

# Renal Denervation Therapy for Resistant Hypertension What May Be Expected, What is Unexpected

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# Disclosure

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Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below

<u>Affiliation/Financial Relationship</u>	<u>Company</u>
Grant/Research Support	Abbott Vascular, Boston Scientific Corporation, Medtronic CardioVascular
Consulting Fees/Honoraria	Abbott Vascular, Boston Scientific Corporation, Medtronic CardioVascular, Micell Technologies, Terumo Medical
Major Stock Shareholder/Equity	None
Royalty Income	None
Ownership/Founder	None
Intellectual Property Rights	None
Other Financial Benefit	None

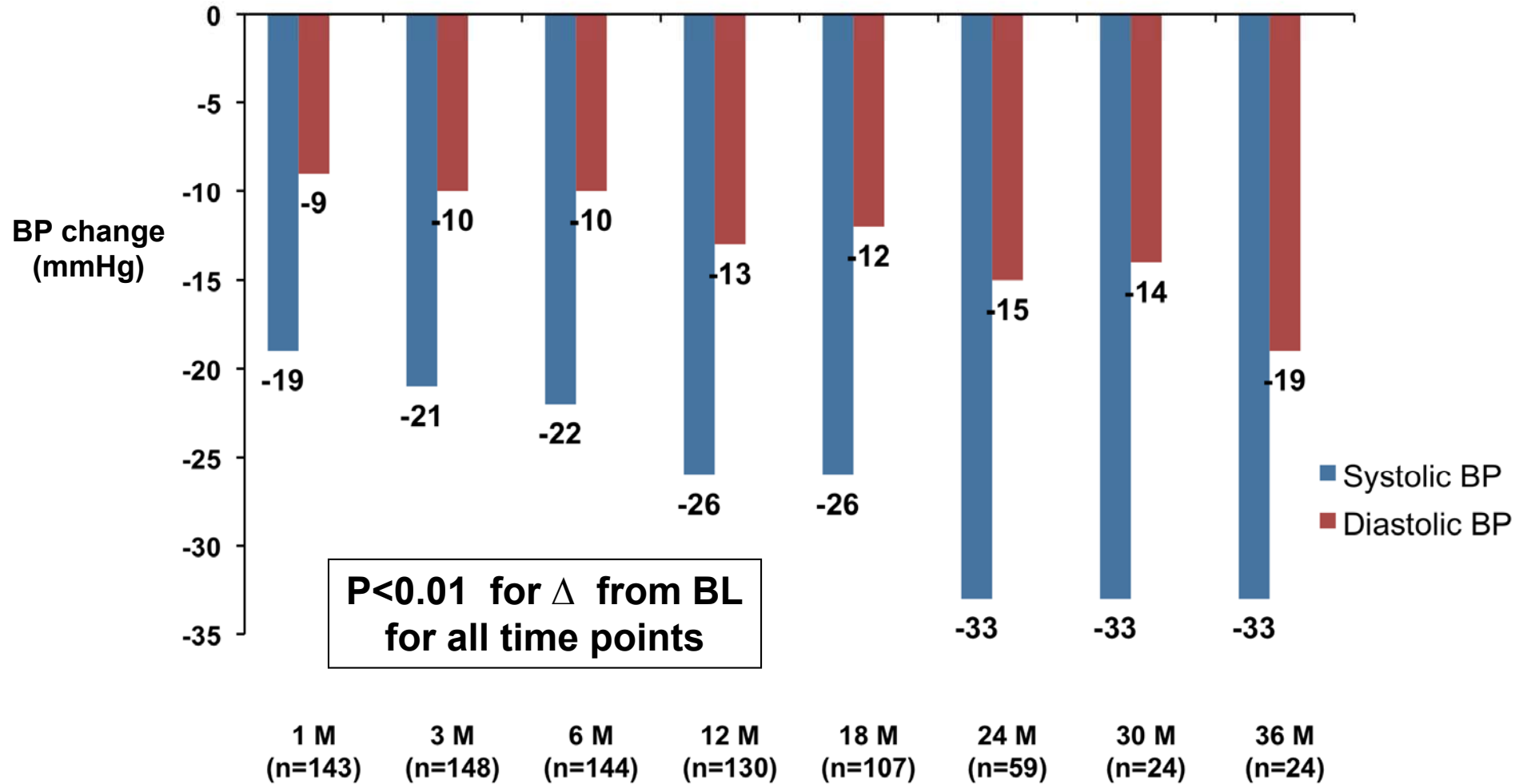
## What is Expected (and Unexpected) From Renal Denervation Therapy

