Know your Risk: Women and Cardiovascular Disease

Christina Light Craigo MSN ACNP CCRN-CMC AACC
Los Angeles Cardiology Associates
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Of the women who died in 2008, one in four women dies from heart disease. It’s the #1 killer of women, regardless of race or ethnicity. It also strikes at younger ages than most people think, and the risk rises in middle age.

Numbers of deaths are based on the most recent data available and rounded to the nearest tenth.

* National Center for Health Statistics,
  Unpublished NHGIS tabulation of 2008 mortality data.

* The Heart Truth, its logo and The Red Dress are registered trademarks of HHS.
Some Statistics

- Since 1984, the total number of deaths from cardiovascular disease has been greater for women compared with men.
- Heart disease killed 292,188 women in 2009.
- About 5.8% of all white women, 7.6% of black women, and 5.6% of Mexican American women have coronary heart disease.
- Almost two-thirds (64%) of women who die suddenly of coronary heart disease have no previous symptoms.

*Insights from the NHLBI-sponsored Women’s Ischemia Syndrome Evaluation Study. JACC 2006*
The current guidelines for CVD prevention in women were formulated based on trials in which the mean percentage of females enrolled was 30%.

Only 1/3 of the trials specifically reported results for women.

Women are more likely to be included in primary prevention than in secondary prevention trials.
Presentation of CHD in Women

- Generally, 10-15 years later than men at time of presentation
- Women more frequently present with nausea, vomiting and indigestion, and also complain more often of pain in the middle of the back and jaw
- Women drastically underestimate their own risk of CHD
- Women who present to the ED with new onset chest pain are approached and diagnosed less aggressively than men
Patient Work-up

- Compared to men, women are less likely to:
  - Undergo an electrocardiogram, cardiac monitoring, or cardiac enzyme measurements
  - Receive a cardiology consult
  - Be admitted to a coronary care or step down unit

- Women are more likely to:
  - Receive controlled substances and anxiolytics in the ED, suggesting that they were being treated for psychiatric or psychosomatic complaints
Limitations with Diagnosis

- Suboptimal performance on treadmill or bicycle stress protocols
- Greater incidence of false-positive ST segment depression during exercise
- Greater prevalence of both mitral valve prolapse and Syndrome X (angina with normal coronary arteries) than men
Noninvasive Testing

- Functional
  - Exercise Stress Treadmill
  - Stress Echocardiogram
  - Stress Thallium

- Anatomical
  - CTA
  - Calcium Score
The inability to perform an exercise test is in itself a negative prognostic factor in patients with coronary disease.

“It’s not looking good. His pulse is up to 202 just from getting out of the chair and stepping on to the treadmill.”
Acute Coronary Syndrome

- STEMI: a transmural infarction of the myocardium, usually due to a complete block of a coronary artery
- NSTEMI: partial dynamic block to coronary arteries, no ST elevation or Q waves on ECG
Acute Coronary Syndrome

Unstable Angina: angina pectoris caused by disruption of an atherosclerotic plaque with partial thrombosis and poss embolization or vasospasm, characterized by at least one:

- Occurs at rest or minimal exertion and usually lasts >20 min (if nitro is not taken)
- Severe and described as frank pain, new onset
- Occurs with a crescendo pattern
Plaque Erosion

Plaque Rupture
Coronary Thrombosis

- Plaque etiologies associated with coronary thrombosis including plaque rupture, erosion and calcified nodule
- Plaque rupture
- Plaque erosion is more common in younger pts, smokers and women; plaques under such thrombi do not have a large lipid core and the prevalence of inflammation is lower than in plaque rupture
"It gets worse: ‘Contains partially hydrogenated oils.’"
Medical Management

- ASA
- Plavix
- Beta Blockers
- Nitrates
- Ace Inhibitors
- Calcium Channel Blockers
- Statins
- Ranolazine (Ranexa)
PCI in Women

- >1 million PCIs in US/year, 33% are women
- Even when referred to cath, decision is often delayed
- Less likely to have hx of MI, PCI, CABG
- Both genders have similar short- and long-term mortality rate after PCI
- Women have similar lesion types, less multi-vessel disease and more preserved LV function
Size Does Matter ….

