Cardiovascular Disease in Women: Scope of the Problem
2017 Update

Christina Economides, MD
Cardiology & Cardiovascular Intervention
“Cardiovascular disease is not as big of a problem in women as breast cancer.”

“Most doctors know about women’s risk of heart disease.”

“Heart disease is a bigger problem in men than it is in women.”

“Women and men with heart disease get the same care.”

“Women don’t have heart disease, they’re just emotional.”
Objectives

• Review the epidemiology of CAD in women
• Identify barriers to cardiovascular care in women
• Discuss gender specific differences in presentation of CVD
• Review disparities in current management of ACS
Social & Economic Impact

• CVD is the leading cause of death in the US
• Someone has a heart attack every 43 seconds in the US
• Each minute, someone dies from a heart disease-related event
• Coronary heart disease alone costs the US $108.9 billion each year
  – Total includes the cost of health care services, medications, and lost productivity
Cardiovascular disease and other major causes of death for all males and females (United States: 2013).

Dariush Mozaffarian et al. Circulation. 2016;133:e38-e360

A indicates cardiovascular disease (International Classification of Diseases, 10th Revision codes I00–I99); B, cancer (C00–C97); C, accidents (V01–X59 and Y85–Y86); D, chronic lower respiratory disease (J40–J47); E, diabetes mellitus (E10–E14); and F, Alzheimer disease (G30).

Dariush Mozaffarian et al. Circulation. 2016;133:e38-e360
Top 10 Most Common Causes of Death in US Women

- Diseases of heart: 329,238
- Cerebrovascular diseases: 86,993
- Lung and bronchus cancer: 69,078
- Chronic lower respiratory disease: 68,497
- Alzheimer’s disease: 51,039
- Accidents (unintentional injury): 41,426
- Diabetes mellitus: 41,116
- Influenza and pneumonia: 38,581
- Colorectal cancer: 34,949
- Other causes: 26,224

Source: Breast Cancer and Statistics by STATISTICA, November 2009
American Cancer Society Estimates Deaths for Men and Women in 2016

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung &amp; bronchus</td>
<td>85,920</td>
<td>27%</td>
<td>Lung &amp; bronchus</td>
<td>72,160</td>
</tr>
<tr>
<td>Prostate</td>
<td>26,120</td>
<td>8%</td>
<td>Breast</td>
<td>40,450</td>
</tr>
<tr>
<td>Colon &amp; rectum</td>
<td>26,020</td>
<td>8%</td>
<td>Colon &amp; rectum</td>
<td>23,170</td>
</tr>
<tr>
<td>Pancreas</td>
<td>21,450</td>
<td>7%</td>
<td>Pancreas</td>
<td>20,330</td>
</tr>
<tr>
<td>Liver &amp; intrahepatic bile duct</td>
<td>18,280</td>
<td>6%</td>
<td>Ovary</td>
<td>14,240</td>
</tr>
<tr>
<td>Leukemia</td>
<td>14,130</td>
<td>4%</td>
<td>Uterine corpus</td>
<td>10,470</td>
</tr>
<tr>
<td>Esophagus</td>
<td>12,720</td>
<td>4%</td>
<td>Leukemia</td>
<td>10,270</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>11,820</td>
<td>4%</td>
<td>Liver &amp; intrahepatic bile duct</td>
<td>8,890</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>11,520</td>
<td>4%</td>
<td>Non-Hodgkin lymphoma</td>
<td>8,630</td>
</tr>
<tr>
<td>Brain &amp; other nervous system</td>
<td>9,440</td>
<td>3%</td>
<td>Brain &amp; other nervous system</td>
<td>6,610</td>
</tr>
<tr>
<td><strong>All Sites</strong></td>
<td><strong>314,290</strong></td>
<td><strong>100%</strong></td>
<td><strong>All Sites</strong></td>
<td><strong>281,400</strong></td>
</tr>
</tbody>
</table>
WHERE WE DONATE VS. DISEASES THAT KILL US