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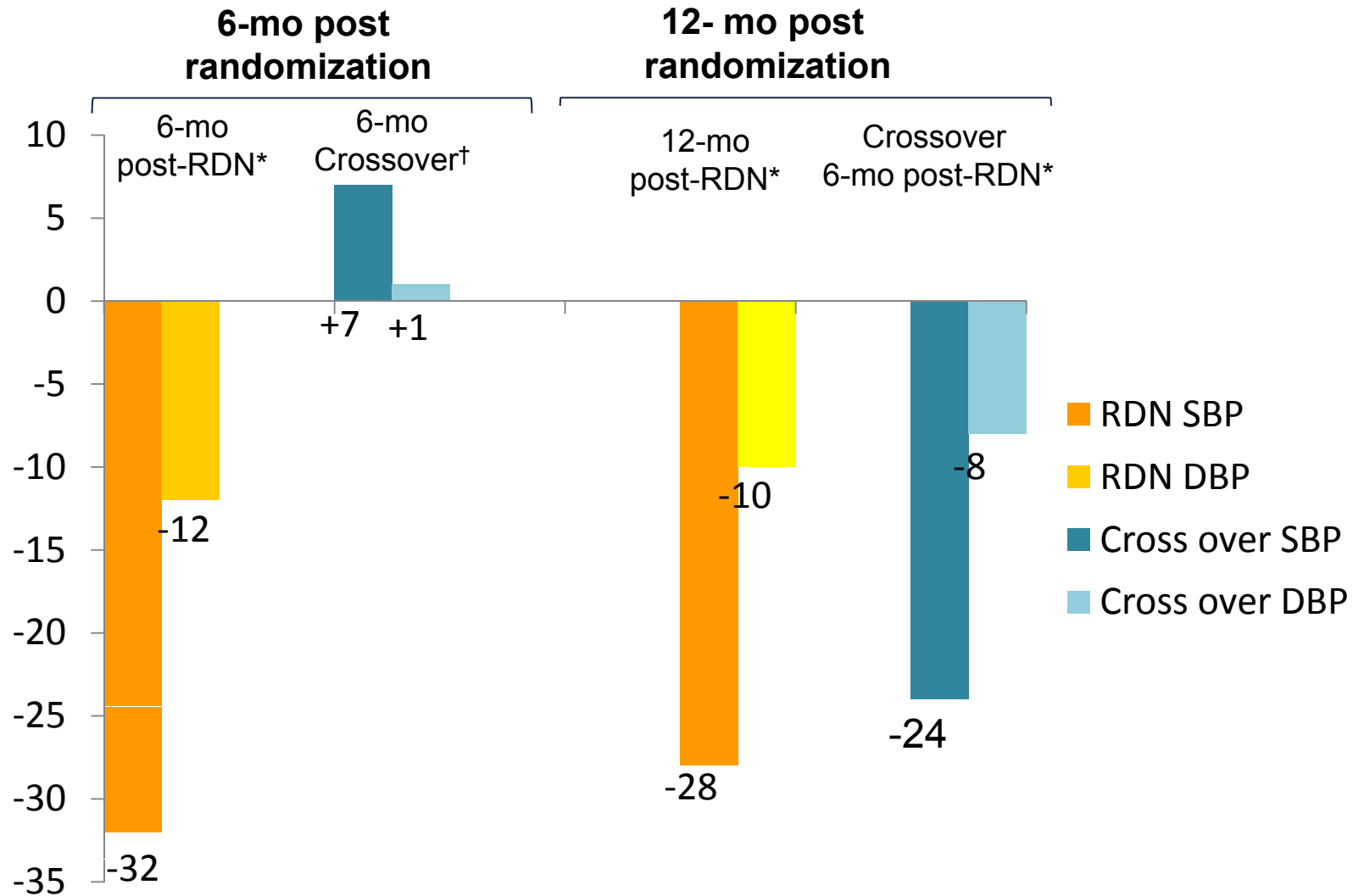
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- 2 Procedural and late-term safety
- 3 Predictability in response to RDN therapy
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# SYMPPLICITY HTN 1

## Change in Office Blood Pressure Through 36 Months



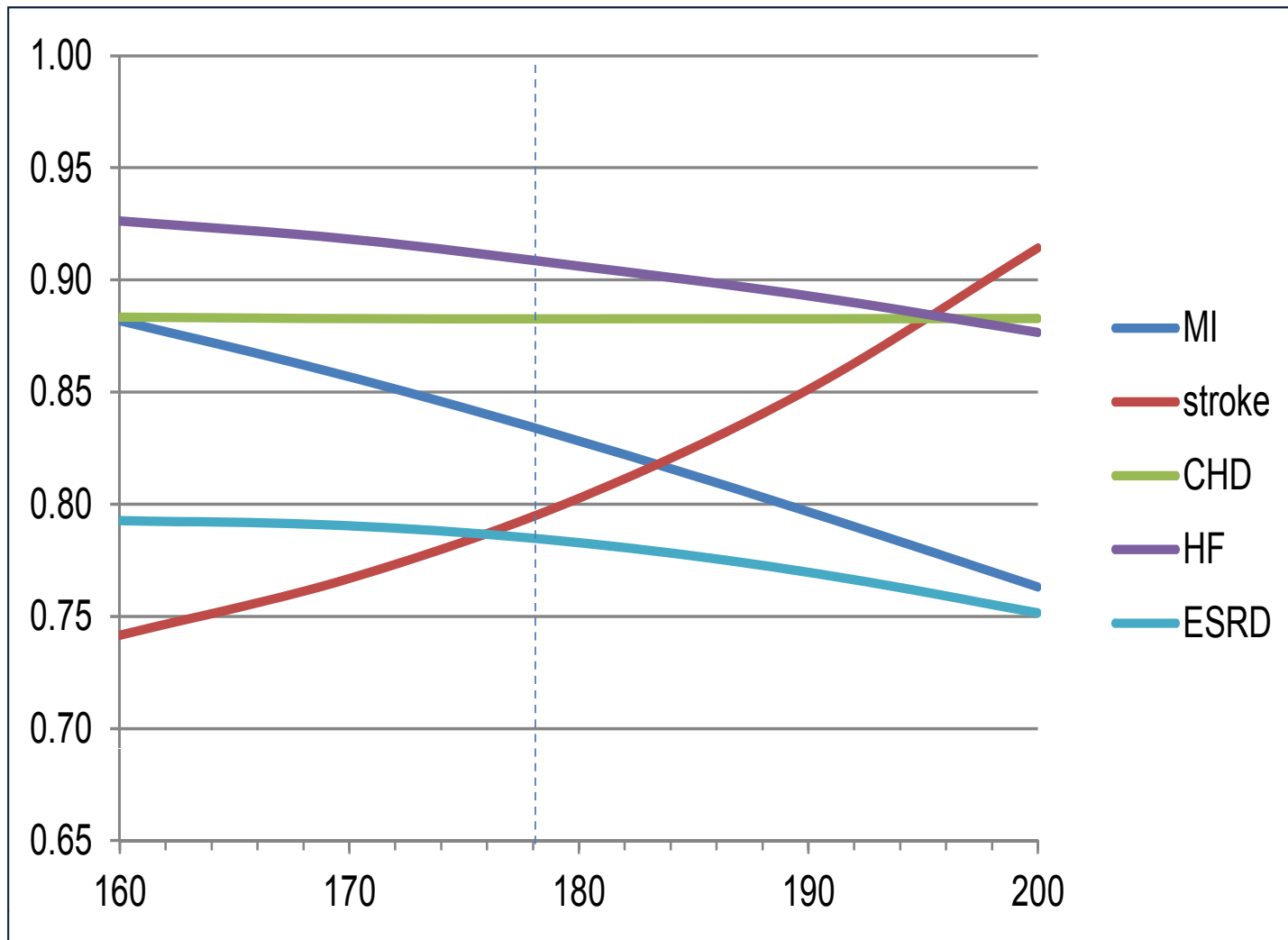
# Change in Office Blood Pressure (mm Hg)