- Women have smaller epicardial coronary arteries than men, independent of body size.
- Women taking androgens have much larger arteries than control women.
- Male patients with female transplanted donor hearts show progressive epicardial vessel enlargement.
- No change in vessel size for male hearts transplanted into women.
CFA size

Fig. 2. Mean diameter and minimal luminal diameter of the common femoral artery.

CFA ~ 2mm smaller in women than in men.

Influence of Sex Hormones

- Differences in sex hormones may partially explain some of the discrepancy between men and women in the way in which CVD manifests.
- Estrogen, progesterone, and testosterone receptors have been identified in vascular cells.
- Sex hormones are known to affect vascular tone:
  - Induce stimulation of endothelium-dependent mechanisms of vascular relaxation.
  - Inhibit mechanisms of vascular smooth muscle contraction.
  - May contribute to the gender differences in vascular tone.
Bleeding and Access Site Complications

- Women undergoing PCI are significantly more likely than men to suffer access site complications, 1.5-4 times higher
  - More major hematoma, retroperitoneal bleed, pseudoaneurysm, bleeding complications requiring transfusion
- Result of smaller vessel size and aggressive anticoagulation
Radial Approach

- Fewer vascular complications
- Women remain more prone to bleeding complications compared to men
- The failure rate of radial access, requiring conversion to femoral access, is higher in women
- *Radial approach provides a greater benefit to women compared with men*
2007 ACC/AHA Task Force recommended that women with STEMI, UA or NSTEMI be treated in a similar manner to men with the same indications for noninvasive and invasive testing.
Unique Causes of Chest Pain in Women

- Stress-Induced Cardiomyopathy
- Microvascular disease/Syndrome X
- Coronary Artery Dissection
Microvascular Disease – Syndrome X

- Disease of the microvascular smooth muscle cell and endothelial dysfunction
- Tests in cath lab:
  - Adenosine or nitroprusside to assess for smooth muscle cell dysfunction
  - Endothelium-dependent vasodilator, Acetylcholine, for endothelial dysfunction
- Treatment includes beta-blockers, calcium channel blockers and nitrates
Stress-Induced Cardiomyopathy

- Transient left ventricular apical ballooning, Takotsubo cardiomyopathy, and “broken heart syndrome”
- Occurs in the absence of critical CAD
- Good prognosis despite frequent hemodynamic compromise or even cardiogenic shock
- Most patients recover completely within 1-4 weeks
Takotsubo Cardiomyopathy
Spontaneous Coronary Dissection

- Rare cause of acute MI, common in younger pts & women
- Sudden cardiac death often first manifestation
  - Majority of cases (69% in 1 review) diagnosed at autopsy
- Etiology not known, most patients do not have risk factors for CHD
- Diagnosis should be considered in any young patient, esp any young woman, without previous cardiac history or risk factors, who presents with cardiac arrest or ACS
Established Risk Factors for Cardiovascular Disease

- Age
- Family History
- Hypertension
- Diabetes
- Tobacco Abuse
- Metabolic Syndrome
- Dyslipidemia
- Obesity
Prevention Works
But what about women?