MONEY RAISED

Heart Disease
Jump Rope for Heart

Diabetes
Step Out: Walk to Stop Diabetes

Motor Neuron Disease (including ALS)
ALS Ice Bucket Challenge

DEATHS (US)

Suicide
Out of Darkness Overnight Walk

HIV / AIDS
Ride to End AIDS

Chronic Obstructive Pulmonary Disease
Fight for Air Climb

Breast Cancer
Komen Race for the Cure

Prostate Cancer
Movember

Source: Death statistics from 2011 CDC report, Money raised from listed charities
Health Status of Minority Women

Mortality rates for major causes of death for females by ethnicity

- **Asian-American**
  - Chronic lower respiratory diseases: 11.5
  - Cerebrovascular diseases: 48.6
  - Malignant neoplasms: 103
  - Diseases of the heart: 113.8

- **Native American**
  - Chronic lower respiratory diseases: 24.9
  - Cerebrovascular diseases: 39.1
  - Malignant neoplasms: 109.1
  - Diseases of the heart: 129.4

- **Hispanic**
  - Chronic lower respiratory diseases: 13.8
  - Cerebrovascular diseases: 36.4
  - Malignant neoplasms: 100.6
  - Diseases of the heart: 137.1

- **White**
  - Chronic lower respiratory diseases: 40
  - Cerebrovascular diseases: 57.8
  - Malignant neoplasms: 168.7
  - Diseases of the heart: 207.5

- **Non-Hispanic White**
  - Chronic lower respiratory diseases: 41.5
  - Cerebrovascular diseases: 58.6
  - Malignant neoplasms: 172.5
  - Diseases of the heart: 210.4

- **African-American**
  - Chronic lower respiratory diseases: 23.1
  - Cerebrovascular diseases: 78.1
  - Malignant neoplasms: 196.6
  - Diseases of the heart: 284.1

# of deaths per 100,000 persons

US Pharm. 2006;31(9):8.
Prevalence of cardiovascular disease in adults ≥20 years of age by age and sex


Mozaffarian D et al. Circulation. 2015;131:e29-e322
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Deaths from cardiovascular disease, US, 1900-2008

Figure 1. Decline in Deaths from Cardiovascular Disease in Relation to Scientific Advances.
Trends in cardiovascular procedures, United States: 1979–2010

- **Catheterizations**
- **Bypass**
- **PCI**
- **Carotid Endarterectomy**
- **Pacemakers**

Note: Inpatient procedures only. Source: National Hospital Discharge Survey, NCHS, and NHLBI.

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Mozaffarian D et al. Published online in Circulation Dec. 16, 2015
Figure 1. Decline in Deaths from Cardiovascular Disease in Relation to Scientific Advances.
Significant Differences Between Men and Women

- In aspects of epidemiology, recognition, diagnosis and treatment
- Women are not referred as often as men for appropriate tests and/or therapeutic procedures by physicians
- Women under-represented in clinical trials
  - Only in the last 15 yrs have women been included, but they are still only represent ~27% of populations in most trials
Barriers to Cardiovascular Care in Women

• Confusion due to mixed messages from the media
• Tendency to underestimate the problem by women themselves
• Lack of awareness on part of patients and healthcare providers
Twelve-Year Follow-Up of American Women’s Awareness of Cardiovascular Disease Risk and Barriers to Heart Health

Lori Mosca, MD, MPH, PhD; Heidi Mochari-Greenberger, MPH, RD; Rowena J. Dolor, MD, MHS; L. Kristin Newby, MD, MHS; Karen J. Robb, MBA

