Approach to the emergency presentation of the “Acute Abdomen”

The emergency clinician is often presented with acutely vomiting patients, and routinely faces a diagnostic challenge regarding the need to recommend diagnostic testing, and the need for symptomatic versus more specific or invasive treatment. For many emergency vomiting cases, the most important decision is whether or not the patient should have surgery, or whether supportive care would be a reasonable choice.

Common non-surgical conditions that could present with acute vomiting include acute gastroenteritis, pancreatitis, renal failure, liver disease, and endocrinopathies such as hypoadrenocorticism or diabetic ketosis. In contrast, there are numerous problems that might require emergency laparotomy, including ingested foreign bodies, intussusceptions, neoplasms, GDV, peritonitis, pyometra and many others.

Physical examination

The physical examination of the vomiting patient provides the first decision point in regard to whether this might be a surgical or non-surgical abdomen. If there is abdominal distension or pain, or a palpable abnormality such as a mass, then it becomes much more likely that the condition will require emergency surgery. Other triggers for this decision include the presence of a fever or any systemic weakness or cardiovascular instability such as shock.

Initial bloodwork

The initial PCV/TS can reveal evidence of dehydration, hemorrhage and/or protein loss in both surgical and non-surgical cases of acute abdomen, therefore although it is vital for case management, it is not a useful decision point to help decide whether or not the case is surgical. The white blood cell count at presentation can also provide very important information, with any evidence of leukopenia or leukocytosis adding to the considerations of sepsis, and therefore the possibility that this might be a surgical abdomen. Serum lactate should be analyzed as soon as possible, with elevations of lactate being an ominous indication of severe abnormalities of tissue perfusion. High serum lactate should increase the suspicion that this may be a surgical abdomen.

The blood glucose at presentation is very helpful. The presence of hypoglycemia should increase suspicion for sepsis or Addison’s disease, while hyperglycemia may be diagnostic for diabetes. Azotemia at presentation may be pre-renal, renal or post-renal and may require additional diagnostics to discern its origin. Pre-hepatic icterus caused by hemolysis is easy to rule out because of
its association with anemia, but other forms of icterus may be hepatic or post-hepatic in origin. Plasma blood gases and electrolytes are important for management but do not help to distinguish between the surgical and non-surgical abdomen. The only exception to this is the presence of a metabolic alkalosis, which is highly suggestive of an upper GI obstruction (although note that this may also occur in some severe acute pancreatitis cases).

Coagulation testing and platelet counts should be considered in many acute abdomen cases, particularly if there is any evidence of sepsis, hemorrhage or anemia. If the animal is anemic at presentation and there is a likelihood of a need for surgery, a blood type should be submitted to prepare for the possibility of transfusion.

Imaging

Imaging of the acute abdomen is the next priority, and this should be performed prior to invasive testing because of the risk of introducing air into the peritoneal cavity, thereby making pneumoperitoneum difficult to interpret.

Obtaining and evaluating peritoneal effusions

If there is peritoneal fluid at presentation, a sample should be obtained for analysis as soon as possible after presentation. Ultrasound may facilitate obtaining a sample. If a PCV/TS indicates that the fluid is blood, then coagulation testing should be performed and the patient should be evaluated for evidence of trauma or neoplasia. Immediate analysis should also include a fluid glucose and lactate. If the glucose is lower than that of the serum, and the lactate is higher than the serum, then this is a strong indication that the fluid is septic and this may be a surgical abdomen.

