

## **Better Blood Pressure Control: The Earlier the Better**

**Kailash K. Jindal**  
**Cardiac Update – Edmonton, AB**  
**May 12, 2007**

## **Objectives**

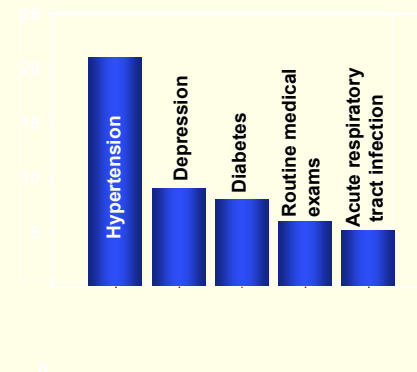
- To discuss new data regarding high normal BP and new recommendations for these patients

## **Hypertension as a Risk Factor**

Hypertension is a significant risk factor for:

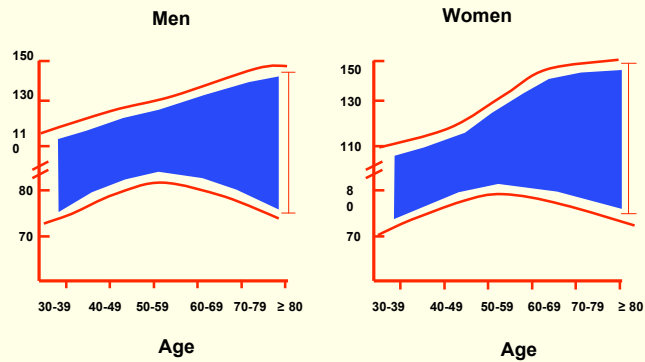
- cerebrovascular disease
- coronary artery disease
- congestive heart failure
- renal failure
- peripheral vascular disease
- dementia
- atrial fibrillation

## **Leading Diagnoses Resulting in Visits to Physician Offices in Canada**



IMS Health Canada 2002. <http://www.imshealthcananda.com/>

## Blood Pressure Distribution in the Population According to Age



Adapted from : Third National Health and Nutrition Examination Survey, *Hypertension* 1995;25:305-13

PP=Pulse Pressure

## Classification of Hypertension

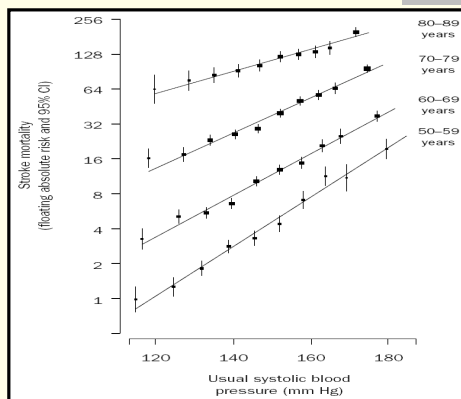
(Pre Hypertension) 120-139 / 80-89

Category	Systolic	and / or	Diastolic
Optimal	<120	and / or	<80
Normal	<130	and / or	<85
High-Normal	130-139	and / or	85-89
Grade 1 (mild hypertension)	140-159	and / or	90-99
Grade 2 (moderate hypertension)	160-179	and / or	100-109
Grade 3 (severe hypertension)	≥ 180	and / or	≥ 110
Isolated Systolic Hypertension (ISH)	≥140	and / or	<90

The category pertains to the highest risk blood pressure

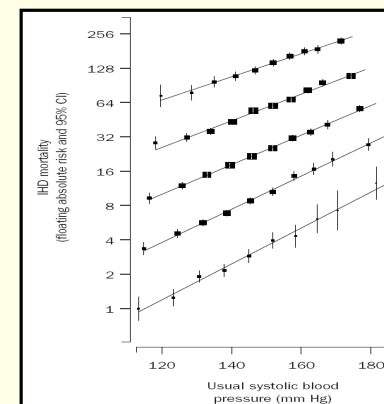
\*ISH=International Society of Hypertension. Chalmers J et al. *J Hypertens* 1999;17:151-85.