\* P<0.001 for SBP and DBP change from baseline

† P=0.026 for SBP change from baseline

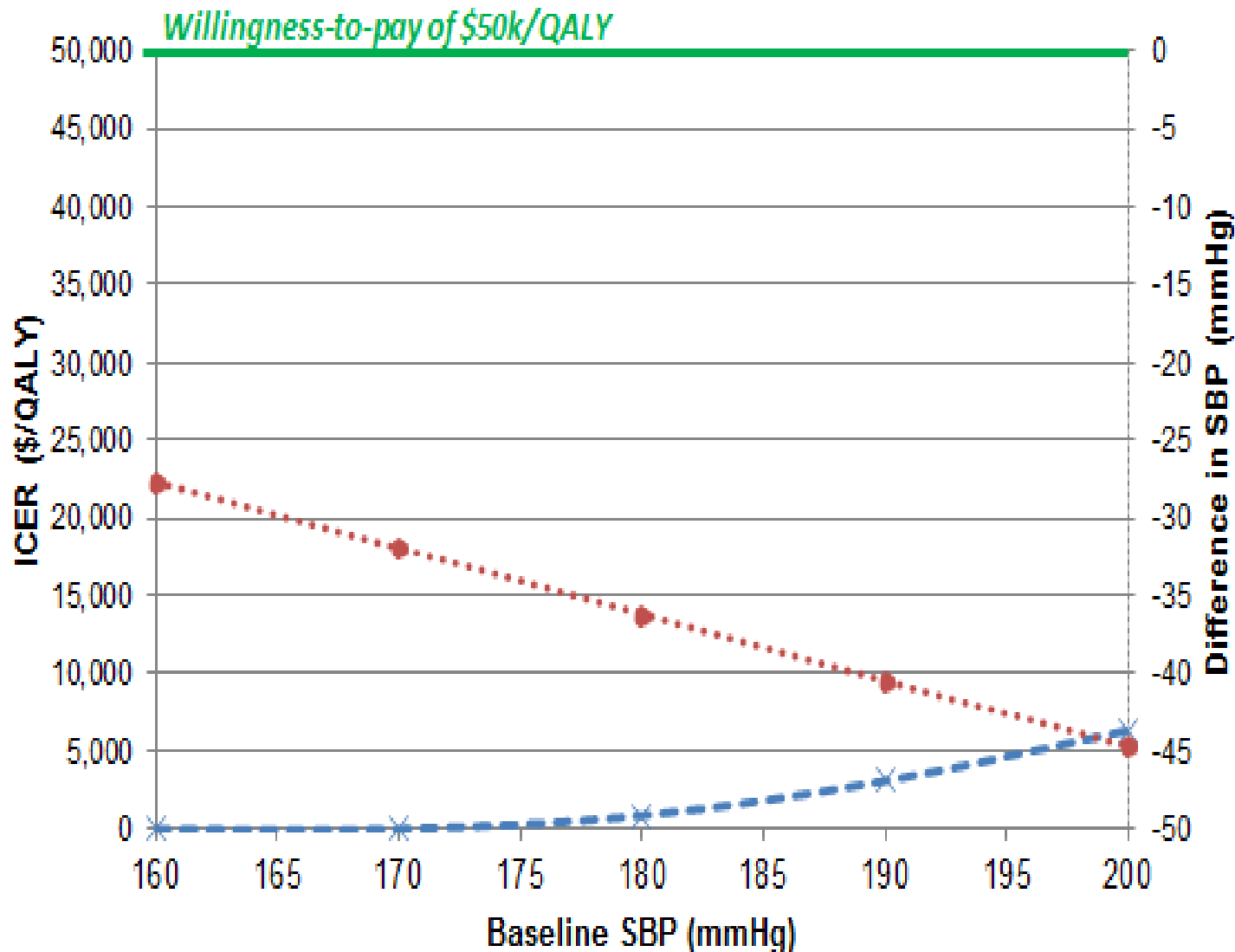
# Relative Reduction in Lifetime Event Risk



