

## NATIONAL QUALITY FORUM—Evidence (subcriterion 1a)

**Measure Title:** [Heart Failure \(HF\): Left Ventricular Function \(LVF\) Testing](#)

**IF the measure is a component in a composite performance measure, provide the title of the Composite**

**Measure here:** [Click here to enter composite measure title](#)

**Date of Submission:** [12/23/2013](#)

### Instructions

- *For composite performance measures:*
  - *A separate evidence form is required for each component measure unless several components were studied together.*
  - *If a component measure is submitted as an individual performance measure, attach the evidence form to the individual measure submission.*
- Respond to all questions as instructed with answers immediately following the question. All information needed to demonstrate meeting the evidence subcriterion (1a) must be in this form. An appendix of *supplemental* materials may be submitted, but there is no guarantee it will be reviewed.
- If you are unable to check a box, please highlight or shade the box for your response.
- Maximum of 10 pages (*includes questions/instructions*; minimum font size 11 pt; do not change margins). **Contact NQF staff if more pages are needed.**
- Contact NQF staff regarding questions. Check for resources at [Submitting Standards webpage](#).

**Note:** The information provided in this form is intended to aid the Steering Committee and other stakeholders in understanding to what degree the evidence for this measure meets NQF's evaluation criteria.

### Subcriterion 1a. Evidence to Support the Measure Focus

The measure focus is a health outcome or is evidence-based, demonstrated as follows:

- Health outcome:<sup>3</sup> a rationale supports the relationship of the health outcome to processes or structures of care.
- Intermediate clinical outcome, Process,<sup>4</sup> or Structure: a systematic assessment and grading of the quantity, quality, and consistency of the body of evidence<sup>5</sup> that the measure focus leads to a desired health outcome.
- Patient experience with care: evidence that the measured aspects of care are those valued by patients and for which the patient is the best and/or only source of information OR that patient experience with care is correlated with desired outcomes.
- Efficiency:<sup>6</sup> evidence for the quality component as noted above.

### Notes

3. Generally, rare event outcomes do not provide adequate information for improvement or discrimination; however, serious reportable events that are compared to zero are appropriate outcomes for public reporting and quality improvement.

4. Clinical care processes typically include multiple steps: assess → identify problem/potential problem → choose/plan intervention (with patient input) → provide intervention → evaluate impact on health status. If the measure focus is one step in such a multistep process, the step with the strongest evidence for the link to the desired outcome should be selected as the focus of measurement.

5. The preferred systems for grading the evidence are the U.S. Preventive Services Task Force (USPSTF) [grading definitions](#) and [methods](#), or Grading of Recommendations, Assessment, Development and Evaluation ([GRADE guidelines](#)).

6. Measures of efficiency combine the concepts of resource use and quality (NQF's [Measurement Framework: Evaluating Efficiency Across Episodes of Care](#); [AQA Principles of Efficiency Measures](#)).

**1a.1. This is a measure of:**

Outcome

☐ Health outcome: [Click here to name the health outcome](#)

*Health outcome includes patient-reported outcomes (PRO, i.e., HRQoL/functional status, symptom/burden, experience with care, health-related behaviors)*

☐ Intermediate clinical outcome: [Click here to name the intermediate outcome](#)

☒ Process: Documentation of left ventricular function testing performed for previously hospitalized heart failure patients

☐ Structure: [Click here to name the structure](#)

☐ Other: [Click here to name what is being measured](#)

**HEALTH OUTCOME PERFORMANCE MEASURE** *If not a health outcome, skip to [1a.3](#)*

**1a.2. Briefly state or diagram the linkage between the health outcome (or PRO) and the healthcare structures, processes, interventions, or services that influence it.**

N/A

**1a.2.1. State the rationale supporting the relationship between the health outcome (or PRO) and at least one healthcare structure, process, intervention, or service.**

N/A

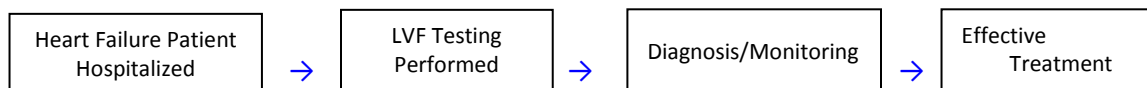
*Note: For health outcome performance measures, no further information is required; however, you may provide evidence for any of the structures, processes, interventions, or service identified above.*

**INTERMEDIATE OUTCOME, PROCESS, OR STRUCTURE PERFORMANCE MEASURE**

**1a.3. Briefly state or diagram the linkages between structure, process, intermediate outcome, and health outcomes.** Include all the steps between the measure focus and the health outcome.

This measure is a process measure which focuses on patients aged 18 years and older. The intent is to perform Left Ventricular Function testing for patients who are hospitalized with a principal diagnosis of Heart Failure. National guidelines advocate the evaluation of left ventricular systolic function as the single most important diagnostic test in the management of all patients with HF. Testing improves the overall quality of care by making health care more patient-centered, reliable, accessible and safe.

Evaluation of Left Ventricular Function (LVF) in HF patients provides important clinical information required to diagnose, monitor and direct appropriate treatment. This improves health by supporting proven interventions that address behavioral determinants of health in addition to delivering higher-quality care. Testing within the past 12 months ensures affordable care by reducing the cost of quality health care for individuals, families, employers and government. The measure attempts to prevent duplicative use of testing by only requiring one test in a 12 months period for those hospitalized with heart failure.



**1a.3.1. What is the source of the systematic review of the body of evidence that supports the performance measure?**

☒ Clinical Practice Guideline recommendation – **complete sections [1a.4](#), and [1a.7](#)**

☐ US Preventive Services Task Force Recommendation – **complete sections [1a.5](#) and [1a.7](#)**

☐ Other systematic review and grading of the body of evidence (e.g., *Cochrane Collaboration*, *AHRQ Evidence Practice Center*) – **complete sections [1a.6](#) and [1a.7](#)**

☒ Other – **complete section [1a.8](#)**

*Please complete the sections indicated above for the source of evidence. You may skip the sections that do not apply.*