Figure. Overall trends in awareness that coronary heart disease is the leading cause of death in women.
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Response (Unaided)</td>
<td>2009 (n=127)</td>
<td>1997 (n=188)</td>
<td>2009 (n=159)</td>
<td>1997 (n=294)</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>14</td>
<td>19&lt;sup&gt;c,d&lt;/sup&gt;</td>
<td>10</td>
<td>17&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cancer (general)</td>
<td>27</td>
<td>38</td>
<td>18</td>
<td>33</td>
</tr>
<tr>
<td>Heart disease/heart attack</td>
<td><strong>50</strong></td>
<td>16&lt;sup&gt;c&lt;/sup&gt;</td>
<td><strong>59</strong></td>
<td>28&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>12</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Don’t know/no answer</td>
<td>7</td>
<td>15&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7</td>
<td>12&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Greatest health problem</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>34&lt;sup&gt;d&lt;/sup&gt;</td>
<td>41&lt;sup&gt;d&lt;/sup&gt;</td>
<td>29</td>
<td>40&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cancer (general)</td>
<td>9</td>
<td>19</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>Heart disease/heart attack</td>
<td>12</td>
<td>4&lt;sup&gt;c&lt;/sup&gt;</td>
<td>20</td>
<td>5&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Obesity</td>
<td>9</td>
<td>...</td>
<td>7</td>
<td>...</td>
</tr>
<tr>
<td>Other</td>
<td>29&lt;sup&gt;c,d&lt;/sup&gt;</td>
<td>13</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Don’t know/no answer</td>
<td>7</td>
<td>23&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>9</td>
<td>13</td>
</tr>
</tbody>
</table>

Telephone results are presented for comparability between 1997 and 2009 surveys. All values are weighted percentages. Superscript letters denote significant differences at P<0.05 between age groups. P values are for tests of proportion between 1997 and 2009. Ellipses indicate response not surveyed in 1997.
## Table 6. Barriers to Living a Heart-Healthy Lifestyle by Race/Ethnicity and Age Group

<table>
<thead>
<tr>
<th>Barriers (Aided)</th>
<th>Overall (n=1158)</th>
<th>White (n=634)</th>
<th>Nonwhite (n=524)</th>
<th>P*</th>
<th>Age &lt;50 y (n=683)</th>
<th>Age &gt;50 y (n=475)</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have family obligations and other people to take care of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>God or some higher power ultimately determines my health</td>
<td>37</td>
<td>35</td>
<td>44</td>
<td>0.02</td>
<td>33</td>
<td>42</td>
<td>0.03</td>
</tr>
<tr>
<td>I am not confident that I can successfully change my behavior</td>
<td>33</td>
<td>33</td>
<td>34</td>
<td>0.80</td>
<td>36</td>
<td>30</td>
<td>0.13</td>
</tr>
<tr>
<td>There is too much confusion in the media about what to do</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am too stressed to do the things that need to be done</td>
<td>28</td>
<td>28</td>
<td>27</td>
<td>0.79</td>
<td>33</td>
<td>21</td>
<td>0.002</td>
</tr>
<tr>
<td>I do not want to change my lifestyle</td>
<td>28</td>
<td>30</td>
<td>25</td>
<td>0.18</td>
<td>32</td>
<td>24</td>
<td>0.04</td>
</tr>
<tr>
<td>My health care professional does not think I need to worry about heart disease</td>
<td>27</td>
<td>26</td>
<td>28</td>
<td>0.58</td>
<td>29</td>
<td>24</td>
<td>0.18</td>
</tr>
<tr>
<td>I do not have time to take care of myself</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not know what I should do</td>
<td>29</td>
<td>24</td>
<td>27</td>
<td>0.19</td>
<td>30</td>
<td>20</td>
<td>0.007</td>
</tr>
<tr>
<td>I am too ill/old to make changes</td>
<td>20</td>
<td>20</td>
<td>22</td>
<td>0.55</td>
<td>23</td>
<td>17</td>
<td>0.08</td>
</tr>
<tr>
<td>I am not confident that I can successfully change my behavior</td>
<td>19</td>
<td>18</td>
<td>21</td>
<td>0.35</td>
<td>21</td>
<td>17</td>
<td>0.23</td>
</tr>
<tr>
<td>My friends/family have told me that I do not need to change</td>
<td>16</td>
<td>17</td>
<td>15</td>
<td>0.51</td>
<td>18</td>
<td>15</td>
<td>0.34</td>
</tr>
<tr>
<td>My health care professional does not speak my language</td>
<td>13</td>
<td>14</td>
<td>10</td>
<td>0.15</td>
<td>12</td>
<td>14</td>
<td>0.48</td>
</tr>
<tr>
<td>My friends/family have told me that I do not need to change</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>0.99</td>
<td>6</td>
<td>6</td>
<td>0.08</td>
</tr>
<tr>
<td>My health care professional does not speak my language</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>0.66</td>
<td>9</td>
<td>8</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Values represent the weighted percent of women surveyed online who strongly or somewhat agreed that they experienced each barrier to living a heart healthy lifestyle.