Cardiovascular Disease Mortality Trends for Males and Females
United States: 1979–2005

Source: americanheart.org
Risk Factors Specific to Women

- Diabetes/Gestational Diabetes
- Tobacco Abuse
- Pregnancy induced Hypertension
- Menopause
- High Triglycerides/Low HDL
Age as a risk factor for CAD

- Women > 65 yrs
- Men > 55 yrs

Gender differences tend to be more pronounced in Caucasians at younger ages
FAMILY HISTORY

Specifically, family history of premature coronary artery disease which is defined as:

- A first degree relative <55 years old in men and <65 years old in women
### JNC-7 Blood Pressure Classification

<table>
<thead>
<tr>
<th>BP Classification</th>
<th>Systolic BP mmHg</th>
<th>Diastolic BP, mm Hg</th>
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<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>and</td>
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<tr>
<td>Pre-Hypertension</td>
<td>120-139</td>
<td>or</td>
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<td>Stage 1 Hypertension</td>
<td>140-159</td>
<td>or</td>
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<tr>
<td>Stage 2 Hypertension</td>
<td>&gt;160 or equal to</td>
<td>or</td>
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</table>
Prevalence of Hypertension in Women in the United States

JNC 7 Algorithm for Treatment of Hypertension

Lifestyle Modifications

Not at Goal Blood Pressure (<140/90 mm Hg) (<130/80 mm Hg for those with diabetes or chronic kidney disease)

Initial Drug Choices

Stage 1 Hypertension (SBP 140-159 or DBP 90-99 mm Hg)
Thiazide-type diuretics for most
May consider ACEI, ARB, BB, CCB, or combination

Stage 2 Hypertension (SBP ≥160 or DBP ≥100 mm Hg)
2-drug combination for most
(usually thiazide-type diuretic and ACEI, ARB, BB, or CCB)

Drug(s) for the compelling indications
Other antihypertensive drugs (diuretic. ACEI, ARB, BB, CCB) as needed

Without Compelling Indications

With Compelling Indications

Optimize dosages or add additional drugs until goal blood pressure is achieved
Consider consultation with hypertension specialist

DIABETES
County-level Estimates of Diagnosed Diabetes among Adults aged ≥ 20 years:
United States 2004
County-level Estimates of Diagnosed Diabetes among Adults aged ≥ 20 years: United States 2005
County-level Estimates of Diagnosed Diabetes among Adults aged ≥ 20 years: United States 2009
Diabetes Mellitus

- Vascular disease
- #1 reason for blindness, kidney disease and amputations in US
- There are 17 million Americans with diagnosed diabetes and 9.5 million are female
- There are 6.4 million Americans with undiagnosed diabetes and 2.5 million are female
Diabetes is considered a risk equivalent
Diabetes: Role in Women

- Women with DM have a greater risk of coronary disease compared to men with DM
- *With weight loss, DM and insulin resistance can be reversed*

Metabolic Syndrome

- Defined as any 3 of the following:
  - Central obesity > 35 inches
  - Triglycerides > or equal to 150 mg/dl
  - HDL < 50
  - SBP > 130 mmHg or DBP > 85 mmHg
  - History of HTN
  - Fasting blood glucose > 100
  - History diabetes mellitus
Metabolic Syndrome

- Prevalence in adults 34.6%
- Prevalence in women ranges 31-44% depending on race
- Management is aggressive lifestyle change and pharmacotherapy for risk factors
- Treat aggressively, an opportunity to prevent predictable complications
  - Diabetes Type 2
  - Cardiovascular events
Pregnancy

- Women with preeclamptic pregnancy have 2-3 times the risk of CVD mortality.
- The prevalence of gestational diabetes is 14% in the U.S.
- Women with gestational diabetes have a 70% risk of future CVD.
- 30 years after a preeclamptic pregnancy requiring early delivery, 1 in 7 women will die of CVD complications whereas only 1 in 143 normotensive mothers will die of CVD.
Estrogen

Potential beneficial effects:
- Improved lipid profiles, inc HDL, dec LDL
- Enhanced endothelial function (lining of blood vessel)
- Improved insulin sensitivity

Potential adverse effects:
- Increased serum triglycerides
- Prothrombotic effects
- Increased hepatic synthesis of vascular inflammatory markers, ie C-reactive protein
Post-Menopause

- Menopause is associated with increased total cholesterol, central fat, and insulin resistance.

