

## Section 2: Conceptualization and Working Definition of Heart Failure

Heart failure (HF) remains a major and growing societal problem despite advances in detection and therapy.<sup>1-4</sup> However, there is no widely accepted characterization and definition of HF, probably because of the complexity of the syndrome. The conceptualization and working definition of HF presented here emerged as these guidelines were developed. They are critical to understanding HF and approaching its treatment appropriately.

**Conceptual Background.** HF is a syndrome rather than a primary diagnosis. It has many potential etiologies, diverse clinical features, and numerous clinical subsets. Patients may have a variety of primary cardiovascular diseases and never develop cardiac dysfunction, and those in whom cardiac dysfunction is identified through testing may never develop clinical HF. In addition to cardiac dysfunction, other factors, such as vascular stiffness, dyssynchrony, and renal sodium handling, play major roles in the manifestation of the syndrome of HF.

Patients at risk for many cardiovascular diseases are at risk for HF. Early identification and treatment of risk factors is perhaps the most significant step in limiting the public health impact of HF.<sup>5-7</sup> Emphasis on primary and secondary prevention is particularly critical because of the difficulty of successfully treating left ventricular (LV) dysfunction, especially when severe.<sup>5</sup> Current therapeutic advances in the treatment of HF do not make prevention any less important.

Although HF is progressive, current therapy may provide stability and even reversibility. The inexorable progression of HF from LV remodeling and dysfunction is no longer inevitable. Prolonged survival with mild to moderate LV dysfunction is now possible. Therapy with angiotensin-converting enzyme inhibitors (or angiotensin receptor blockers), beta blockers, and cardiac resynchronization therapy can lead to slowing or to partial reversal of remodeling.

Because of this prolonged survival, comorbid conditions, such as coronary artery disease or renal failure, can progress, complicating treatment. Given this prolonged survival, considerable attention is devoted in this guideline to disease management, the use of multidrug therapy, and the management of patients with HF at the end of life.

**Working Definition.** Although HF may be caused by a variety of disorders, including valvular abnormalities and dysrhythmias, the following comprehensive guideline and this working definition focus on HF primarily

Table 2.1. Additional HF Definitions

“HF With Reduced Left Ventricular Ejection Fraction (LVEF)” Sometimes: “HF With a Dilated Left Ventricle”	A clinical syndrome characterized by signs and symptoms of HF and reduced LVEF. Most commonly associated with LV chamber dilation.
“HF With Preserved LVEF” Sometimes: “HF With Nondilated LV”	A clinical syndrome characterized by signs and symptoms of HF with preserved LVEF. Most commonly associated with a nondilated LV chamber. May be the result of valvular disease or other causes (Section 11).
“Myocardial Remodeling”	Pathologic myocardial hypertrophy or dilation in response to increased myocardial stress. These changes are generally accompanied by pathologic changes in the cardiac interstitium. Myocardial remodeling is generally a progressive disorder.

from the loss or dysfunction of myocardial muscle or interstitium.

**HF is a syndrome caused by cardiac dysfunction, generally resulting from myocardial muscle dysfunction or loss and characterized by either LV dilation or hypertrophy or both. Whether the dysfunction is primarily systolic or diastolic or mixed, it leads to neurohormonal and circulatory abnormalities, usually resulting in characteristic symptoms such as fluid retention, shortness of breath, and fatigue, especially on exertion. In the absence of appropriate therapeutic intervention, HF is usually progressive at the level of both cardiac function and clinical symptoms. The severity of clinical symptoms may vary substantially during the course of the disease process and may not correlate with changes in underlying cardiac function. Although HF is progressive and often fatal, patients can be stabilized and myocardial dysfunction and remodeling may improve, either spontaneously or as a consequence of therapy. In physiologic terms, HF is a syndrome characterized by either or both pulmonary and systemic venous congestion and/or inadequate peripheral oxygen delivery, at rest or during stress, caused by cardiac dysfunction.**

### Additional Definitions

HF is often classified as HF with reduced systolic function versus HF with preserved systolic function. Myocardial remodeling often precedes the clinical syndrome of HF. Additional definitions are provided in Table 2.1. A table of acronyms and their meaning is provided in Appendix B.

### Disclosures

See Appendix C.

