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How you want to be treated.

COMPREHENSIVE CARDIAC CARE
A unique resource for British Columbians

The Heart Centre

Treating Metabolic Syndrome: Interventions for Success

BC Nephrology Days 2007

Susanne Burns
Metabolic Syndrome Program
Healthy Heart Program
St. Paul's Hospital

Learning Objectives:

- Understand the central role of abdominal obesity
- Identify Metabolic Syndrome criteria
- Understand current management of cardiometabolic risk factors
- Improve ability to adopt a comprehensive lifestyle modification program for individualized therapy

+


STARTED GETTING OFF BUS A FEW STOPS EARLY AND WALKING TO WORK
GRADUALLY WORKED UP TO WALKING 30 MINUTES A DAY 5X A WEEK
HAS CO-WORKERS WONDERING WHO THE NEW GUY IS

THE SUN

The new 'vital sign' for human health: waist size

BY SHARON KIRKEY

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IENTS

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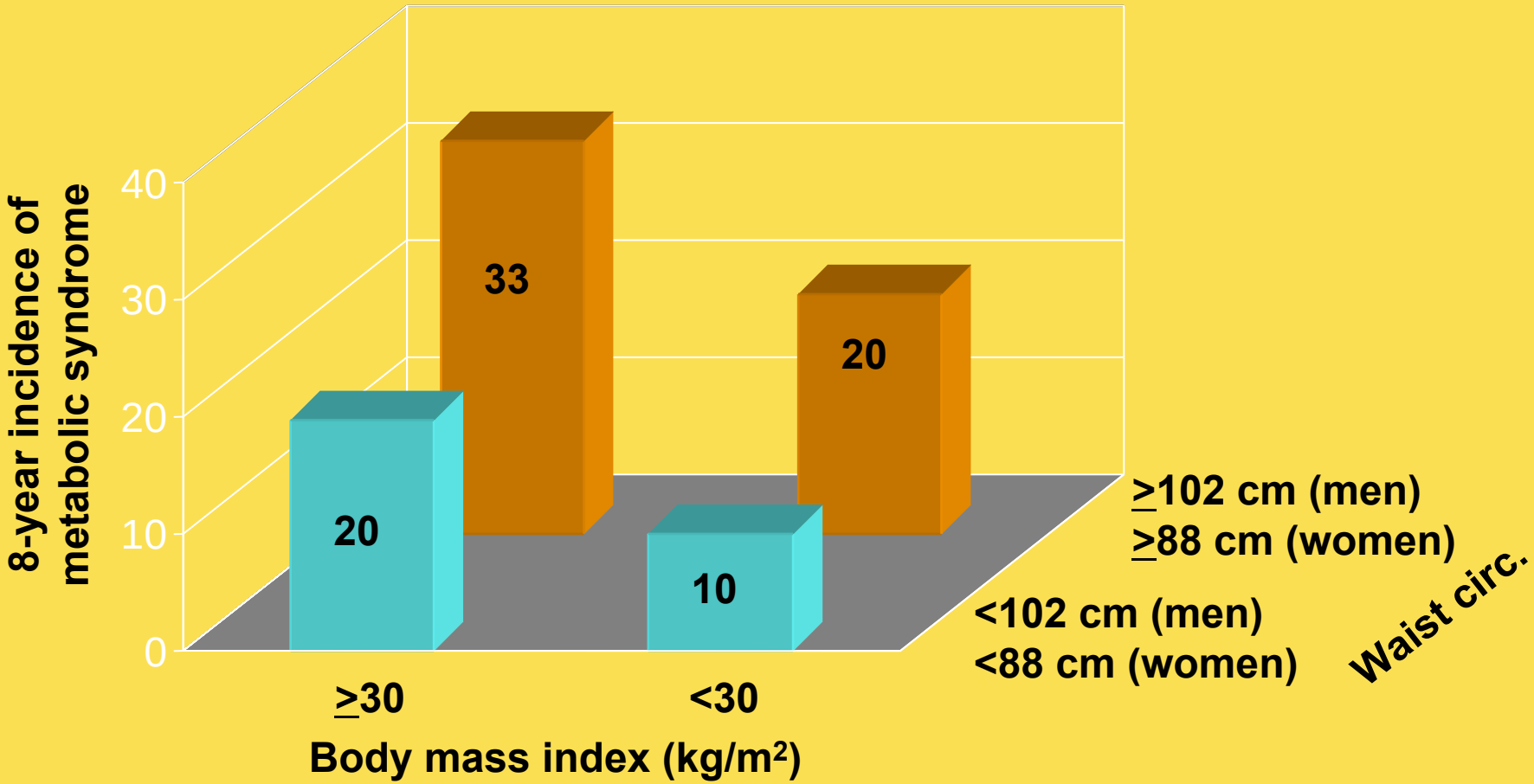
can't enter another

SUN RUN

5

Abdominal Obesity Predicts the Metabolic Syndrome



Hans TS et al. Obes Res. 10(9):923-31; 2002

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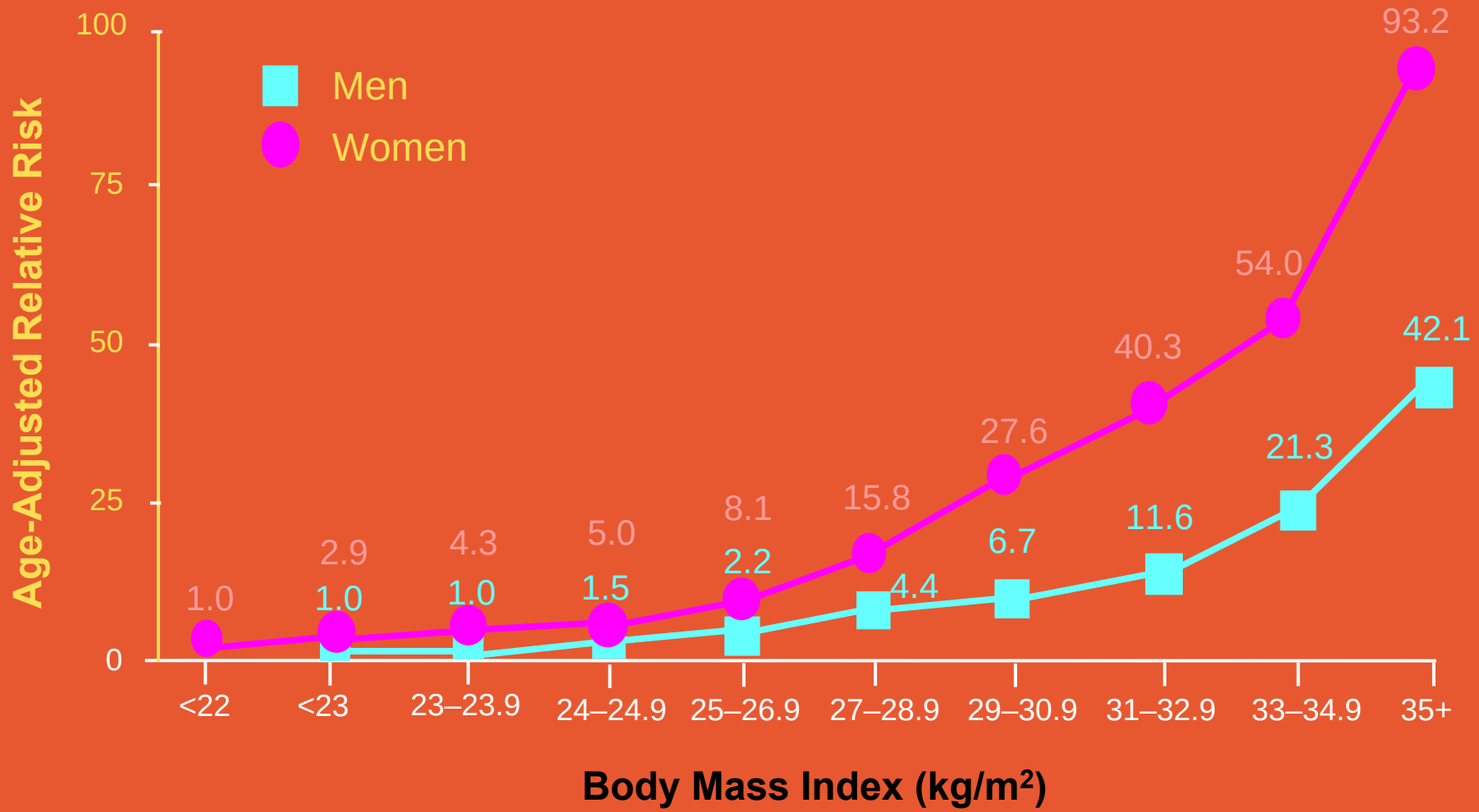
Relationship Between BMI and Risk of Type 2 Diabetes Mellitus