*P value for difference in proportion by race/ethnic group or by age group.
Other Significant Findings

- Only 53% of women would call 911 if they thought they were having symptoms of a heart attack
- Awareness of atypical symptoms of heart disease was low
- Majority of women cited therapies to prevent CVD that are not evidence-based

Circ Cardiovasc Qual Outcomes. 2010
Physicians’ Awareness of CVD

- 2005 American Heart Association study
- Only 8% of primary care physicians and 17% of cardiologists knew that heart disease kills more women than men

<table>
<thead>
<tr>
<th>Physician’s Agreement With Statements About CVD Prevention and Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physician Specialty</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Although I agree in principle that more primary prevention should be done with patients, the time constraints of a “typical” patient visit simply don’t allow it.</td>
</tr>
<tr>
<td>If insurance companies provided better coverage for lifestyle interventions (such as weight loss and smoking cessation), I would spend more time doing it.</td>
</tr>
<tr>
<td>The greatest barrier to prevention of heart disease is the patient him/herself.</td>
</tr>
<tr>
<td>I am more likely to adopt into my practice treatment guidelines that are published by professionals within my specialty.</td>
</tr>
<tr>
<td>The existence of multiple treatment guidelines, each with somewhat different recommendations, makes it difficult to determine which is the best to use with my patients.</td>
</tr>
<tr>
<td>More women than men die each year of CVD.</td>
</tr>
<tr>
<td>I am willing to seek additional training that will allow me to better engage in preventive health treatments for CVD in women.</td>
</tr>
<tr>
<td>By and large, the results of clinical research to determine optimal risk–reducing interventions in men generalize to women.</td>
</tr>
</tbody>
</table>

Values are percentages. Superscript letters indicate statistically significant differences at $P<0.05$ using a $t$ test of proportions.

*Physicians who stated that they agree or strongly agree on a 10-point Likert scale.
History of Women’s Health Research

• 1977, US FDA issued a guideline: “General Considerations for the Clinical Evaluation of Drugs”
  
  Restricted women of childbearing potential from participating in phase 1 and early phase 2 clinical studies until reproductive toxicity studies had been conducted in animals and some evidence of human effectiveness had become available.

• Policy emerged in the aftermath of the discovery of birth defects resulting from fetal exposure to thalidomide and diethylstilbestrol.
1985, The Public Health Service Task Force on Women’s Health Issues:

The “historical lack of research focus on women’s health concerns has compromised the quality of health information available to women as well as the health care they receive”.

• National Institutes of Health established
  – Office of Research on Women’s Health

• US Department of Health and Human Services (HHS) established
  – Office on Women’s Health (OWH) to promote the inclusion of women in clinical research.

• 2001, Institute of Medicine (IOM) published a report: “Exploring the Biological Contributions to Human Health: Does Sex Matter?”
  – Approach to women’s health research was transformed to address sex and gender differences in disease development and progression, as well as response to therapies
When do gender differences become gender disparities?

