



# **Renal Denervation for moderate and resistant hypertension?**

**Con: weigh risks vs benefits and consider new additions to the toolkit**

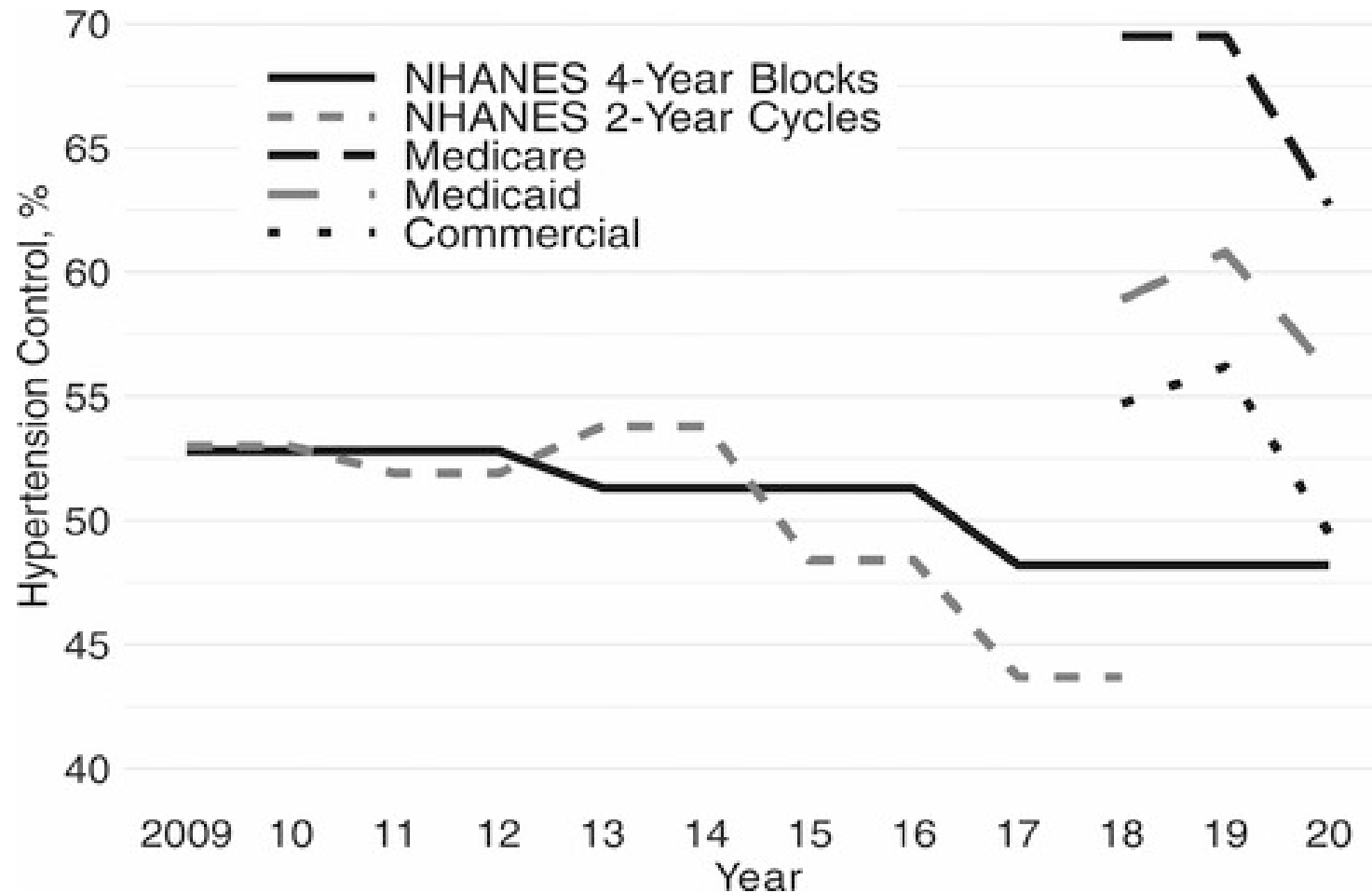
