Π.Γ.Ν.Α "ΛΑΪΚΟ"
ΚΑΡΔΙΟΛΟΓΙΚΗ ΚΛΙΝΙΚΗ

Υπέρταση στους Ηλικιωμένους

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Υπεύθυνος Τμήματος Υπέρτασης Λιπιδίων Προληπτικής Καρδιολογίας
Αντιπρόεδρος Ελληνικής Εταιρείας Υπέρτασης
“Seventy is old enough. After that there is too much risk.”

Mark Twain

Following the Equator, 1897
Who is Elderly?

Clinical trial, epidemiology ......

Old = age 65-79

Very old : 80 and above

Coverments - businesses: the age at which a person is eligible for a pension

Some countries: the age at which the person is no longer able to work in field of mines!!!

Clinicians should NOT use chronological age alone for make clinical decisions
Hypertension is highly prevalent in elderly patients

The greatest prevalence of hypertension is in patients aged >65 years

Prevalence of hypertension (%)

Age (years)

18–39  40–54  55–64  >65

10  31  53  72

Isolated Systolic Hypertension Accounts for Most Uncontrolled HTN in the Elderly

Americans With Uncontrolled Hypertension, by Age and Hypertension Subtype

HTN=hypertension; ISH=isolated systolic hypertension; SDH=combined systolic/diastolic hypertension; IDH=isolated diastolic hypertension; SBP=systolic blood pressure; DBP=diastolic blood pressure.

Isolated Systolic Hypertension Markedly Increases CVD Risk (Framingham)

*OR=2.5*

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP &lt;140/95 mmHg</td>
<td>33 Event Rate Per 1000</td>
<td>18 Event Rate Per 1000</td>
</tr>
<tr>
<td>ISH: BP ≥160/&lt;95 mmHg</td>
<td>82 Event Rate Per 1000</td>
<td>43 Event Rate Per 1000</td>
</tr>
</tbody>
</table>

*OR=2.4*

*P<0.001.
CVD=cardiovascular disease; OR=odds ratio; BP=blood pressure; ISH=isolated systolic hypertension.
Characteristics of Hypertension in the Elderly

**Increased**
- Systolic blood pressure and pulse pressure
- Left ventricular mass and wall thickness
- Arterial stiffness
- Calculated total peripheral resistance

**Decreased**
- Cardiac output and heart rate
- Renal blood flow, plasma renin activity, and angiotensin II levels
- Arterial compliance and blood volume
- Diastolic blood pressure

Black H. JCH 2003; 5:12
SBP increases progressively with age, while DBP decreases.

Mean SBP and DBP in US population; PP – pulse pressure

Adapted from: Burt VL, et al. 1995
Arterial Wall Compliance and Pulse Pressure Wave

**Elastic Vessel**
- **Systole**
- **Diastole**

**Stiff Vessel**
- **Systole**
- **Diastole**

**Stroke Volume**

**Aorta**

**Resistance Arterioles**

**Pressure (Flow)**

**Young Artery**

**Arteriosclerotic Artery**

Conceptual Framework for CV Adaptations to Arterial Stiffening Occurring with Aging

↑ Arterial stiffening

↑ Arterial SBP and pulse pressure
↓ Arterial DBP

↓ CBF

Myocardial ischemia

↑ LV wall thickness

↑ LA size
↑ Late LV filling

Preserved end-diastolic LV volume

↑ Aortic impedance and LV afterload (wall tension)

Partial normalization of LV wall tension

Preserved end-systolic LV volume and EF

↑ Pulse wave velocity

Earlier reflected pressure waves add to late systolic pressure; earlier reflected flow waves subtract from forward blood flow