# Economic Impact of HTN-Related Clinical Events

Health state	Description	Cost (US \$, 2010)	Baseline Utility* (Health-related Quality of Life)
Hypertension	Yearly maintenance	\$ 858	0.96
Stroke	Acute	\$ 18,627	0.63
	1 <sup>st</sup> yr. beyond acute	\$ 30,801	
	2 <sup>nd</sup> and following yrs.	\$ 27,899	
MI	Acute	\$ 21,127	0.76
	1 <sup>st</sup> and following yrs.	\$ 3,750	0.88
HF	1 <sup>st</sup> year	\$ 14,532	0.71
	2 <sup>nd</sup> and following yrs.	\$ 5,212	
AP	Stable, yearly	\$ 3,674	0.84
	Unstable, yearly	\$ 7,104	0.74
ESRD	Diabetics	\$ 76,851	0.63
	all others	\$ 66,844	

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# SYMPPLICITY HTN-1 Procedural Safety

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- 38 minute median procedure time
  - Average of 4 ablations per artery
- Intravenous narcotics & sedatives used to manage pain during delivery of RF energy
- No catheter or generator malfunctions
- No major complications
- Minor complications 4/153:
  - 1 renal artery dissection during catheter delivery (prior to RF energy), no sequelae
  - 3 access site complications, treated without further sequelae

# SYMPPLICITY HTN-1 Late-Term Safety (3 Years)

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- No RF treatment related vascular complications
  - One progression of a pre-existing renal artery stenosis (40%→80%), possibly related to catheter manipulation, successfully stented
  - One new moderate stenosis which was not hemodynamically relevant and no treatment
- 3 deaths within the follow-up period; all unrelated to the device or therapy
- No hypotensive events that required hospitalization
- No orthostatic hypotension
- No electrolyte disturbances
- There was no significant change in mean electrolytes or eGFR





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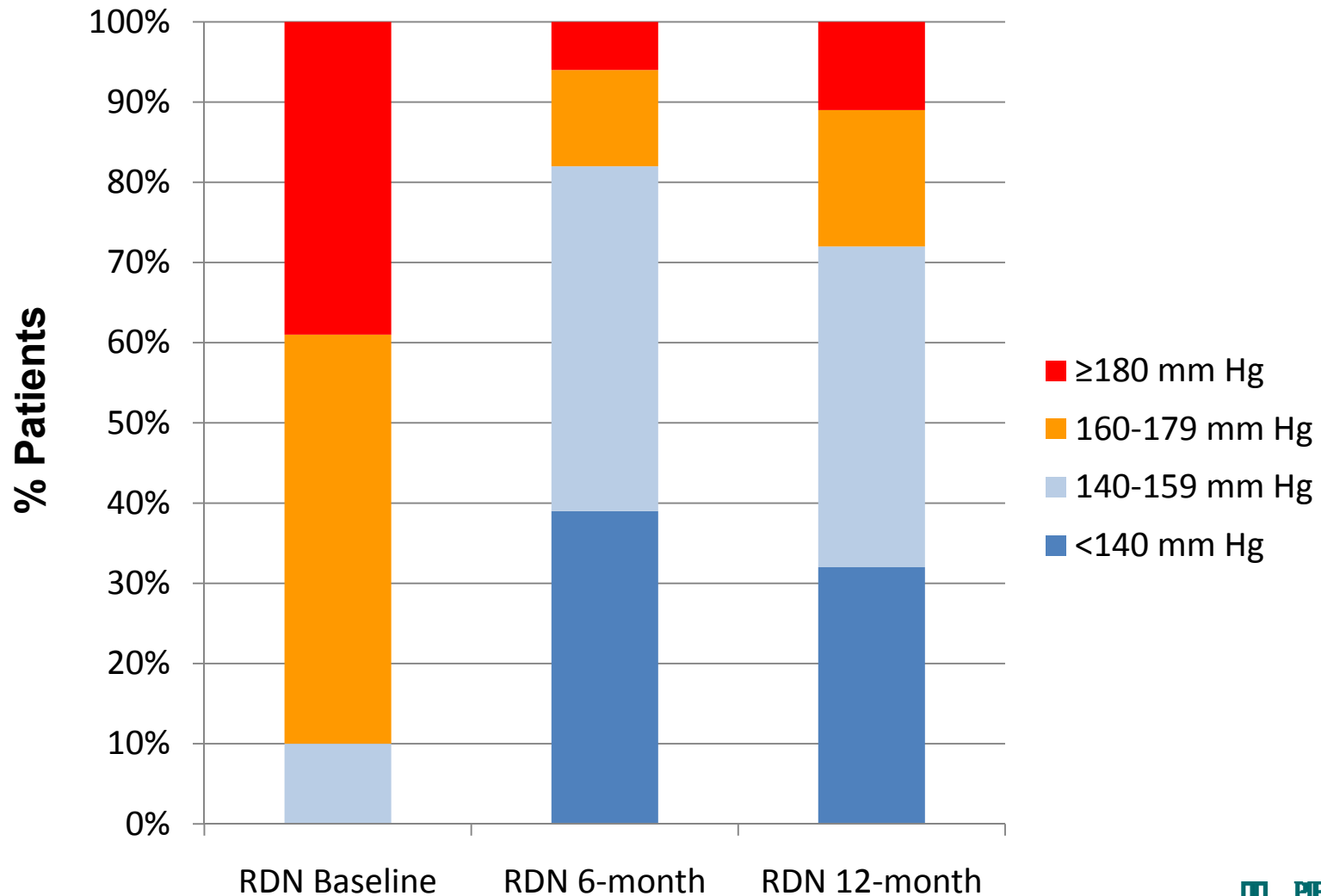
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# SYMPPLICITY HTN-2