**Judith Hsia, MD**

**Research Professor of Medicine, Univ of Colorado**

**20Oct2022**

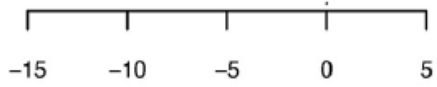
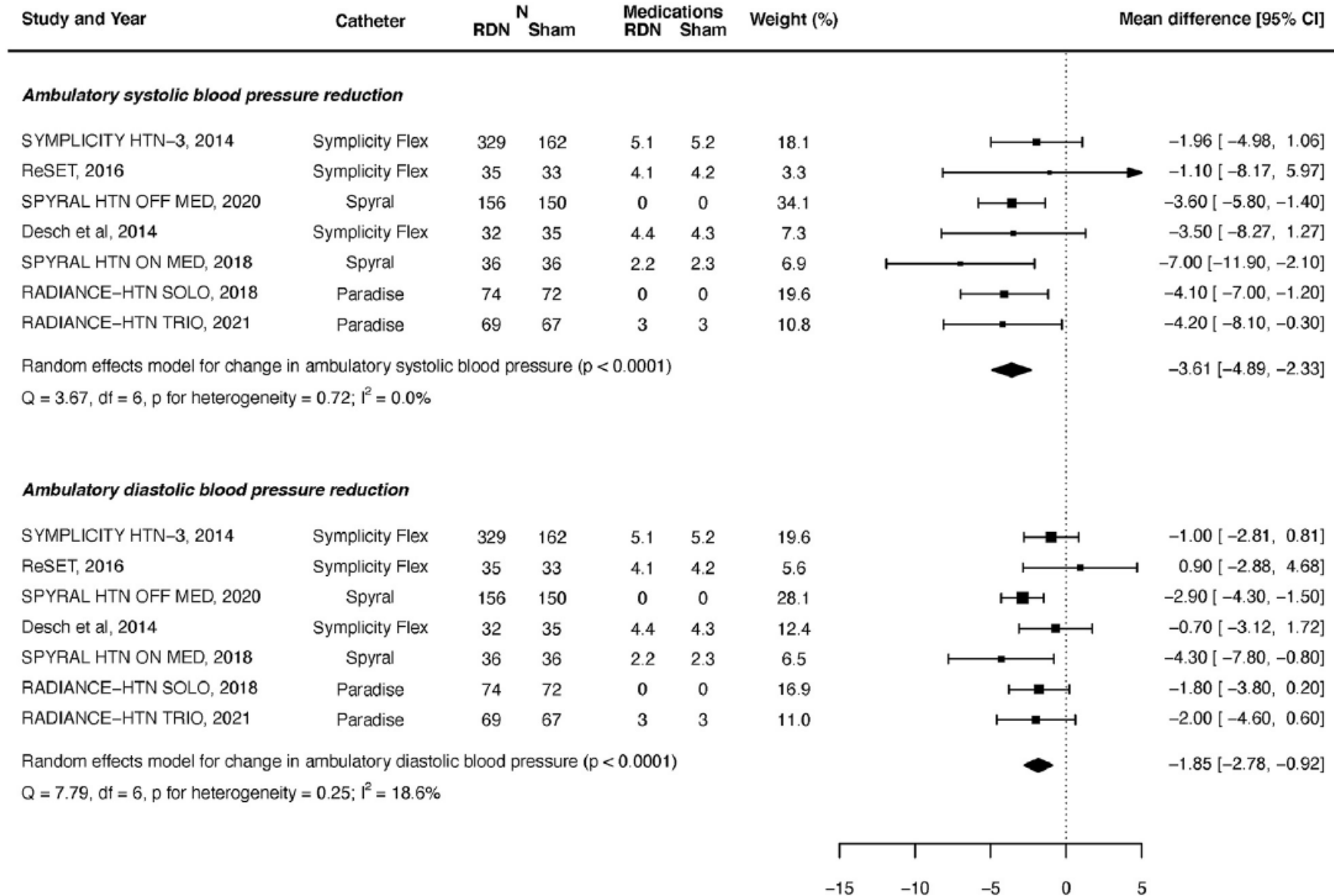
# Hypertension control: Room for improvement