## References

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## Appendix B. Acronyms

Acronym	Meaning
ACE	angiotensin converting enzyme
ADA	American Diabetes Association
ADHF	acute decompensated heart failure
AF	atrial fibrillation
AHA/ACC	American Heart Association/American College of Cardiology
ALVD	asymptomatic left ventricular dysfunction
ARB	angiotensin receptor blocker
ARVD/C	arrhythmogenic right ventricular dysplasia/ cardiomyopathy
AV	arteriovenous
BMI	body mass index
BNP	B-type natriuretic peptide
BUN	blood urea nitrogen
CABG	coronary artery bypass graft
CAD	coronary artery disease
CHD	congenital heart disease
CI	confidence interval
CK-MM	creatinine kinase MM isoenzyme
COPD	chronic obstructive pulmonary disease
COX-2	cyclooxygenase-2
CPAP	continuous positive airway pressure
CPR	cardiopulmonary resuscitation
CR/XL	controlled release/extended release
CREST	a limited cutaneous form of scleroderma defined by calsinosis, Raynaud's syndrome, esophageal dysmotility, sclerodactyly, and telangiectasia
CRT	cardiac resynchronization therapy
CRT-D	cardiac resynchronization therapy device and defibrillator
CTR	cardiothoracic ratio
DASH	Dietary Approaches to Stop Hypertension
DBP	diastolic blood pressure
DCM	dilated cardiomyopathy
DNR	do not resuscitate
DVT	deep venous thrombosis
ECG	electrocardiogram
ED	emergency department
EP, EPS	electrophysiology, electrophysiology study
EVCPP	endoventricular circular patch plasty
FDC	familial dilated cardiomyopathy
GFR, eGFR	glomerular filtration rate, estimated glomerular filtration rate
HCM	hypertrophic cardiomyopathy
HF	heart failure
HFSA	Heart Failure Society of America
HR	hazard ratio
ICD	implantable cardioverter defibrillator
INR	international normalized ratio
JVP	jugular venous pressure
LA	left atrial
LMWH	low molecular weight heparin
LV	left ventricular
LVAD	left ventricular assist device
LVEF	left ventricular ejection fraction
LVH	left ventricular hypertrophy
LVNC	left ventricular noncompaction
MI	myocardial infarction
MRI	magnetic resonance imaging
NCEP	National Cholesterol Education Program
NIV	non-invasive ventilation
NSAID	non-steroidal anti-inflammatory drug
NT-proBNP	N-terminal pro-B-type natriuretic peptide
NYHA	New York Heart Association
OMIM	Online Mendelian Inheritance in Man (online resource)
OU	observation unit
PCI	percutaneous coronary intervention
PCWP	pulmonary capillary wedge pressure
PE	pulmonary embolism
PET-CT	positron emission tomography — computed tomography
PMI	point of maximal impulse
PND	paroxysmal nocturnal dyspnea

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## Appendix B. (continued)

PPAR- $\alpha$	peroxisome proliferator-activated receptor-alpha
PUFA	polyunsaturated fatty acids
PVC	premature ventricular contraction
QTc	QT interval corrected for heart rate
RAAS	renin-angiotensin-aldosterone system
RCM	restrictive cardiomyopathy
RV	right ventricular
SAECG	signal-averaged electrocardiogram
SAVER	surgical anterior ventricular endocardial restoration
SBP	systolic blood pressure
SCD	sudden cardiac death
SDC	serum digoxin concentration
SPECT	single-photon emission computed tomography
SSRI	selective serotonin reuptake inhibitors
STEMI	ST-elevation myocardial infarction
TNF- $\alpha$	tumor necrosis factor-alpha
UFH	unfractionated heparin
USDA	United States Department of Agriculture
VE/VCO <sub>2</sub>	ventilation equivalent of carbon dioxide (production slope)
VF	ventricular fibrillation
VT	ventricular tachycardia
<b>Clinical Trials</b>	
<b>Acronym</b>	<b>Full Trial Name</b>
ACCOMPLISH	Avoiding Cardiovascular Events Through Combination Therapy in Patients Living with Systolic Hypertension
ADHERE	Acute Decompensated Heart Failure National Registry (Registry)
AFFIRM	Atrial Fibrillation Follow-Up Investigation of Rhythm Management
A-HeFT	African-American Heart Failure Trial
ALLHAT	Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial
ALOFT	Aliskiren Observation of Heart Failure Treatment
B-CONVINCED	Beta Blocker Continuation Versus Interruption on Patients with Congestive Heart Failure Hospitalized for a Decompensation Episode
CANPAP	Canadian Continuous Positive Airway Pressure for Patients with Central Sleep Apnea and Heart Failure
CAPRICORN	Carvedilol Post-Infarct Survival Control in Left Ventricular Dysfunction
CARE-HF	Cardiac Resynchronization-Heart Failure
CHARM	Candesartan in Heart Failure Assessment of Reduction in Mortality and Morbidity (Also CHARM-Added, CHARM-Alternative, CHARM-Preserved)
CIBIS	Cardiac Insufficiency Bisoprolol Study
COACH	Coordinating Study Evaluating Outcomes of Advising and Counseling in Heart Failure
COMET	Carvedilol or Metoprolol European Trial
COMPANION	Comparison of Medical Therapy, Pacing, and Defibrillation in Chronic Heart Failure
CONSENSUS II	Cooperative New Scandinavian Enalapril Survival Study II
COPERNICUS	Carvedilol Prospective Randomized Cumulative Survival Study
DIG	Digitalis Investigation Group
EFFECT	Enhanced Feedback for Effective Cardiac Treatment (Evaluation Tool)
EPHESUS	Eplerone Post-Acute Myocardial Infarction Heart Failure Efficacy and Survival Study
ESCAPE	Evaluation Study of Congestive Heart Failure and Pulmonary Artery Catheterization Effectiveness
EUROPA	European Trial on Reduction of Cardiac Events with Perindopril in Stable Coronary Artery Disease
FAIR-HF	Ferinject Assessment in Patients with Iron Deficiency and Chronic Heart Failure
GISSI	Gruppo Italiano Per Lo Studio Della Sopravvivenza Nell'infarto Miocardico (GISSI-Prevenzione, GISSI-HF)
GUSTO-1	Global Utilization of Streptokinase and Tissue Plasminogen Activator for Occluded Coronary Arteries