- **Disparity:**
  - The lack of equality or the presence of inequity

- **World Health Organization (WHO)**
  - Health inequity:
    - Differences in health, which are not only unnecessary and avoidable but, in addition, are considered unfair and unjust
  - Equity in healthcare:
    - Equal access to available care for equal need, equal utilization for equal need, and equal quality of care for all
Healthcare Access Disparities

• Women are more likely than men to have forgone needed healthcare due to cost
• 1 in 5 women (~19 million women) between the ages of 18 and 64 are uninsured
  – More likely to have inadequate access to care
  – Get a lower standard of care when they are in the health system
  – Have poorer health outcomes
Well-established Risk Factors

- Personal history of CVD
- Age > 55
- Family hx of premature CHD
- HTN
- Diabetes
- Dyslipidemia
Sex-specific Risk Factors

- Early menarche
- Premature menopause
- Pregnancy complications:
  - HTN in pregnancy/Pre-eclampsia
  - Gestational Diabetes
  - Spontaneous pregnancy loss
  - Preterm birth
- Women with chronic inflammatory disease:
  - Systemic Lupus Erythematosus
  - Rheumatoid Arthritis
  - Systemic Vasculitis
Psychosocial Risk Factors

- Women drastically underestimate their own risk
- Linked to adverse cardiovascular outcomes in women
- Depression
- Anxiety
- Inadequate social and economic resources
- Adversities early in life
- Caregiver stress
- Marital stress
  - *Marriage reduces CV risk in men,*
  
  *but increases the risk in women!*
Presenting Symptoms
<table>
<thead>
<tr>
<th>Typical Symptoms</th>
<th>Atypical Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest pain/discomfort (pressure, tightness, squeezing)</td>
<td>Chest pain: sharp, pleuritic, burning, aching, soreness, reproducible</td>
</tr>
<tr>
<td>Additional symptoms with chest pain</td>
<td>Other symptoms excluding chest pain</td>
</tr>
<tr>
<td>Radiation of pain to jaw, neck, shoulders, arm, back, epigastrium</td>
<td>Unusual fatigue</td>
</tr>
<tr>
<td>Associated symptoms: dyspnea, nausea, vomiting, lightheadedness, diaphoresis</td>
<td>Unusual shortness of breath</td>
</tr>
<tr>
<td></td>
<td>Upper back/chest pain</td>
</tr>
<tr>
<td></td>
<td>Neck, jaw, arm, shoulder, back, epigastric pain</td>
</tr>
<tr>
<td></td>
<td>Flu-like symptoms</td>
</tr>
<tr>
<td></td>
<td>Dizziness</td>
</tr>
<tr>
<td></td>
<td>Generalized scared/anxiety feeling</td>
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<tr>
<td></td>
<td>Generalized weakness</td>
</tr>
<tr>
<td></td>
<td>Indigestion</td>
</tr>
<tr>
<td></td>
<td>Palpitations</td>
</tr>
</tbody>
</table>

AMI indicates acute myocardial infarction.
Sex Differences in Clinical Presentation

• Consequences for
  – Timely identification of ischemic symptoms
  – Appropriate triage
  – Judicious diagnostic testing and management

• Detrimental consequences for women
  – Misdiagnosis
  – Delayed revascularization
  – Higher AMI mortality rates
During Presentation

• Compared to men, women are less likely to:
  – Undergo an electrocardiogram, cardiac monitoring, or cardiac blood tests
  – Receive a cardiology consult
  – Be admitted to a coronary care or telemetry unit

• Women are more likely to:
  – Receive controlled substances and anti-anxiety medications in the ER, suggesting that they were being treated for psychiatric or psychosomatic complaints
Women were older, presented later, and had a higher mortality rate than men.

Women were less likely to receive aspirin, heparin, and beta-blockers.

When treated with thrombolytic therapy, women received therapy an average of almost 14 min later than men and had a higher incidence of major bleeding.

Women were less likely to undergo cardiac catheterization, percutaneous transluminal coronary angioplasty, and coronary artery bypass surgery.

