Update in Cardiology
2013-2014

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Faculty Relationship Disclosure

• Dr. Dylan Wessman has no relevant financial relationships with any commercial supporters.

• Unlabeled/Investigational products and/or services will not be mentioned during this CME offering.
Highlights 2013-2014

• American Heart Association (AHA) heart disease and stroke statistics update

• American College of Cardiology (ACC) / AHA clinical practice guidelines

• United States Preventive Services Task Force (USPSTF) recommendations
AHA Statistical Update
Cardiovascular disease (CVD) mortality has decreased.
CVD remains the leading cause of death.

AHA Heart Disease and Stroke Statistics – 2013 Update

Source: NCHS and NHLBI. A indicates CVD plus congenital CVD, B, cancer; C, accidents; D, CLRD; E, diabetes; and F, Alzheimer's disease.
The prevalence of CVD increases with age.
The costs of CVD remain high.
The costs of CVD continue to increase.
ACC / AHA Guidelines
ACC / AHA Guidelines

- Assessment of Cardiovascular Risk (2013)
- Atrial Fibrillation (2014)
- Cholesterol (2013)
- Heart Failure (2013)
- Lifestyle Management (2013)
- Non-ST-Elevation Acute Coronary Syndromes (2014)
- Obesity (2013)
- Perioperative Evaluation (2014)
- Stable Ischemic Heart Disease (2014)
- Valvular Heart Disease (2014)
## Classification of Recommendation and Level of Evidence

### Size of Treatment Effect

<table>
<thead>
<tr>
<th>CLASS</th>
<th>Benefit &gt; Risk</th>
<th>Benefit ≥ Risk</th>
<th>Benefit ≈ Risk</th>
<th>Benefit &gt; Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS I</td>
<td>Procedure/Treatment SHOULD be performed/administered</td>
<td>IT IS REASONABLE to perform procedure/administer treatment</td>
<td>Recomendation’s usefulness/effectiveness less well established</td>
<td>Recommendation that procedure or treatment is not useful/effective and may be harmful</td>
</tr>
<tr>
<td>CLASS IIa</td>
<td>Additional studies with focused objectives needed</td>
<td>Additional studies with broad objectives needed</td>
<td>Recommendation’s usefulness/effectiveness less well established</td>
<td>Recommendation that procedure or treatment is not useful/effective and may be harmful</td>
</tr>
<tr>
<td>CLASS IIb</td>
<td>Procedure/Treatment MAY BE CONSIDERED</td>
<td>Procedure/Treatment MAY BE CONSIDERED</td>
<td>Recommendation’s usefulness/effectiveness less well established</td>
<td>Recommendation that procedure or treatment is not useful/effective and may be harmful</td>
</tr>
<tr>
<td>CLASS III</td>
<td>No Benefit or CLASS III Harm</td>
<td>No Benefit or CLASS III Harm</td>
<td>No Benefit or CLASS III Harm</td>
<td>No Benefit or CLASS III Harm</td>
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</tbody>
</table>

### Estimate of Certainty (Precision) of Treatment Effect

<table>
<thead>
<tr>
<th>LEVEL A</th>
<th>Multiple populations evaluated*</th>
<th>Data derived from multiple randomized clinical trials or meta-analyses</th>
<th>Recommendation that procedure or treatment is useful/effective</th>
<th>Recommendation in favor of treatment or procedure being useful/effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVEL B</td>
<td>Limited populations evaluated*</td>
<td>Data derived from a single randomized trial or nonrandomized studies</td>
<td>Evidence from single randomized trial or nonrandomized studies</td>
<td>Some conflicting evidence from single randomized trial or nonrandomized studies</td>
</tr>
<tr>
<td>LEVEL C</td>
<td>Very limited populations evaluated*</td>
<td>Only expert opinion, case studies, or standard of care</td>
<td>Recommendation that procedure or treatment is useful/effective</td>
<td>Recommendation in favor of treatment or procedure being useful/effective</td>
</tr>
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</table>

### Notes
- * indicates evidence not based on randomized controlled trials.
Atrial Fibrillation
Abbreviations

- AAD  Antiarrhythmic drugs
- AF   Atrial fibrillation
- LVEF Left ventricular ejection fraction
- NOAC Novel oral anticoagulants
- NVAF Nonvalvular atrial fibrillation
- OAC  Oral anticoagulant
- PAF  Paroxysmal atrial fibrillation
- RHR  Resting heart rate
AF: Classification

• **Paroxysmal** - terminates spontaneously or with intervention within 7 days of onset; may recur with variable frequency

• **Persistent** - sustained >7 days

• **Permanent** - continuous for >12 months

• **Nonvalvular** - absence of rheumatic mitral stenosis, mechanical or bioprosthetic heart valve, or mitral valve repair
AF: Stroke Prevention

• Use the CHA$_2$DS$_2$-VASc score to assess stroke risk in patients with NVAF (Class I).