## Blood Pressure and Risk of Stroke Mortality



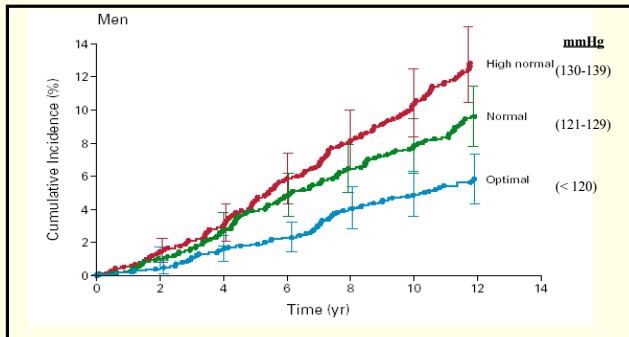
Lancet 2002;360: 1903-13

## Blood Pressure and Risk of IHD Mortality



Lancet 2002;360: 1903-13

## Impact of High-Normal Blood Pressure on the Risk of Cardiovascular Disease



N Engl J Med 2001;345:1291-7

## 2007 Canadian Recommendations for the Management of Hypertension

A slide kit for medical education can be downloaded from:

<http://www.hypertension.ca>

## Incidence rates of hypertension at 1, 2 and 3 yrs

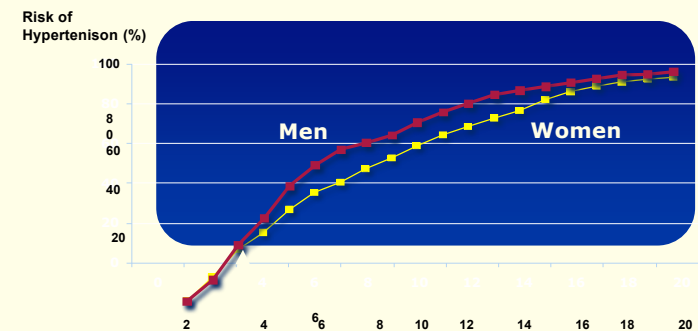
Baseline BP category	Age 35-64 years	Age 65-94 years
% hypertension at 1 year (95% CI)*		
Optimum BP	1.3 (1.1-1.6)	4.3 (3.1-5.7)
Normal BP	4.7 (4.0-5.5)	7.1 (5.5-9.0)
High normal BP	11.0 (9.6-12.6)	15.7 (13.0-18.8)
% hypertension at 2 years (95% CI)*		
Optimum BP	2.7 (2.2-3.2)	8.3 (6.2-11.1)
Normal BP	9.2 (7.9-10.7)	13.7 (10.8-17.2)
High normal BP	20.8 (18.3-23.5)	28.9 (24.2-34.0)
% hypertension at 3 years (95% CI)*		
Optimum BP	4.0 (3.3-4.8)	12.2 (9.2-16.1)
Normal BP	13.5 (11.6-15.7)	19.8 (15.7-24.6)
High normal BP	29.6 (26.2-33.1)	40.1 (34.0-46.4)

\*Rates are per 100, and are adjusted for sex, age, body-mass index, baseline examinations, and baseline systolic and diastolic BP.

**Optimum < 120/80**  
**Normal 120-129/80-84**  
**High normal 130-139/85-89**

Vasan. Lancet 2001

## Lifetime Risk of Developing Hypertension Among Adults Aged 55 to 65 Years\*



\*Residual lifetime risk of developing hypertension among adults aged 55 to 65 years with a blood pressure <140/90 mmHg.

Vasan RS, et al. JAMA. 2002; 287:1003-1010.  
 Copyright 2002, American Medical Association

## Impact of high-normal BP on risk of cardiovascular disease

- Framingham cohort (n=6859)
- High normal BP at baseline
- 10-year cumulative incidence of CVD (CV death, MI, stroke, CHF)

	35-64 years	65-90 years
<b>Men</b>	8% (6% - 10%)	25% (17% - 34%)
<b>Women</b>	4% (2% - 5%)	18% (12% - 23%)

NEJM 2001;345:1291-7

## How 'essential' is Hypertension? Genetics Challenged: Fetal Programming

### Barker's hypothesis

Epidemiological studies have provided evidence that an inverse relationship exists between birth weight and cardiovascular diseases manifest only in adulthood, such as:

- hypertension
- coronary heart disease
- stroke
- type 2 diabetes

This led to the proposal by Dr. Barker that chronic adult diseases are partly determined by events occurring in fetal and early postnatal life.