↑ Aortic root size
Aortic wall thickness

Prolonged myocardial contraction

↓ Early diastolic LV filling rate
ΕΝΑΡΞΗ ΑΓΩΓΗΣ ΚΑΙ ΣΤΟΧΟΣ ΘΕΡΑΠΕΙΑΣ ΤΗΣ Α.Π. ΣΤΗΝ ΤΡΙΤΗ ΗΛΙΚΙΑ
<table>
<thead>
<tr>
<th>Μελέτη</th>
<th>Ν</th>
<th>Ηλικία (έτη)</th>
<th>Αγωγή</th>
<th>Αρχική ΣΑΠ</th>
<th>Τελική ΣΑΠ</th>
<th>Μείωση κινδύνου (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWHPE 1985</td>
<td>840</td>
<td>72</td>
<td>HCTZ+triamterene</td>
<td>172</td>
<td>150</td>
<td>46</td>
</tr>
<tr>
<td>Coope J 1986</td>
<td>884</td>
<td>69</td>
<td>atenolol+bendrofluazide</td>
<td>196</td>
<td>164</td>
<td>38</td>
</tr>
<tr>
<td>STOP-HTN 1991</td>
<td>1627</td>
<td>76</td>
<td>atenolol/HCTZ</td>
<td>186</td>
<td>167</td>
<td>47</td>
</tr>
<tr>
<td>SHEP 1991</td>
<td>4736</td>
<td>72</td>
<td>Chlorothalidone+atenolol</td>
<td>170</td>
<td>143</td>
<td>36</td>
</tr>
<tr>
<td>MRC (diuretic) 1992</td>
<td>3294</td>
<td>70</td>
<td>HCTZ+amiloride</td>
<td>183</td>
<td>149</td>
<td>33</td>
</tr>
<tr>
<td>MRC (b-blocker) 1992</td>
<td>3313</td>
<td>70</td>
<td>atenolol</td>
<td>183</td>
<td>154</td>
<td>17</td>
</tr>
<tr>
<td>STONE 1996</td>
<td>1574</td>
<td>66</td>
<td>Nifedipine</td>
<td>168</td>
<td>146</td>
<td>58</td>
</tr>
<tr>
<td>Syst-Eur 1997</td>
<td>4695</td>
<td>70</td>
<td>Enalapril+HCTZ</td>
<td>161</td>
<td>151</td>
<td>55</td>
</tr>
<tr>
<td>Syst-China 2000</td>
<td>2394</td>
<td>67</td>
<td>Enalapril+HCTZ</td>
<td>160</td>
<td>151</td>
<td>32</td>
</tr>
<tr>
<td>HYVET 2008</td>
<td>3845</td>
<td>84</td>
<td>Indapamide±perindopril</td>
<td>173</td>
<td>144</td>
<td>28</td>
</tr>
</tbody>
</table>
Lowering SBP Improves CV Outcomes in the Elderly
The Systolic Hypertension in the Elderly Program (SHEP)
Active Therapy vs. Placebo

CHD=coronary heart disease; LVF=left ventricular failure; CVD=cardiovascular disease.
THE SWEDISH TRIAL of OLDER PERSONS with HYPERTENSION (STOP-H)
Treating Elderly with Diuretic and Beta Blockers Is Beneficial (1991)

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th>Placebo</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total stroke</td>
<td>16.8*</td>
<td>31.3</td>
<td>0.53</td>
</tr>
<tr>
<td>Total coronary heart disease</td>
<td>14.4</td>
<td>16.5</td>
<td>0.87</td>
</tr>
<tr>
<td>Total cardiovascular disease</td>
<td>33.5*</td>
<td>55.5</td>
<td>0.60</td>
</tr>
<tr>
<td>Total mortality</td>
<td>20.2*</td>
<td>35.4</td>
<td>0.57</td>
</tr>
</tbody>
</table>

* significantly better than placebo

### MEDICAL RESEARCH COUNCIL TRIAL (MRC)

**Treating Elderly with Diuretic and Beta Blockers Is Beneficial (1992)**

<table>
<thead>
<tr>
<th></th>
<th>Diuretic</th>
<th>β-Blocker</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total stroke</td>
<td>7.3*</td>
<td>9.0</td>
<td>10.8</td>
</tr>
<tr>
<td>Total coronary heart disease</td>
<td>7.7*</td>
<td>12.8</td>
<td>12.7</td>
</tr>
<tr>
<td>Total cardiovascular disease</td>
<td>17.4*</td>
<td>24.6</td>
<td>25.2</td>
</tr>
<tr>
<td>Total mortality</td>
<td>21.3</td>
<td>26.4</td>
<td>24.7</td>
</tr>
</tbody>
</table>

* significantly better than placebo

Pooled Analysis of Outcome Trials* in Older Patients With Isolated Systolic Hypertension†

(n = 11,825)

All Cause Mortality
CV Mortality
All CV Endpoints
Total Stroke
M.I.

