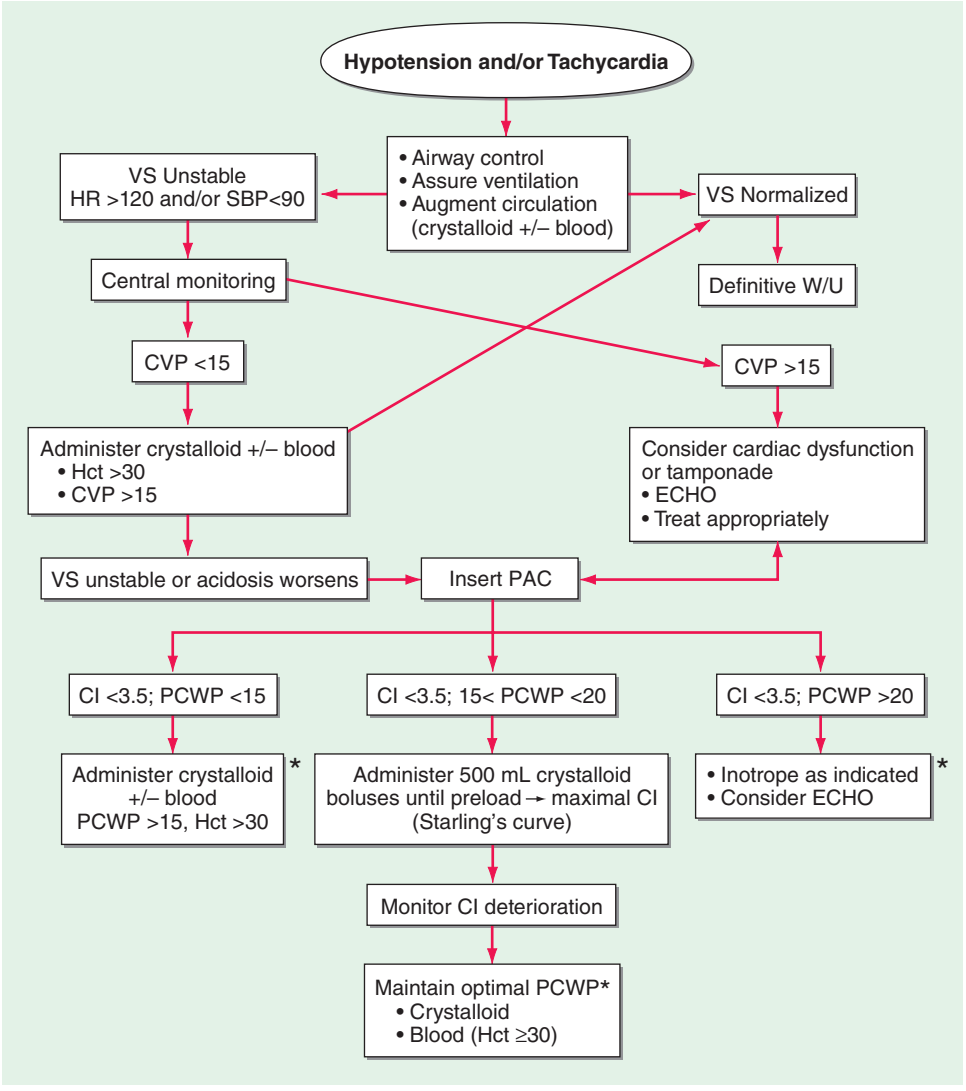

FIGURE 324-3 An algorithm for the resuscitation of the patient in shock. *Monitor Svo_2, SVRI, and RVEDVI as additional markers of correction for perfusion and hypovolemia. Consider age-adjusted CI. CI, cardiac index in (L/min) per m^2; CVP, central venous pressure; ECHO, echocardiogram; Hct, hematocrit; HR, heart rate; PAC, pulmonary artery catheter; PCWP, pulmonary capillary wedge pressure in mmHg; RVEDVI, right ventricular end-diastolic volume index; SBP, systolic blood pressure; Svo_2, saturation of hemoglobin with O_2 in venous blood; SVRI, systemic vascular resistance index; VS, vital signs; W/U, workup.

TREATMENT HYPOVOLEMIC SHOCK

Initial resuscitation requires rapid reexpansion of the circulating intravascular blood volume along with interventions to control ongoing losses. In accordance with Starling's law **(Chap. 265e)**, stroke volume and cardiac output rise with the increase in preload. After resuscitation, the compliance of the ventricles may remain reduced due to increased interstitial fluid in the myocardium. Therefore, elevated filling pressures are frequently required to maintain adequate ventricular performance.

TABLE 324-5 HYPOVOLEMIC SHOCK

Mild (<20% Blood Volume)	Moderate (20–40% Blood Volume)	Severe (>40% Blood Volume)
Cool extremities	Same, plus:	Same, plus:
Increased capillary refill time	Tachycardia	Hemodynamic instability
Diaphoresis	Tachypnea	Marked tachycardia
Collapsed veins	Oliguria	Hypotension
Anxiety	Postural changes	Mental status deterioration (coma)

Volume resuscitation is initiated with the rapid infusion of either isotonic saline (although care must be taken to avoid hyperchloremic acidosis from loss of bicarbonate buffering capacity and replacement with excess chloride) or a balanced salt solution such as Ringer's lactate (being cognizant of the presence of potassium and potential renal dysfunction) through large-bore intravenous lines. Data, particularly on severe traumatic brain injury (TBI), regarding benefits of small volumes of hypertonic saline that more rapidly restore blood pressure are variable but tend to show improved survival thought to be linked to immunomodulation. No distinct benefit from the use of colloid has been demonstrated, and in trauma patients, it is associated with a higher mortality particularly in patients with TBI. The infusion of 2–3 L of salt solution over 20–30 min should restore normal hemodynamic parameters. Continued hemodynamic instability implies that shock has not been reversed and/or there are significant ongoing blood or other volume losses. Continuing acute blood loss with hemoglobin concentrations declining to ≤100 g/L (10 g/dL) should initiate blood transfusion preferably as fully cross-matched, recently banked (<14 days old) blood. Resuscitated patients are often coagulopathic due