Estimation of volume status is a critical component in the care of patients with heart failure. Such assessments are used on a routine basis to guide therapeutic decision making, including adjustment of diuretics, whether to initiate or uptitrate beta-adrenergic blockers, and whether to hospitalize a patient. Traditionally, the cornerstone of volume assessment has been the history and physical examination, but there are concerns regarding its accuracy. Thus, a variety of additional techniques for assessing volume status have been tested, including measurement of biomarkers (e.g., natriuretic peptide levels) and performance of imaging studies (e.g., echocardiography).

In this issue of *JACC*, Pellicori et al. (1) provide an important contribution to the literature. In their study of nearly 700 patients (568 with heart failure) evaluated in a “specialist community clinic” in the United Kingdom, the maximal diameter of the inferior vena cava (IVCmax) at approximately 3 cm from the right atrium was measured by echocardiography. The study’s noteworthy findings included that IVCmax was a reproducible measurement; there was a broad distribution of IVCmax among patients with heart failure; IVCmax was correlated with natriuretic peptide levels and clinical markers of congestion including the jugular venous pressure (JVP); and an increased IVCmax was independently associated with the composite endpoint of heart failure hospital admission and cardiovascular death, as well as overall mortality, in multivariable models that were adjusted for other risk factors including N-terminal pro–B-type natriuretic peptide (NT-proBNP) level. This is the first large study of patients with heart failure to demonstrate that IVC assessed by echocardiography has powerful prognostic utility, and the investigators are to be congratulated for moving the field forward.

**Importance of IVC and right atrial pressure in left heart failure.** The rationale for measuring the IVC in left heart failure is that IVC distention is related to an increased right atrial pressure (RAP) (2), and several lines of evidence demonstrate that elevated RAP is an adverse risk factor in left heart failure. First, elevated JVP, reflecting elevated RAP, was independently associated with the risk of hospitalization and death from pump failure in the SOLVD (Studies of Left Ventricular Dysfunction) treatment trial (3). Second, in patients with left ventricular (LV) systolic heart failure, a reduced right ventricular ejection fraction (which ultimately would result in an elevated RAP) is a risk factor for mortality (4,5). Third, RAP often mirrors LV filling pressure in chronic heart failure, whether the LV ejection fraction is reduced (6–8) or preserved (9), and elevated LV filling pressure has been shown to be associated with adverse outcomes in patients with advanced heart failure (10).

**How best to estimate RAP in heart failure?** In prior studies (2,11,12), the maximal diameter of IVC, which is the method used in the current study (1), correlated modestly with RAP with correlation coefficients between these 2 parameters ranging from $r = 0.48$ (2) to $r = 0.56$ (12). IVC collaps-
Editorial Comment

Drazner

When clinical assessment is not the primary focus of the investigation, but one which should be considered when assessing studies that purport to demonstrate that a new technique (whether it is a biomarker or an imaging technique) is superior to the history and physical examination.

Where do we go from here? The time has come to assess whether routine incorporation of hand-carried echocardiography to assess filling pressures can improve clinical outcomes of patients with heart failure as compared with therapy based upon a carefully performed history and physical examination. An evidence base for such a trial is beginning to emerge. In a study in which hand-carried echocardiography, BNP levels, and clinical evaluation were used to estimate elevated LV filling pressures (pulmonary capillary wedge pressure >15 mm Hg) in patients with chronic systolic heart failure, IVCmax had the highest AUC (0.89) followed by BNP levels (0.88), evaluation of JVP (0.82), and a clinical congestion score (0.74) (14). Importantly, the combination of these parameters had better operating characteristics (AUC 0.97) than any individual test, highlighting the potential utility of combining hand-carried echocardiography with the traditional history and physical examination. The important study by Pellicori et al. (1) provides further impetus to move toward such a clinical trial and emphasizes that IVC measurement should be included in such an endeavor.

Reprint requests and correspondence: Dr. Mark H. Drazner, Division of Cardiology, Department of Internal Medicine, University of Texas Southwestern Medical Center, Dallas, Texas 75390-9047. E-mail: mark.drazner@utsouthwestern.edu.

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