Heart Failure

Purpose

To identify and promote the most important contributors to improved clinical outcomes for adult heart failure in the primary care and hospital settings.

Key Recommendations

- Detection and treatment of risk factors such as hypertension, diabetes, coronary artery disease, dyslipidemia, obesity, smoking and ETOH abuse are critical components to address prevention of heart failure.
- Evaluation of left ventricular function (and ejection fraction) is essential to differentiate heart failure with systolic left ventricular dysfunction or heart failure with preserved left ventricular function.
- For heart failure patients with hypertension, treat to blood pressure target levels: <130/80 mm Hg and <140/90 mm Hg with no diabetes and no kidney disease. [a]
- Use of ACE inhibitors, ARBs, ARNIs, beta-blockers, aldosterone blockers, and SGLT2i is critical to improving symptoms and/or prognosis. Diuretics are important to improving symptoms.
- Optimal dosing of medications is critical to improvements in ejection fraction and mortality; inadequate doses limit potential benefits.
- Referral to heart failure specialist particularly if patient is intolerant to guideline directed therapy or is not responding as expected to guideline therapy.
- Palliative care to address symptoms should be provided concurrently with comprehensive heart failure care.

High Risk Populations/Disparities

- In the Medicare-eligible population (>65 years of age), heart failure (HF) prevalence increased from 90 to 121 per 1000 beneficiaries from 1994 to 2003. Heart failure with reduced ejection fraction and heart failure with preserved ejection fraction (HF*r*EF and HF*p*EF) each make up about half of the overall HF burden. One in 5 Americans will be >65 years of age by 2050. Because HF prevalence is highest in this group, the number of Americans with HF is expected to significantly worsen in the future.[1]
- Behavior risks for cancer, heart disease and stroke include excess body weight, lack of physical activity, poor nutrition and smoking. The table below shows the percentage of Monroe County residents with these risks and the disparities.[2]

Risk Behaviors, Adults Ages 18+, 2012 (% of population)	Monroe County	City	Suburbs	African American	Latino	White
Obese	30	36*	27	38**	41**	27
No physical activity in the past month	16	25*	13	30**	26**	13
Consume 1+ sodas/sugar sweetened beverages per day	23	30*	21	46**	23	20
Consume fruit less than 1 time per day past month	28	33*	26	36**	42**	26
Consume vegetables less than 1 time per day past month	20	30*	16	39**	31**	16
Currently Smoke	16	25*	13	23**	18	15

Heart Failure with Reduced Ejection Fraction Patients

(See page 7 in Guideline for information specific to HF patients with preserved systolic function.)

