1998</td>
<td>Population</td>
<td>1789</td>
<td>Strokes and mortality predicted better by home BP</td>
</tr>
<tr>
<td>SHEAF²</td>
<td>2004</td>
<td>Treated HTN</td>
<td>4939</td>
<td>CV morbidity and mortality predicted better by home BP</td>
</tr>
<tr>
<td>PAMELA³</td>
<td>2005</td>
<td>Population</td>
<td>2051</td>
<td>CV and total mortality predicted better by home BP</td>
</tr>
<tr>
<td>Belgian⁴</td>
<td>2005</td>
<td>Referred</td>
<td>391</td>
<td>Combined CV events predicted better by home BP</td>
</tr>
<tr>
<td>Didima⁵</td>
<td>2006</td>
<td>Population</td>
<td>662</td>
<td>CV events predicted similarly by home and office BP</td>
</tr>
</tbody>
</table>
Overview of ‘JNC 8’ Guidelines for Managing High BP in Adults

Adults ≥18 Years with Hypertension

Implement & Continue Lifestyle Intervention(s)

Set BP Goal and Begin BP Lowering Medication based on age (race), diabetes, CKD

No DM, CKD

- Age ≥60
  - BP Goal <150/<90
    - Non-Black: Thiazide-type diuretic, ACEI, ARB, CCB alone or combo
    - Black: TTD, CCB alone or combo

- Age <60
  - BP Goal <140/<90

DM or CKD

- All Ages–DM
  - BP Goal <140/<90
    - ACEI or ARB alone or combo w/ CCB, TTD

- All Ages–CKD
  - BP Goal <140/<90

# Lifestyle Modification and BP Response

<table>
<thead>
<tr>
<th>Modification</th>
<th>Approximate SBP reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>5–20 mmHg/10 kg weight loss</td>
</tr>
<tr>
<td>Adopt DASH eating plan</td>
<td>8–14 mmHg</td>
</tr>
<tr>
<td>Dietary sodium reduction</td>
<td>2–8 mmHg</td>
</tr>
<tr>
<td>Physical activity</td>
<td>4–9 mmHg</td>
</tr>
<tr>
<td>Moderate alcohol intake</td>
<td>2–4 mmHg</td>
</tr>
</tbody>
</table>
Modern Life Has Its Conveniences and Costs

“ACCESS TO EXCESS”
calories, sugar, fat, salt, labor saving
devices and passive entertainment . . .
A KEY DRIVER OF CHRONIC DISEASE

Lambert, Craig And Bing, Christopher. The Way We Eat Now. Harvard Magazine; May-June, 2004; Page 50.
Sitting is Hazardous to Your Health

Mortality HR in 1906 persons >50 Years from accelerometry. Adjusted for age, sex, race, education

Adherence to DASH-Style Diet and Risk of CHD and Stroke in Women in NHS

<table>
<thead>
<tr>
<th>Adherence Quintile</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Risk CHD</td>
<td>1.0</td>
<td>0.99</td>
<td>0.86</td>
<td>0.87</td>
<td>0.76</td>
<td>&lt;0.001†</td>
</tr>
<tr>
<td>Relative Risk Stroke</td>
<td>1.0</td>
<td>0.92</td>
<td>0.91</td>
<td>0.89</td>
<td>0.82</td>
<td>0.002†</td>
</tr>
</tbody>
</table>

† adjusted for age, smoking, BMI, menopausal status and hormone use, energy intake, MVI, alcohol, family history, physical activity and ASA

DASH and DASH Low Sodium Reduce BP


*P < 0.05; †P < 0.011; ‡P < 0.01

**Graph:**
- **Control Diet:**
  - Systolic BP:
    - 135
    - 130
    - 125
    - 120
  - Daily Dietary Sodium mmol / day:
    - 150
    - 100
    - 50
  - Changes:
    - -5.9†
    - -5.0†
    - -1.3†
    - -2.1*

- **DASH Diet:**
  - Systolic BP:
    - 135
    - 130
    - 125
    - 120
  - Daily Dietary Sodium mmol / day:
    - 150
    - 100
    - 50
  - Changes:
    - -2.2†
    - -1.7‡
    - -2.1*
    - -5.0†
Healthy Food Doesn’t Taste Good & Costs More – Myth Buster!

DASH FOR GOOD HEALTH

SOUTHERN STYLE

A Sensible Eating Plan to Promote Good Health
Based on the DASH for Good Health series
The Revis family of North Carolina.
Food expenditures for 1 week $342
A 1 Week Supply of Food for a Typical Family in Darfur, Sudan Refugee Camp. Cost: $2 U.S.
Cost of Basic Healthy Food in the U.S.

A year supply of wheat, rice, beans, and oats (60 gallons) provides more than the minimum recommended amounts of grains (318 lbs) and legumes (82 lbs) or ~1800 Calories/day for 1 person for 1 year. $449 + $12 shipping from beprepared.com
Initial Pharmacotherapy of Hypertension

Mrs. LC wanted to avoid BP meds and agreed to follow the low Na\(^+\) DASH Eating Plan and extend her walks to 30 minutes morning and evening for the next 6 months.