Chan J et al. *Diabetes Care* 1994;17:961.
Colditz G et al. *Ann Intern Med* 1995;122:481.

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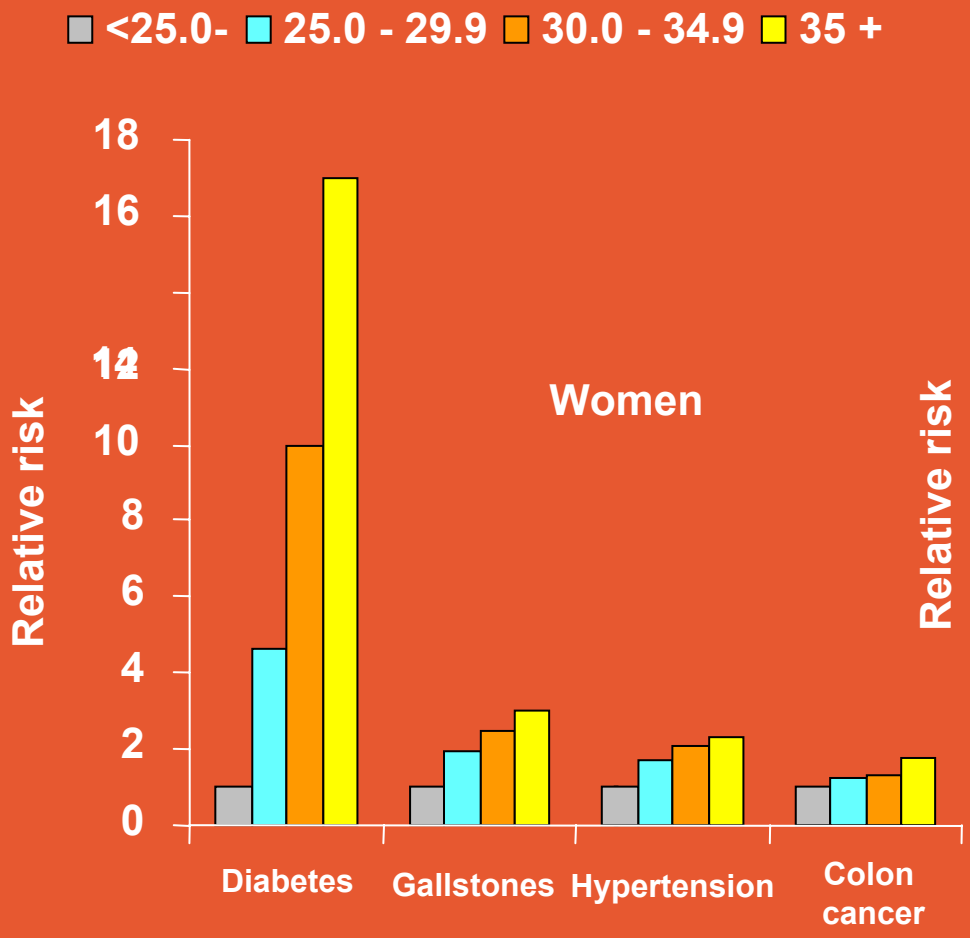
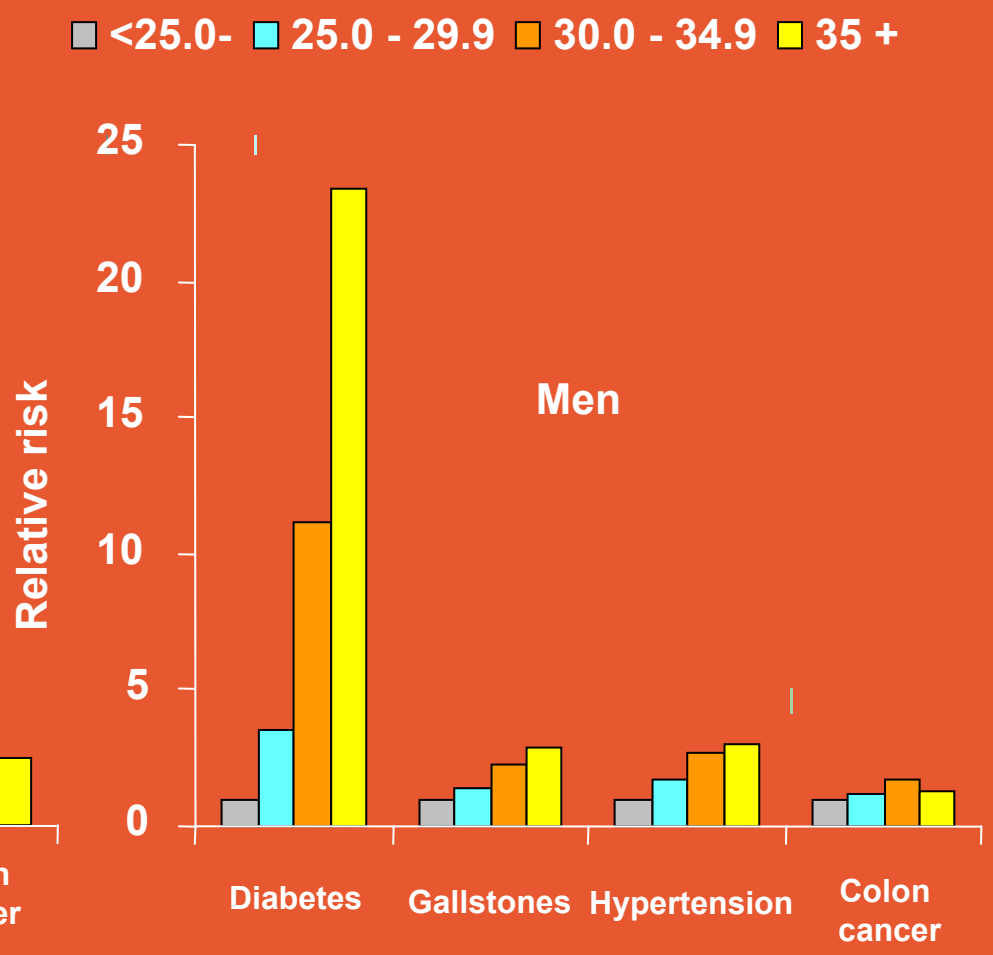
10-year Risk of Developing Chronic Diseases by BMI Level