The next fluid analysis is to perform nucleated cell counts and cytology. Normal nucleated cell counts should be just a few hundred cells. Intermediate cell counts might be one to ten thousand white blood cells. Cell counts suggestive of a necrotic or septic process in the abdomen (which is likely to be surgical) are usually higher than 10,000 cells/mm³. Many septic abdomen patients have nucleated cell counts of 50,000 or more. Fluid cytology is also very important. Neoplastic cells may be diagnostic and may allow the owner to make an immediate decision, although many important neoplasms such as hemangiosarcoma do not exfoliate well. The more important clinical decision is in relation to the finding of a neutrophilic fluid. If many of the neutrophils have toxic changes such as the presence of granules or vacuoles in the cytoplasm, then surgery should be considered, even in the absence of obvious bacteria. Toxic changes suggest the presence of necrosis in the peritoneal cavity, which is usually surgical because of the need for debridement, even if bacteria are not involved. Obviously, the presence of intracellular or extracellular bacteria suggests septic peritonitis which is an immediately surgical condition. If there are high neutrophil counts, toxic changes or obvious bacteria, the fluid should be submitted for culture.

If there is evidence of intra-peritoneal inflammation but no free fluid can be obtained, then diagnostic peritoneal lavage can be considered as a way to obtain cytology. About 10-20 ml/kg of warm saline is instilled into the peritoneal cavity by inserted a peripheral venous catheter on the midline. A few mls of saline are then aspirated using the catheter or a needle, and evaluated for their
cytology. Cell counts should not be performed on this fluid, as it has been diluted by the saline. The cytology is then evaluated as described above.

Biochemical analysis of fluid may be needed, especially if there is any possibility of a uroperitoneum or bile peritonitis. The fluid may be submitted with concurrently obtained serum for creatinine, potassium, or bilirubin testing.

**Management of shock in the feline acute abdomen patient**

Critically ill cats with acute vomiting and abdominal pain are often recumbent, with weak pulses and pale mucous membranes. In order to make the best management decisions for these critical feline patients, it is first important to make sure that we all have the same understanding of some important definitions:

*Dehydration* implies a loss of fluid from the *interstitial and intracellular spaces*, and usually occurs more slowly than the intravascular losses that occur in shock. Clinical signs of dehydration include skin tenting, dry mucous membranes, and sunken or glazed eyes.

*Shock* can be simply defined as a failure of tissue perfusion, and it implies a decrease in the animal’s effective *intravascular volume (hypovolemia)*. Shock is clinically recognized in cats by the presence of pale mucous membranes, weak pulses and generalized weakness or collapse. In contrast to dogs, changes in heart rate in cats with shock are unpredictable, and may include either tachycardia or bradycardia. Similarly, cats rarely exhibit clinical findings of hyperdynamic shock, almost always having pale rather than hyperemic mucous membranes. Several forms of shock can be recognized clinically in cats, but from a practical point of view it is classified as cardiogenic, hypovolemic, or septic. Obviously, in some animals, shock and dehydration can occur simultaneously to varying degrees.

**Types of shock**

Cats presenting with an acute abdomen may have hypovolemic, septic or cardiogenic shock. Hypovolemic shock occurs because of fluid loss through vomiting or into a third body space in the case of peritonitis. Septic shock occurs in the presence of endotoxemia and/or peritonitis. Cardiac changes are also common in cats with shock (see below).

*Hypovolemic shock* in cats has a similar appearance to the problem in dogs. As in dogs, acutely hypovolemic cats are usually pale, tachycardic, with cool extremities and at first bounding, and then weak pulses. Hypovolemic shock is probably the most commonly identified form of shock in everyday practice. Hypovolemia may be absolute or relative. Absolute hypovolemia may be caused by hemorrhage, for example in trauma patients, or by fluid loss into the GI tract or through body cavities, such as might occur in vomiting. As an absolute or a relative intravascular volume deficit develops, several compensatory mechanisms come into play to maintain perfusion of vital organs. Tachycardia occurs in an attempt to increase cardiac output, despite a decreased stroke volume with each cardiac contraction. Next, vasoconstriction of the periphery allows maintenance of blood pressure, thus retaining perfusion of vital organs such as the brain, cardiac muscle, and splanchnic vascular bed. As intravascular volume progressively decreases, peripheral vasoconstriction worsens, resulting in further
decreases in blood supply to the kidneys and gut. Poorly perfused tissue becomes acidotic, resulting in endothelial and cell damage. Finally, when intravascular volume has become so low that vasoconstriction can no longer maintain blood pressure, hypotension occurs, and vital organs are no longer perfused.