• Prescribe OAC for prevention of stroke in patients with NVAF and CHA$_2$DS$_2$-VASc score ≥ 2 (Class I).
  – Warfarin (Coumadin)
  – Dabigatran (Pradaxa)
  – Rivoroxaban (Xarelto)
  – Apixiban (Eliquis)

2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation
Which OAC to prescribe?

• **Major Bleeding**
  – Apixiban had lower risk than Warfarin
  – Dabigatran and Rivaroxaban were equivalent

• **Intracranial Bleeding**
  – All three NOAC had lower risk than Warfarin

• **Gastrointestinal Bleeding**
  – Dabigatran and Rivaroxaban had higher risk than Warfarin
  – Apixiban was equivalent

*2014 AAN “Prevention of Stroke in Nonvalvular Atrial Fibrillation”*
AF: Stroke Prevention

• No antithrombotic therapy is reasonable for patients with CHA$_2$DS$_2$-VASc score = 0 (Class IIa).

• For patients with CHA$_2$DS$_2$-VASc score = 1, consider one of three options (Class IIb):
  – No antithrombotic therapy
  – Aspirin
  – OAC

• NOAC should not be used for patients with AF and mechanical or bioprosthetic heart valves (Class III).

2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation
AF: Rate Control

- Strict rate control (RHR <80 bpm) is preferred over lenient rate control (RHR <110 bpm) for patients with persistent or permanent AF (Class IIa).

- Lenient rate control may be reasonable, as long as the patient is asymptomatic, and LVEF is preserved (Class IIb).

2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation
AF: Rhythm Control

• Catheter ablation is useful for patients with symptomatic PAF who are unresponsive to or intolerant of AAD (Class I).

• Catheter ablation is reasonable in select patients with symptomatic PAF prior to a trial of AAD, provided that it is performed at an experienced center (Class IIa).
Heart Failure
Abbreviations

• ACEi  Angiotensin converting enzyme inhibitor
• ARB  Angiotensin receptor blocker
• EF  Ejection fraction
• HF  Heart failure
• HFpEF  HF with preserved ejection fraction
• HFrEF  HF with reduced ejection fraction
• HTN  Hypertension
• LVEF  Left ventricular ejection fraction
HF: Definitions

• Reduced EF LVEF \leq 40\%

• Preserved EF LVEF \geq 50\%

• Borderline EF LVEF 41\%-49\%

• Improved EF LVEF > 40\%

2013 ACCF/AHA Guideline for the Management of Heart Failure
HF: ACC Stage

• A  At risk but without structural heart disease or symptoms of HF

• B  Structural heart disease without symptoms or signs of HF

• C  Structural heart disease with current or prior symptoms of HF

• D  Refractory HF requiring specialized interventions

2013 ACCF/AHA Guideline for the Management of Heart Failure
HF: Treatment of Stage A

• Avoid or control risk factors for HF (Class I)
  – Hypertension
  – Dyslipidemia
  – Diabetes mellitus
  – Obesity
  – Tobacco use
  – Known cardiotoxic agents

2013 ACCF/AHA Guideline for the Management of Heart Failure
HF: Treatment of Stage B

• For reduced LVEF and to prevent symptomatic HF (Class I)
  – ACEi or ARB
  – β-blocker

• Treat hypertension and dyslipidemia according to clinical practice guidelines (Class I)
Treatment of Stage C HFrEF

- Diuretic(s) for fluid retention and to improve symptoms (Class I)

- ACEi or ARB to reduce morbidity and mortality (Class I)

- β-blocker to reduce morbidity and mortality (Class I)

