Treating Diastolic Hypotension and Hypertension

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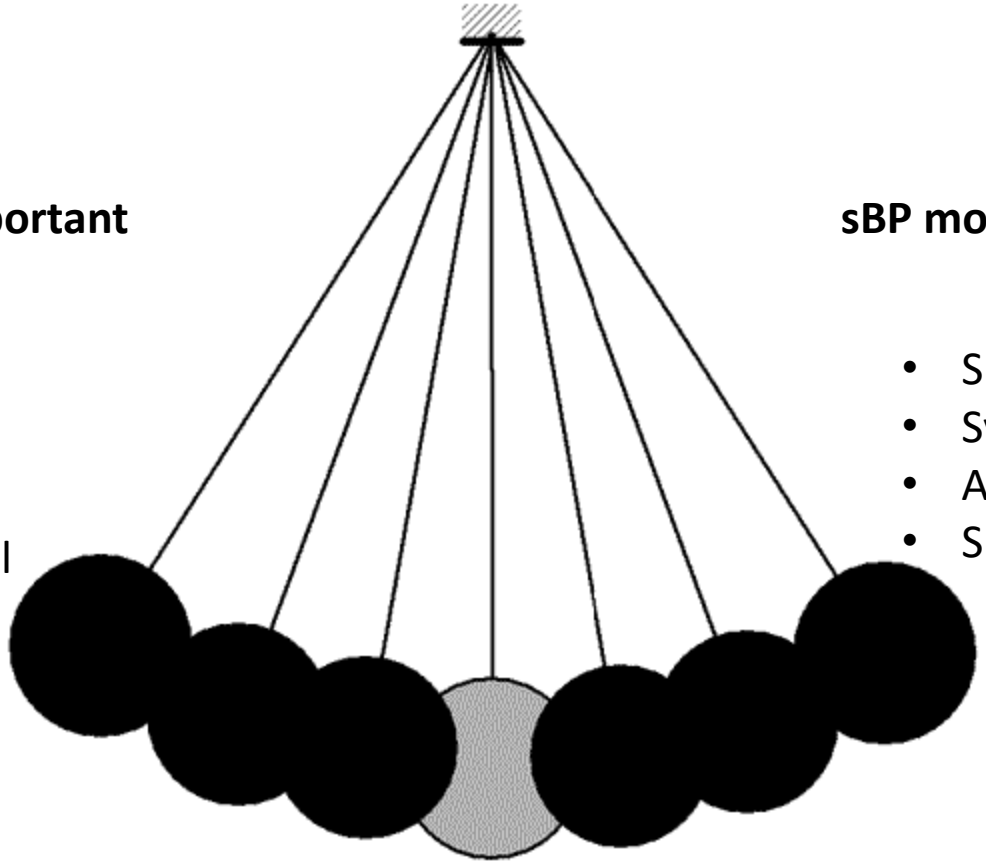
Learning objectives

- By the end of this session, participants will be able to:
  - Relate vascular aging with changes in diastolic blood pressure;
  - Identify patients with high risk of complications with low diastolic blood pressure

Do you remember when we focussed on diastolic BP?

dBP more important

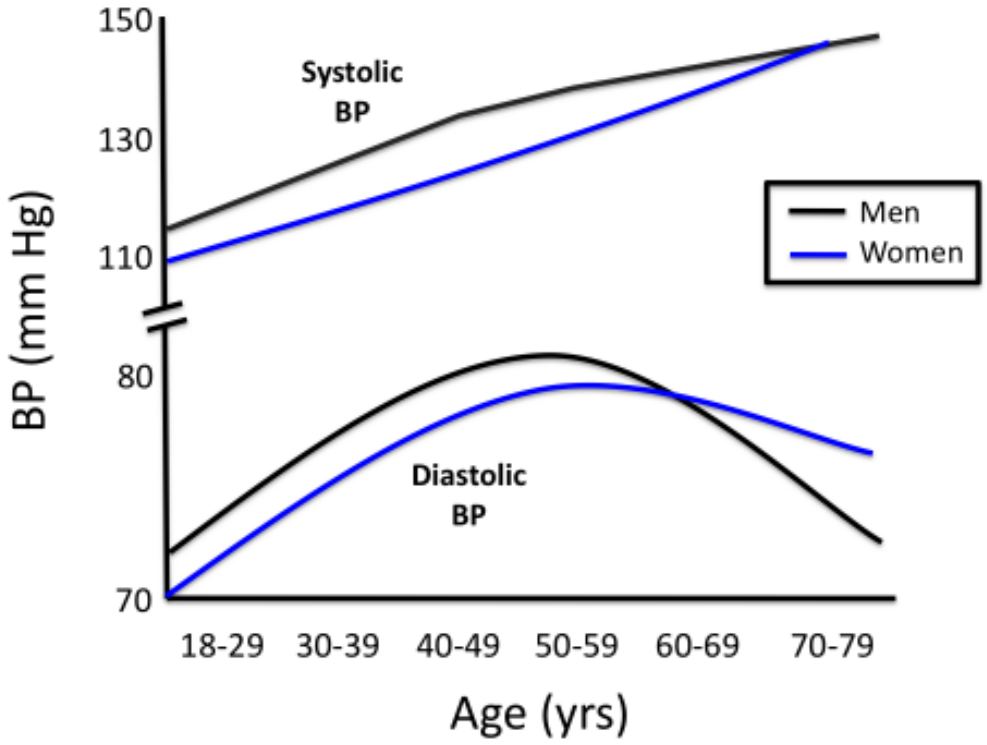
- Hypertension guidelines pre mid 1990's
- Last major dBP study was HOT trial 1998