#### 1a.4. CLINICAL PRACTICE GUIDELINE RECOMMENDATION

##### 1a.4.1. Guideline citation (including date) and URL for guideline (if available online):

Jessup, M., Abraham, W. T., Casey, D. E., Feldman, A. M., Francis, G. S., Ganiats, T. G., . . . Yancy, C. W. (2009). 2009 focused update: ACCF/AHA guidelines for the diagnosis and management of heart failure in adults: A report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines: Developed in collaboration with the International Society for Heart and Lung Transplantation. *Circulation*, 119(14), 1977-2016.  
Retrieved: <http://content.onlinejacc.org/article.aspx?articleid=1139600>

Lindenfeld, J., Albert, N. M., Boehmer, J. P., Collins, S. P., Ezekowitz, J. A., Walsh, M. N. (2010). Heart Failure Society of America, HFSA 2010 comprehensive heart failure practice guideline. *Journal of Cardiac Failure*, 16(6), e1-194.  
Retrieved: <http://download.journals.elsevierhealth.com/pdfs/journals/1071-9164/PIIS1071916410001740.pdf>

McKelvie, R. S., Moe, G. W., Ezekowitz, J. A., Heckman, G. A., Costigan, J., Ducharme, A., . . . Sussex, B. (2013). The 2012 Canadian Cardiovascular Society heart failure management guidelines update: Focus on acute and chronic heart failure. *The Canadian Journal of Cardiology*, 29(2), 168-181.  
Retrieved: <http://download.journals.elsevierhealth.com/pdfs/journals/0828-282X/PIIS0828282X12013797.pdf>

McMurray, J. J., Adamopoulos, S., Anker, S. D., Auricchio, A., Bohm, M., Dickstein, K., . . . ESC Committee for Practice Guidelines. (2012). ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The task force for the diagnosis and treatment of acute and chronic heart failure 2012 of the European Society of Cardiology. developed in collaboration with the heart failure association (HFA) of the ESC. *European Heart Journal*, 33(14), 1787-1847.  
Retrieved: <http://www.escardio.org/guidelines-surveys/esc-guidelines/GuidelinesDocuments/Guidelines-Acute%20and%20Chronic-HF-FT.pdf>

Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2013; 128:1810–1852.  
Full-text guideline: <http://circ.ahajournals.org/lookup/doi/10.1161/CIR.0b013e31829e8776>.

Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2013;128:e240–e327.  
Retrieved: <http://circ.ahajournals.org/content/128/16/e240>

##### 1a.4.2. Identify guideline recommendation number and/or page number and quote verbatim, the specific guideline recommendation.

- “We recommend that echocardiography be performed in all patients with suspected HF to assess cardiac structure and function, to quantify systolic function for planning and monitoring of treatment, and for prognostic stratification. (McKelvie et al. 2013, p 172) (Strong Recommendation, Moderate-Quality of Evidence)
- “Transthoracic echocardiography is recommended to evaluate cardiac structure and function, including diastolic function and to measure LVEF to make the diagnosis of HF, assist in planning and monitoring of treatment and to obtain prognostic information”. (McMurray 2012, p 1796) (Class I, Level C)
- “Of the several imaging modalities available, echocardiography is the method of choice in patients with suspected HF for reasons of accuracy, availability (including portability), safety, and cost.” (McMurray et al., 2012, p 1800) (Class 1, Level C)
- “Echocardiogram provides information about cardiac anatomy (e.g. volumes, geometry, mass) and function (e.g. LV function and wall motion, valvular function, right ventricular function, pulmonary artery pressure, pericardium).” (McMurray et al., 2012, p 1800) (Class 1, Level C)
- “Two-dimensional echocardiography with Doppler should be performed during initial evaluation of patients presenting with HF to assess LVEF, left ventricular size, wall thickness, and valve function.” (Jessup et al., 2009, p 1982) (Level of Evidence: C)
- “A 2-dimensional echocardiogram with Doppler should be performed during initial evaluation of patients presenting with HF to assess ventricular function, size, wall thickness, wall motion, and valve function.” (Yancy et al. 2013, p e257) (Level of Evidence: C)

- Repeat measurement of EF and measurement of the severity of structural remodeling are useful to provide information in patients with HF who have had a significant change in clinical status; who have experienced or recovered from a clinical event; or who have received treatment, including GDMT, that might have had a significant effect on cardiac function; or who may be candidates for device therapy. (Yancy et al. 2013, p e257) (Level of Evidence: C) [GDMT = guideline-directed medical therapy]
- “Although a complete history and physical examination are important first steps, the most useful diagnostic test in the evaluation of patients with or at risk for HF (e.g. postacute MI) is a comprehensive 2-dimensional echocardiogram; coupled with Doppler flow studies, the transthoracic echocardiogram can identify abnormalities of myocardium, heart valves, and pericardium. Echocardiography can reveal subclinical HF and predict risk of subsequent events.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
- “Use of echocardiograms in patients with suspected HF improves disease identification and provision of appropriate medical care.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
- “Echocardiographic evaluation should address whether LVEF is reduced, LV structure is abnormal, and other structural abnormalities are present that could account for the clinical presentation. This information should be quantified, including numerical estimates of EF measurement, ventricular dimensions, wall thickness, calculations of ventricular volumes, and evaluation of chamber geometry and regional wall motion. Documentation of LVEF is an HF quality-of-care performance measure.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
- “Assessment of Cardiac Structure and Function: Echocardiography with Doppler is recommended to determine cardiac structure and function in asymptomatic patients with disorders or findings....” (Lindenfield et al., 2010, p 481) (Strength of Evidence = B)

#### 1a.4.3. Grade assigned to the quoted recommendation with definition of the grade:

- “We recommend that echocardiography be performed in all patients with suspected HF to assess cardiac structure and function, to quantify systolic function for planning and monitoring of treatment, and for prognostic stratification (Strong Recommendation, Moderate-Quality of Evidence). (McKelvie et al. 2013)
  - The “Strong Recommendation, Moderate-Quality of Evidence” follows the Grading of Recommendations Assessment, Development, and Evaluation (GRADE).
    - The GRADE system classifies the quality of evidence as:
      - High (further research very unlikely to change confidence in the estimate of effect),
      - Moderate (further research likely to have an important impact on confidence in the estimate of effect and may change the estimate),
      - Low (further research very likely to have an important impact on confidence in the estimate of effect and likely to change the estimate), and Very Low (estimate of the effect very uncertain).
 The GRADE system offers 2 grades of recommendations: “Strong” (desirable effects clearly outweigh undesirable effects or clearly do not) and “Weak.”
  - SORT: Quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- “Transthoracic echocardiography is recommended to evaluate cardiac structure and function, including diastolic function and to measure LVEF to make the diagnosis of HF, assist in planning and monitoring of treatment, and to obtain prognostic information.” (McMurray 2012) (Class I, Level C)
  - Class I: Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
  - Level C: Consensus of opinion of the experts and/or small studies, retrospective studies, registries
  - SORT Study quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- “Of the several imaging modalities available, echocardiography is the method of choice in patients with suspected HF for reasons of accuracy, availability (including portability), safety, and cost.” (McMurray et al., 2012, p 1800) (Class 1, Level C)
  - Class I: Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
  - Level C: Consensus of opinion of the experts and/or small studies, retrospective studies, registries
  - SORT Study quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- “Echocardiogram provides information about cardiac anatomy (e.g. volumes, geometry, mass) and function (e.g. LV function and wall motion, valvular function, right ventricular function, pulmonary artery pressure, pericardium).” (McMurray et al., 2012, p 1800) (Class 1, Level C)
  - Class I: Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
  - Level C: Consensus of opinion of the experts and/or small studies, retrospective studies, registries