- Aldosterone receptor antagonist to reduce morbidity and mortality (Class I)
  - SCr < 2.0-2.5, eGFR >30, and K+ <5

2013 ACCF/AHA Guideline for the Management of Heart Failure
Treatment of Stage C HFrEF

• Hydralazine + Isosorbide Dinitrate to reduce morbidity and mortality
  – African Americans with HFrEF (Class I)
  – Patients who cannot be given ACEi or ARB (Class IIa)

• Digoxin
  – To decrease hospitalizations for HF (Class IIa)

• Anticoagulation
  – Not for patients without AF, prior thromboembolic event, or cardioembolic source (Class III)

2013 ACCF/AHA Guideline for the Management of Heart Failure
Treatment of Stage C HFpEF

- Use diuretics to relieve symptoms due to volume overload (Class I)

- Control blood pressure in accordance with clinical practice guidelines (Class I)

- Use of ACEi, ARB, and/or β-blocker is reasonable in patients with HTN (Class IIa)

2013 ACCF/AHA Guideline for the Management of Heart Failure
Valvular Heart Disease
Abbreviations

- **AF**: Atrial fibrillation
- **CHD**: Congenital heart disease
- **IE**: Infective endocarditis
- **LVSD**: Left ventricular systolic dysfunction
- **VHD**: Valvular heart disease
- **VTE**: Venous thromboembolism
## VHD: Stages

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>At risk</td>
<td>Risk factors for development of VHD</td>
</tr>
<tr>
<td>B</td>
<td>Progressive</td>
<td>Mild-to-moderate severity, asymptomatic</td>
</tr>
<tr>
<td>C</td>
<td>Asymptomatic severe</td>
<td>C1: compensated L or R ventricle C2: decompensated L or R ventricle</td>
</tr>
<tr>
<td>D</td>
<td>Symptomatic severe</td>
<td>Symptoms due to severe valvular stenosis or regurgitation</td>
</tr>
</tbody>
</table>

*2014 AHA/ACC Guideline on the Management of Patients with Valvular Heart Disease*
# Frequency of Echocardiograms

<table>
<thead>
<tr>
<th>Stage</th>
<th>Severity</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Mild</td>
<td>3-5 years</td>
</tr>
<tr>
<td>B</td>
<td>Moderate</td>
<td>1-2 years</td>
</tr>
<tr>
<td>C</td>
<td>Severe</td>
<td>6-12 months</td>
</tr>
</tbody>
</table>

2014 AHA/ACC Guideline on the Management of Patients with Valvular Heart Disease
Prophylaxis Against Infective Endocarditis (IE)

- Patients with previous IE
- Patients with prosthetic heart valves
- Heart transplant recipients with valve regurgitation due to a structurally abnormal valve
- Patients with congenital heart disease (CHD)
  - Unrepaired cyanotic CHD
  - Completely repaired CHD with prosthetic material or device within first 6 months after procedure
  - Repaired CHD with residual defect at site of or adjacent to prosthetic patch or device

2014 AHA/ACC Guideline on the Management of Patients with Valvular Heart Disease
VHD: Bridging Therapy

• Class I recommendation for:
  – Mechanical mitral valve
  – Bileaflet mechanical aortic valve with any thromboembolic risk factor
    • AF, LVSD, VTE, or hypercoagulable condition
  – Older generation mechanical aortic valve
    • Monoleaflet, caged ball

• Can use intravenous unfractionated heparin or low-molecular-weight heparin (Class I)
Perioperative Evaluation
Abbreviations

- **BMS**: Bare metal stent
- **DAPT**: Dual antiplatelet therapy
- **DES**: Drug-eluting stent
- **GDMT**: Guideline-directed medical therapy
- **MACE**: Major adverse cardiac events
- **MET**: Metabolic equivalent
- **PCI**: Percutaneous coronary intervention
- **RCRI**: Revised cardiac risk index
Stepwise Perioperative Cardiac Assessment

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Stepwise Perioperative Cardiac Assessment

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Definitions of Urgency

- **Emergent** < 6 hours
- **Urgent** 6-24 hours
- **Time-Sensitive** 1-6 weeks
- **Elective** ≤ 1 year
Definitions of Risk

• MACE  Death or MI

• Low-risk  MACE < 1%

• Elevated risk  MACE ≥ 1%

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Functional Capacity

- Excellent: > 10 METs
- Good: 7-10 METs
- Moderate: 4-6 METs
- Poor: < 4 METs
- Unknown

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Predicting Risk

- A validated risk-prediction tool can be useful in predicting the risk of perioperative MACE in patients undergoing noncardiac surgery (Class IIa).