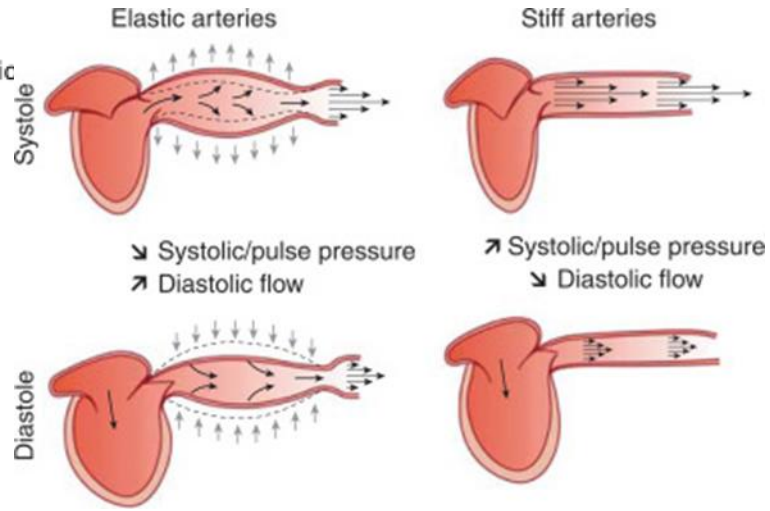
sBP more important

- SHEP trial 1991
- Sys-Eur trial 1997
- Accord BP trial 2010
- Sprint trial 2015

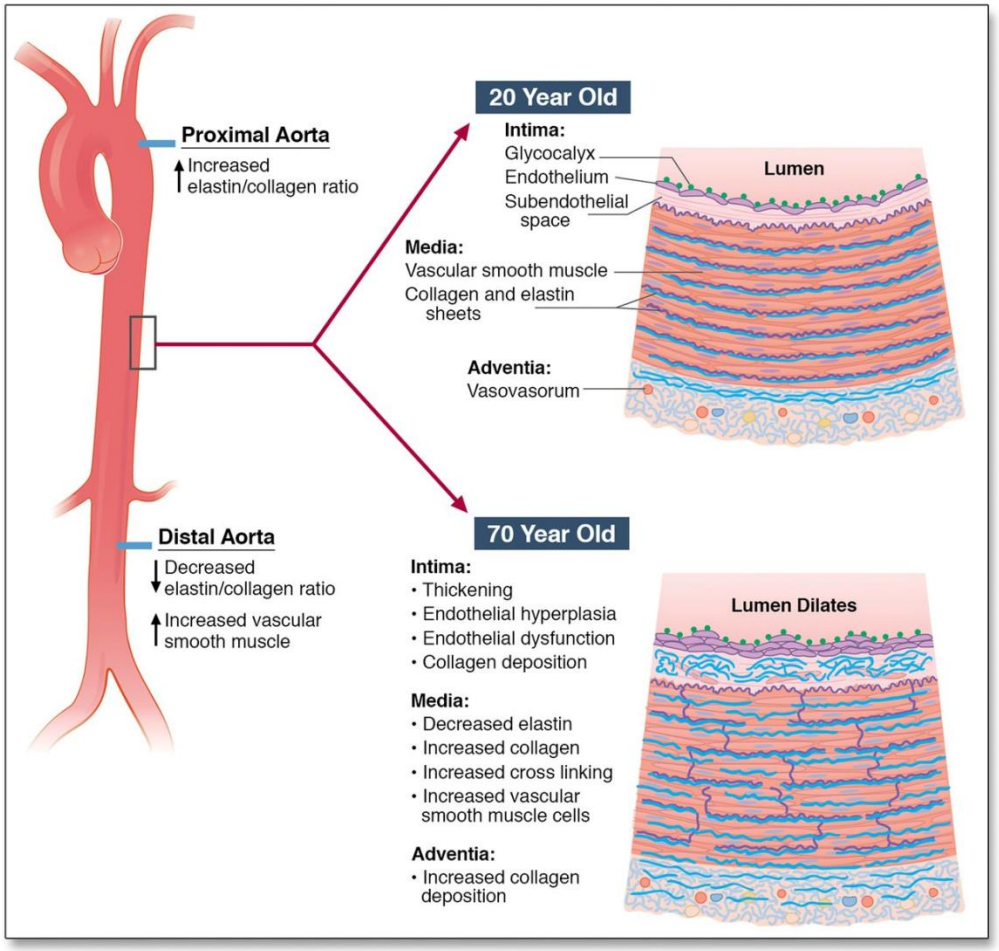
Changes in Systolic & Diastolic BP with Age



Adapted from: JNC7 & Burt et al (1995) Hypertensic



Vascular changes in aorta with age



What does this mean?

