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LANCET LABORATORIES Rwanda

Newsletter

NATRIURETIC PEPTIDES IN PATIENTS WITH HEART FAILURE

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Introduction:

Cleavage of the prohormone proBNP (B-type natriuretic peptide) produces biologically active 32 amino acid BNP and biologically inert 76 amino acid N-terminal pro-BNP (NT-proBNP). Atrial natriuretic peptide (ANP) is a hormone that is released from myocardial cells in the atria, and in some cases the ventricles in response to volume expansion. The circulating concentration of BNP is less than 20% of that of ANP in normal subjects but can equal or exceed that of ANP in patients with heart failure (HF). The wider range of concentrations makes BNP a more useful measurement than ANP in the evaluation of patients with HF, thus there is more clinical experience with BNP. Mid- regional pro-atrial natriuretic peptide (MR-proANP) is available at some specialised institutions.

- -proBNP is the most frequently measured peptide in commercial laboratories, including Lancet Laboratories, due to its analytical stability. It has also been used in many clinical trials, and so is useful to the physician to optimise patient management.

Natriuretic peptides (NPs) in heart failure

Plasma concentrations of NPs are recommended as initial diagnostic tests in patients with symptoms suggestive of HF to rule out the diagnosis. Elevated concentrations support a diagnosis of HF, are useful for prognosis, and may guide further cardiac investigations. However, it should be noted that there are many causes of elevated NPs that may reduce their diagnostic accuracy in patients with suspected HF (**see Table 1**).

Table 1: Causes of elevated concentrations of natriuretic peptides[2]

Cardiac

- Heart failure
- Acute Coronary Syndrome (ACS) Pulmonary embolism Myocarditis
- Left ventricular hypertrophy
- Hypertrophic or restrictive cardiomyopathy Valvular heart disease
- Congenital heart disease
- Atrial and ventricular tachyarrhythmias Heart contusion
- Cardioversion, ICD shock
- Surgical procedures involving the heart Pulmonary hypertension

Non-cardiac

- Advanced age
- Ischaemic stroke
- Subarachnoid hemorrhages
- Renal dysfunction
- Liver dysfunction, mainly liver cirrhosis with ascites
- Paraneoplastic syndrome
- COPD
- Severe infections (including pneumonia and sepsis)
- Severe burns
- Anemia
- Severe metabolic and hormone abnormalities (e.g. thyrotoxicosis, diabetic ketosis)

- **COPD = chronic obstructive pulmonary disease;**
- **ICD = implantable cardioverter-defibrillator**

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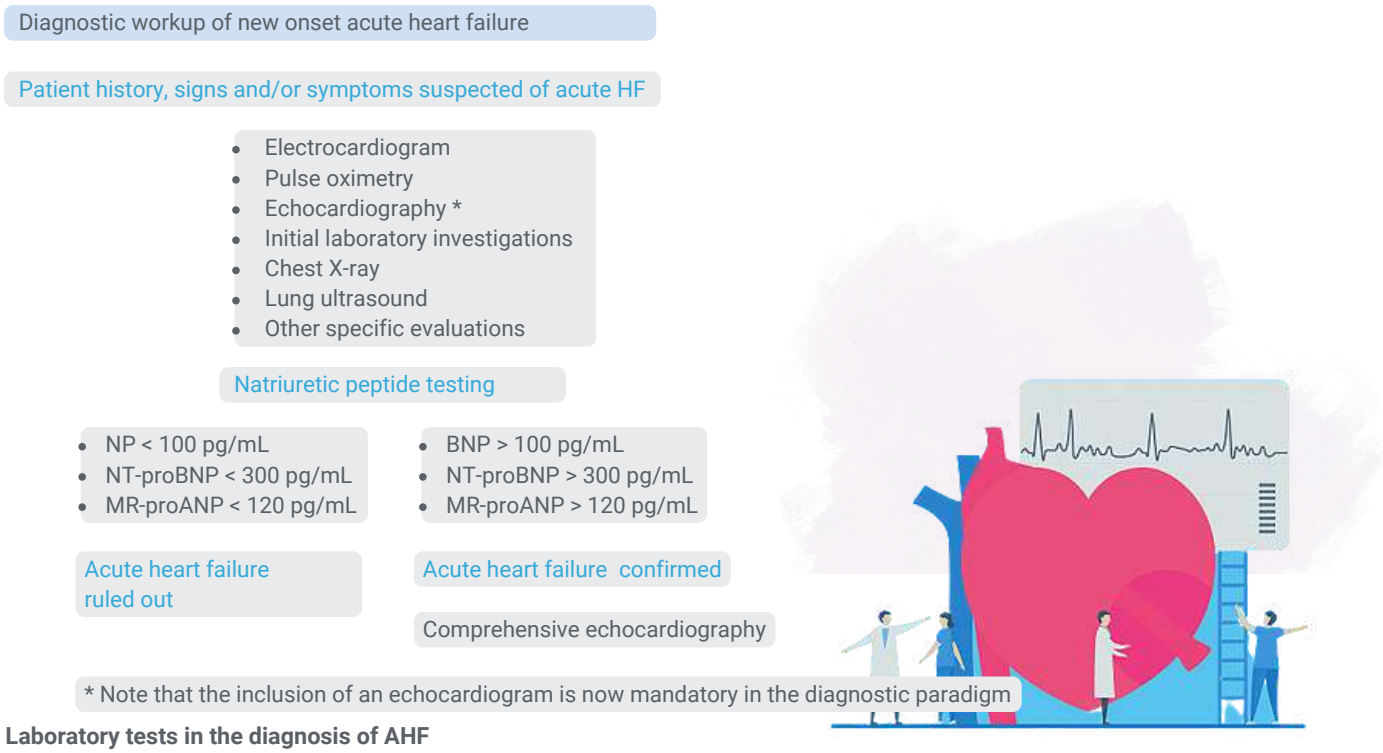
Measurement of BNP or NT-proBNP is useful for establishing prognosis in chronic HF. Elevated levels parallel HF disease severity, assessment by New York Heart Association (NYHA) class, elevated filling pressures, or poorer haemodynamics, and are suggestive of worse clinical outcomes and mortality in chronic HF. Further data demonstrated that each 100 pg/mL increase in BNP was associated with a 35% increase in the relative risk of death.