- SORT Study quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- Two-dimensional echocardiography with Doppler should be performed during initial evaluation of patients presenting with HF to assess LVF, left ventricular size, wall thickness, and valve function. Radionuclide ventriculography can be performed to assess LVF and volumes. (McKelvie et al., 2013; McMurray et al., 2012; Jessup et al., 2009; Lindenfeld et al., 2010). (Jessup 2009) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- Repeat measurement of EF and measurement of the severity of structural remodeling are useful to provide information in patients with HF who have had a significant change in clinical status; who have experienced or recovered from a clinical event; or who have received treatment, including GDMT, that might have had a significant effect on cardiac function; or who may be candidates for device therapy. (Yancy et al. 2013, p e257) (Level of Evidence: C) [GDMT = guideline-directed medical therapy]
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Although a complete history and physical examination are important first steps, the most useful diagnostic test in the evaluation of patients with or at risk for HF (e.g., post acute MI) is a comprehensive 2-dimensional echocardiogram; coupled with Doppler flow studies, the transthoracic echocardiogram can identify abnormalities of myocardium, heart valves, and pericardium. Echocardiography can reveal subclinical HF and predict risk of subsequent events.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Use of echocardiograms in patients with suspected HF improves disease identification and provision of appropriate medical care.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Echocardiographic evaluation should address whether LVEF is reduced, LV structure is abnormal, and other structural abnormalities are present that could account for the clinical presentation. This information should be quantified, including numerical estimates of EF measurement, ventricular dimensions, wall thickness, calculations of ventricular volumes, and evaluation of chamber geometry and regional wall motion. Documentation of LVEF is an HF quality-of-care performance measure.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Assessment of Cardiac Structure and Function: Echocardiography with Doppler is recommended to determine cardiac structure and function in asymptomatic patients with disorders or findings....” (Lindenfeld, et al., 2010, p 481) (Strength of Evidence = B)
  - Level B: Cohort and Case-Controlled Studies. Post hoc, subgroup analysis, and meta-analysis. Prospective observational studies or registries

#### **1a.4.4. Provide all other grades and associated definitions for recommendations in the grading system.**

(Note: If separate grades for the strength of the evidence, report them in section 1a.7.)

- SORT Study Quality level 2: Limited quality – patient-oriented evidence

#### **1a.4.5. Citation and URL for methodology for grading recommendations (if different from 1a.4.1):**

- Ebell, M., Siwek, J., Weiss, B., Woolf, S., Susman, J., Ewigman, B., Bowman, M. (2004). Strength of Recommendation Taxonomy (SORT): A Patient-Centered Approach to Grading Evidence in the Medical Literature. American Family Physician, 69, 548-56.  
Retrieved: <http://www.aafp.org/afp/2004/0201/p548.pdf>

#### **1a.4.6. If guideline is evidence-based (rather than expert opinion), are the details of the quantity, quality, and consistency of the body of evidence available (e.g., evidence tables)?**

☐ Yes → **complete section 1a.7**

☒ No → **report on another systematic review of the evidence in sections 1a.6 and 1a.7; if another review does not exist, provide what is known from the guideline review of evidence in 1a.7**

## **1a.5. UNITED STATES PREVENTIVE SERVICES TASK FORCE RECOMMENDATION**

**1a.5.1. Recommendation citation (including date) and URL for recommendation (if available online):**

N/A

**1a.5.2. Identify recommendation number and/or page number and quote verbatim, the specific recommendation.**

N/A

**1a.5.3. Grade assigned to the quoted recommendation with definition of the grade:**

N/A

**1a.5.4. Provide all other grades and associated definitions for recommendations in the grading system.**

*(Note: the grading system for the evidence should be reported in section 1a.7.)*

N/A

**1a.5.5. Citation and URL for methodology for grading recommendations (if different from 1a.5.1):**

N/A

## **1a.6. OTHER SYSTEMATIC REVIEW OF THE BODY OF EVIDENCE**

**1a.6.1. Citation (including date) and URL (if available online):**

N/A

**1a.6.2. Citation and URL for methodology for evidence review and grading (if different from 1a.6.1):**

N/A

## **1a.7. FINDINGS FROM SYSTEMATIC REVIEW OF BODY OF THE EVIDENCE SUPPORTING THE MEASURE**

**1a.7.1. What was the specific structure, treatment, intervention, service, or intermediate outcome addressed in the evidence review?**

Numerous studies were reviewed in the body of the evidence.

Evidence is annually reviewed through an environmental scan of the measure focus and target population. The measure specification's rationale and clinical recommendation statements were reviewed and revised based on the current evidence found in the environmental scan.