>120 million US adults with BP systolic  $\geq 130$  and/or diastolic  $\geq 80$



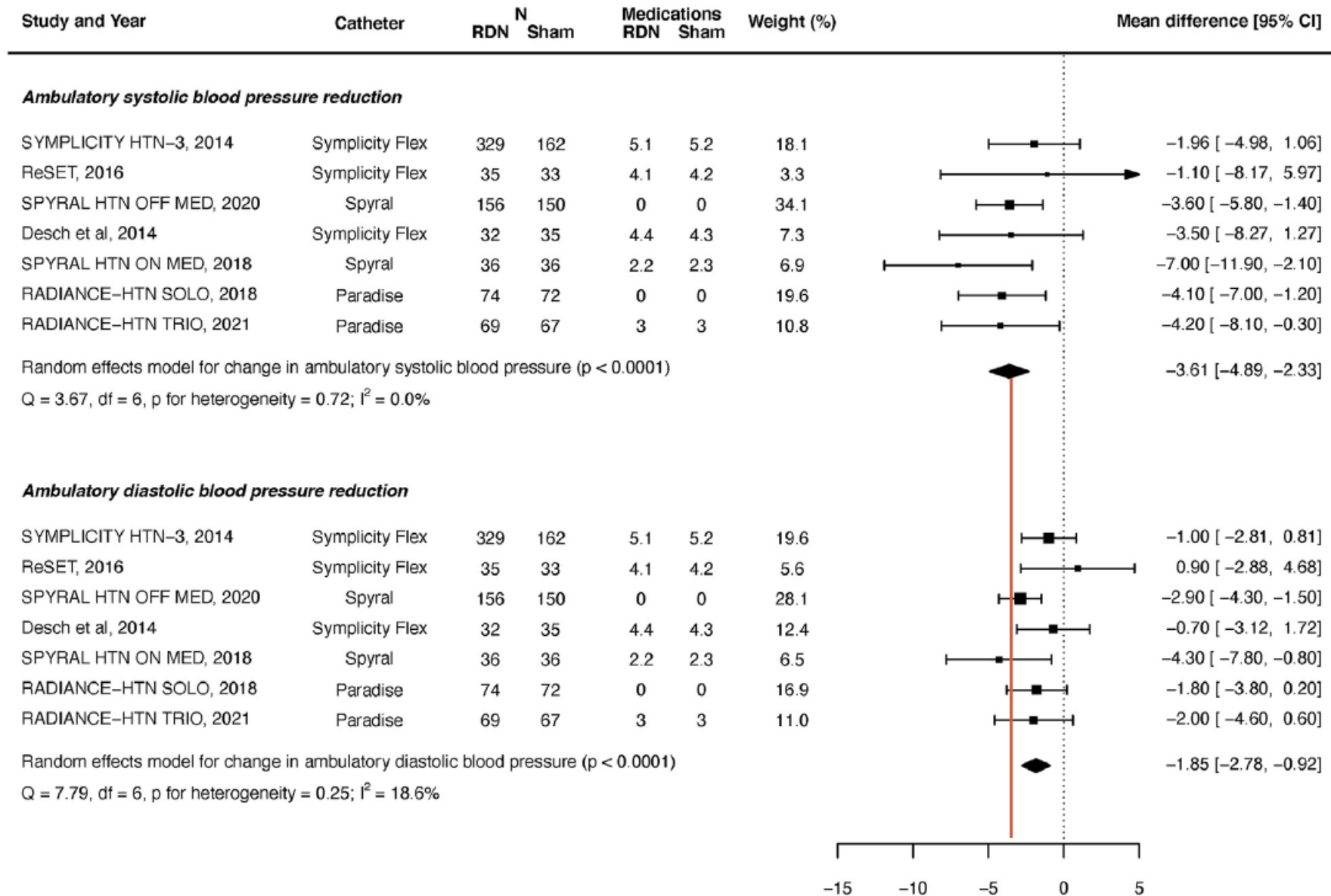
No major adverse effect of COVID on BP control

