

### How Common is this Duo?

- HTN is twice as common in DM
- New onset DM is 2.5 times in HTN
- 20 to 40% of IGT pts have HTN
- 40 to 50% of Type 2 DM have HTN
- Only 1/4 of HTN in DM is controlled
- DM + HTN – ↑ CV Risk 3 fold

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### What Causes HTN in DM

- Metabolic Syndrome – Mainly IR, ED, ↑ BG
- Excessive RAAS activity is the main mechanism
- HTN due to nephropathy in T2DM – GS - KWL
- Renal scarring - Recurrent pyelonephritis
- Endocrine causes for both HTN & DM
  - Cushing’s, Conn’s, Pheochromo, Acromegaly
- Coincidental – DM on existing HTN
- Diabetogenic antihypertensive drugs (D and B)
- Drugs causing both HTN & DM – OCP, CS

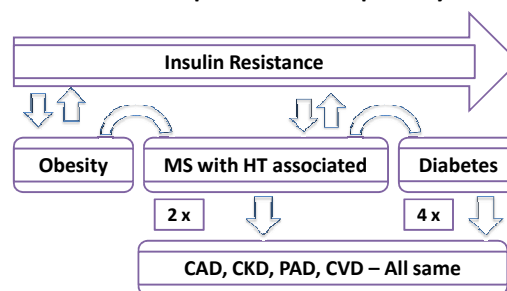
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### Difficulties of HTN in DM

- Systolic HTN more common in DM
- S-HTN is a stronger predictor of CVE
- 65% of T2DM have S-HTN
- S-HTN is more difficult to control
- Depression is more in DM – ↓ Adherence Rx
- ‘Clinician Inertia’ is a big problem
- Glycemic control only is the focus – No VP

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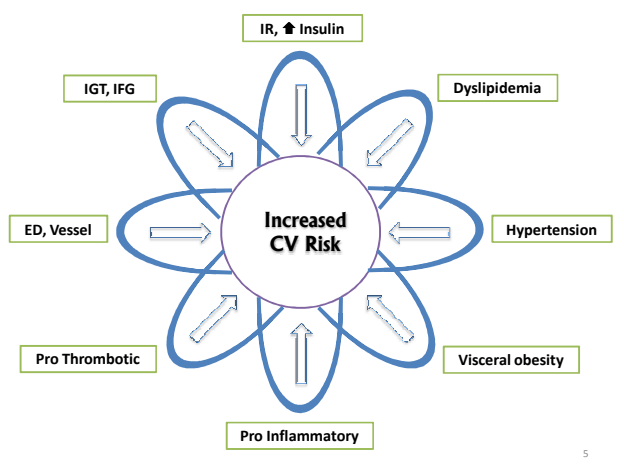
### The Compound Jeopardy !!



Reilly MP et al – Circulation 2003; 108: 1546-1551

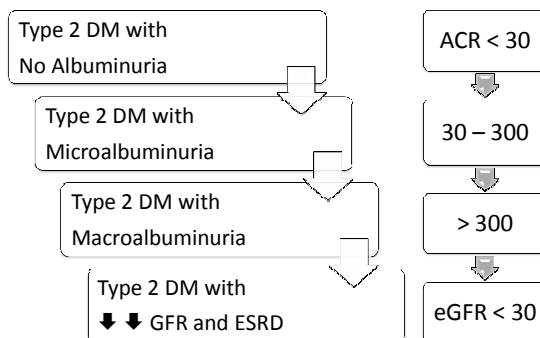
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### Increased CV Risk

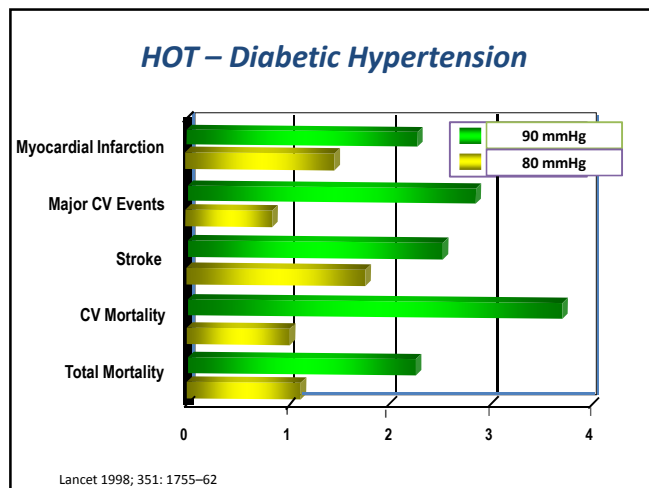
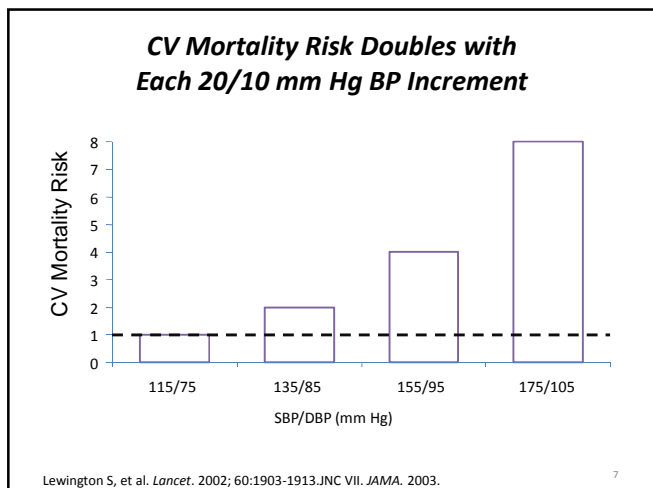