From AE Field et al. Arch Intern Med 2001; 161:1581-1586

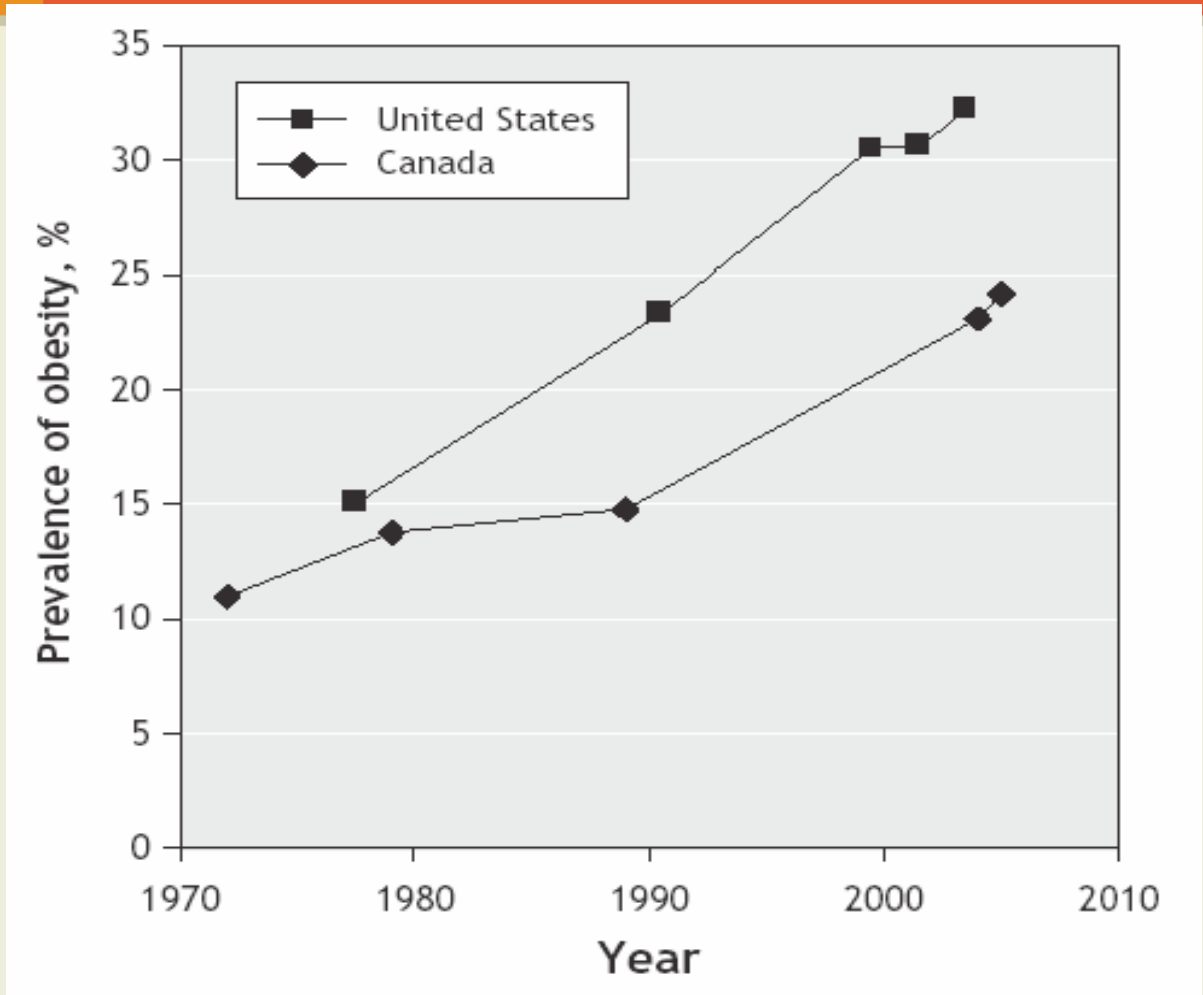
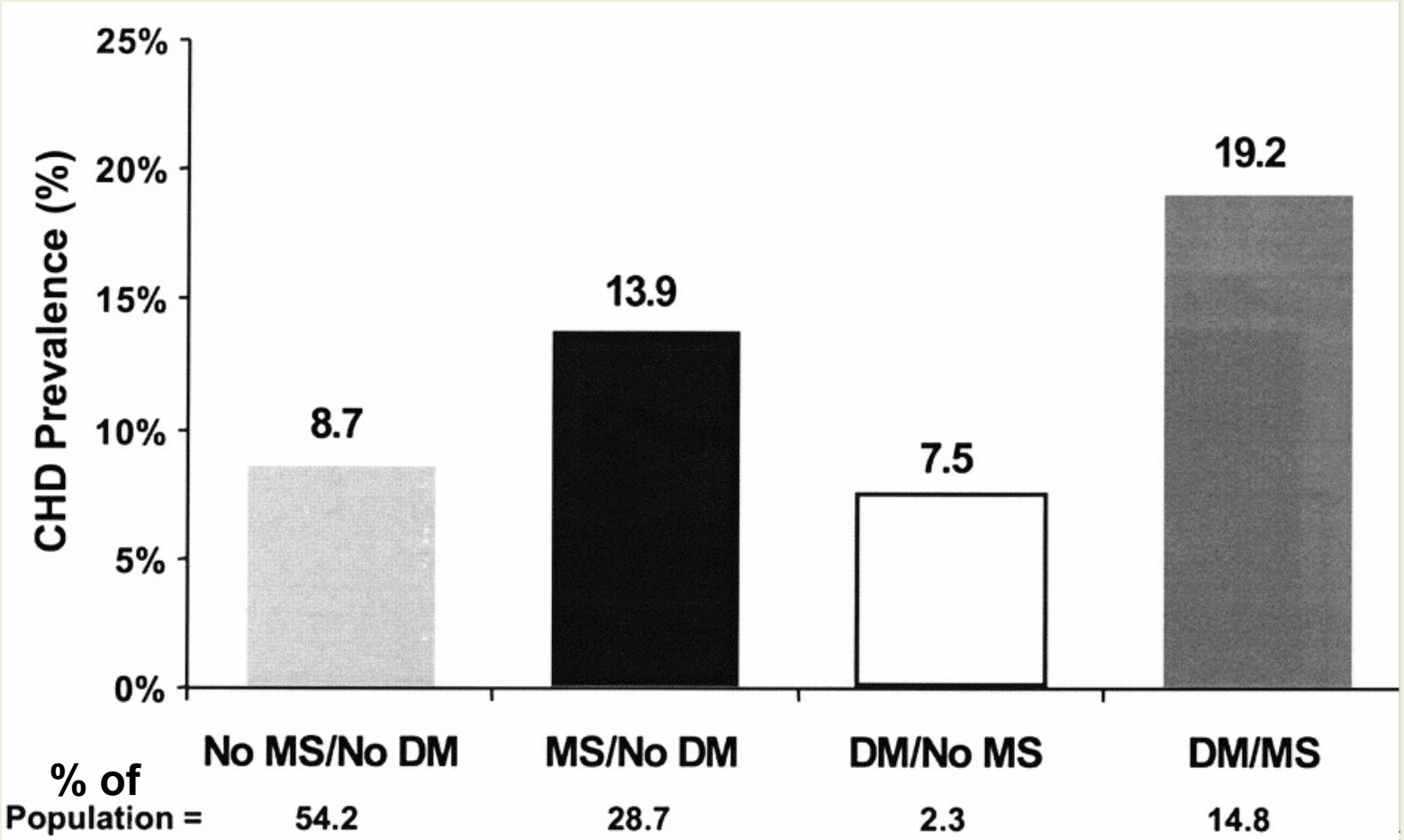


Fig. 2: Temporal trends in the prevalence of measured obesity in Canada and the United States. Sources: US National Health and Nutrition Examination Surveys,[8–12] 1972 Canada Nutrition Survey,[13] Canada Health Survey, 1978–1979,[14] Canadian Heart Health Survey, 1986–1992[15] and Canadian Community Health Surveys.[6,17] The estimates for Canada are age-standardized to the 2004 Canadian Community Health Survey,[6] and the estimates for the United States are age-standardized to the 2000 population census.[16]

Prognosis of Metabolic Syndrome



Data from the Third National Health and Nutrition Examination Survey (NHANES III),

How Prevalent is Metabolic Syndrome?