# Meta-analysis of randomized denervation trials



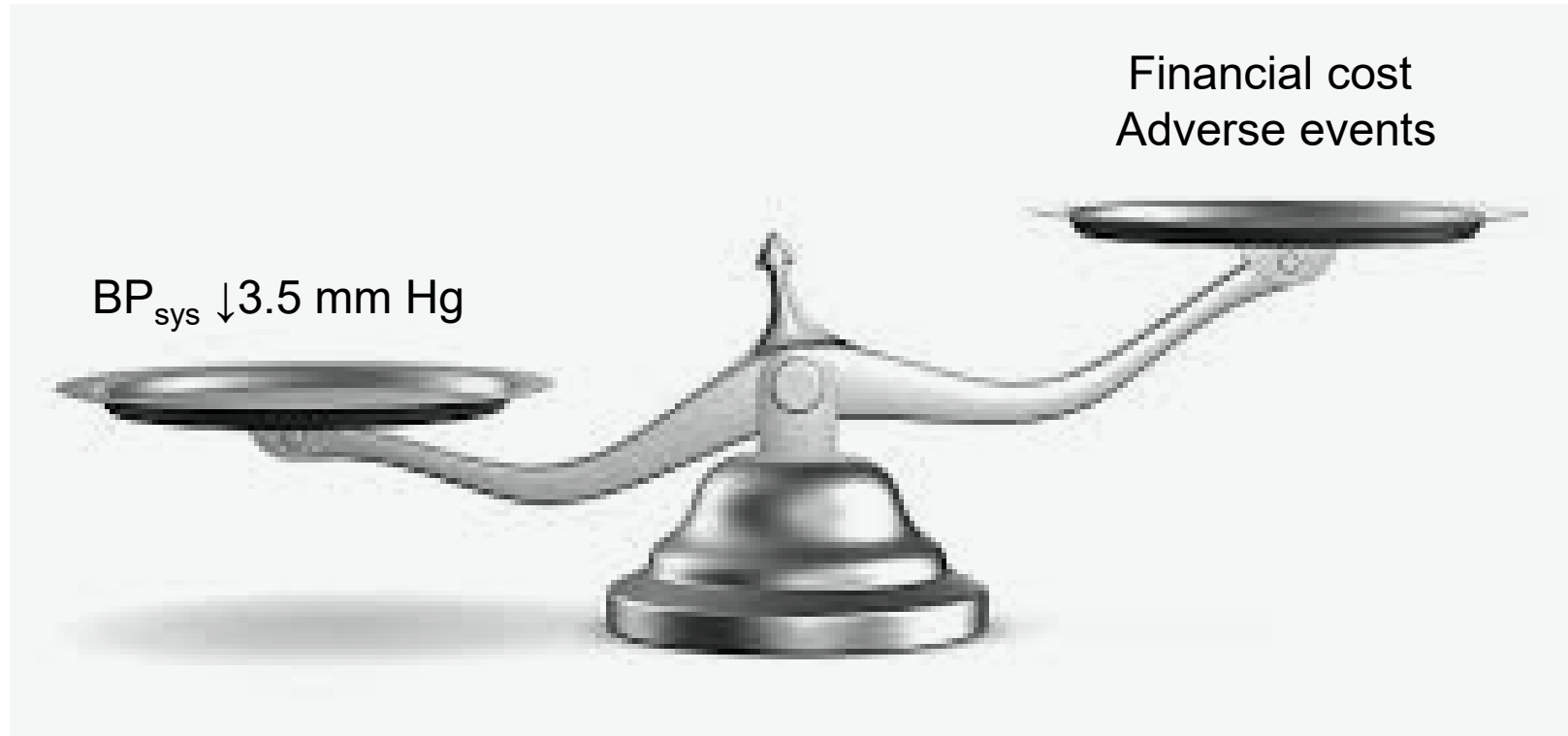
Denervation better < Change in blood pressure (mmHg) > Placebo better

# Meta-analysis of randomized denervation trials



Denervation better < Change in blood pressure (mmHg) > Placebo better

# Balance the magnitude of BP reduction vs costs



# Markov model using meta-analysis efficacy

**Table 2.** Initial CVD risk and base case results of the cost-effectiveness analysis of RDN compared with SoC in 1,000 TRH participants

Treatment arm	Total (discounted)			Incremental (discounted)			ICER: \$/ life year gained	ICER: \$/ QALY gained	Initial 10-year CVD risk for RDN to be cost-effective
	Cost	Life year gained	QALY gained	Cost	Life year gained	QALY gained			
Base case: lifetime horizon									
SoC	\$26,273,976	11630.8	11216.9	\$8,696,568	175.6	184.5	\$ 49,519	\$ 47,130	13.2%
RDN	\$34,970,545	11806.4	11401.5						
Scenario analysis: 20-year time horizon									
SoC	\$28,538,954	10285.9	9845.3	\$8,200,761	165.3	179.8	\$ 49,618	\$ 45,624	24.3%
RDN	\$36,739,714	10451.2	10025.1						
Sensitivity analysis: RDN procedure repeated every 10 years									
SoC	\$41,940,529	8562.6	7960.1	\$9,861,892	197.3	211.3	\$49,859	\$47,333	61.1%
RDN	\$51,802,421	8759.9	8171.4						

Abbreviations: CVD, cardiovascular disease; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life year; RDN, renal denervation; SoC, standard treatment of care; TRH, treatment-resistant hypertension.

