

Letter to the editor regarding ‘Discordance between estimated and measured changes in plasma volume among patients with acute heart failure’

We read with interest the recent article on the discordance between measured and estimated plasma volume (ePV) in patients with heart failure.¹ The study evaluated 36 patients with acute heart failure (AHF) by using a novel method for measured plasma volume (mPV) and comparing this with two existing formulas for ePV, the Strauss and the Kaplan–Hakim formulas, which are based on haemoglobin (Hb) and haematocrit (Hct) levels. The authors found that changes in mPV correlated moderately well with the Kaplan–Hakim formula ($r = 0.75$), and also with the Strauss formula in a subgroup of 19 patients with a stable measured red cell volume (mRVCV) ($r = 0.78$).

The Strauss formula was previously compared with a ¹²⁵Iodine-labelled albumin measurement of PV in 119 healthy volunteers and 30 outpatients with stable HF². There was a positive correlation in both groups, with a bias of only –78 mL in the healthy group ($r = 0.68$), and –281 mL in the HF group ($r = 0.51$).² Interestingly in this study, as with the current study, weight but not haematocrit correlated with PV². Patients with AHF are a heterogeneous group and, although the numbers in this study are small, it would be interesting to try and better characterize this ‘stable mRVCV’ group to see how they differ from the other AHF patients, and we wonder if the authors had any insight into this population in terms of other clinical differences or distinguishing features. In addition, in the ‘methods’ of the study, it is noted that patients with internal bleeding were excluded from the study, yet a total of four patients (11%) in the analysed group had either clinical evidence of a bleeding event or received a blood transfusion (fig. 7).¹ We would inquire as to why these patients weren’t excluded and if the results would differ if they had been. Another question concerns the Kaplan–Hakim formula. Although it had good correlation in this patient group, the use of weight in the formula has been a cause for concern from some groups,³ because the determination of dry body weight, which the formula calls for, can be difficult to assess in this patient cohort.

Another potential confounding factor is that measuring the PV takes place over 1–3 h, while the formulas for ePV

represent an instant in time. It may have been illustrative to also trend the ePV measurements to see if these varied over the measurement time, since, at least for the initial PV assessment, the patients were being actively diuresed for their congestion. Patients were therefore not in a ‘steady-state’, and the mPV would likely have changed over that period, making comparison to ePV less accurate. It would be interesting to see these trends in ePV if these data were available. It may also be possible that mPV is not as accurate in a dynamic environment such as HF diuresis.

This paper highlights the difficulty in accurately assessing PV in a given patient population, and especially in patients with AHF, where volume status is critically important in clinical decision making. Although this new technique for obtaining mPV may prove useful in managing this challenging patient population, there is currently no outcomes data to support its use. On the other hand, there is a growing body of evidence that the calculated ePV formulas are useful in predicting outcomes in many different patient groups. These include patients with AHF,^{3,4} chronic HF,^{3,5} HF with preserved ejection fraction,^{3,6} patients undergoing transcatheter aortic valve replacement,⁷ myocardial infarction,⁸ sepsis,⁹ and all-cause, cardiovascular, and oncologic mortality.^{10,11} Other advantages of these ePV formulas are the ability to be transitioned for outpatient use, which would be a valuable tool for following HF patients after discharge, and their low cost compared with mPV. Given the amount of data supporting the use of ePV formulas regarding these populations, it would seem a large, prospective study evaluating various methods of PV determination would be warranted.

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