## Distribution of Office SBP for RDN Group





# Medication Changes at 6 and 12 Months Post-Renal Denervation

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RDN (n=47)	6 month	12 months
Decrease (# Meds or Dose)	20.9% (9/43)	27.9% (12/43)
Increase (# Meds or Dose)	11.6% (5/43)	18.6% (8/43)

Crossover (n=35)	6 months post-RDN
Decrease (# Meds or Dose)	18.2% (6/33)
Increase (# Meds or Dose)	15.2% (5/33)

***Physicians were allowed to make changes to medications once the 6 month primary endpoint was reached\****

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# SYMPPLICITY Global Registry

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- Prospective, multi-center, global registry
- Minimum 5,000 pts
- Evaluate safety in 'real world' population of patients treated with RDN using the Symplicity<sup>®</sup> Renal Denervation System<sup>™</sup>
- Attention to treatment-resistant hypertension, heart failure, insulin resistance, chronic kidney disease, and sleep apnea

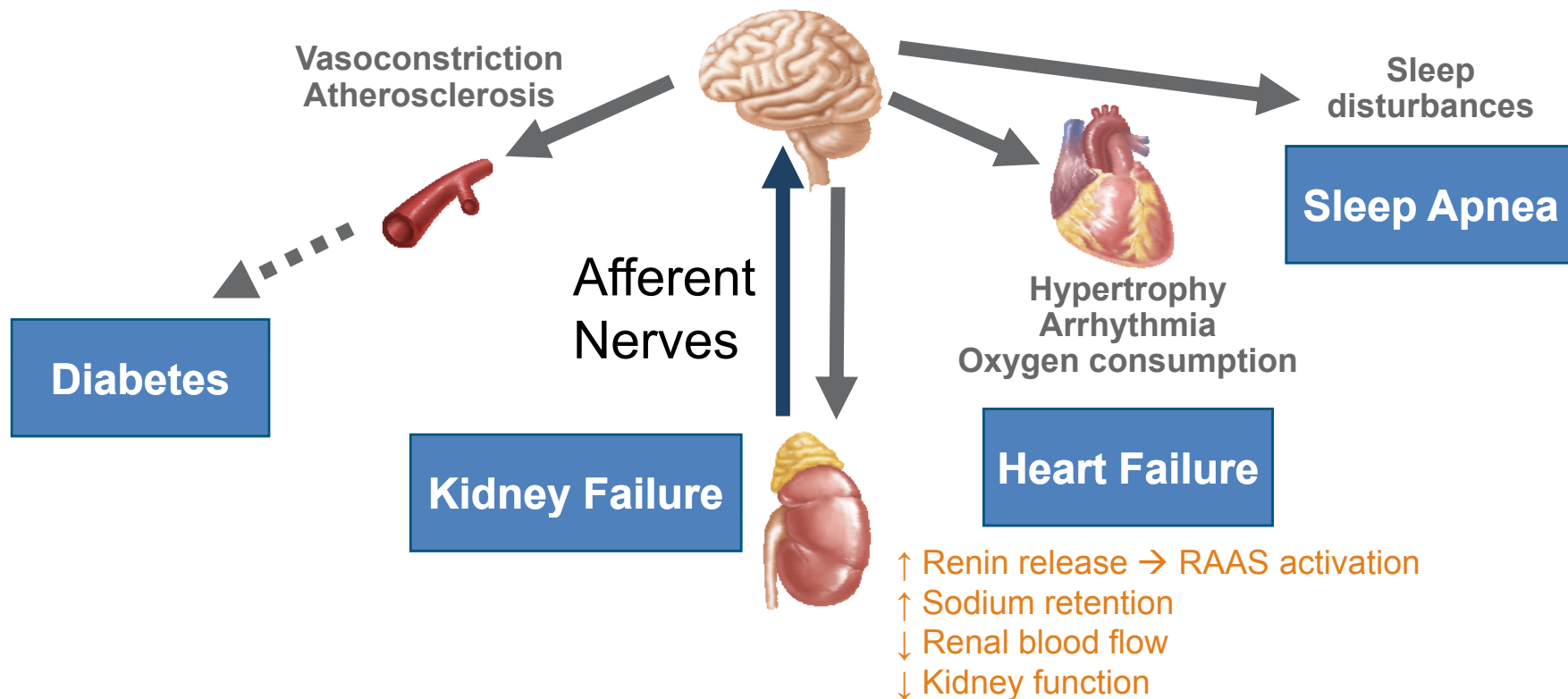
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# Future Directions for Research

- Chronic activation of renal nerves is common in multiple conditions/disease states<sup>1,2</sup>
- Future research may be warranted in disease states characterized by hyperactive afferent and efferent renal nerves



RAAS = renin-angiotensin-aldosterone system.