# AHRQ report 2016: Renal denervation in Medicare population

Adverse effects were uncommon but potentially serious

# AHRQ Report 2016: Renal denervation in Medicare population

## Adverse effects were uncommon but potentially serious

	Renal denervation	Control	Control group management	Study
	n/N (%)			
<b>Access site</b>				
Pseudoaneurysm at puncture site	2/9 (22)	NR	Antihypertensive medication	Schneider 2015
	1/52 (2)	NR	"	Rosa 2015
	1/52 (2)	NR	Unspecified	Symlicity 2010
Groin hematoma	1/46 (2)	0/53	Antihypertensive medication	Azizi 2015
	4/9 (44)	NR	"	Fadi Elmula 2014
AV fistula	1/52 (2)	NR	Antihypertensive medication	Rosa 2015
Vascular complication requiring treatment	1/352 (0.3)	0/171	Sham procedure	Bhatt 2014
Vascular complication	1/355 (0.3)	0/69	Sham procedure	Bhatt 2014
<b>Renal artery events</b>				
Renal artery dissection	1/52 (2)	NR	Antihypertensive medication	Rosa 2015
	NR	1/35 (3)	Unspecified	Symlicity 2010
Renal artery stenosis	1/332 (0.3)	0/165	Sham procedure	Bhatt 2014
Renal artery reintervention	2/355 (0.6)	0/69	Sham procedure	Bhatt 2014
Progression of atherosclerotic lesion	1/43 (2.3)	NR	Unspecified	Symlicity 2010

NR not reported



# AHRQ Report 2016: Renal denervation in Medicare population

## Adverse effects were uncommon but potentially serious

	Renal denervation	Control	Control group mgmt	Study
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<b>Embolic event</b>				
Embolic event resulting in end-organ damage	1/352 (0.3)	0/171	Sham procedure	Bhatt 2014
Significant embolic event resulting in end-organ damage	1/355 (0.3)	0/69	Sham procedure	Bhatt 2014
<b>Renal function</b>				
50% increase in serum creatinine	1/22 (5)	0/19	Antihypertensive med	Kario 2015
	5/352 (1)	1/171 (1)	Sham procedure	Bhatt 2014
Worsening of renal function	NR	1/54 (2)	Antihypertensive med	Rosa 2015
New onset end-stage renal disease	1/355 (0.3)	0/70	Sham procedure	Bhatt 2014
Acute renal failure	1/69 (1)	MR	Unspecified	Symplivity 2010
<b>BP-related event</b>				
Hypertensive crisis/emergency	3/46 (7)	3/53 (6)	Antihypertensive med	Azizi 2015
	9/352 (3)	9/171 (5)	Sham procedure	Bhatt 2014
	17/355 (5)	4/69 (6)	"	Bhatt 2014
Syncope	0	1/53 (2)	Antihypertensive med	Azizi 2015
Post-procedural drop in BP resulting in reduction in anti-hypertensive drugs	1/52 (2)	NR	Unspecified	Symplivity 2010
Symptomatic hypotension	1/9 (11)	4/10 (40)	Antihypertensive med	Fado Elmula 2014

