

# Decision to Discharge: Is the Patient Ready?

Help ensure adequate decongestion with direct blood volume analysis (BVA)



Ellen, 72 years

## Presentation

Patient was admitted to hospital from ER due to shortness of breath and pitting peripheral edema and has been receiving IV furosemide for 3 days

## History and data

- Ischemic cardiomyopathy, atrial fibrillation, dyslipidemia

EF 25% | BP 125/70 | Hct 30% | BUN 45 | Cr 1.7  
Weight 163 lb | Height 62"

- Medications on admission: furosemide oral 20 mg bid, lisinopril 20 mg qd, simvastatin 40 mg qd

## Status

Following 3 days of diuresis, weight change is -8 lb, or -5%; shortness of breath has resolved; patient reports feeling better

To determine if the patient is ready to be discharged, a BVA is performed

### Blood Volume Analysis Results

	<b>BVA Result</b>	<b>Patient Ideal</b>	<b>Deviation from Ideal</b>	<b>Excess / Deficit %</b>	
Total Blood Volume	5611 mL	4037 mL	+1574 mL	+39.0%	
Red Blood Cell Volume	1683 mL	1455 mL	+228 mL	+15.7%	
Plasma Volume	3928 mL	2582 mL	+1346 mL	+52.1%	
	<i>Blood Volume Interpretation Guideline</i>				
	<u>Normal</u>	<u>Mild</u>	<u>Moderate</u>	<u>Severe</u>	<u>Extreme</u>
BV, PV Deviation (± %):	0 to 8	>8 to 16	>16 to 24	>24 to 32	>32
RCV Deviation (± %):	0 to 10	>10 to 20	>20 to 30	>30 to 40	>40

### Hematocrit Analysis

	<b>Patient Result</b>	<b>Normal (Female)</b>
Peripheral Venous Hct	30%	36%-41%
Normalized Hct (nHct)	41.7%	36%-41%

**Although on clinical exam the patient is fully decongested and reports complete symptom resolution, BVA results show she is still significantly hypervolemic**

- A total blood volume (TBV) excess of +39% represents persistent severe hypervolemia despite symptom resolution, due possibly to expanded venous capacitance, and indicates inadequate decongestion

# Direct BVA can help guide individualized therapy in heart failure (HF) patients

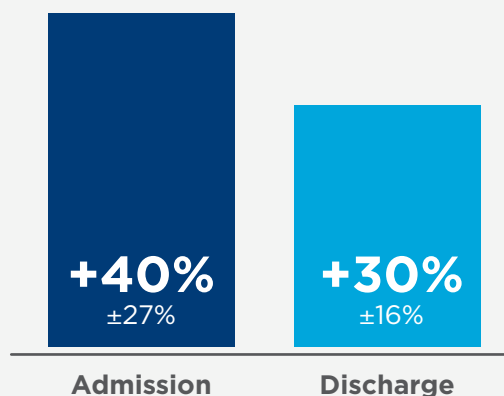
## Management strategy for Ellen based on BVA results

- IV furosemide is continued for another 18 hours, resulting in an additional 6 lb weight loss and a decrease in Cr to 1.2. Repeat BVA at this time shows her TBV excess has decreased to +12%, acceptable in a chronic patient with expanded venous capacitance
- Patient is discharged with an increase in oral furosemide dosage to 40 mg bid and in ACE inhibitor dosage to 30 mg qd. Patient will be followed up in 10 days at outpatient HF clinic, including BVA

### THE NEED FOR INDIVIDUALIZED CARE

## Significant residual congestion may be masked by symptom resolution

Severe hypervolemia persists following inpatient diuresis for many or most hospitalized HF patients: Mayo Clinic<sup>1</sup>



**TBV status: % deviation from patient-specific ideal**

- In this Mayo Clinic HF cohort,\* marked heterogeneity was observed in TBV both at admission and at discharge
- While diuretic therapy decreased hypervolemia, many or most patients were still hypervolemic at discharge, despite an average body weight loss of 6.9 kilograms in the hospital
- 85% of overall fluid loss during diuresis was derived from the interstitial rather than the intravascular space

\*Hospitalized HF patients (n=17) who received observational BVA both at admission and at discharge.

Not an actual patient.

**Reference:** 1. Miller WL, et al. Understanding the heterogeneity in volume overload and fluid distribution in decompensated heart failure is key to optimal volume management. *J Am Coll Cardiol HF* 2014;2:298-305.