Penelope, a 6-year-old, 44-lb, spayed pit bull terrier, presented 10 minutes after being struck by a vehicle traveling 35 miles per hour.

Physical Examination
Penelope had a heart rate of 200 bpm, respiratory rate of 32 breaths/min, and temperature of 99.8°F. She was obtunded and laterally recumbent. Mucous membranes were pale pink to white and moist with a prolonged capillary refill time (CRT) of 3 seconds. Femoral pulses were weak. She had normal heart and lung sounds. Penelope’s abdomen was tense and painful on palpation. No orthopedic or neurologic abnormalities were detected. A Doppler blood pressure of 80 mm Hg was recorded.

Laboratory Results
PCV was 40% (range, 35%–55%) and total protein (TP) was 3.2 g/dL (range, 5.2–7.8 g/dL). Irregularities in the biochemistry profile were present (Table). Coagulation times (prothrombin and partial thromboplastin) were normal. The lactate level was 6.4 mmol/L (range, 1.2–4.14 mmol/L).

Treatment
IV fluid resuscitation was initiated with several rapid infusions totaling 70 mL/kg of crystalloids (Plasmalyte-A, abbottanimalhealth.com), 20 mL/kg colloids (hydroxyethyl starch), and the only unit of stored whole blood (450 mL). Penelope was administered 0.1 mg/kg of IV hydromorphone but remained tachycardic (180 bpm) and had weak pulses. An abdominal fluid wave was noted; abdominocentesis revealed a hemorrhagic effusion with a PCV of 34% and TP of 2.8 g/dL. A recheck revealed peripheral blood PCV of 20% and TP of 2.2 g/dL.

Ask Yourself
What is the best next step for Penelope?
A. Because she seemed stable, she could be safely transferred to the specialty hospital 1 hour away.
B. Because she seemed stable, she should continue to be monitored in the hospital and receive pain medication.
C. Because she was not stable, only IV crystalloid therapy should be continued.
D. Because she was not stable, IV crystalloid therapy should be continued and autologous blood transfusion considered.
E. Because she was not stable, IV crystalloid therapy should be considered and a blood donor retrieved.

Table Abnormal Biochemistry Profile Findings
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alanine aminotransferase (U/L)</td>
<td>120</td>
<td>10–100</td>
</tr>
<tr>
<td>Alkaline phosphatase (U/L)</td>
<td>320</td>
<td>6–102</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>2.2</td>
<td>2.5–3.9</td>
</tr>
<tr>
<td>Blood glucose (mg/dL)</td>
<td>180</td>
<td>64–170</td>
</tr>
</tbody>
</table>

CRT = capillary refill time, TP = total protein
CORRECT ANSWER
D. Because she was not stable, IV crystalloid therapy should be continued and autologous blood transfusion considered.

Life-threatening hemorrhage is not uncommon in veterinary emergency medicine. Knowing how to approach these cases can make the difference between life and death.

The most common reasons for intraabdominal hemorrhage are:
- Gastric dilatation-volvulus
- Ruptured tumors
- Trauma
- Coagulopathies (eg, from anticoagulant rodenticide ingestion)

When significant hemorrhage has occurred, inadequate intravascular volume and decreased hemoglobin can lead to poor oxygen delivery and shock. Basic examination findings and laboratory tests can allow rapid assessment for shock and hemorrhage. Shock can be easily and quickly detected, noting alterations in heart rate, gum color, CRT, pulse quality, and mentation. A patient with a drop in total solids (TS) relative to PCV may indicate hemorrhage has occurred or is ongoing. After fluid resuscitation, a drop in both PCV and TS is expected. A cavitary blood sample that demonstrates a PCV and TS equal to or higher than peripheral blood is consistent with acute hemorrhage. Imaging with a focused assessment with sonography for trauma (FAST) scan or radiographs should not delay treatment of a patient in shock.

BENEFITS, RISKS, & TECHNIQUES FOR AUTOLOGOUS TRANSFUSIONS
Hemorrhage into the thoracic or abdominal cavities can be quickly collected and administered IV. Autologous blood has been demonstrated to be lifesaving, safe, and advantageous (see Suggested Reading).

Benefits
- Simple to collect and administer
- Frequently sterile
- Contains functionally superior cells compared with banked blood
- Does not require warming
- Decreased risk for transfusion reactions from foreign protein
- Can be less expensive than banked blood
- Readily available

Risks
Potential complications attributable to autotransfusion include:
- Hypocoagulation
- Hemolysis
- Sepsis
- Dissemination of malignancy
- Embolism

Techniques
Blood can be suctioned out of the abdominal or thoracic cavity with centesis or direct suction (in a surgical case). Blood should be collected directly into a sterile suction canister, IV fluid bag (Figure 1), commercial blood bag, or syringe (in smaller patients). Passing the blood through a filter is recommended. Adding anticoagulant is often unnecessary unless hemorrhage is ongoing at collection. Monitoring PCV, TS, electrolytes, and renal values is recommended.

CRT = capillary refill time, TP = total protein, TS = total solids
Treatment Options

Mild hemorrhage often responds to IV replacement with crystalloids and colloids. Rapid infusions (over 10–15 min) of 20 to 30 mL/kg of crystalloids and 5 mL/kg of colloids are necessary and may need to be repeated. Patients with coagulopathies or severe hemorrhage may require blood products. When blood banks are stressed or large volumes are required, autologous transfusion remains a viable option.

The risk-benefit ratio weighs heavily in favor of autotransfusion for the resuscitation of select patients, even despite neoplasia or gross contamination, when facing exsanguination and death.

Outcome

Penelope was taken to surgery where a large splenic laceration was identified as the source of ongoing hemorrhage; 900 mL of autologous blood was collected intraoperatively with a Poole suction tip into a sterile canister, transferred to a sterile IV bag, and administered IV. A splenectomy was performed, and the remainder of the abdomen was explored. Penelope recovered uneventfully from anesthesia and was discharged 48 hours later. Four weeks later, she was doing well and had returned to normal activity.

The Take-Home

- Life-threatening hypoperfusion (shock) can be easily detected during examination by assessing heart rate, gum color, CRT, mentation, and pulse quality.
- A drop in TS relative to PCV is an early pathologic sign of hemorrhage; decreases in PCV may not occur until fluids have been administered.
- Imaging should not delay treatment for shock.
- To provide intravascular volume and oxygen carrying capacity, autologous blood transfusion can be easily performed in patients suffering from life-threatening cavitary hemorrhage when blood resources are unavailable or exhausted.