## How 'essential' is Hypertension? Genetics Challenged: Fetal Programming

BMJ VOLUME 298 4 MARCH 1989

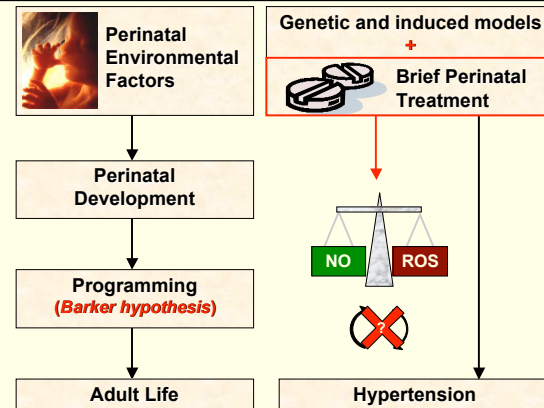
### Growth in utero, blood pressure in childhood and adult life, and mortality from cardiovascular disease

D J P Barker, C Osmond, J Golding, D Kuh, M E J Wadsworth

Mean SBP of 1625 men in the UK at age 36 stratified by weight and birth weight

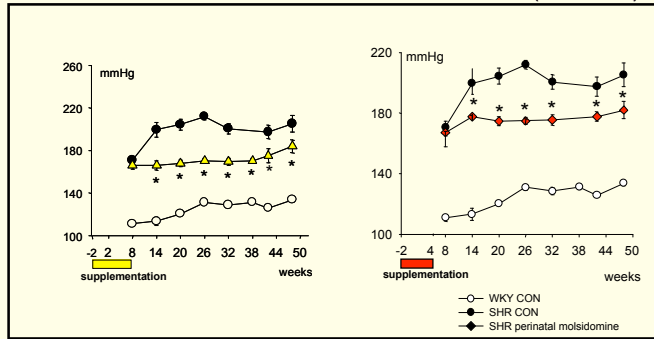
Birth weight*	Men Current weight (kg)			All men
	<71.1	71.1-80.0	>80.0	
Lowest	123.2	124.2	124.6	124.0
Middle	122.2	121.2	125.6	122.8
Highest	121.3	119.8	123.2	121.5
All	122.4	122.0	124.4	122.9

## How 'essential' is Hypertension? Genetics Challenged: Fetal Programming



**How 'essential' is Hypertension?  
Genetics Challenged: Fetal Programming**

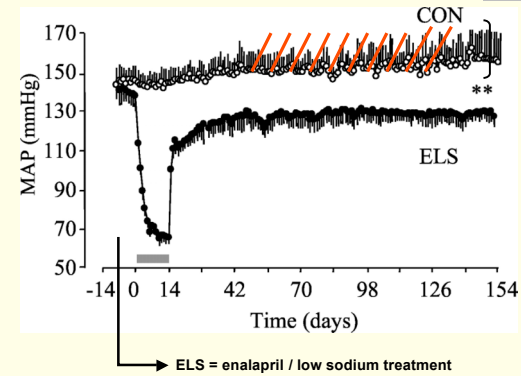
**TACE (L-arginine + antioxidants)      Molsidomine (NO donor)**



Racasan et al. *Hypertension* 2004;44:83-88

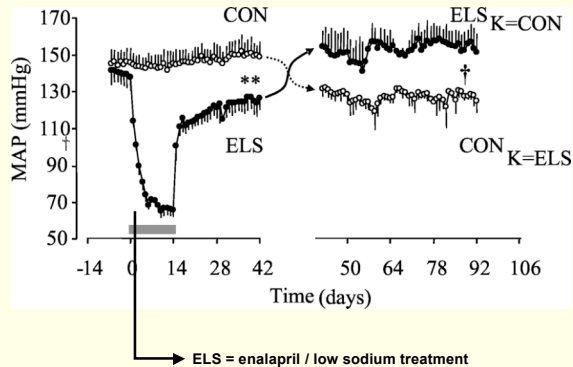
Racasan et al. *Am J Physiol Renal Physiol.* 2005;288:F626-F636