Percent Reduction (Compared to Placebo)

-17
-25
-32
-37
-25
-50
-40
-30
-20
-10
0

* Trials included:
SHEP (n=4736)
Syst-Eur (n=4695)
Syst-China (n=2394)

Staessen JA et al.
_Eur J of Internal Med_ 1999; 10(2):82
The Hypertension in the Very Elderly Trial (HYVET)
The Trial:
International, multi-centre, randomised double-blind placebo controlled

Inclusion Criteria:
Aged 80 or more,
Systolic BP: 160 - 199 mmHg
+ diastolic BP: < 110 mmHg,
Informed consent

Exclusion Criteria:
Standing SBP < 140 mmHg
Stroke in last 6 months
Dementia
Need daily nursing care

Primary Endpoint:
All strokes (fatal and non-fatal)
Secondary Endpoints: death from stroke, cardiovascular causes, cardiac causes and any cause

Target blood pressure
150/80 mmHg
Incidence of Morbidity / Mortality in HYVET

- All stroke: p = 0.055, -30% reduction
- Fatal stroke: p = 0.046, -39% reduction
- Heart failure: p < 0.0001, -64% reduction
- Total mortality: p = 0.019, -21% reduction

Goal SBP < 150 mmHg

Placebo: 173/91 → 160/84 (mmHg)
Active treatment: 173/91 → 144/78 (mmHg)
Reappraisal of European guidelines on hypertension management: a European Society of Hypertension Task Force document
2013 Guidelines for the Management of Arterial Hypertension

European Society of Hypertension
European Society of Cardiology

In elderly hypertensives less than 80 years old with SBP $\geq 160$ mmHg there is solid evidence to recommend reducing SBP to between 150 and 140 mmHg.

In fit elderly patients less than 80 years old SBP values $< 140$ mmHg may be considered, whereas in the fragile elderly population SBP goals should be adapted to individual tolerability.

In individuals older than 80 years and with initial SBP $\geq 160$ mmHg it is Recommended to reduce SBP to between 150 and 140 mmHg provided they are in good physical and mental conditions.
An unmasked, open-label randomized controlled multicenter trial

Treatment target

SPRINT

<120 mm Hg (Intensive)
121.5 mm Hg
2.8 Medications

<140 mm Hg (Standard)
134.6 mm Hg
1.8 Medications

Primary Outcome Experience in the Six Pre-specified Subgroups of Interest

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>HR</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>0.75 (0.64, 0.89)</td>
<td></td>
</tr>
<tr>
<td>No Prior CKD</td>
<td>0.70 (0.56, 0.87)</td>
<td>0.36</td>
</tr>
<tr>
<td>Prior CKD</td>
<td>0.82 (0.63, 1.07)</td>
<td></td>
</tr>
<tr>
<td>Age &lt; 75</td>
<td>0.80 (0.64, 1.00)</td>
<td>0.32</td>
</tr>
<tr>
<td>Age ≥ 75</td>
<td>0.67 (0.51, 0.86)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>0.84 (0.62, 1.14)</td>
<td>0.45</td>
</tr>
<tr>
<td>Male</td>
<td>0.72 (0.59, 0.88)</td>
<td></td>
</tr>
<tr>
<td>African-American</td>
<td>0.77 (0.55, 1.06)</td>
<td>0.83</td>
</tr>
<tr>
<td>Non African-American</td>
<td>0.74 (0.61, 0.90)</td>
<td></td>
</tr>
<tr>
<td>No Prior CVD</td>
<td>0.71 (0.57, 0.88)</td>
<td>0.39</td>
</tr>
<tr>
<td>Prior CVD</td>
<td>0.83 (0.62, 1.09)</td>
<td></td>
</tr>
<tr>
<td>SBP ≤ 132</td>
<td>0.70 (0.51, 0.95)</td>
<td>0.77</td>
</tr>
<tr>
<td>132 &lt; SBP &lt; 145</td>
<td>0.77 (0.57, 1.03)</td>
<td></td>
</tr>
<tr>
<td>SBP ≥ 145</td>
<td>0.83 (0.63, 1.09)</td>
<td></td>
</tr>
</tbody>
</table>