- Hormone replacement therapy may reduce risk of CAD when administered before age 60 and/or within 10 years of menopause.

- *Hormone replacement therapy should never be given in the absence of symptoms.*

Saltiki, K. et al. *Hormones.* 2007;6(1) 9-24
TOBACCO ABUSE

Smoking effects...
Tobacco Abuse

- 21% CAD deaths are from smoking
- Women who smoke have a 25% higher risk of developing CAD compared with men who smoke
- The risk of coronary artery disease decreases by one third two years after smoking cessation
- *All things in moderation, except smoking*

DYSLIPIDEMIA

“Whenever your cholesterol gets too high, a sensor will send out a signal that automatically locks the kitchen door and turns on your treadmill.”
Goal Lipid Levels

- Total Cholesterol < 200 mg/dl
- LDL < 100 mg/dl (bad cholesterol)
- HDL > 50 mg/dl (good cholesterol)
- Triglycerides < 150 mg/dl
- Non-HDL (total chol minus HDL) < 130 mg/dl
Foods High In Animal Fat

Animal fat raises LDL cholesterol and triglycerides leading to plaque deposits in your arteries.

Dr. London, *Maintaining a Healthy Lifestyle*
Dyslipidemia in Women

- Levels of HDL cholesterol and triglycerides appear to be more closely related to CHD risk among women.
- LDL cholesterol appears to be a more potent predictor among men.
- Secondary prevention trials demonstrate that statins appear to work equally effectively in women and men with established CVD.
OBESITY

“How many calories do you burn by downloading diet apps?”
County-level Estimates of Obesity among Adults aged ≥ 20 years:
United States 2009
OBESITY: The percentage of the population older than 15 with a body-mass index greater than 30.

(cc) http://www.wellingtongrey.net/
TOO MUCH FOOD
Obesity

- Obesity increases the likelihood of a woman developing hypertension, type 2 diabetes, dyslipidemia and cardiovascular disease
- Women who are obese are twice as likely to have HTN and 17 times more likely to have type 2 diabetes.
- 50% increase in incidence of coronary disease

Medical Complications of Obesity

- Pulmonary disease
  - abnormal function
  - obstructive sleep apnea
  - hypoventilation syndrome
- Idiopathic intracranial hypertension
- Stroke
- Cataracts
- Coronary heart disease
  - Diabetes
  - Dyslipidemia
  - Hypertension
- Nonalcoholic fatty liver disease
  - steatosis
  - steatohepatitis
  - cirrhosis
- Gall bladder disease
- Gynecologic abnormalities
  - abnormal menses
  - infertility
  - polycystic ovarian syndrome
- Osteoarthritis
- Skin
- Gout
- Severe pancreatitis
- Cancer
  - breast, uterus, cervix
  - colon, esophagus, pancreas
  - kidney, prostate
- Phlebitis
  - venous stasis
HOW DO WE CHANGE OUR RISK???
Prevention Through Weight Loss

- Hypertension, dyslipidemia, type II diabetes and coronary artery disease can all be prevented by lifestyle changes.
- Lifestyle intervention has been proven more effective than metformin in the diabetic population.

What’s your BMI?

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- **Underweight**
- **Healthy Weight**
- **Overweight**
- **Obese**
I think it’ll be ok as long as we don’t eat the buns...

THE ATKINS DIET
Calories Per Day to **Maintain** Ideal Weight

Ideal weight times 15 to 20 calories/day

Height 5 foot 5 inches tall and weighing 132 pounds

15 to 20 calories per day per pound gives 1980 to 2640 calories/day to maintain your weight

Dr. London, *Maintaining a Healthy Lifestyle*
The National Average Calorie Consumption is
>3700 CALORIES PER DAY!
Calories Per Day to **Lose** Weight

Ideal weight times 10 to 12 calories/day

Example: 5 foot 5 inches tall
The Ideal Body Mass Index Is 22

132 pounds x 10 to 12 Cal/Day gives 1320 to 1584 calories per day to **lose** weight

Dr. London, *Maintaining a Healthy Lifestyle*
Keep in Mind…

- 1 pound of fat = 3,500 calories
  ➔ You need to burn 3,500 calories more than you eat to lose 1 lb.
Arteriosclerosis
Forms as early as age 6.