<table>
<tr><th colspan="7">Evaluation</th></tr>
<tr><td colspan="2">History: Thorough assessment of functional status and activities of daily living
Physical: Thorough assessment of volume state
Initial 12 Lead EKG</td><td colspan="3">Initial Lab Tests: CBC, UA, electrolytes, BUN, creatinine, calcium, TSH, liver function test, glucose, lipid profile, BNP/NT-proBNP (as appropriate) + additional testing depending on patient
Serial Monitoring: Weight, electrolytes, renal function</td><td colspan="2">2D Doppler Echocardiogram
Chest X-Ray: PA + LAT
Evaluate For Ischemia: Cardiac cath & angio: if angina present or revascularization is considered</td></tr>
<tr><th colspan="7">Treatment</th></tr>
<tr><td rowspan="2">Classification
(see page 7 for details)</td><td>ACC/AHA HF Stage</td><td>A*</td><td>B</td><td colspan="2">C</td><td>D</td></tr>
<tr><td>NYHA Functional Class</td><td>None</td><td>I</td><td>II</td><td>III</td><td>IV</td></tr>
<tr><td rowspan="15">Medications</td><td>ACE Inhibitor</td><td>For patients with diabetes, atherosclerosis. Consider for HTN or multiple risk factors</td><td colspan="4">For all patients
(Use of ACE inhibitors for patients with LVEF <40% is often used as a performance measure)
Lack of evidence for ACE and ARB combination therapy</td></tr>
<tr><td>ARB</td><td></td><td colspan="4">If ACE intolerant. Lack of evidence for ACE and ARB combination therapy</td></tr>
<tr><td>ARNI</td><td></td><td colspan="4">In patients with chronic symptomatic HFrEF NYHA class II or III who tolerate an ACE inhibitor or ARB, replacement by ARNI is recommended to further reduce morbidity and mortality.</td></tr>
<tr><td>Beta Blockers</td><td></td><td colspan="4">In all patients (use caution when acutely decompensated/volume overloaded)</td></tr>
<tr><td>Aldosterone Antagonists</td><td>Consider in diabetics who are post-MI with EF<40%, Consider in other patients who also have evidence of CHF (rales, abnormal CXR or S3)[b]</td><td colspan="4">If Class II - IV symptoms, for patients with preserved renal function and normal potassium concentration
in non-diabetics with EF<35%</td></tr>
<tr><td>SGLT2i</td><td></td><td></td><td colspan="3">Consider the addition of dapagliflozin or empagliflozin in patients with and without diabetes for patients receiving guideline directed medical therapy</td></tr>
<tr><td>Ivabradine</td><td></td><td></td><td colspan="3">Can be used to reduce hospitalizations for stable patients in sinus rhythm with a heart rate of greater than 70 bpm receiving GDMT including a beta-blocker at a maximum tolerated dose.</td></tr>
<tr><td>Hydralazine/Long-Acting Nitrate</td><td></td><td colspan="4">If ACE or ARB intolerant; or in addition to standard triple therapy (in black patients)
Standard triple therapy is ACE or ARB, beta blocker, and aldosterone antagonist</td></tr>
<tr><td>Nitrates Alone or with Hydralazine</td><td></td><td colspan="4">Consider on top of ACE inhibitor, beta blocker, diuretics</td></tr>
<tr><td></td><td></td><td colspan="4"></td></tr>
<tr><td>Digitalis</td><td colspan="2"></td><td colspan="3">Consider for symptom relief or rate control–target dig. level <1.0.
If prescribed monitor dig. level, especially in the elderly</td></tr>
<tr><td>Diuretics</td><td colspan="2"></td><td colspan="3">Current or recurring fluid retention</td></tr>
<tr><td>Avoid Drugs that Potentiate HF</td><td colspan="5">In all patients
(Drugs such as, but not limited to: NSAID, glitazones, etanercept)
http://circ.ahajournals.org/content/early/2016/07/11/CIR.0000000000000426</td></tr>
<tr><td>Anticoagulants</td><td colspan="5">If AFib or previous thromboembolic event</td></tr>
<tr><td>Influenza and Pneumococcal and COVID-19 vaccines</td><td colspan="5">In all patients</td></tr>
<tr><td></td><td>Hypertension</td><td colspan="5">Control to guideline goals <130/80 mm Hg and <140/90 mm Hg with no diabetes and no kidney disease</td></tr>
<tr><td></td><td>Atrial Fibrillation</td><td colspan="5">Appropriate rate control; oral anticoagulant</td></tr>
</table>

Chart continued on next page

Classification *(see page 7 for details)*	ACC/AHA HF Stage	A*	B	C		D
	NYHA Functional Class	None	I	II	III	IV
Additional Treatment Considerations	Weight Loss	Recommended if BMI >25 kg/m2				
	Exercise	All qualifying patients should be referred for home based exercise and cardiac rehabilitation.				
	Education - including caregiver(s)	Disease process, medications, signs to react to, daily weights, signs and symptoms of depression				
	Restrict salt & excess fluids	In all patients to appropriate levels				
	Cardiotoxins	Avoidance of smoking, alcohol consumption, and illicit drug use				
	Advance Care Directives	For all patients				
	Case/Disease Mgmt	Monitor daily weights and close symptom surveillance (consider referral for nurse case mgmt.)				
	Telehealth Monitoring	Consider use of telehealth monitoring services for selected patients				
Referrals	Cardiovascular Specialist	Consider a referral to evaluate & treat as indicated				
	Telehealth Monitoring	Consider use of telehealth monitoring services for selected patients				
	Cardiovascular Specialist Palliative Care				Consider to evaluate & treat as indicated	

a. beta blockers recommended for use with heart failure: carvedilol, metoprolol succinate, bisoprolol; b. EPHESUS study on eplerenone; c. Serum K+ and GFR should be monitored periodically; d. Nitrates with Hydralazine recommended in addition to standard therapy for all African-Americans with heart failure. *No symptoms of heart failure, no structural heart disease