*Unadjusted for multiplicity

*Treatment by subgroup interaction
Ο Πύργος της Βαβέλ
**Blood Pressure Goal, mm Hg**

<table>
<thead>
<tr>
<th>Population</th>
<th>Age &lt;50 y</th>
<th>Age 50-74 y</th>
<th>Age ≥75 y</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population</td>
<td>&lt;120/80</td>
<td>&lt;130(^b)</td>
<td>&lt;140(^c)</td>
</tr>
<tr>
<td>High-risk population(^a)</td>
<td>&lt;130</td>
<td>&lt;130 in presence of CVD or increased CVD risk or chronic kidney disease(^b)</td>
<td>&lt;140(^c)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;140 in presence of type 2 diabetes (^b)</td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Presence of cardiovascular disease (CVD) or increased CVD risk, chronic kidney disease, or diabetes.

\(^b\) Treat initially to systolic blood pressure of <140 mm Hg. If treatment is well tolerated, proceed to target goal of <130 mm Hg.

\(^c\) Treat to target systolic blood pressure goal of <140 mm Hg. If treatment is well tolerated, proceed to lower target of <130 mm Hg.
ΣΥΣΤΑΣΕΙΣ
ESH-EUGMS
>80 ετών
ΕΝΑΡΞΗ ΘΕΡΑΠΕΙΑΣ
Hypertension 2016
ΕΝΑΡΞΗ ΘΕΡΑΠΕΙΑΣ

>160 mmHG σε άτομα με καλή φυσική και διανοητική κατάσταση

<150 - 130 mmHg

Αν η Α.Π < 130 mmHG
Μείωση ή και διακοπή αγωγής…..

5 κύριες κατηγορίες

Προτίμηση σε διουρητικά,
Ανταγωνιστές Ca, AY A II.
Μονοθεραπεία και έναρξη με μικρές δόσεις
Frailty: at least 3 of the following criteria

Weight loss
Exhaustion
Weakness
Slow walking speed
Diminished physical activity

Increases with age: 3% at 65y; 26% at 85y

2018 ESC-ESH Guidelines for the Management of Arterial Hypertension
<table>
<thead>
<tr>
<th>Age group</th>
<th>Office SBP treatment threshold (mmHg)</th>
<th>Diastolic treatment threshold (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hypertension + Diabetes + CKD + CAD + Stroke/TIA</td>
<td></td>
</tr>
<tr>
<td>18–65 years</td>
<td>≥ 140</td>
<td>≥ 140</td>
</tr>
<tr>
<td>65–79 years</td>
<td>≥ 140</td>
<td>≥ 140</td>
</tr>
<tr>
<td>≥ 80 years</td>
<td>≥ 160</td>
<td>≥ 160</td>
</tr>
<tr>
<td>Diastolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>treatment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>threshold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(mmHg)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
New concepts

Less conservative treatment of BP in older and very old patients

*Lower BP thresholds and treatment targets for older patients* – with emphasis on considerations of *biological* rather than *chronological age* (i.e. the importance of frailty, independence, and the tolerability of treatment).

Recommendation that *treatment should never be denied or withdrawn on the basis of age*, provided that *treatment is tolerated*. 
<table>
<thead>
<tr>
<th>Age group</th>
<th>Hypertension</th>
<th>+ Diabetes</th>
<th>+ CKD</th>
<th>+ CAD</th>
<th>+ Stroke/TIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>65−79 years</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
</tr>
<tr>
<td>≥ 80 years</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
<td>Target to &lt; 140 to 130 if tolerated</td>
</tr>
<tr>
<td>Diastolic treatment target range (mmHg)</td>
<td>&lt; 80 to 70</td>
<td>&lt; 80 to 70</td>
<td>&lt; 80 to 70</td>
<td>&lt; 80 to 70</td>
<td>&lt; 80 to 70</td>
</tr>
</tbody>
</table>
In elderly hypertensives all agents are recommended and can be used in the elderly, although diuretics and calcium antagonists may be preferred in isolated systolic hypertension.
**Office BP treatment targets in hypertensive patients**