- Numbers are alarming
- Prevalence is increasing in the age 50 plus population, it reaches one third of men and one quarter of women in Canada.
- Prevalence culminates particularly in the First Nations ethnic groups

Challenges in Canada

- 20% of population will be ≥65 y/o by 2011
- 31% of adults are overweight or obese (BMI >27)
- 60,000 "new cases" of diabetes a year
- Prevalence of diabetes may increase to 3 million in 2010
- Extremely high frequency of obesity and diabetes in the First Nation populations

Challenges in British Columbia:

- 450,000 people have the metabolic syndrome
- 57% of men and 35 % of women are overweight





Metabolic Syndrome is a constellation of metabolic abnormalities as a result of poor lifestyle habits interacting with underlying genetic susceptibility factors

Metabolic Syndrome

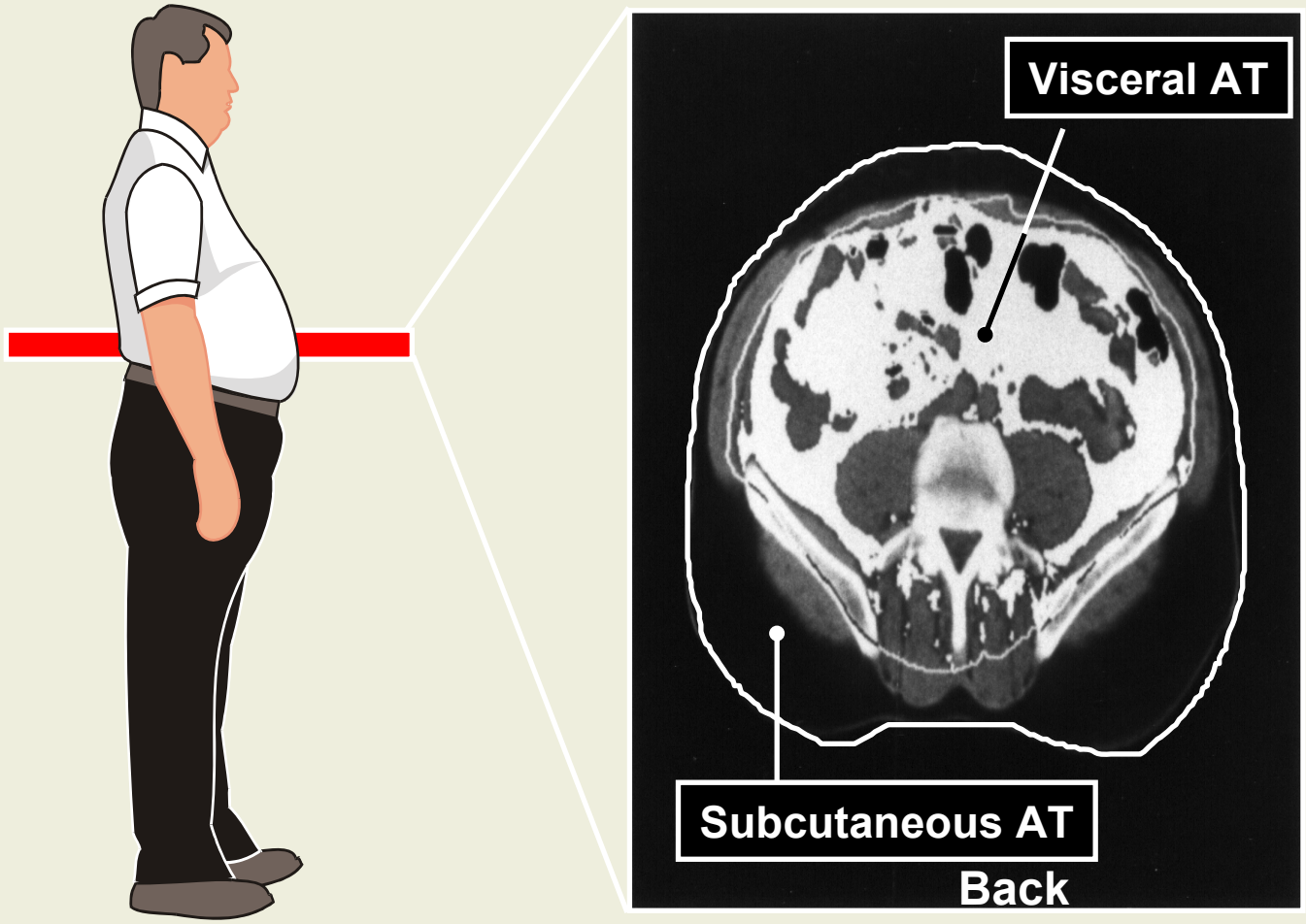
Clustering of Risk Factors:

- Abdominal obesity
- Insulin resistance
- Atherogenic dyslipidemia
- Increased blood pressure