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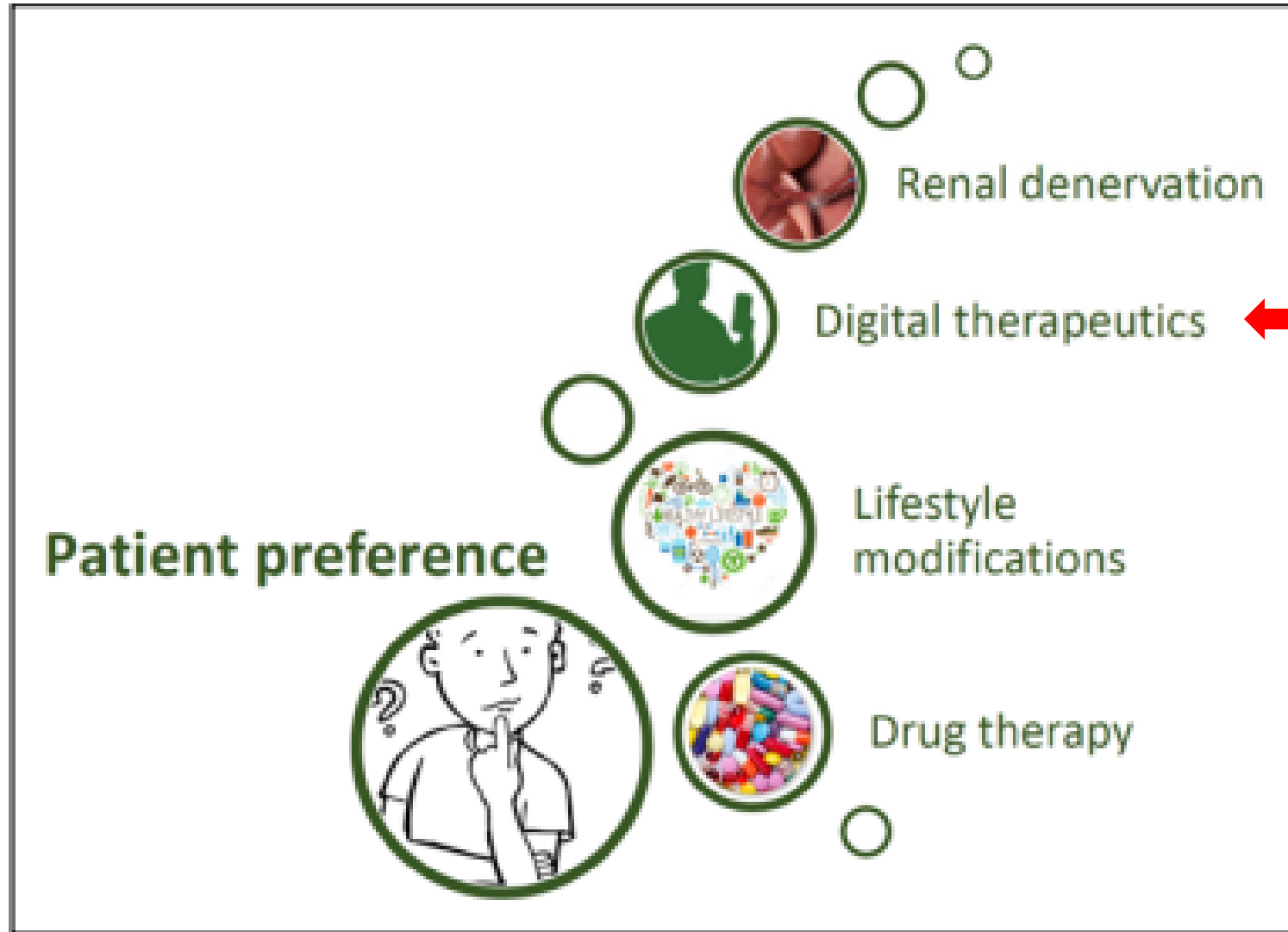
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# AHRQ conclusion

- Further research is needed to
  - identify optimal candidates for renal denervation
  - refine next generation renal denervation technology
  - develop methods for assessing completeness of renal denervation procedure
  - demonstrate efficacy of renal denervation in reducing BP and improving clinical endpoints

# Therapeutic toolkit



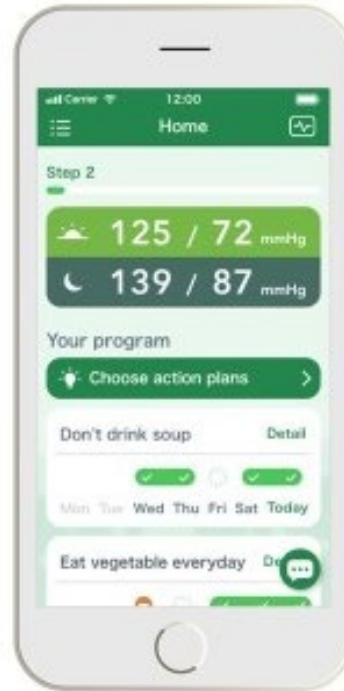
# Digital therapeutic: HERB-DH1

Randomized, open label comparison of digital app + lifestyle modification vs lifestyle modification alone