Medications

General Approach to Titrating Medicine

- Blood pressure and pulse should be reviewed prior to each dose adjustment
- Aim to achieve recommended target dose of heart failure medications. However, if a patient is unable to tolerate the target dose, continue at the maximum tolerated dose as this may still be beneficial
- Start at a low dose and progressively increase to the recommended target dose or to the maximum tolerated dose
- Intervals between titration vary from 1 to 4 weeks, depending on the patient and medication. Generally increase by doubling the dose every 2 weeks
- Generally, only titrate one medicine at a time however, patients do not have to be maximized on ACEI or ARB before initiating a BB
- Where adverse effects arise consider whether these are likely to be transient (such as dizziness) in which case it is prudent to reattempt an increase in dose at a later stage
- Optimization of medications may take a longer time to achieve in some patients
- Patients over 75 years old with co-morbidities are more likely to experience adverse effects
- Diuretics, such as furosemide, may be used in a flexible manner to achieve the minimum effective dose
- Ensure that clinicians involved with a patient's exercise program are aware of titration as this may impact exercise regime.

To view common drug therapy for use in patients with Heart Failure with Low Ejection Factor, use the following link to the AHA/ASA website and article from *Circulation*.2017; 136:e137-e161, Section 7.3

http://circ.ahajournals.org/content/early/2017/04/26/CIR.0000000000000509

Pharmacokinetics of the Loop Diuretics*

Property	Furosemide	Bumetanide	Torsemide
Bioavailability (%)	10 – 100 (average = 50)	80 – 100	80 – 100
Affected by food	yes	yes	no
Metabolism	50% renal conjugation	50% hepatic	80% hepatic
Half-life (h)			
normal	1.5 – 2	1	3 – 4
renal dysfunction	2.8	1.6	4 – 5
hepatic dysfunction	2.5	2.3	8
heart failure	2.7	1.3	6
Onset (min)			
oral	30 – 60	30 – 60	30 – 60
intravenous	5	2–3	unavailable

Emerging Drug Therapies/Devices

vericiguat	A phase 3 trial of vericiguat in patients with EF of <45% and receiving guideline directed medical therapy demonstrated a statistically significant decrease in the composite endpoint of all-cause mortality and hospitalization from heart failure.
CardioMEMS Champion™ Heart Failure Monitoring System	An FDA approved implantable pulmonary artery (PA) sensor device indicated for wirelessly measuring & monitoring PA pressure and heart rate in NYHA class III patients who have been hospitalized for heart failure in the previous year; hemodynamic data is used for heart failure management. Clinically proven to reduce heart failure hospitalizations by 37% in the Champion clinical trial.