**How 'essential' is Hypertension?  
Genetics Challenged: Fetal Programming**



smallegange et al, hypertension 2004

**How 'essential' is Hypertension?  
Genetics Challenged: Fetal Programming**



**How 'essential' is Hypertension?  
Genetics Challenged: Fetal Programming**

**Clinical Implication:  
Short term treatment with ang II inhibitor of  
(pre)hypertension may persistently lower blood  
pressure**

THE NEW ENGLAND JOURNAL OF MEDICINE

ORIGINAL ARTICLE

**Feasibility of Treating Prehypertension  
with an Angiotensin-Receptor Blocker**

Stevó Julius, M.D., Sc.D., Shawna D. Nesbitt, M.D., Brent M. Egan, M.D.,  
Michael A. ... N ENGL J MED 354:116 WWW.NEJM.ORG APRIL 20, 2006 ... D.,  
HERTZ ... FRANZ H. MESSERLI, M.D., SUZANNE OPARIL, M.D., and M. ANTHONY SCHORK, Ph.D.,  
for the Trial of Preventing Hypertension (TROPHY) Study Investigators\*

## TROPHY Study

- 4-year, multicenter, RCT
- Does candesartan reduce progression to hypertension from prehypertension, compared with placebo
- Treatment-naïve, mean BP  $\leq 139/85-89$  mmHg or  $130-139/<89$  mmHg

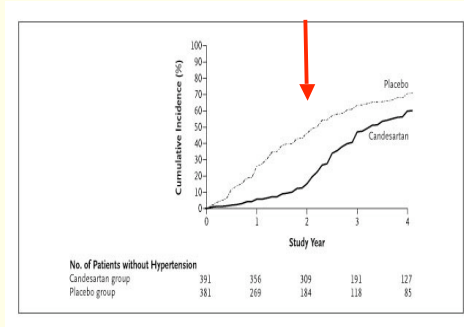
Julius et al. *N Engl J Med* 2006

## Incidence of Hypertension in those Identified with Borderline Hypertension

- 772 subjects, mean age 48.5
- Not receiving tx for HTN
- Avg of 3 BPs at baseline:  
SBP 130-139 and DBP  $< 89$  OR  
SBP  $< 139$  and DBP 85-89
- Primary endpoint – new onset HTN
- Note that mean BMI was 30!

NEJM 2006;354:1685-97

## Kaplan-Meier Plot of New Onset HTN in an RCT



Baseline BP 130-139 / 85-89 mmHg

Julius et al. *NEJM* 2006;354:1685-97

## High risk of developing hypertension in those with high normal blood pressure

- 40% of patients with systolic 130-139 or diastolic 85-89 mmHg developed hypertension in 2 years and 63% in 4 years *NEJM* 2006;354:1685-97
- Annual follow-up of patients with high normal blood pressure is recommended.

NEJM 2006;354:1685-97

## Impact of Lifestyle Therapies on Blood Pressure in Hypertensive Adults

Intervention	Amount	SBP/DBP
Reduce foods with added sodium	1.8g or 78 mmol/d	-5.1 / -2.7
Weight loss	per kg lost	-1.1 / -0.9
Alcohol intake	- 3.6 drinks/day	-3.9 / -2.4
Aerobic exercise	120-150 min/week	-4.9 / -3.7
Dietary patterns	DASH diet	-11.4 / -5.5
	Hypertensive Normotensive	-3.6 / -1.8

Applying the 2005 Canadian Hypertension Education Program recommendations:  
3. Lifestyle modifications to prevent and treat

## Conclusion

**Follow-up for patients with high normal blood pressure (130-139 / 85-89)**

**If BP is high-normal (SBP 130-139 mm Hg and/or DBP 85-89 mm Hg) patients should be followed annually**