**Treating Hypovolaemia:**

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When intravascular volume expansion without whole blood is needed, use crystalloids, colloids, or both. IV isotonic crystalloid fluids are the initial fluid of choice. If electrolytes such as K are needed in the emergent situation, administer through a second IV catheter. High K administration rates may lead to cardiac arrest; therefore, do not exceed 0.5 mmol/kg/hr



**FIGURE 1**

*Patients may be hypovolemic, dehydrated, hypotensive, or a combination of all three.*

*How to administer crystalloids*

* Standard crystalloid shock doses are essentially one complete blood volume.26
* Shock rates are 80–90 mL/kg IV in dogs and 50–55 mL/kg IV in cats.
* Begin by rapidly administering 25% of the calculated shock dose. Reassess the patient for the need to continue at each 25% dose increment.
* Monitor signs as described in the patient assessment portion of this document. In general, if 50% of the calculated shock volume of isotonic crystalloid has not caused sufficient improvement, consider either switching to or adding a colloid.
* Once shock is stabilized, replace initial calculated volume deficits over 6–8 hr depending on comorbidities such as renal function and cardiac disease.

*When to administer colloids*

* When it is difficult to administer sufficient volumes of fluids rapidly enough to resuscitate a patient and/or when achieving the greatest cardiovascular benefit with the least volume of infused fluids is desirable (e.g., large patient, emergency surgery, large fluid loss).
* In patients with large volume losses where crystalloids are not effectively improving or maintaining blood volume restoration.
* When increased tissue perfusion and O2 delivery is needed.
* If edema develops prior to adequate blood volume restoration.
* When decreased oncotic pressure is suspected or when the total protein is ,< 35 g/L (or albumin is ,< 15 g/L).
* When there is a need for longer duration of effect. Preparations vary, and some colloids are longer lasting than crystalloids (up to 24 hr).Use of colloids can prolong the effects of hypertonic saline administration. The typical hydroxyethyl starch dose for the dog is up to 20 mL/kg/24 hr (divide into 5 mL/kg boluses and reassess). For the cat, the dose range is 10–20 mL/kg/24 hr (typically, 10 mL/kg in 2.5–3 mL/kg boluses). Titrate the amount of colloid infused to effect.

*Simultaneously administering crystalloids and colloids*

* Use this technique when it is necessary to both increase intravascular volume (via colloids) and replenish interstitial deficits (via crystalloids).
* Administer colloids at 5–10 mL/kg in the dog and 1–5 mL/kg in the cat. Administer the crystalloids at 40–45 mL/kg in the dog and 25–27 mL/kg in the cat, which is equivalent to approximately half the shock dose. Titrate to effect and continually reassess clinical parameters to adjust rate and type of fluid administered (crystalloid and/or colloid).

*Using hypertonic saline*

* To achieve the greatest cardiovascular benefit with the least volume of infused fluids (typically reserved for large patients or very large volume losses).
* To achieve translocation of fluids from the interstium to the intravascular space (e.g., for initial management of hemorrhage).
* In animals with hemorrhagic hypovolemic shock as a fastacting, low-volume resuscitation. Shock doses of hypertonic saline are 4–5 mL/kg for the dog and 2–4 mL/kg for the cat. Direct effects of hypertonic saline last 30–60 min in the vascular space before osmotic forces equilibrate between the intraand extravascular space. Once the patient is stabilized, continue with crystalloid therapy to replenish the interstitial fluid loss.
* In conjunction with synthetic colloids to potentiate the effects of the hypertonic saline.
* Do not use hypertonic saline in cases of either hypernatremia or severe dehydration.

*Treating hypovolemia due to blood loss*
The decision of when to use blood products instead of balanced electrolyte solutions is based on the severity of estimated blood loss. Use of blood products is addressed elsewhere. If blood products are not deemed necessary, note that patients with low vascular volume (due to either vasodilation or hemorrhage) will benefit more from the use of colloids than crystalloids. Following 15 mL/kg of hemorrhage, even 75 mL/kg of crystalloid will not return blood volume to prehemorrhage levels because crystalloids are highly redistributed. Large volumes may be needed to achieve blood volume restoration goals, and large volumes may be detrimental to patients with normal whole body fluid volume but decreased vascular volume resulting from acute blood loss.