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How to assess volume status in critically ill patients

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Assessment of patients' intravascular volume at the bedside is crucial in the care of critically ill patients. Hypervolemia can have harmful effects on organ function by inducing edema, and therefore restrictive fluid administration and diuretic therapy or ultrafiltration are required. However, diagnosing hypervolemia merely based on the presence of edema is unacceptable, because edema may coexist with normovolemia and even hypovolemia. Decongestive therapy in the absence of hypervolemia can possibly lead to worsening renal failure. Recently, Doppler ultrasonography of hepatic veins, portal veins, intrarenal veins, and IVC diameter are used to evaluate venous volume excess or congestion.

Identifying hypovolemia is more challenging for intensivists. Unquestionably, administration of intravenous fluid should be done during the initial phase of circulatory shock. However, after the resuscitation phase, and/or if fluid losses are not obvious, it is essential to evaluate whether giving fluids will increase the cardiac output and accordingly improve tissue oxygenation and organ function. For predicting fluid responsiveness, volume markers of cardiac preload, which have been used for decades, sometimes lack precision. A number of dynamic tests have been developed, based on the principle of inducing short-term changes in cardiac preload, by passive leg raise end-expiratory occlusion test or the infusion of small volumes of fluid, and to observe the resulting effect on cardiac output. All have some limitations, but they are frequently complimentary, and clinicians should choose between them based on the status of the patient and the cardiac output monitoring technique.