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### Progression of DM - Nephropathy



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### STENO-2 Study in DM – Event ↓

1. Nephropathy ↓ 56%
2. Proliferative retinopathy ↓ 55%
3. Cardiovascular events ↓ 59%
4. Total Mortality ↓ 40%

% ↓ in Complications with intensive Rx

NEJM 2003; 358:580

### Mandatory Clinical Actions

- BP check – Goal < 130/80, WC, BMI
- MAU/ACR on spot urine < 30, LVH
- Serum creatinine – eGFR > 90 ml/min
- Screen for MS and RF for CAD, ABI, Eye
- HbA1c, Full lipid profile, Lp(a), hs-CRP

### HTN – Lifestyle modifications

- Regular 30' of moderately intense exercise
- No tobacco and minimizing alcohol
- Na restriction to < 6 g of NaCl per day
- Avoiding high salt foods – pickles, savouries
- Four adult family – 6 x 30 x 4 = 720 g (500 g)
- Use of K containing foods – fruits, vegetables
- Weight reduction – goal ideal weight
- Reducing coffee consumption

### HTN – Lifestyle modifications

- Weight Reduction • 5-20 mmHg/10kg
- DASH diet eating • 8-14 mmHg
- Sodium Restriction • 2-8 mmHg
- Physical Activity • 4-9 mmHg
- Alcohol Abstinence • 2-4 mmHg
- All put together • 20-55 mmHg

### DASH Diet Plan

Type of Food	Servings (1600 K cal)
Grains (whole grains)	6 per day
Vegetables	3 per day
Fruits (not tinned juices)	4 per day
Low fat milk	2 per day
Lean meat, poultry	3 per day
Nuts, seeds (dry roast, soak)	3 per week
Fats and oils	2 per day
Sweets and pastries	0 per day
Salt at table & salted foods	None

### BP Targets in DM

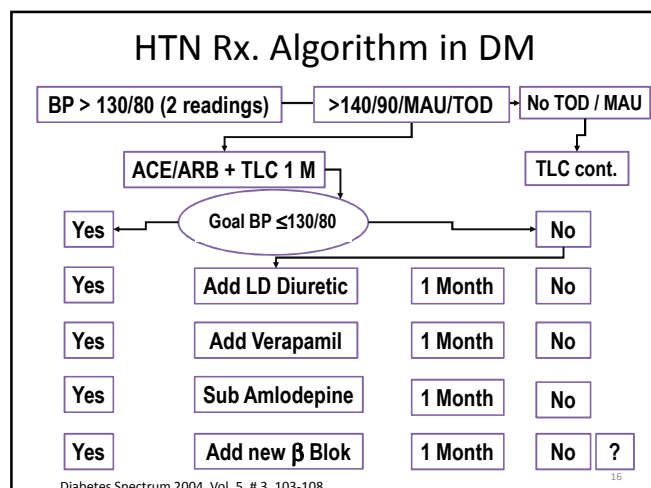
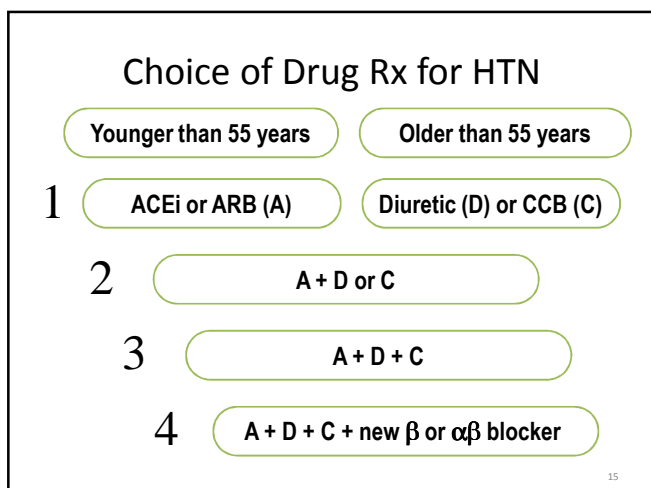
Ideal Blood Pressure

