PALLIATIVE CARE NETWORK OF WISCONSIN

FAST FACTS AND CONCEPTS #143
PROGNOSTICATION IN HEART FAILURE

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Background This *Fast Fact* reviews prognostication data in Heart Failure (HF). Although the Framingham Heart Study (1990-1999) showed a 5-year mortality rate of 50% for newly identified cases, providing accurate prognostic data for 6-12 month mortality in HF has been nearly impossible. Reasons cited include: 1) an unpredictable disease trajectory with high incidence (25-50%) of sudden death; 2) disparities in the application of evidence-based treatment guidelines; 3) inter-observer differences in New York Heart Association (NYHA) classification; and 4) heterogeneous study populations

NYHA Classification The NYHA classification remains the major gauge of disease severity. Based on data from SUPPORT, Framingham, IMPROVEMENT, and other studies, 1-year mortality estimates are:

- Class II (mild symptoms): 5-10%.
- Class III (moderate symptoms): 10-15%.
- Class IV (severe symptoms): 30-40%.

General Predictors of Shorter Prognosis:

- Cardiac hospitalization (triples 1-year mortality; nearly 1 in 10 die within 30 days of admission).
- Intolerance to neurohormonal therapy (i.e. beta-blockers or ACE-inhibitors) is associated with high 4 month mortality
- Elevated BUN (defined by upper limit of normal) and/or creatinine ≥1.4 mg/dl (120 µmol/l).
- Systolic blood pressure <100 mm Hg and/or pulse >100 bpm (each doubles 1-year mortality).
- Decreased left ventricular ejection fraction (linearly correlated with survival at LVEF ≤ 45%).
- Ventricular dysrhythmias, treatment resistant.
- Anemia (each 1 g/dl reduction in hemoglobin is associated with a 16% increase in mortality).
- Hyponatremia (serum sodium ≤135-137 mEq/l).
- Cachexia or reduced functional capacity.
- Orthopnea.
- Co-morbidities: diabetes, depression, COPD, cirrhosis, cerebrovascular disease, and cancer

Hospice Eligibility Guidelines The National Hospice and Palliative Care Organization's 1996 guidelines for heart disease admission criteria include: a) symptoms of recurrent HF at rest (NYHA class IV) *and* b) optimal treatment with ACE inhibitors, diuretics, and vasodilators (*contemporary optimal treatment now includes β-blockers, aldosterone antagonists, and device therapies*). The NHPCO guide indicates that an ejection fraction ≤ 20% is "helpful supplemental objective evidence," but not required. The NHPCO guidelines also assert that each of the following further decreases survival: treatment resistant ventricular or supraventricular arrhythmias, history of cardiac arrest in any setting, history of unexplained syncope, cardiogenic brain embolism, and concomitant HIV disease.

Prognostic Models Since publication of the NHPCO's guidelines, several models have been developed for predicting short- and/or long-term mortality among HF patients. Two recent models purport to predict mortality among patients *hospitalized with acutely decompensated HF.* Fonarow et al (2005), using a model based on admission BUN (≥ 43 mg/dl), creatinine (≥ 2.75 mg/dl), and systolic BP (< 115 mmHg), identified in-hospital mortality rates ranging from about 2% (0/3 risk factors) to 20% (3/3 risk factors). Lee et al (2003), using a model based on admission physiologic variables and co-morbidities (almost all from above list of indicators) identified 30-day mortality and 1-year mortality rates ranging from <1% and <10%, respectively, for the lowest risk patients to >50% and >75%, respectively, for the highest risk patients. While both models are applicable to bedside use, neither has been applied prospectively or in independent patient samples, nor do they address HF treatments as predictive variables. More recently, Levy et al (2006) developed a 24-variable risk model using the PRAISE1 (*n*=1125) database and validated it on preexisting ELITE2, ValHeFT, UW, RENAISSANCE, and IN-CHF (*n*=9942) databases. The model purports to accurately estimate mean 1-, 2-, and 3-year survival and, importantly, *dynamically* incorporates clinical and laboratory variables, HF medications, and device therapies. It awaits

independent, prospective evaluation in unselected HF patients. A web-based interactive calculator can be accessed at http://www.seattleheartfailuremodel.org.

Bottom Line Meticulous application of medication and device therapies can and will continue to change HF prognosis. HF follows an unpredictable disease trajectory, one which is highly mutable by application of evidence-based therapies, yet still marked by a high incidence of sudden death. The 1996 NHPCO criteria are not accurate predictors of 6-month mortality. Several models have recently been developed to aid in determining short- and long-term mortality in HF patients. These models await independent, prospective validation in unselected ambulatory HF patients and will need periodic updating to control for continually evolving standards of HF care. At present, accurate prognostication remains problematic.

References

1. Anand I, McMurray JJV, Whitmore J. Anemia and its relationship to clinical outcome in heart failure. *Circulation.* 2004; 110:149-154.
2. Anker SD, Ponikowski P, Varney S, et al. Wasting as an independent risk factor for mortality in chronic heart failure. *Lancet.* 1997; 349:1050-1053.
3. Curtis JP, Sokol SI, Wang Y, et al. The association of left ventricular ejection fraction, mortality, and cause of death in stable outpatients with heart failure. *J Am Coll Cardiol.* 2003; 42(4): 736-742.
4. Fonarow GC, Adams KF, Abraham WT, et al. Risk stratification for in-hospital mortality in acutely decompensated heart failure. *JAMA*. 2005;2 93(5):572-580.
5. Horwich TB, Fonarow GC, Hamilton MA, et al. Anemia is associated with worse symptoms, greater impairment in functional capacity and a significant increase in mortality in patients with advanced heart failure. *J Am Coll Cardiol.* 2002; 39(11):1780-1786.
6. Kearney MT, Fox KAA, Lee AJ. Predicting death due to progressive heart failure in patients with mild-to-moderate chronic heart failure. *J Am Coll Cardiol*. 2002; 40(10):1801-1808.
7. Lee DS, Austin PC, Rouleau JL, et al. Predicting mortality among patients hospitalized for heart failure. *JAMA.* 2003; 290(19):2581-2587.
8. Levenson JW, McCarthy EP, Lynn J, et al. The last six months of life for patients with congestive heart failure. *J Am Geriatr Soc.* 2000; 48(Suppl 5):S101-S109.
9. Levy D, Kenchaiah S, Larson MG, et al. Long-term trends in the incidence of and survival with heart failure. *NEJM.* 2002; 347(18):1397-1402.
10. Levy WC, Mozaffarian D, Linker DT, et al. The Seattle Heart Failure Model. Prediction of Survival in Heart Failure. *Circulation*. 2006; 113:1424-1433.
11. Muntwyler J, Abetel G, Gruner C, et al. One-year mortality among unselected outpatients with heart failure. *Eur Heart J.* 2002; 23:1861-1866.
12. Stuart B, et al. *Medical Guidelines for determining prognosis in selected non-cancer diseases*. 2nd Edition. Alexandria, VA: National Hospice Organization; 1996.
13. Zannad F, Briancon S, Julliere Y. Incidence, clinical and etiologic features, and outcomes of advanced chronic heart failure: the EPICAL study. *J Am Coll Cardiol.* 1999; 33(3):734-742.
14. Desai AS, Stevenson LW. There must be a better way: piloting alternate routes around heart failure hospitalizations. *J of Am Coll of Card*. 2013; 61(2):127-30.

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