

Are Renal Function Markers Predictors of Mortality in Patients with Decompensated Heart Failure?

Aronson D, Mittleman MA, Burger AJ. Elevated blood urea nitrogen level as a predictor of mortality in patients admitted for decompensated heart failure. Am J Med 2004;116:466–73.

Study Overview

Objective. To determine the long-term prognostic importance of laboratory markers associated with renal dysfunction in patients admitted with acute decompensated heart failure.

Design. Evaluation of 2 prospective cohorts of patients enrolled in 2 randomized controlled trials.

Setting and participants. 541 patients previously diagnosed with heart failure (ie, 96% with New York Heart Association class III or IV symptoms) admitted to the hospital with clinical decompensation.

Main outcome measures. The main outcome measure was mortality as measured by the National Death Index. Blood urea nitrogen (BUN), serum creatinine, BUN:creatinine ratio, and estimated creatinine clearance were measured. Secondary outcome measures included neurohormone levels known to be elevated in patients with acutely decompensated heart failure.

Main results. Of the 541 patients enrolled in the 2 trials, 177 (33%) died during the follow-up period. Patients were followed for an average of 343 ± 185 days. While all 4 markers of renal function were associated with mortality on univariate analyses, only elevated BUN and elevated BUN:creatinine ratio were associated with increased risk of mortality on adjusted analyses. Patients in the highest quartile of BUN had 2.3 times the risk of death (95% confidence interval, 1.3–4.5; $P = 0.005$) during follow-up compared with patients in the lowest quartile; BUN:creatinine ratio had similar prognostic value. Of the 4 neurohormones, 2 were correlated with elevated BUN and creatinine level, while the remaining 2 markers were not associated with declining renal function.

Conclusion. Elevated BUN level in patients with acutely decompensated heart failure is an independent predictor of long-term mortality. Whether these patients need more aggressive therapy to reduce their risk of death needs further study.

Commentary

Congestive heart failure (CHF) is the most common and expensive cause of admission among elderly Americans. Its incidence is rising due to increasing rates of diabetes, hypertension, and coronary disease and an aging population. Although morbidity and mortality rates are high, increased use of angiotensin-converting enzyme inhibitors and β blockers and advances in the management of underlying risk factors have improved the prognosis for CHF patients. Nevertheless, major challenges remain.

One critical challenge facing clinicians is how to determine which patients are at high risk. Poor renal function plays a role. Clinical studies suggest that poor renal function and heart failure create a vicious circle—worsening heart failure decreases perfusion to the kidneys, and consequently worsening renal function leads to neurohormonal activation that worsens heart failure [1]. It is in this context that Aronson and colleagues studied the effect of renal dysfunction in acutely decompensated heart failure.

It is not a surprise that elevated BUN levels at admission portend poor long-term outcomes; this association has also been found in ambulatory patients. The degree to which higher BUN increases the risk of mortality, even when adjusting for all other known risk factors for heart failure, is surprising. Patients in the highest BUN group had more than twice the risk of death, independent of other comorbidities. Also surprising is that while elevated BUN and elevated BUN:creatinine ratio were both predictive of worse outcomes, elevated creatinine alone was not. Elderly patients, and especially those with chronic diseases (eg, heart failure), experience significant muscle loss [2]. Since serum creatinine levels are correlated with muscle mass, it is possible that sicker patients have lower muscle mass and therefore lower baseline creatinine. As a result, the elevation of creatinine due to renal dysfunction is masked. This inability to differentiate between those with or without renal dysfunction using creatinine levels biases the results towards a null finding.

Applications for Clinical Practice

Elevated BUN level independent of other clinical factors

increases risk of death in patients with acutely decompensated heart failure. The exact value of this prognostic factor is not clear. It is uncertain whether attempts to maintain renal perfusion or treatment with more aggressive therapies in these patients will lead to better clinical outcomes.

—Review by Ashish K. Jha, MD

References

1. Shlipak MG. Pharmacotherapy for heart failure in patients with renal insufficiency. *Ann Intern Med* 2003;138:917–24.
2. Janssen I, Shepard DS, Katzmarzyk PT, Roubenoff R. The healthcare costs of sarcopenia in the United States. *J Am Geriatr Soc* 2004;52:80–5.

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