- Without proteinuria < 130/80
- With proteinuria < 125/75

Goal BP maximum for DM < 130/80

Almost all DM pts require > 1 drug for HTN

Identify the co-morbidity – CAD, CKD, CVD



- ### ACEi or ARB – A must for VP
- Antihypertensive, vasoprotective, anti-thrombotic and anti-inflammatory
  - Inevitable in DM more so in DM + HT/CVD
  - Reduce CV events, Reduce atherosclerosis
  - Reduce renal disease - a strong CV risk factor
  - Metabolically 'friendly' drugs in DM
  - They prevent new onset DM, Nephropathy
  - Well-tolerated with few side effects

- ### ACE inhibitor or ARB
- Renal impairment – These improve e-GFR, microalbuminuria or proteinuria
  - LV dysfunction (along with new  $\beta$  blocker)
  - Previous MI (along with new  $\beta$  blocker)
  - Contraindicated in pregnancy
  - Relative contraindications
    - Bilateral renal artery stenosis
    - Severe renal impairment (Cr > 3.0)
    - Monitor renal function
    - Angioedema, ACEi cough

### JNC 7 – Antihypertensive Agents

Based on Favorable Outcome Data From Clinical Trials

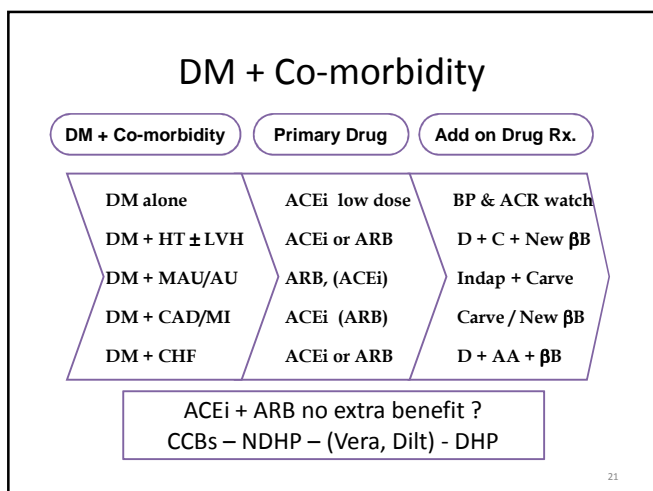
	Diure	BB	ACEi	ARB	CCB	AA
CHF	✓	✓	✓	✓		✓
Post-MI		✓	✓			✓
CAD Risk	✓	✓	✓	✓	✓	
Diabetes Mellitus	✓		✓	✓	✓	
Nephropathy			✓	✓		
Stroke Prevention	✓		✓			

Chobanian AV et al. *JAMA*. 2003;289:2560-2572. 19

### Other Effects of HTN Drugs

Drug Class	Dysglycemia	Dyslipidemia
ACEi and ARB	↓ ↓	↓ ↓
CCBs	↔	↔
Diuretics	↑	↑
β Blockers	↑	↑ ↑
α Blockers	↔	↑

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- ### Advantages of Carvedilol
- Neutral on Glycemic control
  - Improves IR and MS, Lipid Neutral
  - Add on to RAAS blockade in DM
  - Improves MAU / ACR and ED
  - First β blocker approved for CHF
- GEMINI trial and OPTIMIZE-HF Study 22

- ### Ideal anti HTN drug in DM
- Must decrease blood pressure to ≤ 130/80
  - Must reduce the RAAS activity, improve ED
  - Must prevent, improve or arrest proteinuria
  - Must prevent and protect from CAD, CKD, CHF
  - Must be favourable on glycemic control
  - Must improve the dyslipidemia – not worsen it
  - Must not worsen peripheral arterial disease
  - Must improve ED and not cause impotence
  - Must not decrease eGFR and ↑ serum creatinine
  - Must not raise uric acid, serum potassium
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- ### What should We take home ?
- ‘Clinician Inertia’ for HTN in DM must be overcome
  - HTN in DM is serious; So manage aggressively
  - TLC, Lipid control, Glycemic targets – VP is a must
  - HTN Rx. delays or arrests CVD, CKD, PAD, CVD
  - ACEi or ARBs are the main stay of Rx - ↓ RAAS
  - Postural hypotension, DAN are important in Rx
  - MAU/ACR must for all DM – Predict CAD, CKD
  - Typically 2 or more drugs are needed for HTN Rx.
  - New βB, Carvedilol, CCBs are add-on drugs
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