**1a.7.2. Grade assigned for the quality of the quoted evidence with definition of the grade:**

- "We recommend that echocardiography be performed in all patients with suspected HF to assess cardiac structure and function, to quantify systolic function for planning and monitoring of treatment, and for prognostic stratification (Strong Recommendation, Moderate-Quality of Evidence). (McKelvie et al. 2013)
  - The "Strong Recommendation, Moderate-Quality of Evidence" follows the Grading of Recommendations Assessment, Development, and Evaluation (GRADE).
    - The GRADE system classifies the quality of evidence as:
      - High (further research very unlikely to change confidence in the estimate of effect),
      - Moderate (further research likely to have an important impact on confidence in the estimate of effect and may change the estimate),
      - Low (further research very likely to have an important impact on confidence in the estimate of effect and likely to change the estimate), and Very Low (estimate of the effect very uncertain). The GRADE system offers 2 grades of recommendations: "Strong" (desirable effects clearly outweigh undesirable effects or clearly do not) and "Weak."
  - SORT: Quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- Transthoracic echocardiography is recommended to evaluate cardiac structure and function, including diastolic function and to measure LVEF to make the diagnosis of HF, assist in planning and monitoring of treatment, and to obtain prognostic information. (McMurray 2012) (Class I, Level C)
  - Class I: Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
  - Level C: Consensus of opinion of the experts and/or small studies, retrospective studies, registries
  - SORT Study quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening

- “Of the several imaging modalities available, echocardiography is the method of choice in patients with suspected HF for reasons of accuracy, availability (including portability), safety, and cost.” (McMurray et al., 2012, p 1800) (Class 1, Level C)
  - Class I: Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
  - Level C: Consensus of opinion of the experts and/or small studies, retrospective studies, registries
  - SORT Study quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- “Echocardiogram provides information about cardiac anatomy (e.g. volumes, geometry, mass) and function (e.g. LV function and wall motion, valvular function, right ventricular function, pulmonary artery pressure, pericardium).” (McMurray et al., 2012, p 1800) (Class 1, Level C)
  - Class I: Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective
  - Level C: Consensus of opinion of the experts and/or small studies, retrospective studies, registries
  - SORT Study quality level 3 (other evidence)- Consensus guidelines, extrapolations from bench research, usual practice, opinion, disease-oriented evidence (intermediate or physiologic outcomes only), or case series for studies of diagnosis, treatment, prevention, or screening
- Two-dimensional echocardiography with Doppler should be performed during initial evaluation of patients presenting with HF to assess LVEF, left ventricular size, wall thickness, and valve function. Radionuclide ventriculography can be performed to assess LVEF and volumes. (McKelvie et al., 2013; McMurray et al., 2012; Jessup et al., 2009; Lindenfeld et al., 2010). (Jessup 2009) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- Repeat measurement of EF and measurement of the severity of structural remodeling are useful to provide information in patients with HF who have had a significant change in clinical status; who have experienced or recovered from a clinical event; or who have received treatment, including GDMT, that might have had a significant effect on cardiac function; or who may be candidates for device therapy. (Yancy et al. 2013, p e257) (Level of Evidence: C) [GDMT = guideline-directed medical therapy]
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Although a complete history and physical examination are important first steps, the most useful diagnostic test in the evaluation of patients with or at risk for HF (e.g., post acute MI) is a comprehensive 2-dimensional echocardiogram; coupled with Doppler flow studies, the transthoracic echocardiogram can identify abnormalities of myocardium, heart valves, and pericardium. Echocardiography can reveal subclinical HF and predict risk of subsequent events.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Use of echocardiograms in patients with suspected HF improves disease identification and provision of appropriate medical care.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Echocardiographic evaluation should address whether LVEF is reduced, LV structure is abnormal, and other structural abnormalities are present that could account for the clinical presentation. This information should be quantified, including numerical estimates of EF measurement, ventricular dimensions, wall thickness, calculations of ventricular volumes, and evaluation of chamber geometry and regional wall motion. Documentation of LVEF is an HF quality-of-care performance measure.” (Yancy et al., 2013, p e258) (Level of Evidence: C)
  - Level C: Very limited populations evaluated. Only consensus opinion of experts, case studies, or standard of care.
- “Assessment of Cardiac Structure and Function: Echocardiography with Doppler is recommended to determine cardiac structure and function in asymptomatic patients with disorders or findings....” (Lindenfeld et al., 2010, p 481) (Strength of Evidence = B)  
 Level B: Cohort and Case-Controlled Studies. Post hoc, subgroup analysis, and meta-analysis. Prospective observational studies or registries



**1a.7.3. Provide all other grades and associated definitions for strength of the evidence in the grading system.**

The Strength of Recommendation Taxonomy (SORT)

- A Level: An A-level recommendation is based on consistent and good-quality patient-oriented evidence;
- B Level: A B-level recommendation is based on inconsistent or limited-quality patient-oriented evidence; and
- C Level: A C-level recommendation is based on consensus, usual practice, opinion, disease oriented evidence, or case series for studies of diagnosis, treatment, prevention, or screening.

The quality of individual studies is rated 1, 2, or 3; numbers are used to distinguish ratings of individual studies from the letters A, B, and C used to evaluate the strength of a recommendation based on a body of evidence.

Ebell M, Siwek J, Weiss B, Woolf S, Susman J, Ewigman B, Bowman M (2004). Strength of Recommendation Taxonomy (SORT): A Patient-Centered Approach to Grading Evidence in the Medical Literature. American Family Physician, 69, 548-56.

Retrieved from: <http://www.aafp.org/afp/2004/0201/p548.pdf>

**1a.7.4. What is the time period covered by the body of evidence? (provide the date range, e.g., 1990-2010). Date range: 2009 to 2013**

**QUANTITY AND QUALITY OF BODY OF EVIDENCE**

**1a.7.5. How many and what type of study designs are included in the body of evidence? (e.g., 3 randomized controlled trials and 1 observational study)**

The body of evidence consists of six clinical practice guidelines that all are collaborative in their recommendation to perform left ventricular function testing for patient with a diagnosis/hospitalization for heart failure.

**1a.7.6. What is the overall quality of evidence across studies in the body of evidence? (discuss the certainty or confidence in the estimates of effect particularly in relation to study factors such as design flaws, imprecision due to small numbers, indirectness of studies to the measure focus or target population)**

The overall quality of evidence is consistently positive across studies.

**ESTIMATES OF BENEFIT AND CONSISTENCY ACROSS STUDIES IN BODY OF EVIDENCE**

**1a.7.7. What are the estimates of benefit—magnitude and direction of effect on outcome(s) across studies in the body of evidence? (e.g., ranges of percentages or odds ratios for improvement/ decline across studies, results of meta-analysis, and statistical significance)**

Patient with heart failure benefit from the assessment of left ventricular function due to the ability to diagnosis, monitor and direct appropriate treatment.

**1a.7.8. What harms were studied and how do they affect the net benefit (benefits over harms)?**

Studies show consistent benefits while detecting no harm and yielding consistent net benefits.