1. Adapted from Schlaich MP, et al. *Hypertension*. 2009;54:1195-1201.
2. Blankestijn PJ, et al. *Nephrol Dial Transplant*. 2011;26:2732-2734.

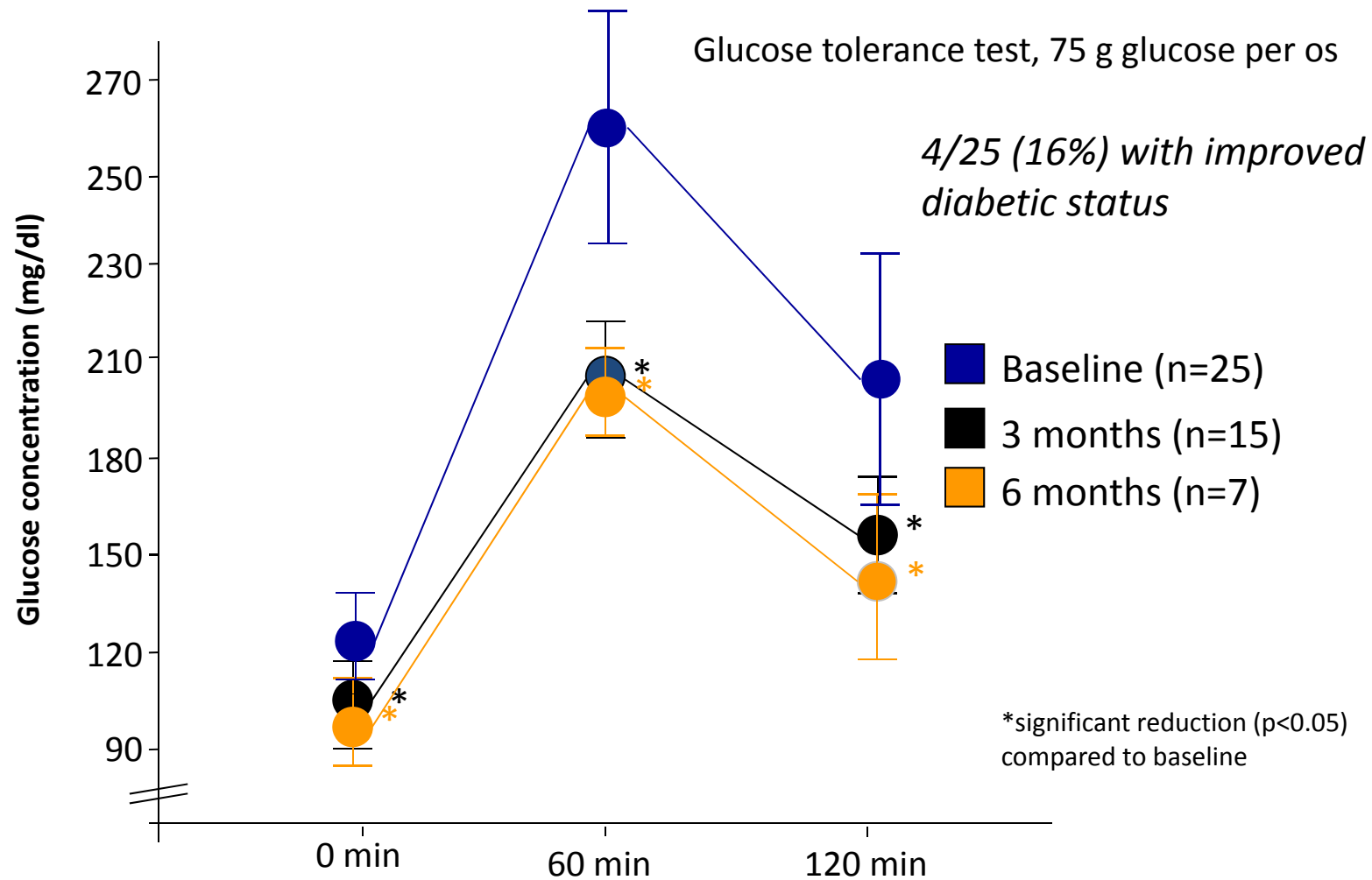


# Pilot Study in Heart Failure with Reduced LVEF

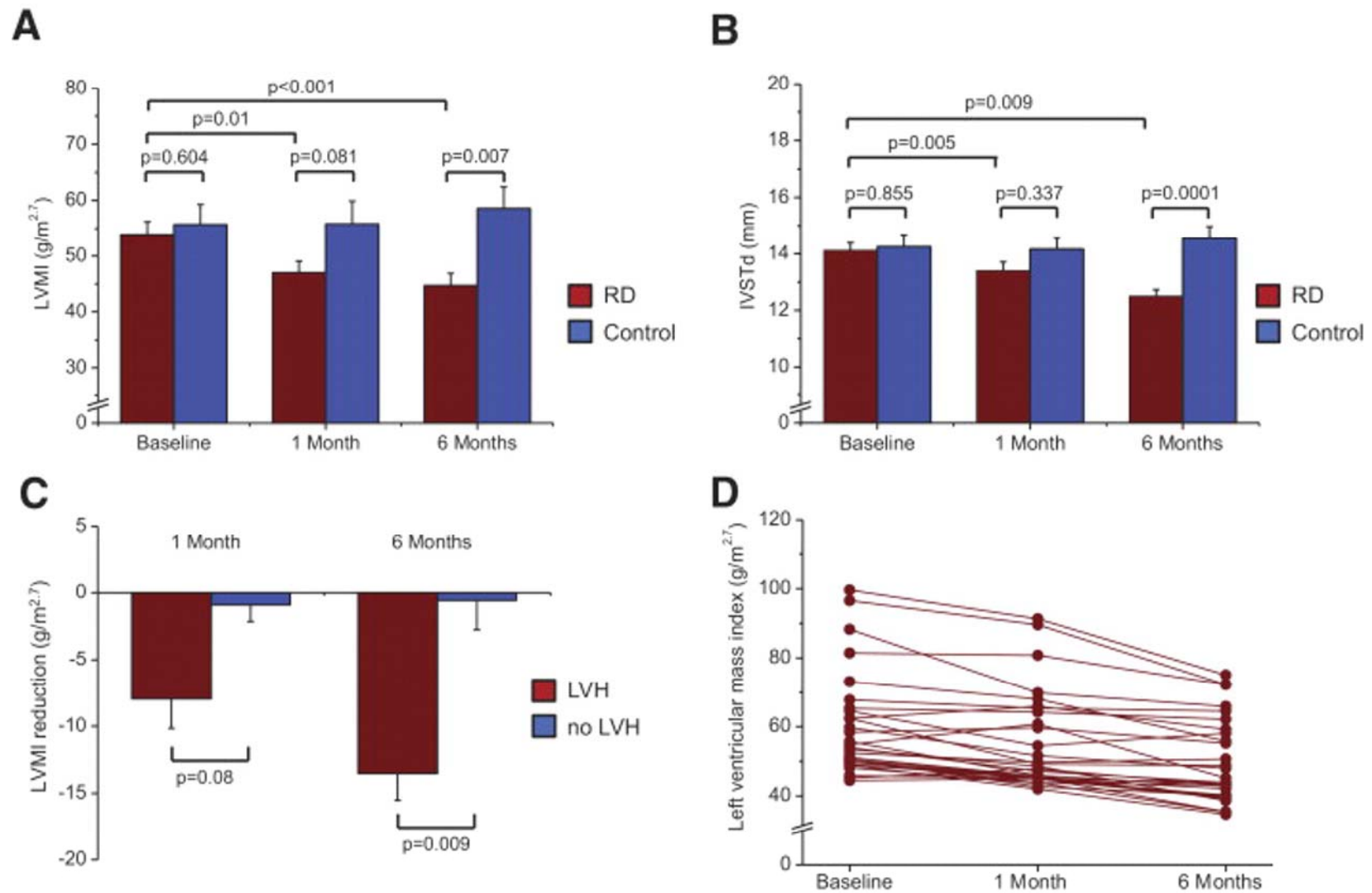
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- 40 patients at up to 5 international centers
- Inclusion Criteria:
  - Heart Failure patients NYHA Class II or III
  - Renal Impairment Left Ventricular Ejection Function <40%
  - GFR 30 to 75 mL/min/1.73m<sup>2</sup>
  - Optimal stable medical therapy
- Exclusion Criteria:
  - Renal artery anatomy must be eligible for treatment as determined by Angiography, and
  - History of prior renal artery intervention
  - Single functioning kidney.
  - Myocardial Infarction, unstable angina pectoris or cerebrovascular Accident within 3 months
  - Systolic BP <110mmHg