Heart Failure

Palliative Care in Heart Failure

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
	Initial symptoms of HF develop and HF treatment is initiated	Plateau of variable length reached with initial medical management, or following mechanical support or heart transplant	Functional status declines with variable slope; intermittent exacerbations of HF that respond to rescue efforts	Stage D HF, with refractory symptoms & limited function	End of life
NYHA Functional Class - ACC/AHA Stage	II–III - C	II–IV - C/D	IIB - C	IV – C/D	IV – C/D
Decision-making	-Preferences for CPR/defibrillator -Durable power of attorney for health care or proxy	-Defibrillator for primary prevention of SCD? -Durable power of attorney for health care or proxy decision-maker -General goals for care, preferences for unacceptable health states	-Urgent care decisions using doctor's best judgment or clear patient preferences -Are advanced or invasive therapies indicated? -Are advanced therapies consistent with patient preferences?	-Candidate for transplant or destination VAD? -Is palliative care appropriate? -Does patient benefit from inotrope infusion? -Review preferences for CPR/defibrillator	-Clarify goals of care -Site of care (hospital, home, other) -Health care delivery (hospice, other provider) -How to manage death (review CPR decision, review ICD & other devices; if appropriate, plan deactivation)
Supportive care A. Communication	-Understand patient concerns & fears -Identify life-limiting nature of HF -Elicit preferences for care in emergencies or sudden death & for information & role in decision-making -Elicit symptoms and assess QOL	-Elicit symptoms & assess QOL -Re-evaluate resuscitation preferences for care in emergencies -Set goals for care -Identify coping strategies -Re-educate about sodium, weight, & volume status	-Elicit symptoms & QOL -Elicit values & re-evaluate preferences -Identify present status & likely course(s) -Re-evaluate goals of care -Re-educate about sodium, weight, & volume status, medication compliance	-Elicit symptoms -Acknowledge present status -Elicit preferences & reset goals of care -Identify worries -Review appropriate care options & likely course with each -Explore suitability & preferences about surgery or devices	-Elicit desired symptom relief & identify medication for symptom goals -Assistance with delivery of care -Preferences for end-of-life care, site of care, family needs, & capabilities -Plan after death (care of the body, notifications, memorials, burial)
B. Education	-Patient & family self-management (sodium, weight & volume) -Diet, exercise -HF course including sudden death & options for management	-What to do in an emergency -Review self-management	-Review self-management -Review what to do in an emergency -Symptom management -Eliminate NSAIDs	-Optimal management for given care approach - Interventions for deterioration in status -What to do in an emergency	-Likely course & plans for management of events -Symptom management -What to do for worsened or change in status -What to do when death is near & at the time of death
C. Psychosocial & spiritual issues	-Coping with illness -Insurance & financial resources -Insurance & financial resources regarding medications & loss of income -Emotional & spiritual support	-Roles & coping for patient & family -Emotional support -Spiritual support -Social interaction -Evaluate both patient & family anxiety, distress, depression, impaired cognition	-Family stresses & resources -Re-evaluate patient & family needs -Caregiver education & assistance with care -Evaluate cognition & initiate compensation	-Insurance coverage -Re-evaluate stresses, needs, &support patient & family -Address spiritual & existential needs - Support coping with dying	-For both patient & family: -Address anxiety, distress, depression -Address spiritual & existential needs, concerns regarding dying -Anticipatory grief support -Assist in care provision -Post-death bereavement

D. Symptom management	- HF medications for dyspnea -Exercise/endurance training for fatigue -Antidepressant for depression (check Na_ with SSRIs) -Local treatment &/or opioids for pain	-Identify new or worsened symptoms -CPAP/O2 for sleep-disordered breathing -Exercise program (lower extremity strengthening) -Local treatment &/or opioids for pain -SSRI or tricyclic or stimulant for depression	-Oxygen for dyspnea; consider opioids for acute relief of dyspnea -Lower extremity strengthening for dyspnea/fatigue -CPAP/O2 for sleep-disordered breathing -Local treatment &/or opioids for pain -SSRI or tricyclic or stimulant for depression	-Oxygen for dyspnea -Opioids for dyspnea - Lower extremity & inspiratory strengthening -CPAP/O2 for sleep-disordered breathing - Local treatment &/or opioids for pain -Benzodiazepines/counseling for anxiety -Stimulant for depression	-Opioids for dyspnea & pain -Oxygen for dyspnea -Stimulants for fatigue -Benzodiazepines/ counseling for anxiety -Lower extremity strengthening for fatigue & dyspnea -CPAP/O2 for sleep-disordered breathing -Stimulant for depression

CPAP- continuous positive airway pressure; CPR- cardiopulmonary resuscitation; CRT- cardiac resynchronization therapy; CRT/D- cardiac resynchronization therapy defibrillator; EF- ejection fraction; HF - heart failure; ICD - implantable cardioverter-defibrillator; LVAD - left ventricular assist device; LVEF - left ventricular ejection fraction; LVSD - left ventricular systolic dysfunction; NSAID - nonsteroidal anti-inflammatory drug; NYHA - New York Heart Association; QOL - quality of life; SCD - sudden cardiac death; SSRI - selective serotonin reuptake inhibitor; VAD - ventricular assist device.