It is progressive and very difficult to reverse.

Dr. London, *Maintaining a Healthy Lifestyle*
Percent of Children Ages 10-17 Classified as Overweight or Obese, by State: 2007

## Saturated Fat Content

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<tr>
<th>Food</th>
<th>Serving Size</th>
<th>SF, grams</th>
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<tbody>
<tr>
<td>Porterhouse steak</td>
<td>3 oz.</td>
<td>7</td>
</tr>
<tr>
<td>Dark meat poultry with skin</td>
<td>3 oz.</td>
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<tr>
<td>Skinless chicken breast</td>
<td>3 oz.</td>
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<tr>
<td>Butter</td>
<td>1 tbsp.</td>
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<tr>
<td>Cheese</td>
<td>1 slice</td>
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<tr>
<td>Reduced fat, 2% milk</td>
<td>8 oz.</td>
<td>3</td>
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<tr>
<td>Coconut milk</td>
<td>½ cup</td>
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<tr>
<td>Olive oil</td>
<td>1 tbsp.</td>
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<tr>
<td>Palm Kernel oil</td>
<td>1 tbsp.</td>
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Diet Modification

- Fruits and Vegetables
- Fiber
- Avoidance of Trans-fatty Acids and saturated fats
Fish

- Consuming fish 2 or more times per week is associated with a 30% lower risk of CHD in women
- The more often fish is consumed, the lower the risk of mortality
Cardiovascular Effects of Omega-3 Fatty Acids

- Decreases abnormal heart rhythms
- Inhibit platelet aggregation
- Vasodilator – dilates vessels
- Lowers triglycerides
- *The three most nutritionally important omega-3 fatty acids are alpha-linolenic acid, EPA and DHA*

EAT FOODS WITH OMEGA-3 FATTY ACIDS

- Salmon
- Tuna
- Trout
- Sardines
- Swordfish
- Marlin
- Red Snapper
- Walnuts
- Flax Seed
- Tofu
- Beans
- Spinach
- Avocados
- Squash
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<tr>
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<tr>
<td>Flaxseed (linseed) oil</td>
<td>8.5</td>
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Adapted from USDA Nutrient Data Laboratory.¹⁰⁴
Mediterranean diet

- **Secondary Prevention:**
  post myocardial infarction patients who followed a Mediterranean diet had 67% reduction in future coronary events

- **Primary Prevention:**
  30% relative risk reduction in cardiovascular event in high risk pts. No statistical sign difference in MI reduction. Stat significant reduction in combined CV endpoint and stroke.

The Gladstone Institute of Cardiovascular Disease

Lifestyle Recommendations for Heart Disease Management & Prevention

Studies show people that follow these types of recommendations lower their LDL (bad) cholesterol levels and lower their risk for heart disease.

Reduce:
Butter, lard, ghee, suet

Options to use instead:
___ Use canola oil or cooking spray for cooking
___ Use walnut oil and olive oil in salad dressings
___ Use liquid pump margarines or one of these: Benecol Light. Smart Balance light with flax, Promise, Olivio, Brummel & Brown
___ Make sure the first ingredient in your margarine is water or canola oil
Beef, lamb and pork