# Improvement in Glucose Metabolism

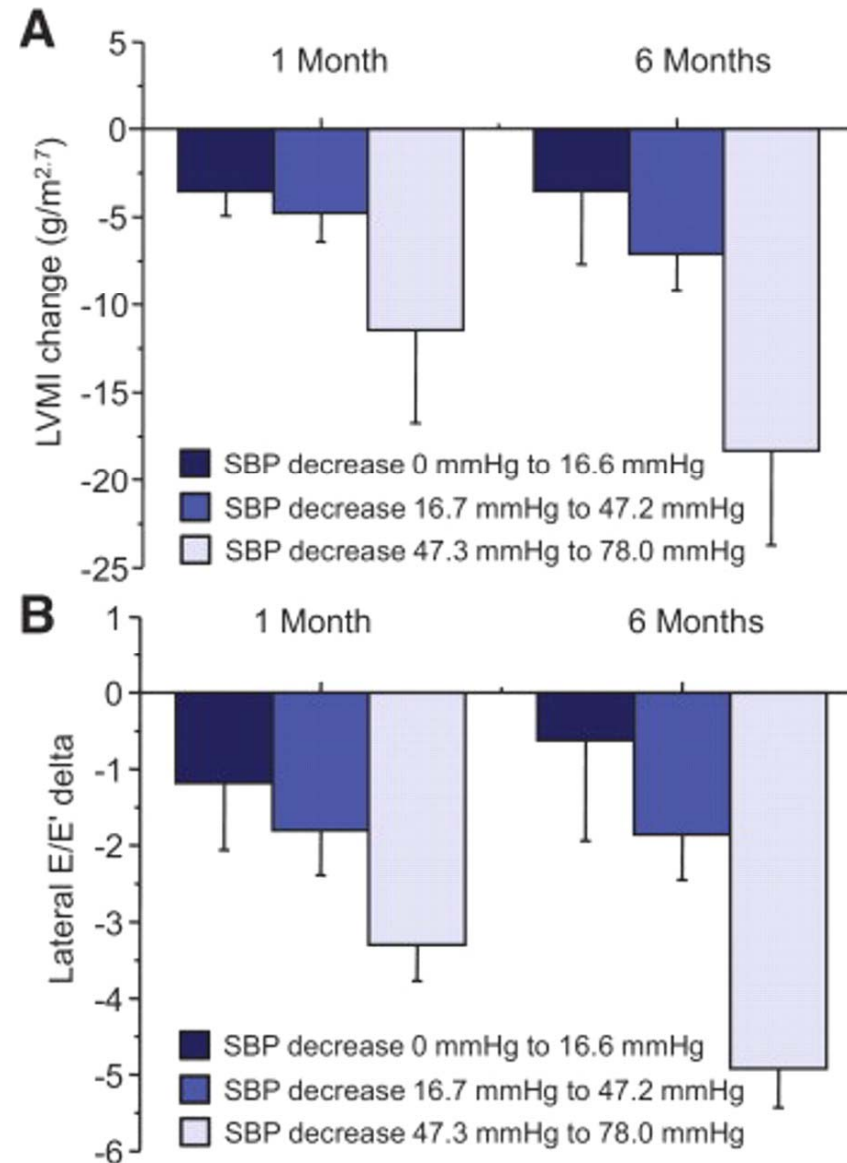


# Influence of Renal Denervation on Regression of LVH and Improvement of Diastolic Function

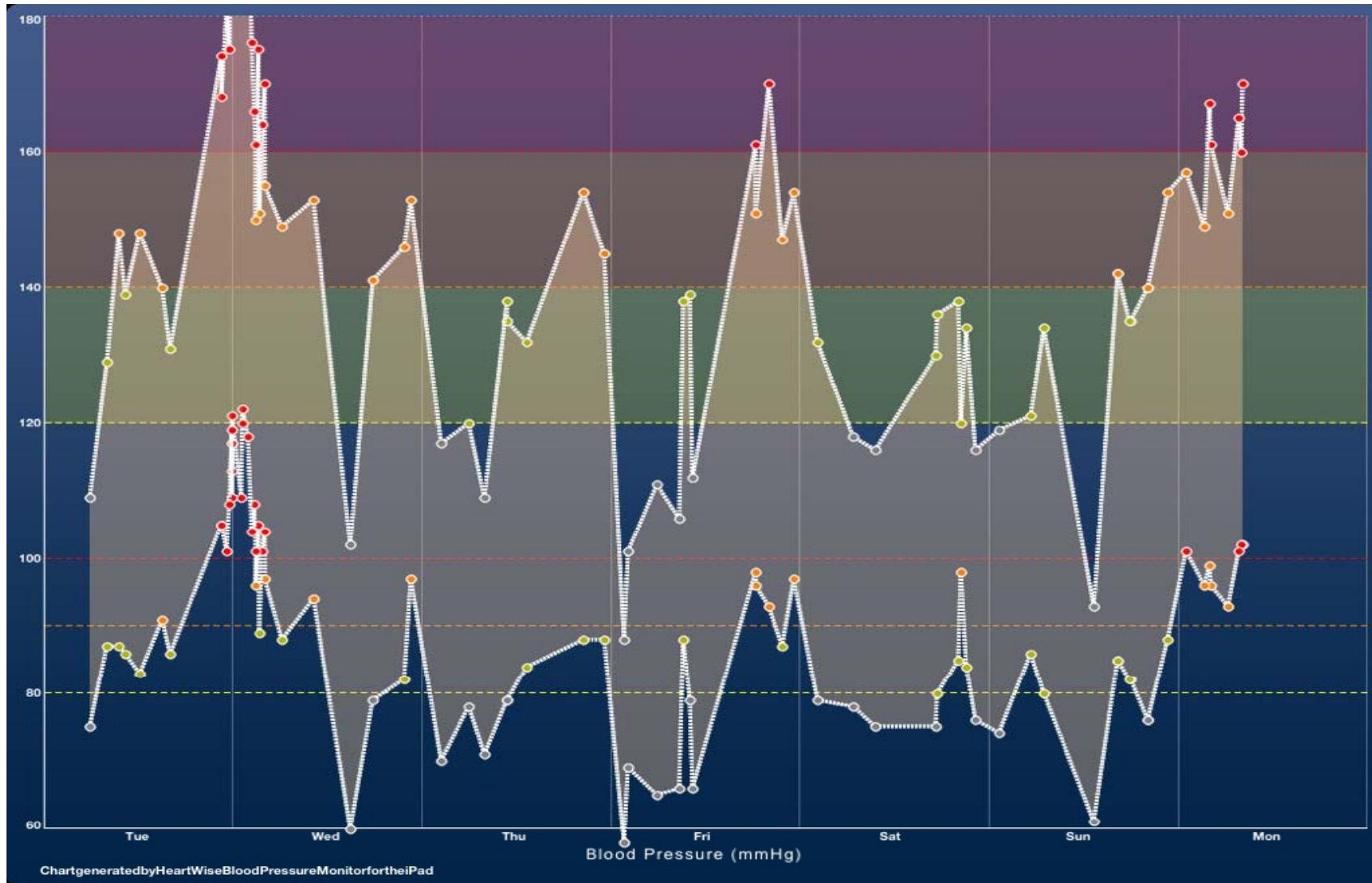


# Regression of LVH and Improvement of Diastolic Function Relative to BP Reduction Achieved by Renal Denervation

Reduction in LV mass likely result of decreased LB workload and decreased sympathetic activity



# Blood Pressure Variation and Obstructive Sleep Apnea



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