1. Younger hypertensive patients (<55 years) will have predominately diastolic hypertension while older patients have isolated systolic hypertension
2. Isolated systolic hypertension may be associated with low diastolic BP (ie high pulse pressure) which may complicate treatment

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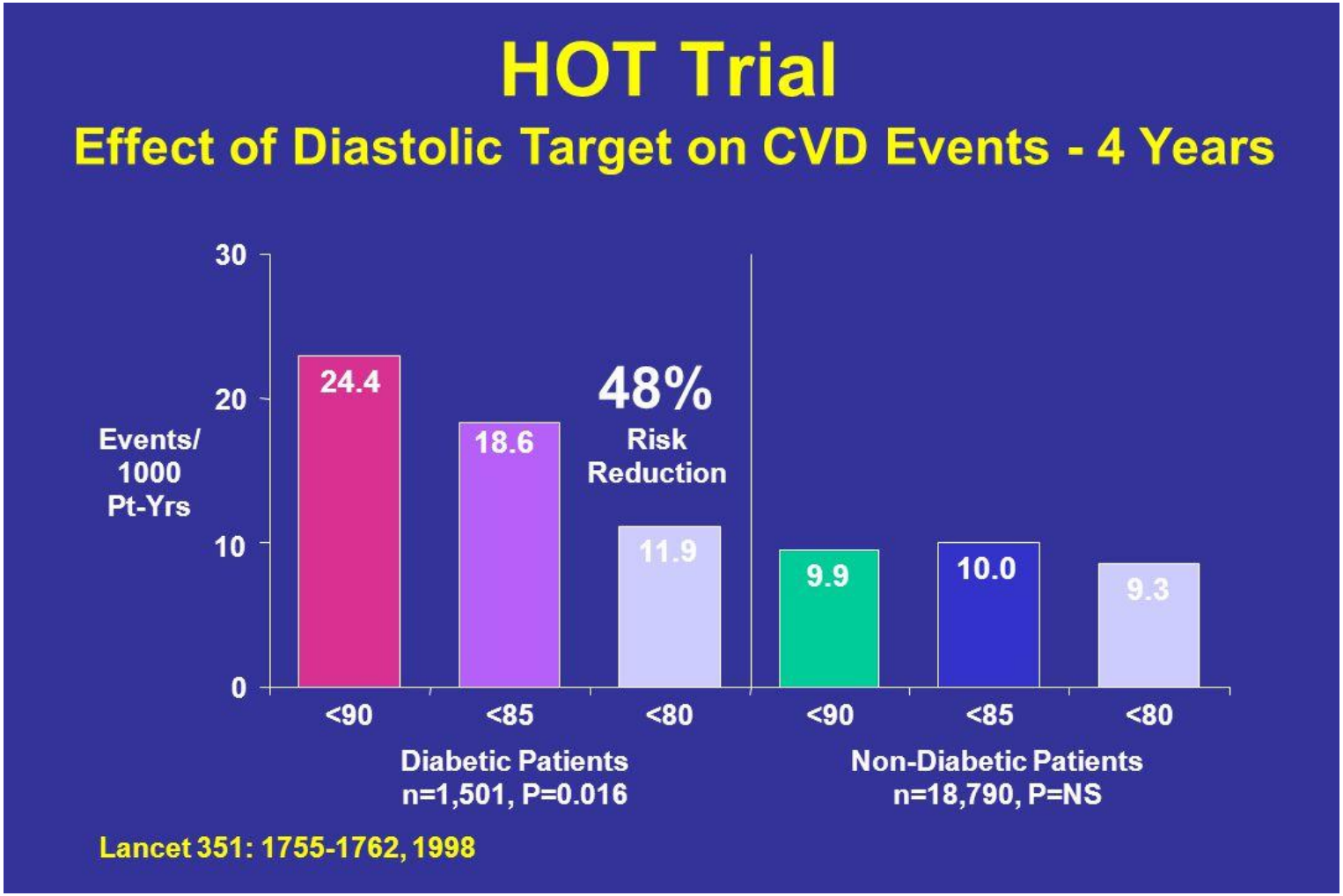
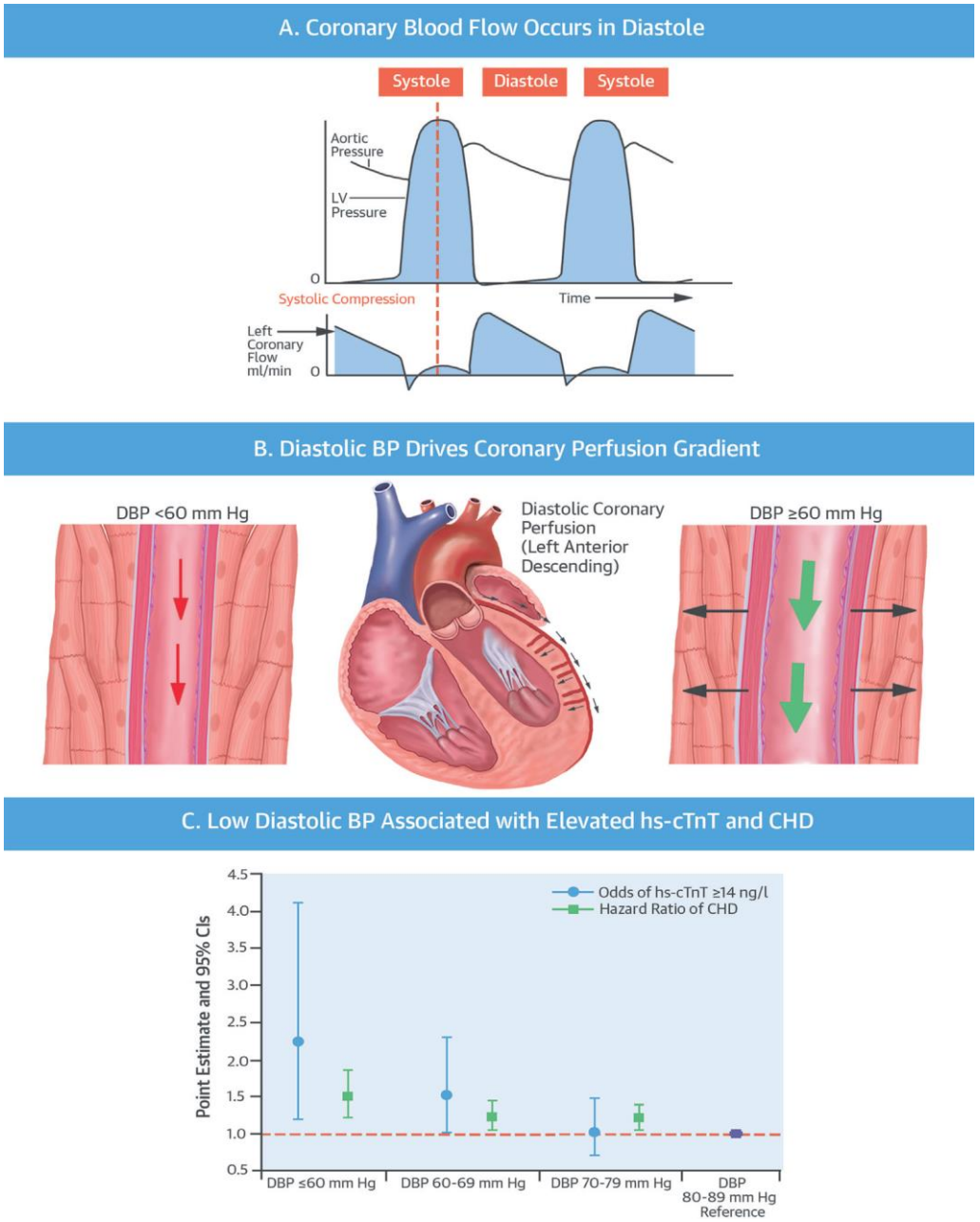