Classification of Heart Failure

Comparison between ACC/AHA HF Stage and NYHA Functional Class

<table>
<tr><th colspan="2">ACC/AHA HF Stage</th><th colspan="2">NYHA Functional Class</th></tr>
<tr><td>A</td><td>At high risk for heart failure but without structural heart disease or symptoms of heart failure (e.g., patients with hypertension or coronary artery disease)</td><td colspan="2">None</td></tr>
<tr><td>B</td><td>Structural heart disease but without symptoms of heart failure</td><td rowspan="2">I</td><td rowspan="2">Asymptomatic</td></tr>
<tr><td rowspan="3">C</td><td rowspan="3">Structural heart disease with prior or current symptoms of heart failure</td></tr>
<tr><td>II</td><td>Symptomatic with moderate exertion</td></tr>
<tr><td>D</td><td>Refractory heart failure requiring specialized interventions</td><td>III</td><td>Symptomatic with minimal exertion</td></tr>
<tr><td colspan="2"></td><td rowspan="2">IV</td><td rowspan="2">Symptomatic at rest</td></tr>
</table>

Heart Failure with Preserved Systolic Function

Heart failure with preserved systolic function (HFPSF) or “diastolic heart failure” should be differentiated from the presence of “diastolic dysfunction” alone. By definition, HFPSF is a condition with classic findings of congestive failure, with abnormal diastolic and normal systolic function at rest (i.e., normal LV ejection fraction). There are unfortunately limited evidence- based treatment recommendations for HFPSF at the present time. The beneficial class effects of medications used in systolic heart failure have not been proven in diastolic heart failure. The appropriate diagnosis and treatment of underlying diseases that may be causative or contributing to HFPSF is important (e.g., HTN/LVH, CAD/ischemia).

General principles of treatment include:

- Evaluate and treat hypertension with appropriate medications as per recommendations from the *Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8)*. See MCMS Community-wide Guideline for Management of Hypertension).
- Consider the use of spironolactone in selected patients with elevated BNP levels or a HF admission in the last year to reduce hospital admissions. Patients should have a calculated GFR of >30 ml/min, SCr <2.5 mg/dL, and potassium levels of <5.0 mEq/L.
- Rate control is important, particularly in AF. Consider restoration of sinus rhythm in AF patients when appropriate.
- Evaluate for ischemic heart disease and consider coronary revascularization if appropriate.
- Utilize diuretics for control of volume overload (pulmonary congestion, peripheral edema).
- Counseling on low sodium diet is also appropriate in HFPSF patients.

Resources for Physicians

2019 ACC Expert Consensus Decision Pathway on Risk Assessment, Management, and Clinical Trajectory of Patients Hospitalized With Heart Failure: A Report of the American College of Cardiology Solution Set Oversight Committee. J Am Coll Cardiol. 2019 Oct, 74 (15) 1966–2011.

2017 ACC/AHA/HFSA Focused Update Guideline for the Management of Heart Failure (most current version)
American Heart Association
The American Heart Association is a national voluntary health agency to help reduce disability and death from cardiovascular diseases and stroke.

- Get With The Guidelines®- An in-hospital program for improving care by promoting consistent adherence to the latest scientific treatment guidelines
- CV Risk Calculator - a companion tool to the 2013 ACC/AHA Guideline on the Assessment of Cardiovascular Risk (Available as a downloadable spreadsheet, free Smartphone apps or launch web version.)

Million Hearts®
An initiative of the Department of Health and Human Services to prevent 1 million heart attacks and strokes by 2017; co-led by CDC and the Centers for Medicare & Medicaid Services. The initiative brings together communities, health care professionals, health systems, nonprofit organizations, federal agencies, and private-sector partners to improve care and empower Americans to make heart-healthy choices