- **In older patients (aged ≥ 65 years) receiving BP-lowering drugs:**
  - It is recommended that SBP should be targeted to a **BP range of 130 to < 140 mmHg.**

- **Close monitoring of adverse effects is recommended.**

- **These BP targets are recommended for patients at any level of CV risk and in patients with and without established CVD.**
## Lifestyle Modifications

<table>
<thead>
<tr>
<th>Modification</th>
<th>Approximate SBP Reduction (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Reduction</td>
<td>5-10 mmHg/10kg</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>Moderation of alcohol consumption</td>
<td>2–4 mmHg</td>
</tr>
</tbody>
</table>
Effect of 30 minute walk 3 days a week
Age 70 - 79

<table>
<thead>
<tr>
<th></th>
<th>Systolic</th>
<th>Diastolic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exercise Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>156 ± 10 mm Hg</td>
<td>86 ± 8 mm Hg</td>
</tr>
<tr>
<td>3 months</td>
<td>151 ± 15 mm Hg</td>
<td>80 ± 6 mm Hg</td>
</tr>
<tr>
<td><strong>Control Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>153 ± 7 mm Hg</td>
<td>85 ± 8 mm Hg</td>
</tr>
<tr>
<td>3 months</td>
<td>156 ± 10 mm Hg</td>
<td>85 ± 6 mm Hg</td>
</tr>
</tbody>
</table>

Sodium Reduction and Weight Loss (n=147)

Sodium Reduction (n=144)

Weight Loss (n=147)

Usual Care (n=147)

Hazard Ratios Relative to Usual Care

Sodium Reduction and Weight Loss: 0.47 (95% CI, 0.35-0.64), P<.001
Sodium Reduction: 0.60 (95% CI, 0.45-0.80), P<.001
Weight Loss: 0.64 (95% CI, 0.49-0.85, P=.002

TONE Study. JAMA 1998;279:844
Clinical Trials in Hypertension

Should we treat diastolic HBP?
What is the goal of treatment?
Should we treat DBP in older persons?
What is the best way to treat HBP?
Should we treat ISH in older persons?
Can we prevent hypertension?


HDFP
VA Cooperative Studies
EWPHE MRC-1 ANHBP-1
SHEP MRC-2 STOP-1
HAPPHY MAPHY
TOMHS VA MONORx
HOT UKPDS
Syst-Eur Syst-China
CAPPP STOP-2
INSIGHT NORDIL
SCOPE CONVINCE ALLHAT ANBP2 LIFE
VALUE ASCOT ACCOMPLISH TROPHY


A Report of the American College of Cardiology Foundation Task Force on Expert Consensus Documents
The following combinations of antihypertensive agents has shown to reduce CV risk in the elderly

1. Diuretics + beta blockers
2. ACEI + diuretics
3. ACEI + calcium antagonists
4. Angiotensin receptor blockers + diuretics

Guideline recommendations - start with low dose thiazide diuretic in uncomplicated disease, otherwise select agents known to reduce CV risk in elderly with appropriate indicated risk factors
2013 Guidelines for the Management of Arterial Hypertension

European Society of Hypertension
European Society of Cardiology

In elderly hypertensives all agents are recommended and can be used in the elderly, although diuretics and calcium antagonists may be preferred in isolated systolic hypertension.
Antihypertensive Treatment-Related Side Effects

The high prevalence of both CV and non-CV comorbidities among the elderly dictates need for great vigilance to avoid treatment-related side effects such as:

- Electrolyte disturbances
- Renal dysfunction
- Excessive orthostatic BP decline
ΟΡΘΟΣΤΑΤΙΚΗ ΥΠΟΤΑΣΗ

↓ συστολικής ≥ 20 mmHg ή/και διαστολικής ≥ 10 mmHg εντός 3 min από την έγερση σε όρθια θέση.