2. Isolated systolic hypertension may be associated with low diastolic BP (ie high pulse pressure) which may complicate treatment



McEvoy, J.W. et al. J Am Coll Cardiol. 2016;68(16):1713–22.

Changes in sBP vs dBP with treatment

- SHEP:
  - Intervention group
    - Start 170/77
    - End 144/68

    26/9 change

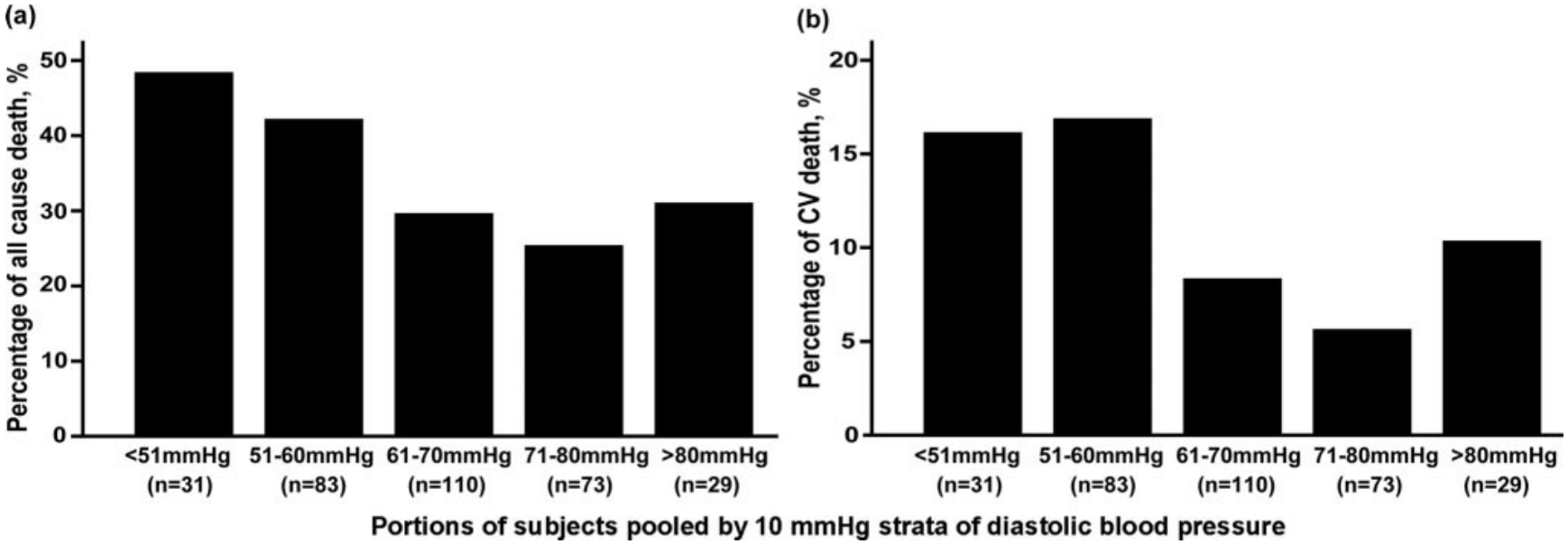
    3 mm systolic for 1 mm diastolic (similar in HYVET)