- For patients with low risk of perioperative MACE, further testing is not recommended before the planned operation (Class III).

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Revised Cardiac Risk Index (RCRI)

• Predicts risk of major cardiac complications:
  – Myocardial infarction (based on CK-MB)
  – Pulmonary edema (based on chest x-ray)
  – Complete heart block
  – Ventricular fibrillation
  – Primary cardiac arrest

### Revised Cardiac Risk Index for Pre-Operative Risk

Estimates risk of cardiac complications after surgery.

#### High-Risk Surgery

- Intraperitoneal
- Intrathoracic
- Suprainguinal vascular

#### History of ischemic heart disease

- History of MI
- History of positive exercise test
- Current chest pain considered due to myocardial ischemia
- Use of nitrate therapy
- ECG with pathological Q waves

#### History of congestive heart failure

- Pulmonary edema, bilateral rales or S3 gallop
- Paroxysmal nocturnal dyspnea
- CXR showing pulmonary vascular redistribution

#### History of cerebrovascular disease

- Prior TIA or stroke

#### Pre-operative treatment with insulin

- Pre-operative creatinine > 2 mg/dL

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**0 points**  
**Class I Risk**

Risk of Major Cardiac Event (see below)

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American College of Surgeons (ACS) Risk Calculators

• National Surgical Quality Improvement Program (NSQIP)
  – Data from 525 US hospitals and >1 million operations

• ACS NSQIP MICA Risk Calculator
  – Predicts risk of MI or SCA

• ACS NSQIP Surgical Risk Calculator
  – Predicts risk of MACE, death, and 8 other outcomes
  – Best estimation of surgery-specific risk

Exercise Stress Testing

• Reasonable to *forgo* stress testing for
  – Patients with elevated risk and excellent functional capacity (>10 METs) [Class IIa]
  – Patients with elevated risk and moderate to good functional capacity (4-10 METs) [Class IIb]

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Pharmacologic Stress Testing

• Reasonable for patients with elevated risk and poor functional capacity (<4 METs) if it will change management (Class IIa)
  – Dobutamine stress echo (DSE)
  – Regadenoson myocardial perfusion imaging (MPI)

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Timing of Surgery after PCI

• Delay *elective* noncardiac surgery
  – 14 days after balloon angioplasty (Class I)
  – 30 days after PCI with BMS (Class I)
  – 365 days after PCI with DES (Class I)

• Elective noncardiac surgery after PCI with DES may be considered *after 180 days* if the risk of further delay is greater than the risk of ischemia or stent thrombosis (Class IIb)

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Antiplatelet Agents

• Perioperative management should be determined by consensus of the surgeon, anesthesiologist, cardiologist, and patient, who should weigh the risk bleeding versus the risk of stent thrombosis (Class I).

  – Aspirin, clopidogrel (Plavix), prasugrel (Effient), and/or ticagrelor (Brilinta)
Beta-Blocker Therapy

• Should be continued in patients who have been on beta blockers chronically (Class I)

• May be reasonable to begin in patients with intermediate- or high-risk myocardial ischemia on preoperative testing (Class IIb)

• May be reasonable to begin in patients with 3 or more RCRI risk factors (Class IIb)

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Beta Blocker Therapy

• Should not be started on the day of surgery (Class III)

• Begin long enough in advance to assess safety and tolerability, preferably >1 day before surgery (Class IIb)
Beta Blocker Therapy

• Starting 1 day before surgery is ineffective and may be harmful.

• Starting 2-7 days before surgery may be preferred.