Mrs. LC is now 57 years old; office BP 146/86 and consistent with home readings in the past month. Her weight is 184# (BMI 30; WC 36.5”). Repeat labs show:

- FBS 108
- K+ 4.2
- Creat 1.3
- eGFR 46
- TC 198
- TG 150
- HDL 45
- LDL 123
- FBS 118
- A1c 6.4%
- urine alb/creat 19
- 10-yr ASCVD risk 5%
British NICE Hypertension Treatment Guideline
Adapted by Clinical Leaders in the CCI Network

Age <55 Years

Step 1: A
Step 2: A + C
Step 3: A + C + D

Step 4: Intensify diuretic or add α- and/or β-blocker

Age ≥55 Years or Black

Step 1: C
Step 2: C + A
Step 3: A + C + D

A=ACEI or ARB; C=calcium antagonist; D=thiazide-type diuretic

http://www.nice.org.uk/guidance/CG127
Initial Pharmacotherapy of Hypertension

Which of the following is the preferred choice for initial treatment of Mrs. LC’s hypertension?

1. Chlorthalidone (recommended JNC 7 and ‘8’, increase risk of Type 2 DM [T2D])
2. Metoprolol (not recommended as initial therapy unless compelling indications)
3. Amlodipine (preferred initial therapy for patients >55 years (BHS – NICE); Stage 3A/B but not proteinuric
4. Lisinopril (less risk of T2D, Stage 3A/B CKD)
5. Doxazosin (not recommended initial therapy – ALLHAT)
NATURE, SALT & ACEI
Incident Diabetes in Clinical Trials of Antihypertensive Medications

22 trials with 143,153 Patients

- ARB: Odds ratio 0.57 (0.46–0.72), p<0.0001
- ACE inhibitor: Odds ratio 0.67 (0.56–0.80), p<0.0001
- CCB: Odds ratio 0.75 (0.62–0.90), p=0.002
- Placebo: Odds ratio 0.77 (0.63–0.94), p=0.009
- \( \beta \) blocker: Odds ratio 0.90 (0.75–1.09), p=0.30
- Diuretic (Referent)

Incoherence=0.000017

2013 Cholesterol Guideline: Ms. LC has an indication for moderate-intensity statin therapy.

Pt >21 years without CHF or ESRD
- Screen for CVD risk factors
- Measure LDL-C

Clinical ASCVD
- High-Intensity Statin

DM Type 1 or 2, age 40–75, LDL 70–189
- Moderate-Intensity Statin all
- If ≥7.5%, high intensity statin

NO DM, age 40–75, LDL 70–189
- Calculate 10-yr risk of ASCVD
- If risk ≥7.5%, mod-high intensity statin
- If risk 5–7.4%, moderate-intensity statin

LDL ≥190
- High-Intensity Statin

Legend:
- Green: should be done
- Yellow: reasonable to do

ASCVD = atherosclerotic cardiovascular disease

http://circ.ahajournals.org/content/early/2013/11/11/01.cir.0000437738.63853.7a.citation
Selecting Combination Therapy

Mrs. LC has done well on Lisinopril 40 mg daily the past 2 years. BP ~126/78 at home and office. Urine alb/creat decreased from 19 to 8. Other labs unchanged.

3 mo ago she sprained her knee and stopped walking. She watches more TV and snacks. Weight ↑ from 149 to 158 along with home BP to 138/86 in the past month.

She returns for a scheduled visit at age 59. BP 142/86, HR 76, wt 158, BMI 25.4, WC 34”. Gr 1 KW, soft S4.

FBS 120 K+ 4.4 Creat 1.3 (eGFR 45) TC 198
TG 167 HDL 45 LDL 115 HbA1c 6.3%
Alb/creat 22 10-yr ASCVD risk 5.6%
Selecting Combination Therapy

After discussion, Mrs. LC agrees to see an orthopedic surgeon who finds a torn medical meniscus. Given the elevated BP and emerging signs of target organ change, you decide to increase her antihypertensive Rx by adding:

1. HCTZ 12.5 mg daily
2. Carvedilol 12.5 mg twice daily
3. Amlodipine 5 mg daily (eGFR 45)
4. Losartan 50 mg daily (dual RAS blockade very rarely indicated)
ACCOMPLISH Results:

Composite CV Morbidity and Mortality

HR: 0.80 (0.72, 0.90)

P <0.001

Blood Pressure Control in ACCOMPLISH

Hypertension Can Get More Complicated

**History:** Mrs. LC (age 63 yrs) has done well for the past 4 years on lisinopril 40, amlodipine 5 and HCTZ 25 daily. She fell and broke her leg 6 mo ago and gained 20#. Home BP readings have increased from ~122/78 to ~152/84. She is inactive and is snacking more. Her husband reports she snores loudly and stops breathing.