Women with STEMI

- Pooled data from 22 randomized trials of primary PCI vs thrombolysis in pts w/ STEMI, women had lower 30-day mortality w/ primary PCI than w/ thrombolysis, 2006
- Confirmed in Gusto II-B angioplasty substudy 2004
Benefits of direct angioplasty for women and men with acute myocardial infarction: Results of the Global Use of Strategies to Open Occluded Arteries in Acute Coronary Syndromes (GUSTO II-B) Angioplasty Substudy

Jacqueline E. Tamis-Holland, MD, a Angela Palazzo, MD, a Amanda L. Stebbins, MS, b James N. Slater, MD, a Jean Boland, MD, c Stephen G. Ellis, MD, d and Judith S. Hochman, MD, e for the GUSTO II-B Angioplasty Substudy Investigators New York, NY, Durham, NC, Liège, Belgium, and Cleveland, Ohio

Conclusions

The GUSTO II-B PTCA substudy was a large randomized trial comparing direct PTCA to t-PA. The results of this study demonstrated that although the relative benefit of PTCA to t-PA for women and men appeared similar with a similar adjusted OR for reaching the 30-day clinical end point of death, nonfatal MI, and nonfatal disabling stroke, women derived a greater absolute benefit from this therapy. We therefore conclude that in institutions where PTCA is readily available, women with acute ST-segment elevation MI who are at higher risk for ICH following thrombolytic therapy should be referred for direct PTCA.
Temporal Trends and Sex Differences in Revascularization and Outcomes of ST-Segment Elevation Myocardial Infarction in Younger Adults in the United States

Sahil Khera, MD,* Dhaval Kolte, MD, PhD,* Tanush Gupta, MD,* Kathir Selvan Subramanian, MD,* Neel Khanna, MD,* Wilbert S. Aronow, MD,* Chul Ahn, PhD,† Robert J. Timmermans, MD,* Howard A. Cooper, MD,* Gregg C. Fonarow, MD,† William H. Frishman, MD,* Julio A. Panza, MD,* Deepak L. Bhatt, MD, MPH§
Study

- Determine temporal trends and sex differences in revascularization and in-hospital outcomes of younger pts with STEMI.
- 2004 to 2011 Nationwide Inpatient Sample databases
- All patients age 18 to 59 years hospitalized with STEMI
- Analyzed temporal trends and sex differences in revascularization strategies, in-hospital mortality, and length of stay
- 1,363,492 younger adults (age <60 years) with acute myocardial infarction
- 632,930 (46.4%) had STEMI
- Younger women with acute myocardial infarction were less likely than men to present with STEMI (adjusted odds ratio [OR]: 0.74; 95% confidence interval [CI]: 0.73 to 0.75)
Younger women with STEMI were 26% less likely to receive reperfusion as compared with younger men (percutaneous coronary intervention adjusted OR: 0.74.)
Thrombolysis

PCI

CABG

Temporal trends in use of (A) thrombolysis (lytic), (B) percutaneous coronary intervention (PCI), and (C) coronary artery bypass grafting (CABG) among younger men and women with STEMI. *p* < 0.001 for all Abbreviations as in Figure 1.
In-hospital mortality was significantly higher in younger women compared with men (4.5% vs. 3.0%; adjusted OR: 1.11; 95% CI: 1.07 to 1.15).
Use of PCI for STEMI and in-hospital mortality have increased, whereas length of stay has decreased in both sexes over the past several years. Younger women are less likely to receive revascularization for STEMI and have higher in-hospital mortality as compared with younger men.
Women with NSTEMI

• Experience more complications than men:
  – Cardiogenic shock
  – Heart failure
  – Renal failure
  – Stroke
  – Re-infarction
  – Bleeding
  – Readmission

• 2014 ACC/AHA NSTEMI guidelines:
  Early invasive strategy as a class I indication (Level of Evidence: A) for women with high-risk features
Women and CABG

- Review of 23 CABG studies with outcomes stratified by sex:
  - Women patients were older and had more comorbidities than the men
  - Early mortality was significantly higher in the women, even after risk adjustment for comorbidities, use of internal mammary grafts, age, and body surface area

Meta-analysis of 20 CABG Studies

• Pts who underwent isolated CABG
• Short-term mortality higher in women
  – Who were older
  – Had greater comorbidities
  – Were more likely to undergo urgent CABG than men
• Short-term mortality persisted at mid- and long-term follow-up

Gender-specific predictors of early mortality after coronary artery bypass graft surgery.

