

A NEW WAY TO DIAGNOSE CONGESTIVE HEART FAILURE

Not an obvious diagnosis

Congestive heart failure (CHF) is the leading cause of admission to hospital, but its diagnosis is not always obvious. Emergency physicians and other clinicians are often challenged with difficult cases involving patients who present with shortness of breath. CHF can be a major cause of this symptom, however, other causes include chronic obstructive pulmonary disease (COPD) and infections. Like CHF, these other causes are not always evident. The results of the Breathing Not Properly multinational study shed light on the use of plasma aminoterminal brain natriuretic peptide (BNP) in the diagnosis of CHF.

Breathing Not Properly trial results

In this study, 1,586 patients presenting to the emergency department with shortness of breath

as their primary complaint, were evaluated in a prospective, blinded fashion. Using enzyme evaluations and echocardiogram, myocardial infarction was excluded as a cause. Other possible causes, such as blunt trauma, were also excluded. BNP, a hormone produced by the ventricle in response to increasing stretch or volume overload, was measured and evaluated. The gold standard was set by two cardiologists who applied their own judgments and clinical criteria in their task. (One can argue that the gold standard may not be perfect, but it is the best measuring mechanism available.) Patients were divided into three groups:

- Group 1: Patients with shortness of breath related to CHF;
- Group 2: Patients with a history of CHF whose shortness of breath was unrelated to CHF or secondary to other causes, such as pneumonia, COPD, *etc.*; and
- Group 3: Patients whose shortness of breath was not at all due to CHF.

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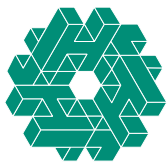


Table 1

BNP level and associated New York Heart Association functional class

Average BNP level	NYHA class
150 pg/mL	I
250 pg/mL	II
550 pg/mL	III
900 pg/mL	IV

BNP: plasma aminoterminal brain natriuretic peptide

McCullough PA, Hollander JE, Nowak RM, et al: Uncovering heart failure in patients with a history of pulmonary disease: Rationale for the early use of B-type natriuretic peptide in the emergency department. *Acad Emerg Med* 2003; 10(3): 198-04.

Seventy-four per cent of physicians used their clinical judgment to come up with the right diagnosis, but adding BNP improved the accuracy to 81%. BNP is most helpful when physicians are uncertain of the diagnosis. Using Bayesian analysis, if physicians are unsure of the pretest probability of the shortness of breath being caused by CHF, a high BNP brings the probability up to 90%, while a low value brings it down to 10%. This analysis can be very useful.


In patients with CHF, the BNP averaged 600 pg/mL, while in those whose shortness of breath was unrelated to CHF, the result was less than 50 pg/mL. An intermediate value of 150 pg/mL was seen in Group 2 (*i.e.*, individuals with a history of heart failure), however, their shortness of breath was due to a noncardiac condition. It is also important to note that heart failure severity and BNP correlated extremely well.

Physician's Perspective

The vast majority of patients who present with shortness of breath do not need to have their BNP level measured. If your patient has obvious heart failure, proven radiologically and by examination, BNP level does not help in the diagnosis. However, it may help guide therapy and determine prognosis. This study does not address these issues well, but further research in this area is underway.

If the patient clearly has another obvious cause for the shortness of breath, BNP adds very little. In many patients the diagnosis is unclear; a BNP level > 100 pg/mL has a sensitivity of 90% and a specificity of 74%. Applying Bayesian analysis can increase diagnosis accuracy to close to 90%. Having a low BNP value brings down the post-test probability of CHF to > 10%. Table 1 shows the functional class associated with different BNP levels.

BNP measurement appears extremely valuable and will certainly have important implications in the future diagnosis of CHF.

In addition, BNP levels may also add important prognostic information on patient management strategies. The assay is currently available in 500 hospitals in the U.S. and costs approximately \$30 per test. Hopefully the assay will soon be made readily available in Canada. 

Suggested Reading

1. McCullough PA, Hollander JE, Nowak RM, et al: Uncovering heart failure in patients with a history of pulmonary disease: Rationale for the early use of B-type natriuretic peptide in the emergency department. *Acad Emerg Med* 2003; 10(3):198-04.