Acute heart failure (AHF)

According to data from the OPTIMIZE-HF Registry, episodes of acutely decompensated HF are associated with decreased survival (the risk of death within 90 days of hospitalisation was 8,6%), high rates of rehospitalization (approximately a third of patients are readmitted within 90 days of discharge), and high costs of care.

Figure 1. Diagnostic work-up of new onset AHF as per the European Society of Cardiology (ESC) Guidelines2



Laboratory tests in the diagnosis of AHF

In the acute HF setting, diagnostic cut-offs for BNP at 100 ng/L and NT-proBNP at 300 ng/L are recommended to rule out the presence of HF in clinical guidelines, regardless of the assay manufacturer, age, or sex of the patient. The age-independent NT-proBNP cut-off of 300 ng/L was validated in the PRIDE and ICON clinical trials to optimise the negative predictive value for exclusion of acute HF. These trials also derived age-stratified diagnostic cut-offs for the positive predictive values to rule in acute HF: 450 ng/L, 900 ng/L and 1800 ng/L for age categories < 50 years, 50 – 75 years and > 75 years, respectively. Causes of increased or decreased natriuretic peptides in the table above must be considered in clinical decision making.

Other laboratory tests may assist management in these patients. Troponins are useful for the detection of acute coronary syndrome (ACS), although elevated levels occur in most patients with AHF. Blood urea, creatinine and electrolytes may help tailor treatment. Detection of abnormal liver function tests identifies patients with a poor prognosis. Since both hypo- and hyperthyroidism may precipitate AHF, thyroid-stimulating hormone (TSH) should be assessed in those with newly diagnosed AHF. Arterial blood gas analysis should be performed when a precise measurement of O2 and CO2 partial pressure is needed (i.e. in patients with respiratory distress). Lactate and pH levels should be measured in patients with cardiogenic shock. D-dimer levels assist when acute pulmonary embolism is suspected. Procalcitonin may assist in the diagnosis of pneumonia. Pulse oximetry should be measured routinely at initial presentation of patients with AHF, and continuous monitoring is recommended as clinically indicated.

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Other clinical scenarios in HF

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References:

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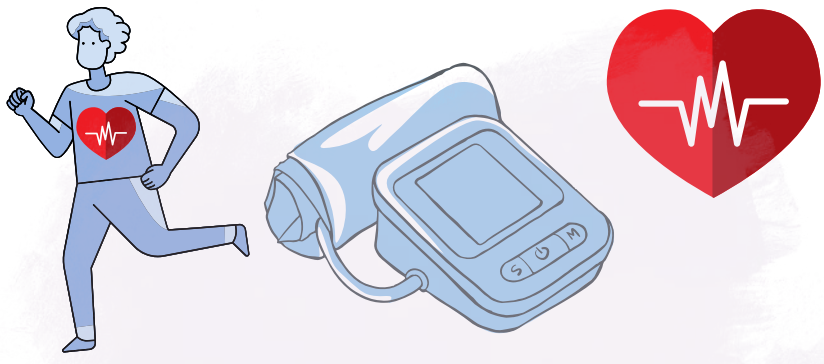
n of HF medical therapies to improve patient guidelines. For detailed information, and cut-off values for individual patient management kindly refer to the 2017 American College of Cardiology / American Heart Association / Heart Failure Society of America (ACC/AHA/HFSA) focused guideline update below (see Reference 7). It is important to note that there is a lack of standardisation of proBNP assays, thus serial monitoring, especially in chronically ill or hospitalised patients, should be with the same laboratory.



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