- SPRINT
  - Intervention group
    - Start 140/78
    - End 121/69

    - 19/9 change

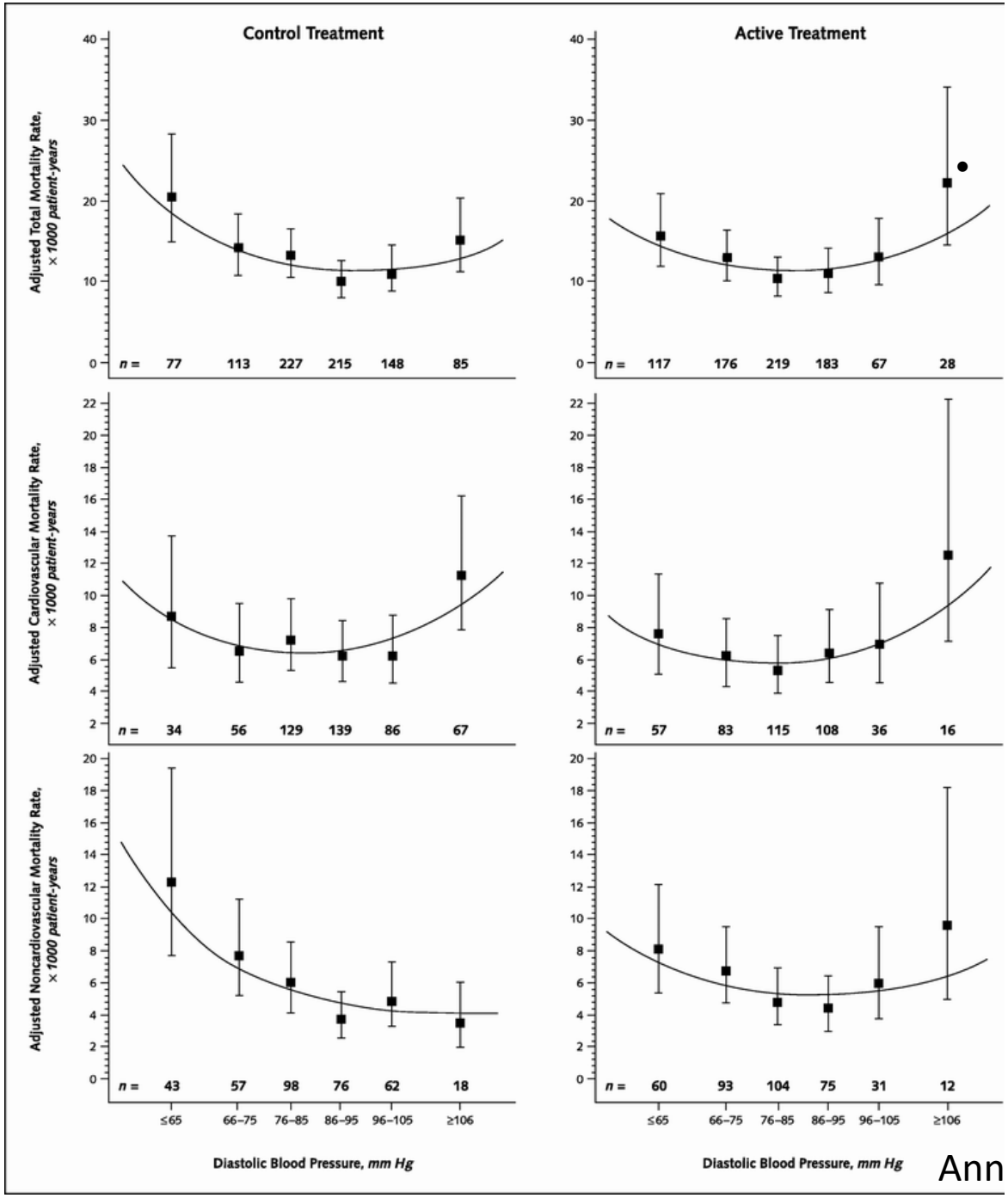
    2 mm systolic for 1 mm diastolic

J shaped relationship between dBP and vascular events



- 2-year follow-up period, 331 hospitalized patients > 70 year, 110 subjects died
- No relationship between systolic BP and outcomes

Hypertension. 2007;50:172-180



- Meta analysis of 5 RCTs with 40 233 patients, (mean follow-up, 3.9 years).

1. The increased risk for mortality with low dBP not related to antihypertensive treatment
2. Poor health conditions leading to low dBP probably explain the J-shaped curve.

Ann Intern Med. 2002;136:438-448

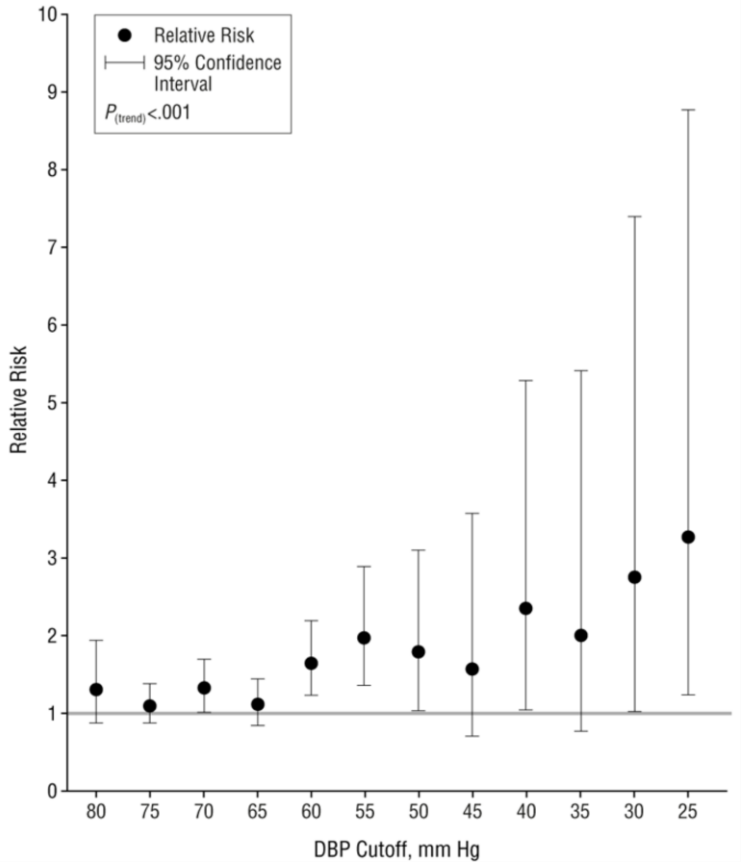
What is the trade-off between lowering sBP and dBP in the elderly?

- Sys –Eur dBP sub-study:
  - Non-cardiovascular mortality, but not cardiovascular mortality, increased with low achieved diastolic BP with active treatment (P<.005) and with placebo (P<.05);
  - Low diastolic BP with active treatment was associated with increased risk of cardiovascular events, but only in patients with coronary heart disease at baseline (P=.02; hazard ratio for BP 65-60 mm Hg, 1.17; 95% confidence interval, 0.98-1.38).

Arch Intern Med. 2007;167(17):1884-1891

What is the trade-off between lowering sBP and dBP in the elderly?

Relative risk for cardiovascular disease by (DBP)



SHEP dBP sub study

- patients who received active treatment whose DBP fell below 55 mm Hg did not do worse than patients who received placebo.
- patients who received treatment whose DBP never fell below 55 mm Hg did significantly better than patients receiving placebo.
- **Conclusion: achieved dBP below 55 mm Hg eliminated the benefit of active treatment**

Arch Intern Med. 1999;159(17):2004-2009

Any help from Sprint?