**UPDATE TO THE SYSTEMATIC REVIEW(S) OF THE BODY OF EVIDENCE**

**1a.7.9. If new studies have been conducted since the systematic review of the body of evidence, provide for each new study: 1) citation, 2) description, 3) results, 4) impact on conclusions of systematic review.**

N/A – Described in 1a.4.

**1a.8 OTHER SOURCE OF EVIDENCE**

*If source of evidence is NOT from a clinical practice guideline, USPSTF, or systematic review, please describe the evidence on which you are basing the performance measure.*



### 1a.8.1 What process was used to identify the evidence?

Quality Insights conducts an ongoing environmental scan to evaluate the most current research and evidence-based guidelines. The evidence is annually reviewed through an analysis of the measure focus and target population. The measure specification's rationale and clinical recommendation statements are reviewed and revised based on the current evidence found in the environmental scan.

A Technical Expert Panel (TEP), composed of subject matter specialists and experts with technical measure expertise, evaluates the results of the scan and provides recommendations based on scientific merits of the evidence using the Strength of Recommendation Taxonomy (SORT) and other grading systems, as required.

The initial measure process included a public comment period. Based on the process of multiple stakeholder input, expert panel discussion and public comment, CMS/Quality Insights measures can be assumed to be established.

Thomas Jefferson University assists with the environmental scan on an ongoing basis. Dr. Crawford is our contact.

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### 1a.8.2. Provide the citation and summary for each piece of evidence.

- Ananthasubramaniam, K., Dhar, R., & Cavalcante, J. L. (2011). Role of multimodality imaging in ischemic and non-ischemic cardiomyopathy. *Heart Failure Reviews*, 16(4), 351-367.

**Abstract:** Chronic heart failure (CHF) is a major and growing problem in the western hemisphere, affecting about 5 million patients in the United States. In daily practice patients with left ventricular systolic dysfunction (LVSD) and significant angiographic coronary artery disease (CAD) are felt to have an ischemic cardiomyopathy (ICMP) and those without CAD or mild-moderate CAD out of proportion to the extent of LVSD are felt to have a non-ischemic cardiomyopathy (NICMP). Although invasive coronary angiography is the gold standard for the diagnosis of CAD, recent advances in non-invasive imaging have created multiple options for evaluating ICMP and NICMP. This review details the role of cardiac imaging in the diagnosis of ICMP and NICMP and outlines an algorithm of use of non-invasive tests in asymptomatic LVSD and symptomatic heart failure.

- Bonow RO, Ganiats TG, Beam CT, Blake K, Casey DE Jr, Goodlin SJ, Grady KL, Hundley RF, Jessup M, Lynn TE, Masoudi FA, Nilasena D, Pin~a IL, Rockswold PD, Sadwin LB, Sikkema JD, Sincak CA, Spertus J, Torcson PJ, Torres E, Williams MV, Wong JB. ACCF/AHA/AMA-PCPI 2011 performance measures for adults with heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Performance Measures and the American Medical Association-Physician Consortium for Performance Improvement. *Circulation*. 2012; 125: 2382-2401. Retrieved: <http://circ.ahajournals.org/content/125/19/2382>

#### Introduction

The ACCF/AHA/American Medical Association-Physician Consortium for Performance Improvement (AMA-PCPI) 2011 Performance Measures for Adults With Heart Failure Writing Committee (the writing committee) was charged with the development of performance measures concerning the diagnosis, treatment, and outcomes of patients with HF. The purpose of this effort is to provide measures that can be used to improve care for patients with HF. This updated performance measure document set addresses both in-hospital care and continuing care in the outpatient setting. Many guideline recommended processes were considered but ultimately not translated into performance measures. Decisions about which measures to include were based on many factors. Common considerations included the complexity of the guideline recommendations (making translation difficult), ability to define patients to be included in the denominator without a large number of exclusions, and feasibility of collecting the required data. This document is intended to supersede the prior publication of HF performance measures.<sup>3</sup>

This updated performance measure set presents 9 measures, including 3 new measures and 6 revised measures, of which 3 measures are designated as quality metrics (appropriate for internal quality improvement only). Two measures apply to care in both the inpatient and outpatient setting, 5 measures address care in the outpatient setting only, and 2 measures address care in the inpatient setting only. In addition, 8 earlier measures have been retired. The 3 quality metrics represent test measures that address areas worthy of measurement, but for considerations such as strength of evidence and uncertainty regarding feasibility, these are not considered appropriate for use for public accountability at this time.

- Ebell, M., Siwek, J., Weiss, B., Woolf, S., Susman, J., Ewigman, B., Bowman, M. (2004). Strength of Recommendation Taxonomy (SORT): A Patient-Centered Approach to Grading Evidence in the Medical Literature. *American Family Physician*, 69, 548-56.  
Retrieved: <http://www.aafp.org/afp/2004/0201/p548.pdf>

A large number of taxonomies are used to rate the quality of an individual study and the strength of a recommendation based on a body of evidence. We have developed a new grading scale that will be used by several family medicine and primary care journals (required or optional), with the goal of allowing readers to learn one taxonomy that will apply to many sources of evidence. Our scale is called the Strength of Recommendation Taxonomy. It addresses the quality, quantity, and consistency of evidence and allows authors to rate individual studies or bodies of evidence. The taxonomy is built around the information mastery framework, which emphasizes the use of patient-oriented outcomes that measure changes in morbidity or mortality. An A-level recommendation is based on consistent and good-quality patient-oriented evidence; a B-level recommendation is based on inconsistent or limited-quality patient-oriented evidence; and a C-level recommendation is based on consensus, usual practice, opinion, disease oriented evidence, or case series for studies of diagnosis, treatment, prevention, or screening. Levels of evidence from 1 to 3 for individual studies also are defined. We hope that consistent use of this taxonomy will improve the ability of authors and readers to communicate about the translation of research into practice.

- Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, Dai S, Ford ES, Fox CS, Franco S, Fullerton HJ, Gillespie C, Hailpern SM, Heit JA, Howard VJ, Huffman MD, Judd SE, Kissela BM, Kittner SJ, Lackland DT, Lichtman JH, Lisabeth LD, Mackey RH, Magid DJ, Marcus GM, Marelli A, Matchar DB, McGuire DK, Mohler ER 3rd, Moy CS, Mussolino ME, Neumar RW, Nichol G, Pandey DK, Paynter NP, Reeves MJ, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Wong ND, Woo D, Turner MB; on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2014 update: a report from the American Heart Association. *Circulation*. 2014; 129:.....  
Retrieved at: <http://circ.ahajournals.org/content/early/2013/12/18/01.cir.0000441139.02102.80>

#### Summary

Each year, the American Heart Association (AHA), in conjunction with the Centers for Disease Control and Prevention, the National Institutes of Health, and other government agencies, brings together the most up-to-date statistics on heart disease, stroke, other vascular diseases, and their risk factors and presents them in its Heart Disease and Stroke Statistical Update. The Statistical Update is a critical resource for researchers, clinicians, healthcare policy makers, media professionals, the lay public, and many others who seek the best available national data on heart disease, stroke, and other cardiovascular disease—related morbidity and mortality and the risks, quality of care, use of medical procedures and operations, and costs associated with the management of these diseases in a single document. Indeed, since 1999, the Statistical Update has been cited >10 500 times in the literature, based on citations of all annual versions. In 2012 alone, the various Statistical Updates were cited ≈3500 times (data from Google Scholar). In recent years, the Statistical Update has undergone some major changes with the addition of new chapters and major updates across multiple areas, as well as increasing the number of ways to access and use the information assembled.

For this year's edition, the Statistics Committee, which produces the document for the AHA, updated all of the current chapters with the most recent nationally representative data and inclusion of relevant articles from the literature over the past year. This year's edition includes a new chapter on peripheral artery disease, as well as new data on the monitoring and benefits of cardiovascular health in the population, with additional new focus on evidence-based approaches to changing behaviors, implementation strategies, and implications of the AHA's 2020 Impact Goals.

- Lindenfeld, J., Albert, N. M., Boehmer, J. P., Collins, S. P., Ezekowitz, J. A., Walsh, M. N. (2010). Heart Failure Society of America. Executive Summary: HFSA 2010 comprehensive heart failure practice guideline. *Journal of Cardiac Failure*, 16(6), e1-194.  
Retrieved: <http://download.journals.elsevierhealth.com/pdfs/journals/1071-9164/PIIS1071916410001740.pdf>

**Abstract:** Heart failure (HF) is a syndrome characterized by high mortality, frequent hospitalization, reduced quality of life, and a complex therapeutic regimen. Knowledge about HF is accumulating so rapidly that individual clinicians may be unable to readily and adequately synthesize new information into effective strategies of care for patients with this syndrome. Trial data, though valuable, often do not give direction for individual patient management. These characteristics make HF an ideal candidate for practice guidelines. The 2010 Heart Failure Society of America comprehensive practice guideline addresses the full range of evaluation, care, and management of patients with HF.

- Cowie, M. R., & Zaphiriou, A. (2002). Management of chronic heart failure. *BMJ (Clinical Research Ed.)*, 325(7361), 422-425.

Introduction: Heart failure is a complex syndrome that results from any structural or functional cardiac disorder that impairs the ability of the heart to function as a pump. It has a major impact on longevity and quality of life. One to two per cent of the general population of developed countries have heart failure, and the average age at diagnosis is 76 years. Although the steady rise in hospital admissions for heart failure has slowed recently, the management of heart failure still accounts for 1-2% of healthcare expenditure in the United Kingdom and other countries in the developed world. Improvements in cardiac imaging and new biochemical assays have made diagnosis more straightforward. Major changes in treatment have resulted from a better understanding of the pathophysiology of heart failure and the results of large clinical trials. Improving outcomes now increasingly depends on improved communication between healthcare professionals, education of patients and caregivers, and better chronic disease management. SORT Study quality level 3 (other evidence)

- Kirkpatrick, J. N., Vannan, M. A., Narula, J., & Lang, R. M. (2007). Echocardiography in heart failure: Applications, utility, and new horizons. *Journal of the American College of Cardiology*, 50(5), 381-396.

Echocardiography is well qualified to meet the growing need for noninvasive imaging in the expanding heart failure (HF) population. The recently-released American College of Cardiology/American Heart Association guidelines for the diagnosis and management of HF labeled echocardiography “the single most useful diagnostic test in the evaluation of patients with HF. . .,” because of its ability to accurately and noninvasively provide measures of ventricular function and assess causes of structural heart disease. It can also detect and define the hemodynamic and morphologic changes in HF over time and might be equivalent to invasive measures in guiding therapy.

In this article we will discuss: 1) the clinical uses of echocardiography in HF and their prognostic value; 2) the use of echocardiography to guide treatment in HF patients; and 3) promising future techniques for echocardiographic-based imaging in HF. In addition, we will highlight some of the limitations of echocardiography. SORT Study quality level 3 (other evidence)

- Atherton, J. J. (2010). Screening for left ventricular systolic dysfunction: Is imaging a solution? *JACC. Cardiovascular Imaging*, 3(4), 421-428.

To address the heart failure burden, our focus needs to shift to disease prevention. Strategies to initially screen for heart failure precursors such as asymptomatic left ventricular systolic dysfunction have been evaluated, including clinical scores, the 12-lead electrocardiogram, and natriuretic peptides. However, their specificity limits their broad application as screening tools in asymptomatic populations. High- quality images are now available from hand-carried cardiac ultrasound devices, at a fraction of the capital cost of standard echocardiography with favorable diagnostic performance, especially when experienced staff performs the imaging.

Questions that remain to be addressed include how we should select the target population to screen, who should perform the screening studies, how much training is required, and how often screening studies should be performed. SORT Study quality level 3 (other evidence)

- Akiyama, E., Sugiyama, S., Matsuzawa, Y., Konishi, M., Suzuki, H., Nozaki, T., . . . Ogawa, H. (2012). Incremental prognostic significance of peripheral endothelial dysfunction in patients with heart failure with normal left ventricular ejection fraction. *Journal of the American College of Cardiology*, 60(18), 1778-1786.

Objectives: The purpose of this study was to investigate whether peripheral endothelial dysfunction could predict the occurrence of cardiovascular events in patients with heart failure (HF) with normal left ventricular ejection fraction (HFNEF).

Background: Endothelial dysfunction plays an important role in HF, but the relation between peripheral endothelial dysfunction and prognosis in HFNEF remains unknown.

Methods: We conducted a prospective cohort study of 321 patients with HFNEF. We evaluated cardiac function by echocardiography measuring the ratio of early transmitral flow velocity to tissue Doppler early diastolic mitral annular velocity ( $E/e'$ ), noninvasively assessed peripheral endothelial function by reactive hyperemia-peripheral arterial tonometry (RH-PAT) as the RH-PAT index (RHI), and followed cardiovascular events.