N=390

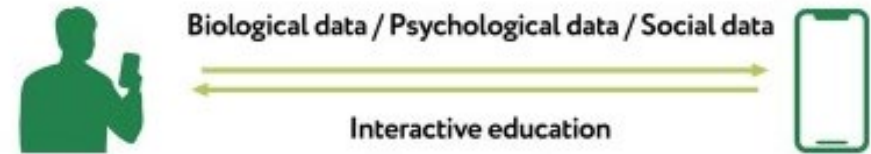
12 weeks

1° endpoint: ABPM



## App-supported lifestyle modification

### 【Step1】 Input and education



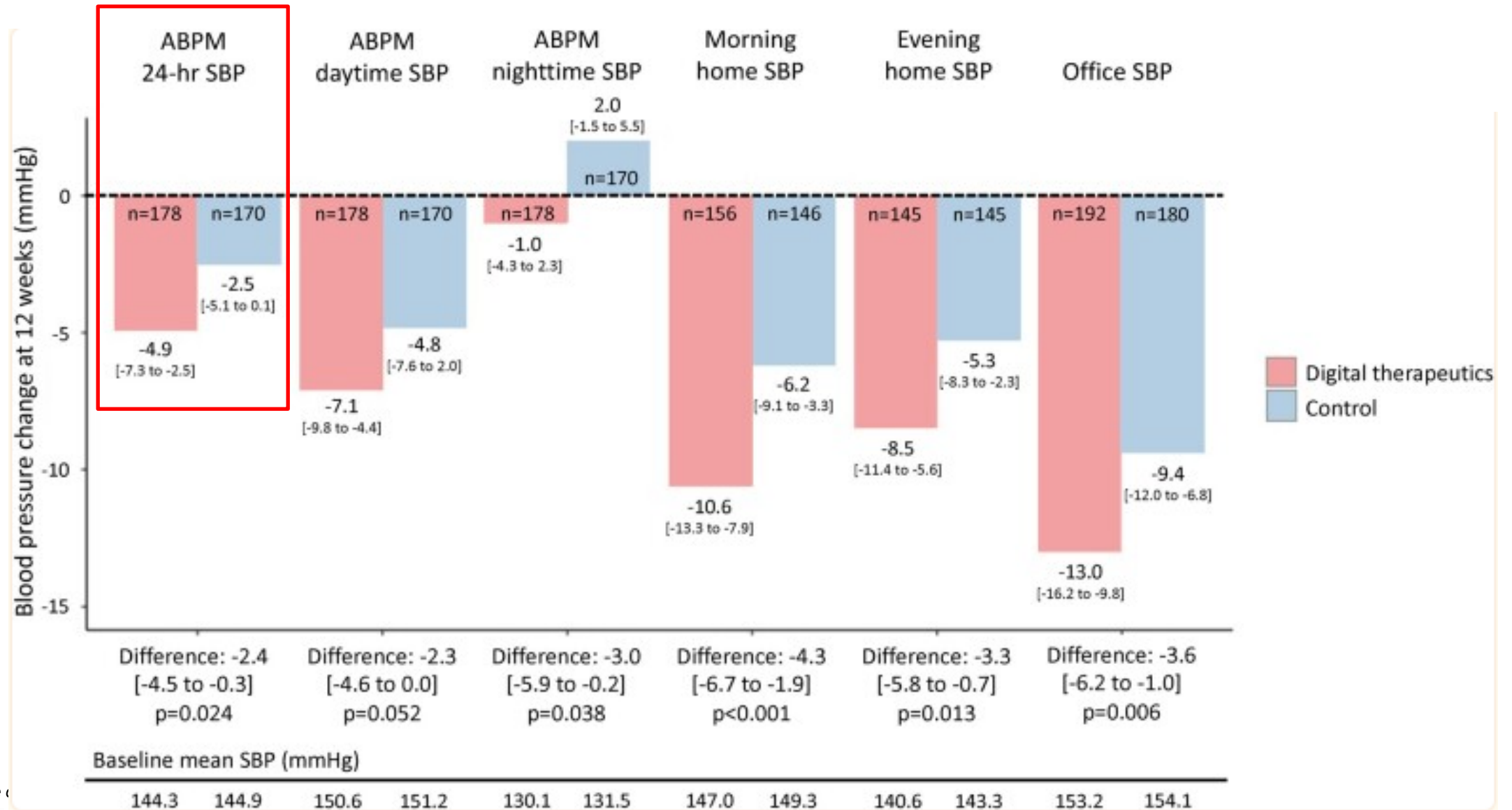
### 【Step2】 App-supported experiences



### 【Step3】 Self planning and evaluation



# Digital therapeutic: HERB-DH1



# Cognitive behavioral therapy for hypertension

## Meta-analysis

15 trials, 2195 subjects

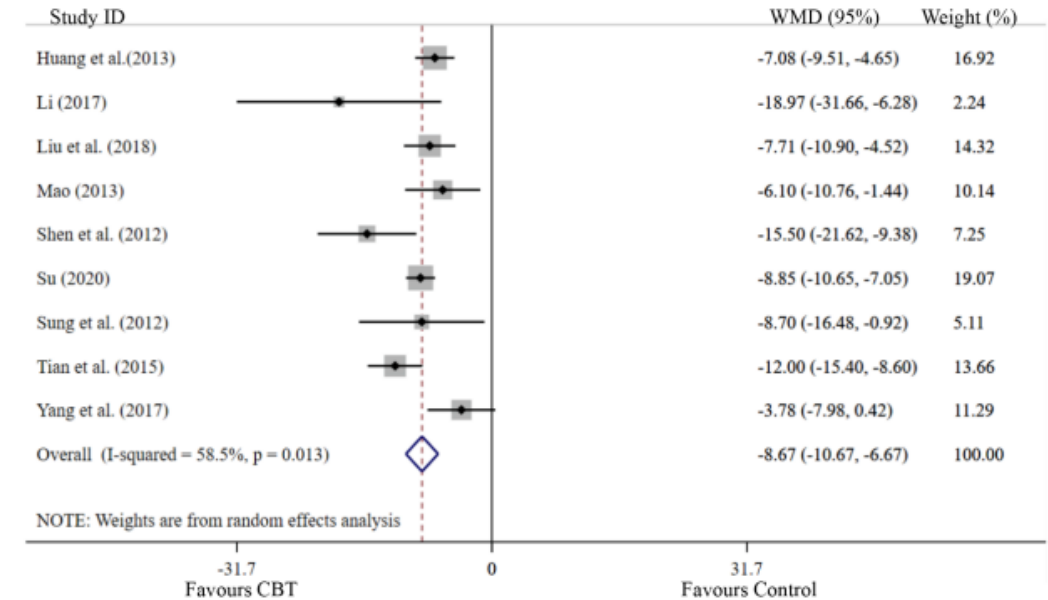
Mean reduction of systolic BP

**- 8.7** mm Hg (95% CI: - 10.7 to - 6.7)

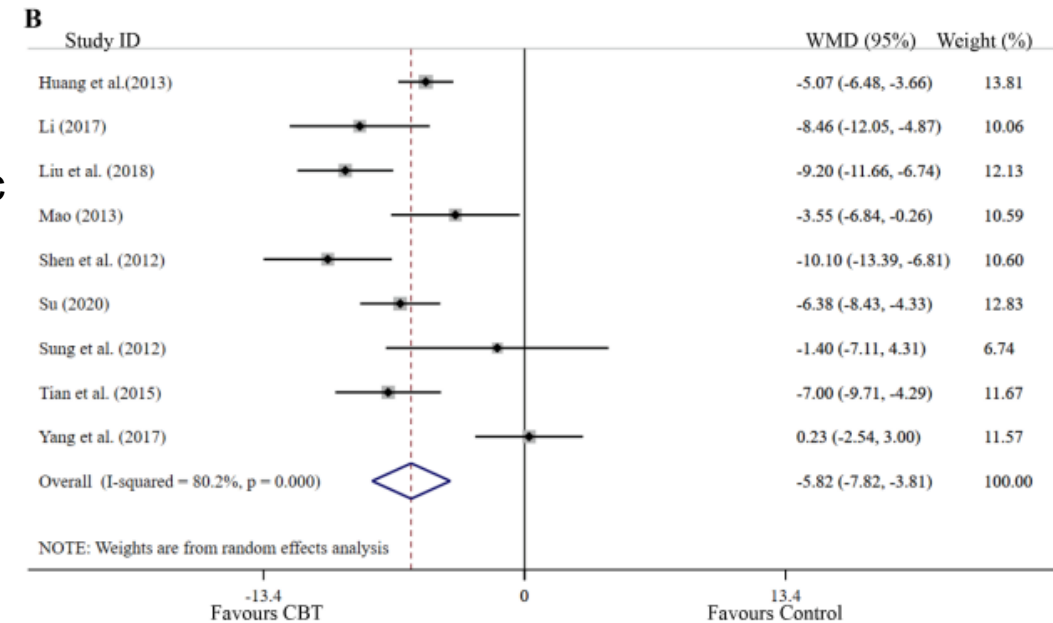
Mean reduction of diastolic BP

**- 5.8** mm Hg (95% CI: - 7.8 to - 3.8)

Systolic



Diastolic





# Fully automated digital cognitive behavioral therapy

CBT well suited to automated, digital delivery

- Highly structured
- Time limited, eg 12-20 sessions
- Developed or in development for
  - Anxiety
  - Depression
  - Insomnia
  - Type 2 diabetes

Future possibility for  
hypertension toolkit



# Conclusion

- **Renal denervation appears to provide modest BP reduction**
- **Considering the cost and adverse event profile, risks and benefits of alternative complementary therapies should be considered**