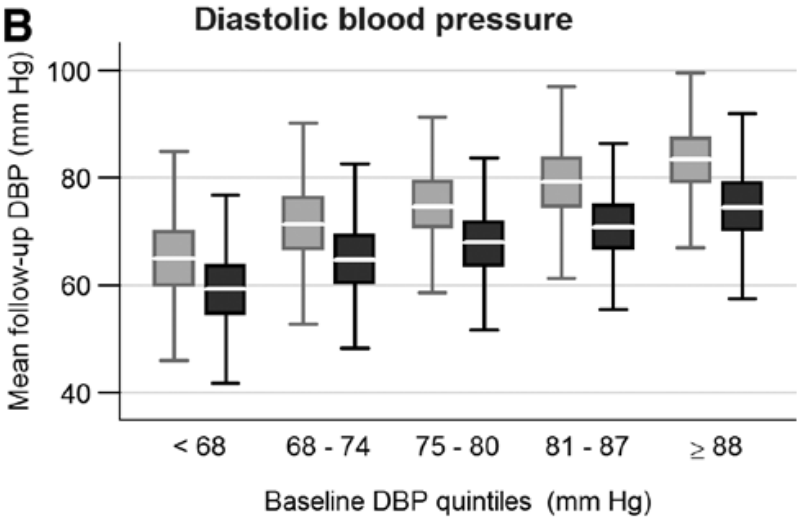
	Quintile 1 <68 mm Hg (n=1749)	Quintile 2 68–74 mm Hg (n=1874)	Quintile 3 75–80 mm Hg (n=1816)	Quintile 4 81–87 mm Hg (n=1934)	Quintile 5 ≥88 mm Hg (n=1988)
DBP, mm Hg	61±5	71±2	78±2	84±2	95±6
Age, y	74.7±8.2	70.3±8.8	68.0±8.5	65.2±8.3	62.3±8.3
Female sex, %	39.5	36.0	35.8	32.3	34.9
Black race, %	23.2	25.1	29.7	33.6	44.4
History of CVD, %	29.1	24.1	18.0	15.3	14.9
CKD, %	42.3	29.8	27.6	23.2	20.1
Framingham 10-y CVD risk score ≥15%, %	60.3	59.5	60.3	60.8	67.2
Never smoked, %	43.2	43.6	45.5	44.6	43.3
Antihypertensive agents, n/patient	2.1±1.0	1.9±1.0	1.8±1.0	1.7±1.0	1.6±1.1
Systolic blood pressure, mm Hg*	131±15	134±13	138±13	142±13	152±15
PP, mm Hg	70±15	63±14	61±13	58±13	57±13
MAP, mm Hg	85±6	92±5	98±5	103±5	114±8
Body mass index, kg/m^2	28.3±5.3	29.4±5.7	30.0±5.7	30.5±5.8	30.8±6.0
eGFR, mL-min^{-1}-1.73 m^{-2}	65±20	70±20	72±20	75±20	76±21
Urine ACR, mg/g	10.7 (6.2, 24.8)	9.4 (5.6, 20.3)	8.5 (5.2, 18.7)	8.9 (5.4, 20.5)	10.2 (6.1, 24.6)

Results are presented as percents for binary variables, as mean±SD for continuous variables other than ACR, and as median (interquartile range) for ACR. For comparison of differences between the quintiles, $P<0.001$ for all except never smoked ($P=0.57$).

ACR indicates albumin-to-creatinine ratio; CKD, chronic kidney disease; CVD, cardiovascular disease; DBP, diastolic blood pressure; eGFR, estimated glomerular filtration rate; MAP, mean arterial pressure; and PP, pulse pressure.