- Eat fish at least twice per week: salmon, sardines, trout
- Eat lentils, beans & tofu instead of meat
- Make ½ of your plate vegetables & fruits
- Eat vegetarian meals daily or weekly
- Eat skinless chicken breast & thigh, turkey, fish, extra-lean ham, pork tenderloin, buffalo, ostrich
- Eat “extra-lean” & “lean” meats (see additional handout)
- Eat Select or Choice grades of meat, “Safeway select”
- Eat meat & chicken less often than you currently eat it
- When eating meat, eat less than a deck of cards
- Trim away visible fat on meat
- Pour off the fat drippings
- Choose low-fat, 99% fat-free and low sodium sandwich meats
Cream, whole & 2% fat dairy and cheese

Milk: skim (fat-free) or 1% milk-fat
Low-fat & reduced-fat cheese

Eggs

Egg whites (2 eggs whites = 1 egg in recipes)
Egg Beaters (other egg substitutes)

Store-bought snacks, pastries, desserts

Eat fruits, vegetables & non-fat dairy as snacks
Eat small amounts of salt-free nuts as snacks (7-10 nuts every few days)
Read labels: eat foods with 0-2g of saturated fat and trans-fat and foods that have no palm or “partially-hydrogenated” oils
Eat “baked” or “low-fat” snacks
Eat smaller servings
Aspirin

- Effective in the treatment of acute myocardial infarction and in the management of stable heart disease
- Its use in primary prevention in women remains controversial
- Largest study looking at women age 45 years of age or older showed that aspirin lowered the risk of stroke but not heart attack or death (compared with men where a reduction in MI was found)

Alcohol Use in Women

- Moderate drinking (1/2-1 drinks daily) increases HDL levels, insulin sensitivity, and antithrombotic activity and decreases inflammation.
- Alcohol related mortality among women begins to increase with 2 or more drinks per day.
- Excessive drinking can lead to cardiomyopathy, hypertension, stroke, cancer, and cirrhosis.

SUPPLEMENTS??
Omega-3 Fatty Acids

- Cardiovascular effects
  - Controls heart rhythms
  - Lower triglyceride levels
  - Inhibit platelet aggregation
  - Vasodilator

- Studies are still ongoing to determine if supplementation will be effective in primary prevention against heart disease

Other Supplements

- Folic acid B vitamins have failed to lower coronary events and are not recommended.
- There is no direct relationship between vitamin D supplementation and reduce risk of coronary disease.

Eilat-Adar, S. et al. *Nutrition, Metabolism and Cardiovascular Diseases.* 2010;20:459-466
Physical Activity

Just 1-1.5 hours of walking per week = 51% decreased risk of heart disease versus non regular walkers

Rexrode, K. et al. *JAMA.* 2001;285;1447-454
What Kind of Exercise??

- Moderate Exercise is good
  - At 65% of MHR
- Vigorous exercise is BETTER
  - At 75-85% MHR
  - Increasing your calories burned during vigorous endurance exercise *increases your life span*
- Exercise 5 days/wk for 30 mins with your HR at 65 to 85% of max HR
Pick the Right Exercise

- Raise your heart rate
  - Large amounts of light exercise will not improve your lifespan over that of an inactive individual

- Exercise is based upon a percentage of your maximum heart rate.
  - Maximum Heart Rate $= 206 - (0.67 \times \text{age})$
Exercise

- Boosts mood
- Enhances work performance
- Reduces stress and anxiety
- Reduces risk of disease

Shawn Achor, *The Happiness Advantage*
The Happiness Advantage

- Happiness is predicted by how your brain processes external forces.
- Job successes is predicted by optimism level, social support and your ability to see stress as a challenge instead of as a threat.
- The absence of disease is not health.
- Change your formula for happiness and success to change your reality.

Shawn Achor, *The Happiness Advantage*
Conclusions

- Gender differences exist in both diagnosis and management of cardiovascular disease.
- There are numerous reasons for these gender-based issues, including social and medical.
- Current treatment recommendations in women are similar to that in men; women should be treated as aggressively as men.
- Importance of certain risk factors in women differ from men, DM and smoking.
- Prevention, prevention, prevention!
What are you thinking about?

Nothing.

The Only Time it's Okay for a Man to Think about Nothing