• Data does not support
  – Starting >30 days before surgery
  – Preoperative dose titration
  – “Tight” heart rate control

2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
Non-ST-Elevation Acute Coronary Syndromes
Abbreviations

- ACS: Acute coronary syndrome
- BMS: Bare metal stent
- DAPT: Dual antiplatelet therapy
- DES: Drug-eluting stent
- LVEF: Left ventricular ejection fraction
- NSTE: Non-ST-elevation
- PCI: Percutaneous coronary intervention
- PPI: Proton pump inhibitor
NSTE-ACS: Terminology

• Definite or likely

• Ischemia-guided strategy
  – Formerly known as “initial-conservative strategy”
  – Troponin-negative, low-risk TIMI or GRACE score
  – Stress testing and/or evaluation of LVEF

• Invasive strategy
  – Diagnostic angiography with intent to perform revascularization if appropriate

2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes
NSTE-ACS: Terminology

- Immediate invasive
  - Within 2 hours

- Early invasive
  - Within 3-24 hours

- Delayed invasive
  - Within 25-72 hours

2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes
NSTE-ACS: Diagnosis

• Measure cardiac-specific troponin I or T at presentation and 3-to-6 hour intervals (Class I)

• Measuring CK-MB and myoglobin is *not* useful (Class III)
**NSTE-ACS: Treatment**

- After PCI, it is reasonable to use Aspirin 81 mg per day (Class IIa).

- After PCI, it is reasonable to choose ticagrelor (Brilinta) or prasugrel (Effient) over clopidogrel (Plavix) (Class IIa).
  - Do *not* use prasugrel (Effient) in patients with history of stroke or TIA (Class III).

*2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes*
After PCI with BMS or DES, continue DAPT for at least 12 months (Class I).

Limit the duration of “triple therapy” (warfarin, aspirin, and P2Y12 receptor inhibitor) to minimize the risk of bleeding (Class I).

It is reasonable to use PPI in patients who require triple therapy (Class IIa).

2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes
USPSTF Recommendations
USPSTF Recommendations

• Abdominal Aortic Aneurysm (AAA): Screening (2014)
• Carotid Artery Stenosis (CAS): Screening (2014)
• Healthy Diet and Physical Activity: Counseling Adults with High Risk of Cardiovascular Disease (CVD) (2014)
• Vitamin Supplementation to Prevent Cancer and CVD: Counseling (2014)
• Peripheral Arterial Disease (PAD) and CVD in Adults: Risk Assessment with Ankle-Brachial Index (ABI) (2013)
## USPSTF Recommendations

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
<th>Suggestions for Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>The USPSTF recommends the service. There is high certainty that the net benefit is substantial.</td>
<td>Offer or provide this service.</td>
</tr>
<tr>
<td>B</td>
<td>The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.</td>
<td>Offer or provide this service.</td>
</tr>
<tr>
<td>C</td>
<td>The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.</td>
<td>Offer or provide this service for selected patients depending on individual circumstances.</td>
</tr>
<tr>
<td>D</td>
<td>The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.</td>
<td>Discourage the use of this service.</td>
</tr>
<tr>
<td>I</td>
<td>The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.</td>
<td>Read the clinical considerations section of USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.</td>
</tr>
</tbody>
</table>

[http://www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org)
USPSTF Recommendations

• For screening for AAA with ultrasonography in men ages 65 to 75 years who have ever smoked (Grade B)

• For referring adults who are overweight or obese and have additional CVD risk factors to intensive behavioral counseling interventions to promote a healthful diet and physical activity (Grade B)

• Against screening for asymptomatic CAS in the general adult population (Grade D)

http://www.uspreventiveservicestaskforce.org
USPSTF Recommendations

• Current evidence is insufficient to assess the balance of benefits and harms of screening for PAD and CVD with ABI in adults (Grade I)

• Against the use of carotene or vitamin E supplements for the prevention of CVD (Grade D)

• Current evidence is insufficient to assess the balance of benefits and harms of the use of multivitamins and single- or paired-nutrient supplements for the prevention of CVD (Grade I)

http://www.uspreventiveservicestaskforce.org
References

• AHA Heart Disease and Stroke Statistics – 2014 Update

• 2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation

• 2014 AAN Prevention of Stroke in Nonvalvular Atrial Fibrillation

• 2013 ACCF/AHA Guideline for the Management of Heart Failure
References

- 2014 AHA/ACC Guideline on the Management of Patients with Valvular Heart Disease
- 2014 ACC/AHA Guideline on Perioperative Cardiovascular Evaluation and Management of Patients Undergoing Noncardiac Surgery
- 2014 AHA/ACC Guideline for the Management of Patients with Non-ST-Elevation Acute Coronary Syndromes
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