**Exam:** BP 156/82 (avg 3)  HR 74  Wt 153  BMI 24.7
Fundi: Gr I KW  Neck and Lungs: Nl  Heart: S4
Abd: no bruits/aneurysm  Ext: pulses 2+, tr edema

**Lab:** FSG 124  K⁺ 4.2  Creat 1.5  (eGFR 37)
Chol 208  TG 160  HDL 45  LDL 131
A1c 6.4%  alb/creat 22  10-yr ASCVD 10.1%
Treatment Resistant Hypertension (TRH)

Resistant hypertension: Mean BP $\geq$140/90 (above goal) on a rational $\geq$3 med regimen (optimal doses, preferably including a diuretic) or BP controlled on $\geq$4 meds

(sleep apnea is common in patients with treatment resistant hypertension)
BP Effects of Low-Dose Spironolactone in 1411 ASCOT Hypertensives Uncontrolled on 3 Meds

Δ SBP = 21.9
(95%CI 20.8, 23.0)

Δ DBP = 9.5
(95%CI 9.0, 10.1)

4% serum K+ >5.5
and 2% >6.0 mmol/L

Caution using spironolactone if eGFR <45
and/or serum K+ >4.5

Treatment Options for Mrs. LC

1. Remember lifestyle: Weight loss, exercise, DASH, salt

2. Add spironolactone 12.5 mg daily with return visit in 1 week to check for hyponatremia, hypokalemia, ≥20% ↓ in eGFR.

3. Change HCTZ 25 mg to chlorthalidone 25 mg daily. The latter works better in Stage 3B CKD than HCTZ and will reduce systolic BP an average of 5 – 7 mmHg.

4. Renin-guided therapy.
   a. If PRA <0.65, then consider changing to chlorthalidone 25 or adding a non-dihydropyridine CCB or α₁-antagonist. Consider primary aldosteronism
   b. Since she is on an ACEI that reduces net RAS activity 80 – 90%, if PRA is <4.5, the same medications as in 3a could be considered.
   c. If PRA is >4.5, consider β-blocker to counter neurohormonal activation. Consider renal artery stenosis
Overnight Rostral Fluid Shift & Obstructive Sleep Apnea (OSA) in Treatment Resistant HTN (TRH)

OSA was greater in TRH than controlled HTN (apnea-hypopnea index [AHI]: 43 vs 18/hr, \( P=0.02 \). In both groups, AHI correlated strongly with leg fluid volume displaced overnight (\( R^2=0.56, P<0.0001 \)) with greater changes in TRH than controlled HTN (347 vs 176 mL, \( P=0.01 \)).

Our findings support the concept that fluid redistribution centrally during sleep accounts for the high prevalence of OSA in TRH.

Prevalence of Optimal Treatment in Apparent TRH in a Community-Based Practice Network

• Among 468,877 hypertensives in CCI, their clinicians more often prescribed optimal therapy for aTRH when CVD risk was greater (black, CVD, CKD)

• ~1 in 7 of all uncontrolled hypertensives and 1 in 2 with aTRH are prescribed ≥3 BP meds in optimal regimens (diuretic + 2 other classes at 50% of maximum approved / recommended dose).

• Prescribing more optimal Rx for uncontrolled hypertensives could improve BP control.

Resistant Hypertension: Diagnostic & Therapeutic Recommendations: Will resolve ≥80% of TRH.

1. **Confirm Treatment Resistance.** Office BP >140/90 on ≥3 BP meds optimal doses, preferably including a diuretic

2. **Exclude Pseudoresistance.** Is patient adherent with regimen? Obtain automated office BP, out-of-office BP to exclude office effect

3. **Identify & Reverse Contributing Lifestyle Factors,** e.g., Obesity, physical inactivity, excess alcohol, high salt

4. **Discontinue, minimize interfering substances,** e.g., NSAIDs, sympathomimetics, oral contraceptives

5. **Screen for 2º Causes of Hypertension,** e.g., OSA, 1º aldo, CKD, renal artery stenosis, pheo, Cushing’s dz

6. **Pharmacologic Treatment.** Maximize diuretic Rx, incl possible aldo antagonist, use agents with complementary mechanisms

7. **Refer to Specialist** for known or suspected 2º cause(s) of hypertension or if BP remains uncontrolled after 6 months Rx

Hypertension Update 2016: ‘Take Home’ Points

1. ~70% of treated hypertensive patients are controlled; severe HTN becoming less common – **major victory!!**
2. Hypertensive patients are complex, multiple meds
3. Evaluation incudes cardiometabolic risk & concomitant chronic diseases – don’t forget statins
4. Simplify pharmacotherapy, reduce cost, sync refills
5. Lifestyle is important – weight, exercise, DASH - sodium
6. In the absence of compelling indications, follow a standard treatment algorithm, e.g., BHS – NICE, which is effective and linked to good outcomes (ACCOMPLISH)
7. Most treatment resistant hypertension can be managed in primary care settings & control rates of 80+% are feasible