- Prospective study of 1559 pts admitted to the German Heart Institute Berlin, 2005 – 2008
- Key mediators of excess mortality in women
  - Older age
  - Lower physical functioning
  - Postoperative complications, including low cardiac output syndrome, respiratory insufficiency, and resuscitation
- These sex-specific differences in outcomes persist with modern off-pump CABG techniques, Emmert MY et al, 2010.
Sex Differences in Cardiac Risk Factors, Perceived Risk, and Health Care Provider Discussion of Risk and Risk Modification Among Young Patients With Acute Myocardial Infarction

The VIRGO Study

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VIRGO (Variation in Recovery: Role of Gender on Outcomes of Young AMI Patients)

- Compared prevalence of 5 cardiac risk factors by sex (DM, DL, HTN, Obesity, Smoking)
- Risk perceptions
- Health care provider feedback on heart disease and risk modification between young women and men hospitalized w/AMI
  - 3,501 AMI patients age 18 to 55 years
  - 2349 women, 1152 men
  - U.S. and Spanish hospitals
  - August 2008 and January 2012
TABLE 2  Modifiable Risk Factors by Sex and Country

<table>
<thead>
<tr>
<th></th>
<th>Overall</th>
<th>United States</th>
<th>Spain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women (n = 2,349)</td>
<td>Men (n = 1,152)</td>
<td>Women (n = 2,009)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>38.8</td>
<td>26.7</td>
<td>39.9</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>82.6</td>
<td>92.1</td>
<td>83.7</td>
</tr>
<tr>
<td>Hypertension</td>
<td>63.8</td>
<td>62.3</td>
<td>67.1</td>
</tr>
<tr>
<td>Obesity</td>
<td>51.0</td>
<td>44.6</td>
<td>55.3</td>
</tr>
<tr>
<td>Smoking</td>
<td>59.7</td>
<td>59.3</td>
<td>57.7</td>
</tr>
<tr>
<td>Total number of risk factors</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>0</td>
<td>3.0</td>
<td>1.2</td>
<td>3.1</td>
</tr>
<tr>
<td>1</td>
<td>11.2</td>
<td>10.2</td>
<td>10.2</td>
</tr>
<tr>
<td>2</td>
<td>20.5</td>
<td>26.1</td>
<td>18.6</td>
</tr>
<tr>
<td>3</td>
<td>28.4</td>
<td>33.9</td>
<td>28.2</td>
</tr>
<tr>
<td>4</td>
<td>26.1</td>
<td>22.3</td>
<td>28.2</td>
</tr>
<tr>
<td>5</td>
<td>10.9</td>
<td>6.3</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Values are %.

98% of pts had ≥1 risk factor
64% had ≥3 risk factors
Percentage of women and men reporting that before their index acute myocardial infarction event, they considered themselves at risk for heart disease, were told by a health care professional that they were at risk, or had a health care provider talk to them about heart disease and ways to modify their risk. p Values for comparisons by sex within the overall, U.S., and Spanish cohorts were calculated with chi-square tests.
Recommendations

• Currently ACC/AHA recommend that women with heart attacks and heart disease be treated in an equal manner to men with the same indications for noninvasive and invasive testing
Conclusions: CVD in Women

- There are real gender disparities that exist and contribute to elevated mortality rates for women with CVD
- Sustained educational efforts are needed to raise awareness in public and healthcare professionals
- Raise the index of suspicion during evaluation of women
- Further sex-specific research is warranted