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**Appendix B.** *(continued)*


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HEART	Heart Failure Revascularization Trial
HELP	Hospitalized Elderly Longitudinal Project
HERS	Heart and Estrogen/Progestin Replacement Study
HF-ACTION	A Controlled Trial Investigating Outcomes of Exercise Training
HOBIPACE	Homburg Biventricular Pacing Evaluation
HOPE	Heart Outcomes Prevention Evaluation
HOT	Hypertension Optimal Treatment
INTERMACS	Interagency Registry for Mechanically Assisted Circulatory Support (Registry)
I-PRESERVE	Irbesartan in Heart Failure with Preserved Ejection Fraction
IRON-HF	Iron Supplementation in Heart Failure Patients with Anemia
ISIS-4	Fourth International Study of Infarct Survival
MADIT-CRT	Multi-Center Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy
MERIT-HF	Metoprolol CR?XL Randomized Intervention Trial in Congestive Heart Failure
MIRACLE	Multicenter Insync Clinical Study
MTT	Myocarditis Treatment Trial
MUSTT	Multicenter Unsustained Tachycardia Trial
NHANES	National Health and Nutrition Examination Survey Epidemiologic Follow-Up Study
OAT	Occluded Artery Trial
OPTIMAAL	Optimal Trial in Myocardial Infarction with the Angiotensin II Antagonist Losartan
OPTIME-HF	Outcomes of a Prospective Trial of Intravenous Milrinone for Exacerbations of Chronic Heart Failure
OPTIMIZE-HF	Organized Program to Initiate Lifesaving Treatment in Hospitalized Patients with Heart Failure (Registry)
PRIDE	N-Terminal Pro-BNP Investigation of Dyspnea in the Emergency Department
PRIMA	Can Pro-Brain-Natriuretic-Peptide Guided Therapy of Chronic Heart Failure Improve Heart Failure Morbidity and Mortality?
PROVED	Prospective Randomized Study of Ventricular Function and Efficacy of Digoxin
RADIANCE	Randomized Assessment of Digoxin on Inhibitors of the Angiotensin Converting System
RALES	Randomized Aldactone Evaluation Study
RED-HF	Reduction of Events with Darbepoetin Alfa in Heart Failure
REMATCH	Randomized Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure
REVERSE	Resynchronization Reverses Remodeling in Systolic Left Ventricular Dysfunction
REVERT	Reversal of Ventricular Remodeling with Toprol-XL
SCD-HeFT	Sudden Cardiac Death in Heart Failure Trial
SENIORS	Study of the Effects of Nebivolol Intervention on Outcomes and Rehospitalization in Seniors with Heart Failure
SOLVD	Studies of Left Ventricular Dysfunction
STARS-BNP	Systolic Heart Failure Treatment Supported By BNP
STICH	Surgical Treatment for Ischemic Heart Failure
SUPPORT	Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment
TIME-CHF	Trial of Intensified Vs Standard Medical Therapy in Elderly Patients with Congestive Heart Failure
UKPDS	United Kingdom Prospective Diabetes Study
Val-HeFT	Valsartan Heart Failure Trial
VALIANT	The Valsartan in Acute Myocardial Infarction Trial
V-HeFT	Vasodilator Heart Failure Trial
VMAC	Vasodilator in the Management of Acute Heart Failure
WASH	Warfarin/Aspirin Study in Heart Failure
WATCH	Warfarin and Antiplatelet Therapy in Chronic Heart Failure

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