Quality Measures Commonly Used by National Organizations

- ACE Inhibitor or ARB Therapy for Left Ventricular Systolic Dysfunction: Percentage of patients aged 18 years and older with a diagnosis of heart failure with a current or prior left ventricular ejection fraction <40% who were prescribed ACE inhibitor or ARB therapy either within a 12 month period when seen in the outpatient setting OR at each hospital discharge. *MIPS)*
- Beta-Blocker Therapy for Left Ventricular Systolic Dysfunction: Percentage of patients aged 18 years and older with a diagnosis of heart failure with a current or prior left ventricular ejection fraction < 40% who were prescribed beta-blocker therapy either within a 12 month period when seen in the outpatient setting OR at each hospital discharge. *(MIPS, ACO)*
- Documentation of Current Medications in the Medical Record: Percentage of visits for patients aged 18 years and older for which the eligible professional attests to documenting a list of current medications using all immediate resources available on the date of the encounter. This list must include ALL known prescriptions, over-the-counters, herbals, and vitamin/mineral/dietary (nutritional) supplements AND must contain the medications' name, dosage, frequency and route of administration. *(MIPS, ACO)*
- Functional status assessment for complex chronic conditions: Percentage of patients aged 65 years and older with heart failure who completed initial and follow-up patient-reported functional status assessments. *(CMS)*
- Care Plan: Percentage of patients aged 65 years and older who have an advance care plan or surrogate decision maker documented in the medical record or documentation in the medical record that an advance care plan was discussed but the patient did not wish or was not able to name a surrogate decision maker or provide an advance care plan.*(MIPS)*

Resources for Patients

American Heart Association
The American Heart Association is a national voluntary health agency to help reduce disability and death from cardiovascular diseases and stroke. Provides online tools and resources, e-newsletters, and interactive library.

Centers for Disease Control and Prevention
Provides educational fact sheets and podcasts

Medline Plus
A service of the U.S. National Library of Medicine, National Institutes of Health. Provides online information about heart failure.

References

Yancy CW, Jessup M, Bozkurt B, et al. 2017 ACC/AHA/HFSA Focused Update Guideline for the Management of Heart Failure Journal of the American College of Cardiology Volume 70, Issue 6, August 2017DOI: 10.1016/j.jacc.2017.04.025

Adamson PB, Abraham WT, Aaron M et al., Impact of Wireless Pulmonary Artery Pressure Monitoring on Heart Failure Hospitalizations and 30-Day Readmissions in Medicare-Eligible Patients with NYHA Class III Heart Failure: Results from the CHAMPION Trial AHA 2014, Chicago. Abstract 16744.

American Diabetes Association Standard of Medical Care in Diabetes – 2018. Diabetes Care 2018 18;41 (Suppl.1): S1-S159

Butler J, Ezekowitz JA, et al., Update on aldosterone antagonists use in heart failure with reduced left ventricular ejection fraction. Heart Failure Society of America Guidelines Committee. J Card Fail. 2012 Apr;18(4):265-81

Centers for Disease Control and Prevention, National Center for Immunization and Respiratory Diseases (NCIRD), Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/flu/heartdisease/

Combination of Isosorbide Dinitrate and Hydralazine in Blacks with Heart Failure, New England Journal of Medicine. 2004; 351:2049-2057

Monroe County, New York 2016-2018 Community Health Improvement Plan Available at: https://www2.monroecounty.gov/files/health/DataReports/Community%20Health%20Improvement%20Plan%2C%20Monroe%20County%2C%20NY%20%202016-2018%20.pdf

Farrell MH, Foody JM, Krumholz HM, β-Blockers in Heart Failure: Clinical Applications. JAMA. 2002; 287(7):890-897

Goodlin SJ. Palliative Care in Congestive Heart Failure. JACC.Vol.54, No. 5, 2009.

Implications of Recent Clinical trials for the NCEP ATP III Guidelines, Circulation. 2004; 110:227-239

Lindenfeld J, Albert NM, et al. Executive Summary: HFSA 2010 Comprehensive Heart Failure Practice Guideline. J Card Fail 2010; 16:475e539

McMurray JV, Adamopoulos S, et al. ESC Guidelines for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012, European Heart Journal 2012; doi:10.1093/eurheart/ehs104; advance access published May 19, 2012

SCD-HeFT: The Sudden Cardiac Death in Heart Failure Trial, American College of Cardiology. March 8, 2004.