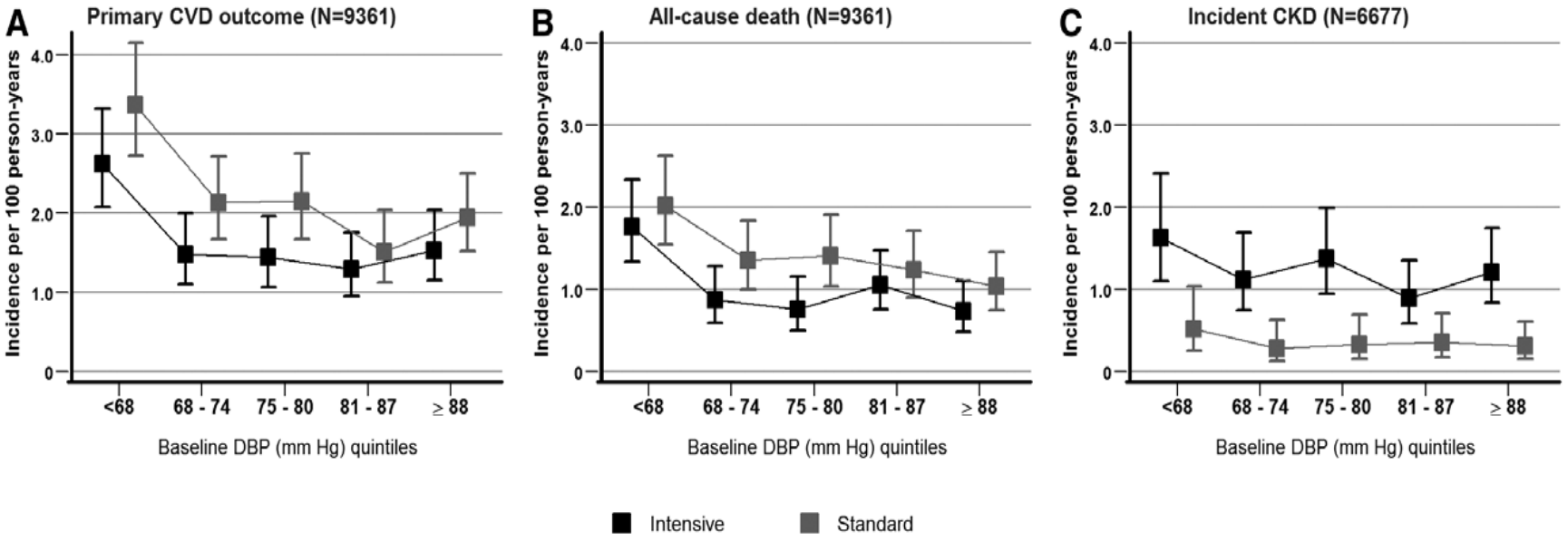
*Systolic blood pressure at screening visit was used to determine trial eligibility. Baseline visit values are presented in this table.

- Authors reviewed outcomes based on baseline dBP in both control and intervention arms based on quintiles of dBP



Circulation. 2018;137:134–143

Any help from Sprint?



- Low dBP at baseline associated with worse outcomes
- active treatment improved outcomes (except for incident CKD) even in lowest dBP group

Circulation. 2018;137:134–143

Any help from Sprint?

	Intensive vs. Standard in Lowest DBP Quintile, HR (95% CI)	Intensive vs. Standard in Top 4 DBP Quintiles, HR (95% CI)	Interaction *P**
Primary CVD outcome (n=9361)	0.78 (0.57–1.07)	0.74 (0.61–0.90)	0.78
All-cause death (n=9361)	0.88 (0.60–1.29)	0.68 (0.53–0.87)	0.29
Composite kidney outcome in CKD subgroup (n=2646)	1.17 (0.36–3.84)	0.79 (0.31–2.00)	0.61
Incident CKD in non-CKD subgroup (n=6677)	3.16 (1.42–7.00)	3.58 (2.37–5.41)	0.79

CI indicates confidence interval; CKD, chronic kidney disease; CVD, cardiovascular disease; DBP, diastolic blood pressure; HR, hazard ratio; and SBP, systolic blood pressure.

*HRs comparing the intensive and standard SBP interventions are presented for patients in the lowest baseline DBP quintile subgroup (left) and for patients in the upper 4 baseline DBP quintiles (right). Interaction *P* values evaluate whether the HRs differed between the 2 baseline DBP subgroups and were computed with likelihood ratio tests for the interaction between the randomized SBP intervention and baseline DBP subgroup in Cox regressions with separate baseline hazards for the 2 baseline DBP subgroups.

- Statistically, baseline low dBP did not reduce the benefit (or harms) of intensive sBP lowering.

Conclusions

1. Low dBP is a risk factor for cardiovascular events and non cardiovascular death. Risk probably starts as dBP 70 mm Hg
2. Among patients without CAD, it is probably beneficial to lower sBP provided baseline dBP >60 (Sprint) and safe to allow dBP to fall below 55 mm Hg (SHEP)
3. Those with CAD do worse with achieved dBP below 60-65 mmHg (Sys Eur)

Cases

- 77M, DM, no established vascular disease
  - On coversyl plus 8/2.5
  - Tolerating medications well
  - Resting AOBP 145/65

Would you intensify BP treatment?

- 85M, CAD, prior stroke, no DM
  - On bisoprolol, coversyl, hctz
  - Occasional postural presyncope “has to get up slow”
  - Resting AOBP 150/55, HR 60

Would you intensify BP treatment?

- 65F, otherwise healthy
  - On hctz 25 mg, tolerating well
  - Resting AOBP 135/65

Would you intensify BP treatment?

- 65F, stage 3 CKD (GFR 40 mL/min)
  - On hctz 25 mg, tolerating well
  - Resting AOBP 135/65

Would you intensify BP treatment?