Results: A total of 59 patients had a cardiovascular event. Kaplan-Meier analysis demonstrated a significantly higher probability of cardiovascular events in the low RHI group than in the high RHI group (mean follow-up: 20 months; log-rank test:  $p = 0.001$ ). Multivariate Cox hazard analysis identified RHI (per 0.1) (hazard ratio [HR]: 0.80; 95% confidence interval [CI]: 0.67 to 0.94;  $p = 0.007$ ),  $E/e'$  ( $\ln[E/e']$  [per 0.1]) (HR: 1.15; 95% CI: 1.04 to 1.26;  $p = 0.006$ ), and B-type natriuretic peptide (BNP) ( $\ln[BNP]$  [per picogram/milliliter]) (HR: 1.81; 95% CI: 1.44 to 2.28;  $p = 0.001$ ) as independent predictors of cardiovascular events. The C-statistics for cardiovascular events substantially increased when the RHI was added to the HFNEF prognostic 5 factors (PF5)—age, diabetes, New York Heart Association classification, HF hospitalization history, and

left ventricular ejection fraction—which were identified in the I-PRESERVE (Irbesartan in Heart Failure with Preserved Ejection Fraction Study) (PF5 alone: 0.671; PF5 + RHI: 0.712). The net reclassification index was significant after addition of the RHI (19.0%,  $p = 0.01$ ).

Conclusions: Peripheral endothelial dysfunction independently correlated with future cardiovascular events, adding incremental clinical significance for risk stratification in patients with HFNEF. (Endothelial Dysfunction Assessed by Reactive Hyperemia Peripheral Arterial Tonometry and Heart Failure with Preserved Left Ventricular Ejection Fraction. SORT Study quality level 2 (limited quality-patient-oriented evidence))

- Nagueh, S. F., Appleton, C. P., Gillebert, T. C., Marino, P. N., Oh, J. K., Smiseth, O. A., . . . Evangelisa, A. (2009). Recommendations for the evaluation of left ventricular diastolic function by echocardiography. *European Journal of Echocardiography : The Journal of the Working Group on Echocardiography of the European Society of Cardiology*, 10(2), 165-193.

Preface: The assessment of left ventricular (LV) diastolic function should be an integral part of a routine examination, particularly in patients presenting with dyspnea or heart failure. About half of patients with new diagnoses of heart failure have normal or near normal global ejection fractions (EFs). These patients are diagnosed with “diastolic heart failure” or “heart failure with preserved EF.” The assessment of LV diastolic function and filling pressures is of paramount clinical importance to distinguish this syndrome from other diseases such as pulmonary disease resulting in dyspnea, to assess prognosis, and to identify underlying cardiac disease and its best treatment. SORT Study quality level 3 (other evidence)

- Mielniczuk, L. M., & Beanlands, R. S. (2012). Does imaging-guided selection of patients with ischemic heart failure for high risk revascularization improve identification of those with the highest clinical benefit? Imaging-guided selection of patients with ischemic heart failure for high-risk revascularization improves identification of those with the highest clinical benefit. *Circulation. Cardiovascular Imaging*, 5(2), 262-70; discussion 270.

Concluding Remarks: There is no doubt about the efficacy of ischemia assessment in selecting patients for revascularization. Myocardial viability assessment is also needed and effective in select patients. As was demonstrated in the case presented at the beginning of this article, the identification of a significant amount of hibernating myocardium can predict which patient will receive the most benefit with surgical revascularization. Vast and mostly consistent literature supports that these benefits translate to improved morbidity and mortality compared with standard medical therapy.

Viability testing may not offer additional prognostic information in all patients and should not be considered in isolation but, rather, in the context of symptoms; LV size and function; comorbidities; and the potential for symptom, quality-of-life, and outcome benefit with revascularization versus medical therapy.

Viability assessment should be ordered in circumstances when it will affect decision-making, and results must be interpreted in light of the particular clinical setting. Viability testing will offer the most benefit in patients in whom decisions regarding revascularization are more difficult and uncertain.

Evidence supports the notion that when viability testing is done with validated protocols in experienced and capable centers, the demonstration of a significant amount of hibernating myocardium can predict the patients who will most likely benefit from a strategy of revascularization. SORT Study quality level 3 (other evidence)

- Shabana, A., & El-Menyar, A. (2012). Myocardial viability: What we knew and what is new. *Cardiology Research and Practice*, 2012, 607486.

Some patients with chronic ischemic left ventricular dysfunction have shown significant improvements of contractility with favorable long-term prognosis after revascularization. Several imaging techniques are available for the assessment of viable myocardium, based on the detection of preserved perfusion, preserved glucose metabolism, intact cell membrane and mitochondria, and presence of contractile reserve.

Nuclear cardiology techniques, dobutamine echocardiography and positron emission tomography are used to assess myocardial viability. In recent years, new advances have improved methods of detecting myocardial viability.

This paper summarizes the pathophysiology, methods, and impact of detection of myocardial viability, concentrating on recent advances in such methods. We reviewed the literature using search engines MIDLINE, SCOPUS, and EMBASE from 1988 to February 2012. We used key words: myocardial viability, hibernation, stunning, and ischemic cardiomyopathy. Recent studies showed that the presence of viable myocardium was associated with a greater likelihood of survival in patients with coronary artery disease and LV dysfunction, but the assessment of myocardial viability did not identify patients with survival benefit from revascularization, as compared with medical therapy alone. This topic is still debatable and needs more evidence. SORT Study quality level 3 (other evidence)

- Yin, W. H., Chen, J. W., & Lin, S. J. (2012). Prognostic value of combining echocardiography and natriuretic peptide levels in patients with heart failure. *Current Heart Failure Reports*, 9(2), 148-153.

Abstract: Heart failure (HF) is still a global public health issue, despite the enormous progress made in its diagnosis and treatment. More often than not, acute or chronic decompensated HF leads to hospitalization and presents a dismal prognosis. Evidently, clinical symptoms alone are not reliable enough guidance for the HF treatment; therefore, parameters able to identify adverse prognoses are valuable in tailoring treatment regimens for individual patients.

Echocardiography and natriuretic peptides (NPs) have demonstrated their capacities in giving independent diagnostic and prognostic information regarding patients with HF.