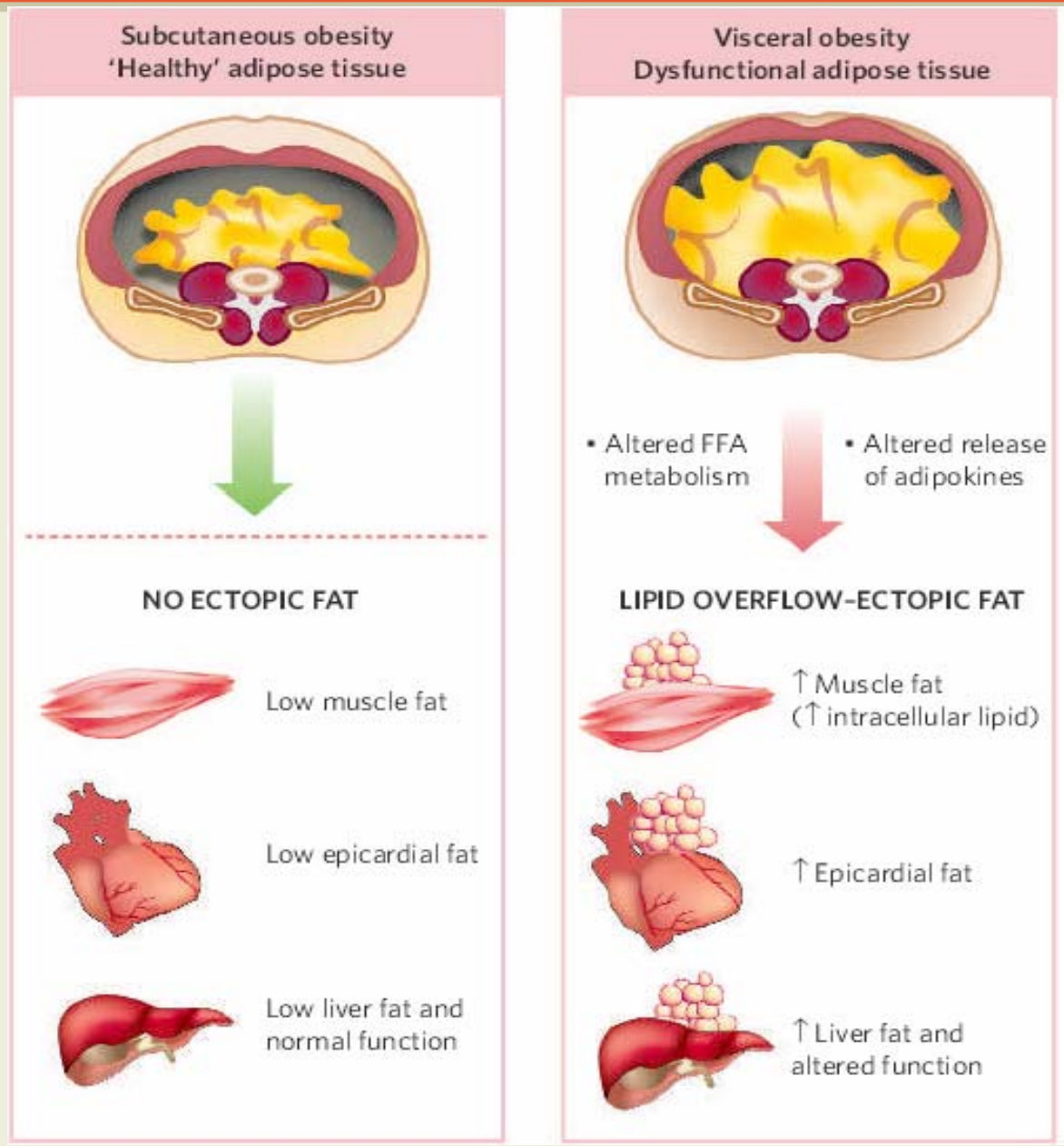
Metabolic Syndrome

- Increases risk for both cardiovascular disease and diabetes
- Metabolic syndrome has become the most important target of preventive strategies in the developed world

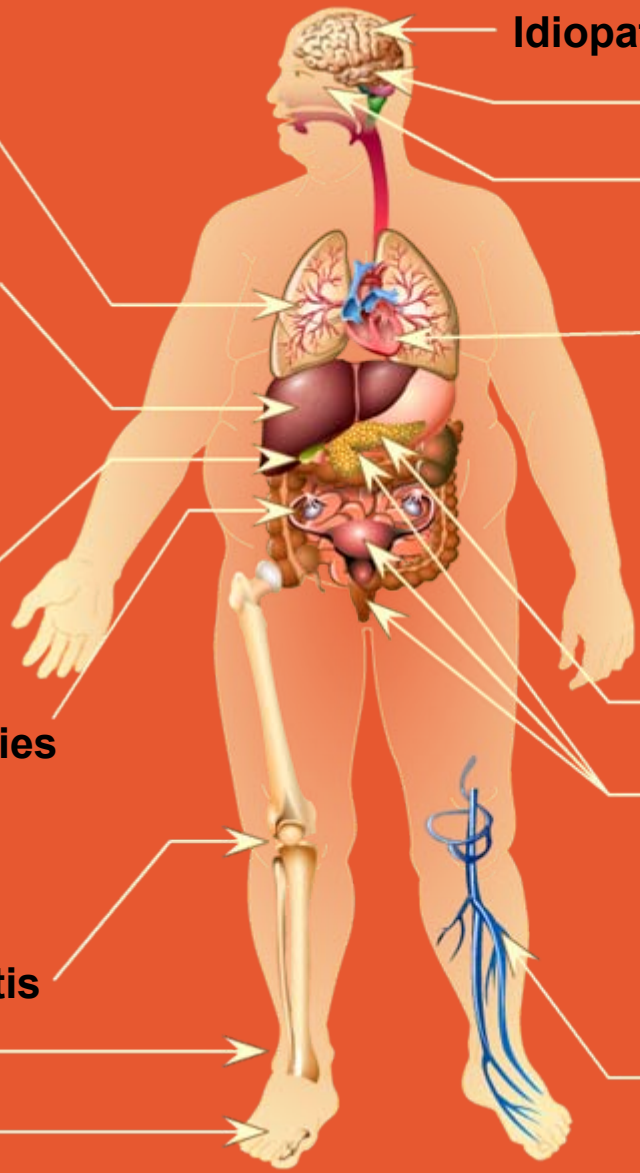
Intra-abdominal (visceral) fat: The dangerous inner fat!



AT: adipose tissue


Subcutaneous obesity
'Healthy' adipose tissue
Visceral obesity
Dysfunctional adipose tissue
• Altered FFA metabolism
• Altered release of adipokines
NO ECTOPIC FAT
LIPID OVERFLOW-ECTOPIC FAT
Low muscle fat
↑ Muscle fat
(↑ intracellular lipid)
Low epicardial fat
↑ Epicardial fat
Low liver fat and normal function
↑ Liver fat and altered function

Medical Complications of Obesity



Pulmonary Disease
abnormal function
obstructive sleep apnea
hypoventilation syndrome

Non-alcoholic Fatty Liver Disease
statuses
steatohypatitis
cirrhosis

Gall Bladder Disease

Gynecologic Abnormalities
abnormal menses
infertility
polycystic ovarian syndrome

Osteoarthritis

Skin

Gout

Idiopathic Intracranial Hypertension

Stroke

Cataracts

Accelerated Atherosclerosis

Coronary Heart Disease

Diabetes

Dyslipidemia

Hypertension

Severe Pancreatitis

Cancer
breast, uterus, cervix, colon, esophagus, pancreas, kidney, prostate

Phlebitis
venous stasis

How do you diagnose Metabolic Syndrome ?

Required For Diagnosing the Metabolic Syndrome

IDF criteria of the metabolic syndrome

- High waist circumference, plus any two of:
- ↑ Triglycerides (≥ 1.7 mmol/L)‡
- ↓ HDL cholesterol‡
  - Men < 1.0 mmol/L
  - Women < 1.3 mmol/L
- ↑ Blood pressure ≥ 130 / ≥85 mm Hg‡
- ↑ FPG (≥ 5.6 mmol/L), or diabetes

‡or specific treatment for these conditions

International Diabetes Federation (2005)

NCEP ATP III Criteria: 3 or more criteria

Abdominal obesity	**Waist Circumference**
Men	**> 102 (40")**
Women	**> 88 (35")**
Blood pressure	**> 130/85 mmHg**
Triglycerides	**≥1.7 mmol/L**
High Density Lipoprotein Cholesterol	
Men	**< 1.0 mmol/L**
Women	**< 1.3 mmol/L**
Fasting glucose	**5.7-7.0 mmol/L**

Abdominal Obesity and Waist Circumference Thresholds

New IDF criteria

	Men	Women
Europid	≥94 cm (37.0 in)	≥80 cm (31.5 in)
South Asian	≥90 cm (35.4 in)	≥80 cm (31.5 in)
Chinese	≥90 cm (35.4 in)	≥80 cm (31.5 in)
Japanese	≥90 cm (33.5 in)	≥80 cm (35.4 in)

Current NCEP ATP-III criteria:

> 102 cm (>40 in) in men

> 88 cm (>35 in) in women

NCEP 2002; International Diabetes Federation (2005)

How do you identify high-risk patients?