ΜΕΛΕΤΗ PARTAGE:
994 ηλικωμένοι > 80 ετών → 18%
Physiologic Changes with Aging: Potential to Influence Antihypertensive Drug Pharmacokinetics

<table>
<thead>
<tr>
<th>Process</th>
<th>Physiologic Change</th>
<th>Result</th>
<th>Drugs Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorption</td>
<td>Reduced gastric acid production</td>
<td>Reduced tablet dissolution / decreased solubility of basic drugs</td>
<td>All tablets</td>
</tr>
<tr>
<td></td>
<td>Reduced gastric emptying rate</td>
<td>Decreased absorption for acidic drugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduced GI motility, GI blood flow, and absorptive surface</td>
<td>Less opportunity for drug absorption</td>
<td>All</td>
</tr>
<tr>
<td>Distribution</td>
<td>Decreased total body mass; increased proportion of body fat</td>
<td>Increased vol of distribution of highly lipid soluble drugs</td>
<td>β-blockers, central α-agonists</td>
</tr>
<tr>
<td></td>
<td>Decreased proportion of body water</td>
<td>Decreased vol of distribution of hydrophilic drugs</td>
<td>ACEIs</td>
</tr>
<tr>
<td></td>
<td>Decreased plasma albumin, disease-related increased α₁-acid glycoprotein, altered relative tissue perfusion</td>
<td>Changed percent of free drug, vol of distribution, and measured levels of bound drugs</td>
<td>propranolol</td>
</tr>
</tbody>
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Physiologic Changes with Aging: Potential to Influence Antihypertensive Drug Pharmacokinetics

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<td>Absorption</td>
<td>Reduced gastric acid production</td>
<td>Reduced tablet dissolution / decreased solubility of basic drugs</td>
<td>All tablets</td>
</tr>
<tr>
<td></td>
<td>Reduced gastric emptying rate</td>
<td>Decreased absorption for acidic drugs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reduced GI motility, GI blood flow, and absorptive surface</td>
<td>Less opportunity for drug absorption</td>
<td>All</td>
</tr>
<tr>
<td>Distribution</td>
<td>Decreased total body mass; increased proportion of body fat</td>
<td>Increased vol of distribution of highly lipid soluble drugs</td>
<td>β-blockers, central α-agonists</td>
</tr>
<tr>
<td></td>
<td>Decreased proportion of body water</td>
<td>Decreased vol of distribution of hydrophilic drugs</td>
<td>ACEIs</td>
</tr>
<tr>
<td></td>
<td>Decreased plasma albumin, disease-related increased α1-acid glycoprotein, altered relative tissue perfusion</td>
<td>Changed percent of free drug, vol of distribution, and measured levels of bound drugs</td>
<td>propranolol</td>
</tr>
</tbody>
</table>
Physiologic Changes with Aging: Potential to Influence Antihypertensive Drug Pharmacokinetics

<table>
<thead>
<tr>
<th>Process</th>
<th>Physiologic Change</th>
<th>Result</th>
<th>Drugs Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metabolism</td>
<td>Reduced liver mass, liver blood flow, and hepatic metabolic capacity</td>
<td>Accumulation of metabolized drugs</td>
<td>propranolol, diltiazem, labetalol, verapamil</td>
</tr>
<tr>
<td>Excretion</td>
<td>Reduced GRF, tubular function, and renal blood flow</td>
<td>Accumulation of drugs cleared by kidneys</td>
<td>ACEIs, atenolol, sotalol, nadolol</td>
</tr>
</tbody>
</table>
Συμπεράσματα

• Ο ηλικιωμένος υπερτασικός ασθενής θέλει ιδιαίτερη αντιμετώπιση σε στόχους ΣΑΠ<140-130mmHg ΔΑΠ<80-70mmHg εφόσον το ανέχεται, και έναρξη θεραπείας >140-160 mmHg.

• Προσοχή στην τεκμηρίωση της ΑΠ, μέτρηση ΠΑΝΤΑ και σε ορθία θέση.

• Εάν χρειασθεί θεραπεία ξεκινάμε συντηρητικά με χαμηλές δόσεις φαρμάκων εξατομικευμένα, ενώ πάντα πρέπει να μας απασχολεί ο όρος της βιολογικής κυρίως ηλικίας στη λήψη των αποφάσεων.