Although abnormalities either of an echocardiographic index of left ventricular function or of an NP denote an increased risk of mortality or HF, the highest risk comes from abnormalities of both left ventricular function and NP levels. In this review, we survey the most recent publications exploring the utility of NP levels and echocardiographic indices integration, claimed to offer powerful incremental prognostication in patients with established HF. SORT Study quality level 3 (other evidence)

- Jessup, M., Abraham, W. T., Casey, D. E., Feldman, A. M., Francis, G. S., Ganiats, T. G., . . . Yancy, C. W. (2009). 2009 focused update: ACCF/AHA guidelines for the diagnosis and management of heart failure in adults: A report of the American college of cardiology Foundation/American heart association task force on practice guidelines: Developed in collaboration with the international society for heart and lung transplantation. *Circulation*, 119(14), 1977-2016.

Evidence Review: Late-breaking clinical trials presented at the 2005, 2006, and 2007 annual scientific meetings of the ACCF, AHA, and European Society of Cardiology, as well as selected other data, were reviewed by the standing guideline writing committee along with the parent task force and other experts to identify those trials and other key data that might impact guideline recommendations.

On the basis of the criteria/considerations noted earlier, recent trial data and other clinical information were considered important enough to prompt a focused update of the ACC/AHA 2005 Guideline Update for the Diagnosis and Management of Chronic Heart Failure in the Adult.<sup>2</sup>

In addition, the guidelines writing committee thought that a new section on the management of the hospitalized patient with heart failure (HF) should be included in this update. A number of recent HF trials reviewed for this update, were, in fact, performed on hospitalized patients, and a number of newer therapies are under development for this population. Moreover, there is increasing government and other third-party payer interest in the prevention of HF hospitalizations, and rehospitalizations. Quality indicators about the process of discharging the HF patient have already been developed, and data about rehospitalizations for HF by hospital have already been made public. Thus, the committee thought that a new section about this important aspect of HF care should be added to this update.

Various specific recommendations received ACCF/AHA Task Force on Practice Guidelines Level of Evidence Ratings of Level B (Limited populations evaluated; Data derived from a single randomized trial or non-randomized studies) or Level C (Very limited populations evaluated; Only consensus opinion of experts, case studied, or standard of care).

- McMurray, J. J., Adamopoulos, S., Anker, S. D., Auricchio, A., Bohm, M., Dickstein, K., . . . ESC Committee for Practice Guidelines. (2012). ESC guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The task force for the diagnosis and treatment of acute and chronic heart failure 2012 of the European society of cardiology. Developed in collaboration with the heart failure association (HFA) of the ESC. *European Heart Journal*, 33(14), 1787-1847.

The aim of this document is to provide practical, evidence-based guidelines for the diagnosis and treatment of heart failure (HF).

The principal changes from the 2008 guidelines relate to:

- (i) An expansion of the indication for mineralocorticoid (aldosterone) receptor antagonists (MRAs); (ii) a new indication for the sinus node inhibitor ivabradine;
- (iii) An expanded indication for cardiac resynchronization therapy (CRT);
- (iv) New information on the role of coronary revascularization in HF; (v) recognition of the growing use of ventricular assist devices; and
- (vi) The emergence of transcatheter valve interventions.

SORT Study quality level 3 (other evidence)

- McKelvie, R. S., Moe, G. W., Ezekowitz, J. A., Heckman, G. A., Costigan, J., Ducharme, A., . . . Sussex, B. (2013). The 2012 Canadian cardiovascular society heart failure management guidelines update: Focus on acute and chronic heart failure. *The Canadian Journal of Cardiology*, 29(2), 168-181.

Abstract: The 2012 Canadian Cardiovascular Society Heart Failure (HF) Guidelines Update provides management recommendations for acute and chronic HF. In 2006, the Canadian Cardiovascular Society HF Guidelines committee first published an overview of HF management. Since then, significant additions to and changes in many of these recommendations have become apparent.

With this in mind and in response to stakeholder feedback, the Guidelines Committee in 2012 has updated the overview of both acute and chronic heart failure diagnosis and management.

The 2012 Update also includes recommendations, values and preferences, and practical tips to assist the medical practitioner manage their patients with HF.

SORT Study quality level 3 (other evidence)

- Penicka, M., Bartunek, J., Trakalova, H., Hrabakova, H., Maruskova, M., Karasek, J., & Kocka, V. (2010). Heart failure with preserved ejection fraction in outpatients with unexplained dyspnea: A pressure-volume loop analysis. *Journal of the American College of Cardiology*, 55(16), 701-1710.

Objectives: The aim of the present study was to diagnose heart failure with preserved ejection fraction (HFPEF) in outpatients with unexplained chronic dyspnea and to elucidate its underlying mechanisms in this population using invasive pressure-volume loop analysis.

Conclusion: A significant proportion of stable outpatients with unexplained chronic dyspnea may have HFPEF. In the patients whom we studied, increased LV stiffness, dyssynchrony, and dynamic mitral regurgitation were the major mechanisms underlying development of HFPEF.

- Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2013;128:1810–1852. Full-text guideline available at:

<http://circ.ahajournals.org/lookup/doi/10.1161/CIR.0b013e31829e8776>.

The American College of Cardiology Foundation (ACCF) and the American Heart Association (AHA) have jointly produced guidelines in the area of cardiovascular disease since 1980. The ACCF/AHA Task Force on Practice Guidelines (Task Force), charged with developing, updating, and revising practice guidelines for cardiovascular diseases and procedures, directs and oversees this effort. Writing committees are charged with regularly reviewing and evaluating all available evidence to develop balanced, patient-centric recommendations for clinical practice.

- Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Drazner MH, Fonarow GC, Geraci SA, Horwich T, Januzzi JL, Johnson MR, Kasper EK, Levy WC, Masoudi FA, McBride PE, McMurray JJV, Mitchell JE, Peterson PN, Riegel B, Sam F, Stevenson LW, Tang WHW, Tsai EJ, Wilkoff BL. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2013;128:e240–e327. Retrieved from: <http://circ.ahajournals.org/content/128/16/e240>

The American College of Cardiology Foundation (ACCF) and the American Heart Association (AHA) have jointly produced guidelines in the area of cardiovascular disease since 1980. The ACCF/AHA Task Force on Practice Guidelines (Task Force), charged with developing, updating, and revising practice guidelines for cardiovascular diseases and procedures, directs and oversees this effort. Writing committees are charged with regularly reviewing and evaluating all available evidence to develop balanced, patient-centric recommendations for clinical practice.