Global Risk Score and Metabolic Syndrome

- Framingham Risk Score used in assessment
- Metabolic syndrome individuals often at higher risk than predicted by FRS
- Double the total percentage score

Assess Other Contributing Factors of Hypertriglyceridemia:

- Obesity/Overweight
- Decreased physical activity
- Increased in alcohol intake
- High carbohydrate diet
- Underlying diabetes
- Renal failure
- Genetic disorders
- Medications (BB, estrogens, oral contraceptives, diuretics)

Assess Associated Conditions of Insulin Resistance:

- Skin (acanthosis nigricans)
- PCOS (polycystic ovarian syndrome)
- Pediatric risk factors
- Sleep disturbances (sleep apnea, daytime sleepiness and fatigue)
- Dysregulation of insulin increases risk for cognitive impairment, Alzheimer's disease
- Liver – nonalcoholic fatty liver disease
  - Screen ALT

Metabolic Syndrome: Treatment

Comparative Effects of Interventions

	Exercise	Diet	Meds
BP	-7/-3 mmHg	-7 to -11 mmHg	-15/-9 mmHg
Lipids			
LDL	-5%	-5%	-30%
HDL	+5%	--	+5%
TG	-4%		-20%
TC		-3%	
A1C	-10%	Reduced	> -20%
Hs-CRP	Reduced	Reduced	Reduced
Cytokines	Reduced	Reduced	Reduced
Total body weight	~8%	~8%	+/-
Waist circumference	Reduced	Reduced	Reduced
Abdominal fat	Reduced	Reduced	Reduced
Intra-abdominal fat	Reduced	Reduced	Reduced

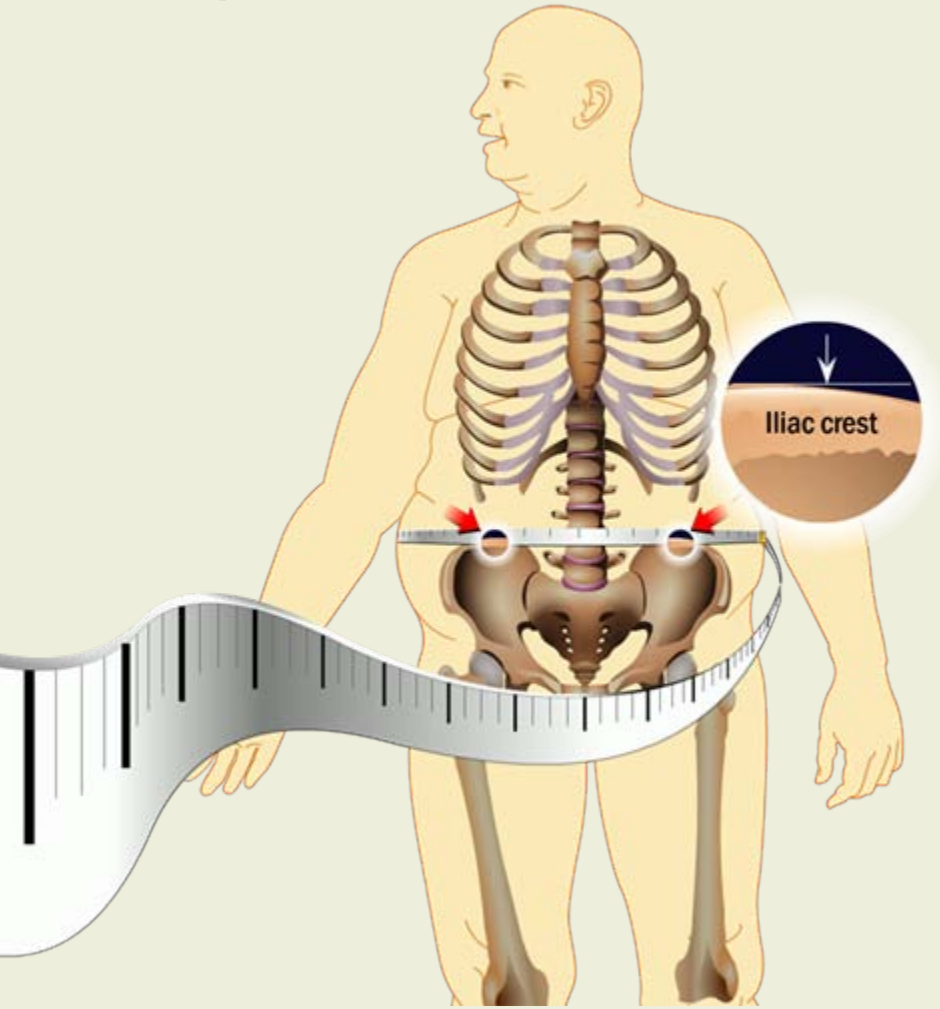
Therapeutic Objectives:

- **To reduce underlying causes**
  - Overweight and obesity
  - Physical inactivity
- **To treat associated lipid and non-lipid risk factors**
  - Atherogenic dyslipidemia (lipid triad)
  - Hypertension
  - Dysglycemia
  - Prothrombotic state
  - Proinflammatory state

Treatment of the Metabolic Syndrome
Assessment:

- Recognize and identify cardiometabolic risk factors
- BP, HR
- Medical history
- Medications
- Anthropometrics: WT, HT, WC, BMI, WHR
  - Measure waist circumference
  - Make waist circumference a new vital sign!

Measuring Waist Circumference: A Practical Guide From the NIDDK/NIH



- The waist circumference is measured by locating the upper hip bone and the top of the right iliac crest and placing a measuring tape in a horizontal plane around the abdomen at the level of the iliac crest.
- Before reading the tape measure, the tape should be snug but not compressing the skin and should be parallel to the floor.
- The measurement is made at the end of normal expiration.

http://win.niddk.nih.gov/publications/tools.htm#circumf

Assessment of Current Lifestyle Factors:

- Nutrition history
  - eating disorders, obesity, yo-yo dieting
- Weight history
  - Range of weight and usual weight (past programs)
- Exercise and physical activity patterns
- Tobacco use
- Alcohol use/other drugs
- Psychosocial variables (stress, anxiety, depression, anger, social support)

Other:

- Psychiatric comorbidities
- Family history

Lifestyle Interventions: Nutrition and Weight Management

The Most Important Goal in Treatment:

Focus on making *healthy lifestyle changes.*

- **Physical activity and diet changes that lead to weight loss can reduce or reverse the metabolic syndrome.**
- **Balance calorie intake and physical activity to reach or keep up a healthy body weight.**

Diagnosis and Management of the Metabolic Syndrome Executive Summary

Circulation2005;112:285-290

- Reduce body weight by 7-10% during the first year of therapy
- Anti-atherogenic diet
  - Saturated fat <7% of total calories
  - Reduce trans fat
  - Dietary cholesterol <200mg/day
  - Total fat 25-35% of total calories
  - Simple sugars should be limited

Dietary Principles:

Diet and Lifestyle Recommendations Revision 2006 A Scientific Statement From the American Heart Association Nutrition Committee Circulation 2006;114:82-96

AHA 2006 Diet and Lifestyle Recommendations for Cardiovascular Disease Risk Reduction

- Balance calorie intake and physical activity to achieve or maintain a healthy body weight.
- Consume a diet rich in vegetables and fruits.
- Choose whole-grain, high-fiber foods.

Dietary Principles:

- Consume fish, especially oily fish, at least twice a week.

- Limit your intake of saturated fat to <7% of energy, *trans* fat to <1% of energy, and cholesterol to <300 mg per day

Dietary Principles:

- Minimize your intake of beverages and foods with added sugars.
- Choose and prepare foods with little or no salt.
- If you consume alcohol, do so in moderation.
- When you eat food that is prepared outside of the home, follow the AHA Diet and Lifestyle Recommendations.

Adult Weight Management Evidence-Based Nutrition Practice Guideline (American Dietetic Association – ADA evidence library.com)

- **An individualized reduced calorie diet is the basis of the dietary component of a comprehensive weight management program. Reducing dietary fat and/or carbohydrates is a practical way to create a caloric deficit of 500-1000kcal below estimated energy needs and should result in a weight loss of 1-2lbs per week**

- **Total caloric intake should be distributed throughout the day, with the consumption of 4 to 5 meals/snacks per day including breakfast. Consumption of greater energy intake during the day may be preferable to evening consumption.**

CMAJ · JAMC

April 10, 2007, Vol. 176, No. 8 • Le 10 avril 2007, vol. 176, nº 8

2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children

This complete set of guidelines consists of an executive summary and 26 chapters on specific aspects of obesity prevention and management. It is available online as a PDF at www.cmaj.ca/cgi/content/full/176/8/S1/DC1.

CMAJ 2007;176(8 suppl):Online-1–117

www.cmaj.ca

2006 Canadian Clinical Practice Guidelines on the management and prevention of obesity in adults and children CMAJ April 10, 2007.Vol 176 No.8

- Dietary intervention for the treatment of obesity in adults
  - Reduced energy intake (by about 500kcal/day) will promote gradual weight loss over time at the expected rate of 1-2kg per month
  - Currently insufficient evidence to conclude that manipulation of the macronutrient distribution to achieve either a low carbohydrate intake or a low fat intake offers any significant advantages

Dietary Interventions:

- **Low-carbohydrate diets**
  - **The use of long-term (>6months) is not recommended**
- **Low-fat diets**
  - **<10% fat diet without energy restriction resulted in an average weight loss of 3.2kg after 1 year**

Dietary Interventions:

- **High Protein Diets**
  - **Higher protein diets (25% vs 12%) – no change in weight but a greater decrease in waist circumference, waist–to-hip ratio and abdominal fat mass at 1 year**
  - **Evidence to suggest that higher protein intake increases satiety compared with diets of lower protein content**

Dietary Interventions:

- **Low glycemic index, high-fiber diets**
  - **Review of dietary interventions on appetite and energy balance comparing low glycemic vs high glycemic showed no differences in 14 trials**
  - **22 studies on impact of fiber on appetite suppression and weight loss concluded that the addition of 10-14g of fiber may promote a weight loss of 1.3-1.9kg over 3 months**

Nutrition Education in SPH Metabolic Syndrome Program:

- Food Trackers
- Nutrition Lifestyle Questionnaire
- Portion Distortion – portions and fiber
- Grocery Shopping Tour
- Mood and Food
- Facts about Fat
- Potluck
- Holiday/Vacation Scenarios

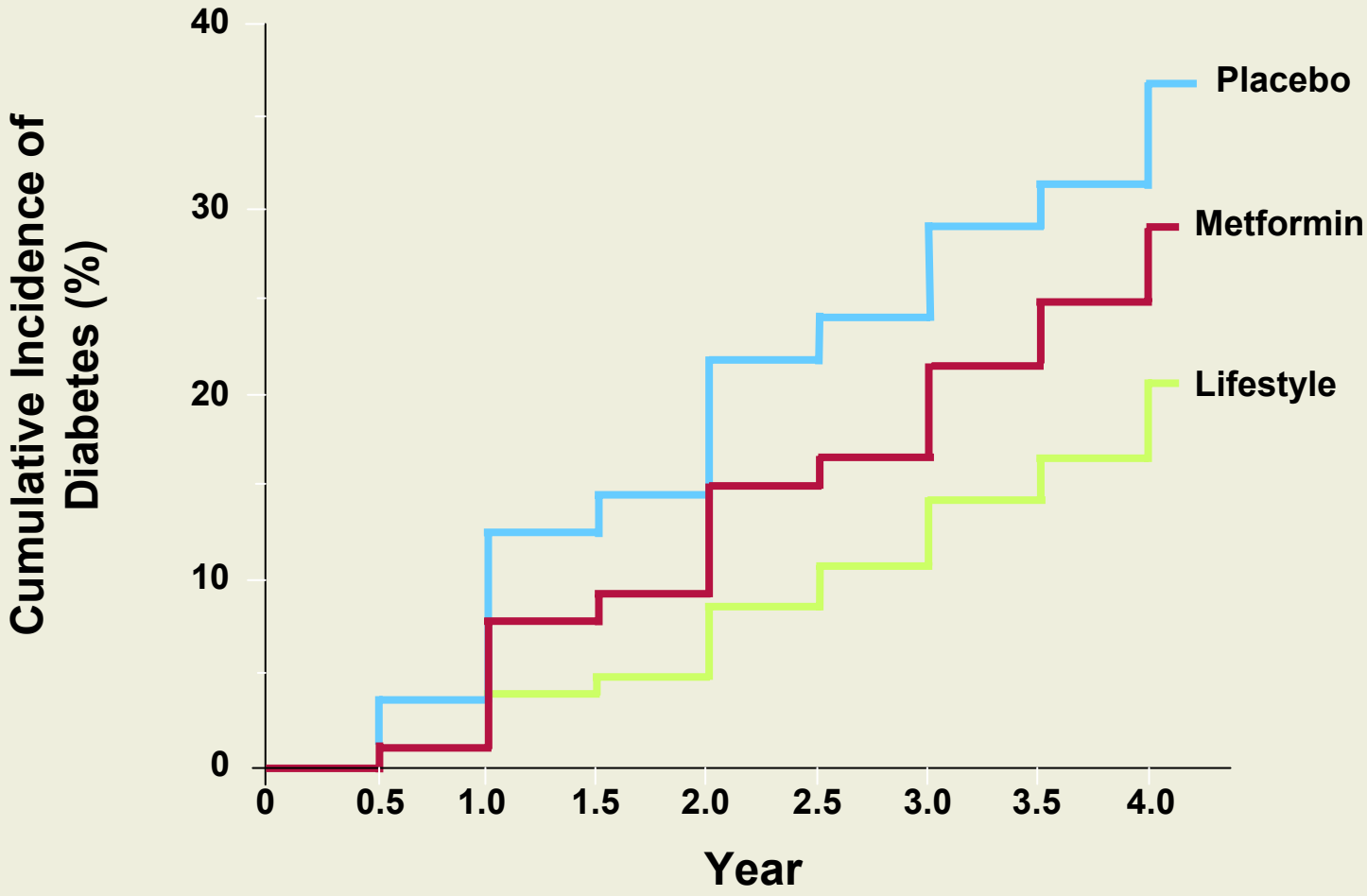
What are the Key Fundamentals for Initiating Behavior Change:

- Exercise and nutrition goals should be SMART:
  - S pecific
  - M easurable
  - A ttainable
  - R ealistic
  - T ime-defined

Common Barriers:

- Irregular eating patterns
- Lack of balanced meals
- Night-time eating
- Low intake of fruits and vegetables
- Low intake of fiber
- Restaurant Dining
- Psychological issues

Weight Loss Prevents Diabetes!



Adapted from Diabetes Prevention Program Research Group. New Engl J Med. 2002;346:393-403.

Lifestyle Interventions: Exercise and Physical Activity

Lifestyle Interventions: Physical Activity

- **Physical activity is an important component of successful weight loss and weight loss maintenance programs.**
- **Has independent beneficial effects on cardiometabolic risk factors and overall CVD risk.**

SMART Principles and Exercise Prescription:

- Exercise prescriptions should be SMART:
  - S pecific
    - Concise, clear exercise instructions
  - M easurable
    - Use pedometers
    - Exercise equipment
    - Defined distances
  - A ttainable
    - Patient-specific goals
  - R ealistic
    - Use your common sense
  - T ime-defined
    - Expect improvements in 6–12 weeks

What are the Key Fundamentals of an Exercise Prescription?

- Exercise prescriptions should follow
  - FITT
    - F requency
    - I ntensity
    - T ime (duration)
    - T ype

Cardio

Frequency: most days

Intensity: "moderate" 50-70% of max HR, or use the "talk test"

Time: 10 minutes or more at a time

Type: what you like! (preferably low impact exercise)

Strength

- 2-3 times per week (non-consecutive days)
- 8-20 repetitions against a resistance that causes fatigue.
- 1-2 sets
- One exercise for every major muscle group (largest muscle groups take priority)

Physical Activity and Weight Management

- **30 minutes cardio most days for health, 60 minutes or MORE for weight-loss**
- **National Weight Control Registry**
  - "Physical activity has remained the same at roughly 2600 calories per week"
  - That is approximately equal to a 235 pound person walking for an hour every day on level ground

Exercise Calorie Estimator

Walking (up to 4 mph)			
Weight (lbs)	235	mets	3.3
Walking Speed (mph)	3	kcal/min	6.2
Walking Grade (%)	0	minutes to burn 500 kcal	81
		minutes to burn 250 kcal	41

Running (as low as 3 mph if truly jogging)			
weight (lbs)		mets	1.0
Running Speed (mph)		kcal/min	0.0
Running grade (%)		minutes to burn 500 kcal	#####
		minutes to burn 250 kcal	#####

How fast will I lose weight?

	walking	running
Days exercise/week	7	
Duration of exercise	60	
Intensity of exercise	6.2	0.0
kcals/week	2588.454312	0
pounds of fat per week	0.739558375	0

Phelan S, Wyatt HR, Hill JO, Wing RR. Are the eating and exercise habits of successful weight losers changing? Obes Res. 2006 Apr, 14(6):710-16.

Strength Training to Improve Metabolic Control: an Underutilized Tool

Strength Training to Improve Metabolic Control : an Underutilized Tool

- **Particularly useful for :**
  - Improving glucose metabolism
    - Improvement in HbA1C levels and insulin sensitivity in T2DM
  - Increasing basal metabolic rate
    - In theory 1kg lean muscle mass increases BMR by 21 kcal/day[1]
    - May potentially offset age relate weight gain.

1) Circulation. 2007 Jul 16

Strength Training…

- **Despite misconceptions, strength training is safe even with high workloads**
  - **Hemodynamically less demanding than aerobic exercise**
- **Supervised, centre-based training most effective; however, home based exercise may still have some efficacy, especially in the elderly[2].**

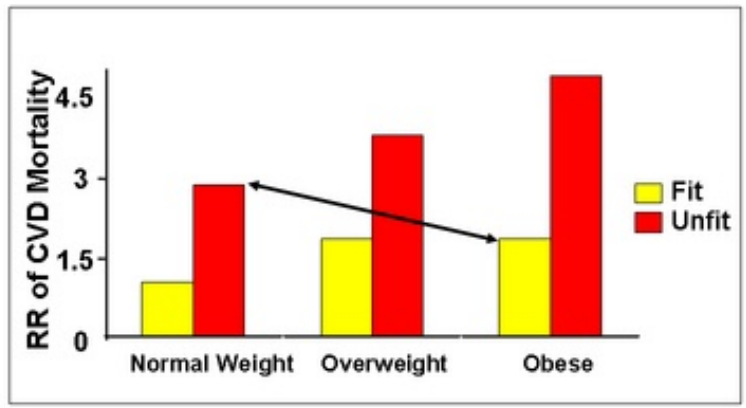
2) Diabetes Care. 2005 Jan;28(1):3-9

Fitness versus Fatness

- Fitness (time on Bruce treadmill) independently predicts risk of total mortality, CV mortality and CV events.
  - 1 Met decrease on the treadmill = +1.20 RR for CV mortality in asymptomatic women
- Exercise, even without significant decrease in weight (or waist) should reduce risk

Effect of Fatness (BMI) and Fitness on Cardiovascular Disease (CVD) Mortality

Wei M et al. JAMA 1999; 282:1547-53



"…low cardiorespiratory fitness was a strong and independent predictor of CVD and all-cause mortality and of comparable importance with that of diabetes mellitus and other CVD risk factors."

JAMA. 2003 Sep 24;290(12):1600-7.

Safety considerations

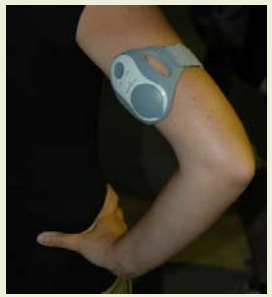
- An appropriately designed strength and conditioning program is very safe for asymptomatic people with metabolic syndrome.
- If Framingham 10 year risk score exceeds 10%, graded exercise stress testing may be considered, particularly if patient is new to exercise.
- Supervised exercise is not a necessity; however, patients may find benefit from the structure and expert staff associated with cardiac rehabilitation programs.
- Referral to a qualified exercise professional (ACSM Exercise Specialist or equivalent)

American College of Sports Medicine: Guidelines for Exercise Testing and Prescription

Measuring Physical Activity: the SPH experience

- Measuring free living physical activity patterns continues to be a challenge:

1) Self report questionnaires
    - Over reporting
    - IPAQ (www.ipaq.ki.se)
2) Pedometers / step counters
    - No indication of exercise intensity
3) Continuous heart rate monitoring
    - Tremendous inter-individual variation
4) Accelerometers
    - Better than pedometers, but only capture dynamic activity
5) Indirect calorimetry
    - More accurate
    - $$$ and not realistic to wear for the whole day
6) Doubly labeled water
    - $$$, not practical



Physical Activity and Exercise Therapy Summary

- Obesity and overweight
  - Is related to physical inactivity
  - Is improved by regular exercise
- Physical activity and exercise
  - Significant health benefits in obesity
    - Preserves lean body mass
    - Vascular benefits
  - For weight management
    - Time much more important than intensity
    - Use pedometers as motivators
      - 10 000 Steps program
    - Be SMART and be FITT

Lifestyle Intervention Strategies:

- Self-monitoring
- Problem solving around barriers
- Cognitive restructuring – moderating unrealistic goals, reduce self-defeating thoughts and feelings
- Prevent relapse – Anticipate lapses in lifestyle change and practice coping strategies to get back on track
- Social support – involve family and friends
- Contracting – may increase commitment

Pharmacotherapy:

- May be needed after trial of intensive lifestyle intervention (6-12 months)
- Lipid lowering therapy
- Hypoglycemic agents
- Antihypertensive agents
- Weight loss agents
- Smoking cessation
- Mental health agents

Psychosocial Interventions:

- Assessment
- Acknowledgement!
- Letter to referring physician/family physician
- Education materials to patient
- Self-management workbook on depression
  - www.carmha.ca/publications
- Referral to community resources
  - Support programs, Psychology, Psychiatry

Summary: Lifestyle Therapy

- **Lifestyle modification – including weight loss, increased physical activity and an anti-atherogenic diet – is the primary therapeutic goal for the treatment of metabolic syndrome**

- **Prescribing lifestyle changes are underutilized in routine clinical practice!**

Summary: Lifestyle Therapy…

- Drug therapy alone does not completely eliminate the cardiovascular disease risk; lifestyle therapies provide a multifaceted approach to reduce this residual risk.
- Once metabolic syndrome is diagnosed, lifestyle therapies need to be introduced, reinforced, and monitored.

Summary

- Multidisciplinary team members are able to effectively and confidently support the identification and treatment plans of individuals with the metabolic syndrome both at the bedside and in the outpatient setting.
- Patient risk reduction is a team effort – share with the primary or referring doctor plan of action and recommendations. Refer to other health care professionals or programs for additional patient support.

Friday, November 16, 2007
Interactive Policy Discussion
Saturday November 18, 2007
Education Program

1st Annual Western Cardiometabolic Summit

- St. Paul's Hospital
- 1081 Burrard Street, Vancouver, BC
- New Lecture Theatre – Providence Building

- Sponsored by St. Paul Hospital

- Unrestricted grants-in-aid of continuing medical education have been provided

HEART CENTRE AT ST. PAUL'S HOSPITAL

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Questions and Discussion