**Septic shock** appears clinically to be slightly different (and is poorly understood) in cats compared to dogs. Although the general pathophysiology of inflammation as a sequela to bacteria or endotoxin is the same, the clinical signs are different between the two species. The hyperdynamic or hyperemic stage of septic shock is very rarely seen in cats. Instead, septic cats usually appear to progress straight to the vasoconstrictive stage of septic shock. Thus they appear clinically with pale mucous membranes, weak pulses and generalized collapse, signs that are not easily distinguishable from hypovolemic shock. The presence of fever in a pale, hypotensive cat should raise strong clinical suspicion of septic shock. Septic cats are often hypothermic however, and frequently have evidence of mild to moderate anemia and icterus. Cardiac function is often dramatically, but temporarily, affected in cats with septic shock, a factor that has great significance for decisions about fluid therapy. During hospitalization of these cats, cardiac contractility can become diminished, the heart may appear enlarged, and the left atrium may be large: all findings that mimic cardiomyopathy. From a clinical perspective, heart rate can be a useful clue about the presence of abnormal cardiac function in septic cats. Cats with myocardial changes due to sepsis are often bradycardic, with heart rates of 120-160 bpm. This is “inappropriate” in the face of hypovolemia and hypotension. If it is present, inappropriate bradycardia should be noted and fluids should be administered judiciously because there is a real risk that fluid therapy could result in pleural effusion and pulmonary edema. The cause of these cardiac changes is not well understood, and they appear to be potentially reversible following resolution of sepsis.

**Cardiogenic shock** is much more common in cats than in dogs, with diastolic failure occurring frequently in cats that have hypertrophic cardiomyopathy. Cardiogenic shock implies failure of tissue perfusion due to poor cardiac output as a result of primary heart disease, and it is clinically recognized by the presence of pale mucous membranes, cool extremities and weak pulses. Cardiogenic shock usually occurs simultaneously with congestive heart failure; the two are different because cardiogenic shock refers to inadequate perfusion of the body as a result of insufficient forward output from the heart, while congestive heart failure refers to back-up of fluid behind the heart. Cardiogenic shock must always be ruled out immediately during management of the shock patient, because in this case fluid restriction, rather than fluid expansion, is appropriate. Cardiogenic shock should be considered in any cat with abnormal heart sounds (murmur, gallop), dyspnea, or abnormalities such as crackles on thoracic auscultation. In these cats, fluid therapy should be restricted or avoided.

**Initial clinical thought process in cats with pale mucous membranes and weakness**

Cats frequently present with pale mucous membranes and generalized weakness, which should lead us to consider a diagnosis of shock. It may not be initially clear whether we are dealing with hypovolemic, septic or cardiogenic shock.

Before calling this “shock”, we must answer one additional question. Could this cat have pale mucous membranes due to anemia rather than because of vasoconstriction and decreased blood
volume? This question can usually be easily answered by measurement of the packed cell volume, as part of the emergency database. If severe anemia is present, blood transfusion therapy should be considered immediately instead of fluid therapy.

**Vascular access**

Once it has been determined that the patient is in shock, the next step is to establish functional vascular access. Vascular access allows the administration of intravenous fluids and drugs such as glucose or antibiotics, and also allows an emergency database to be obtained from blood at the hub of the catheter during catheter placement. Placement of an over-the-needle catheter in a peripheral vein such as the cephalic and saphenous is a routine starting point in the emergency room. If possible, care should be taken to thoroughly clip and scrub the site prior to placement of the catheter. The widest bore and shortest catheter possible should always be used in the emergency setting, to facilitate rapid administration of fluids and blood sampling. If a catheter cannot be easily placed percutaneously in a peripheral or a central vein, the next step is to quickly perform a cut-down to a central vessel such as the jugular vein, and to place a large bore catheter in that vessel.

In the emergency situation, especially in a crisis such as an arrest, intraosseous access provides quick and easy access that is comparable to intravenous access. This is particularly useful for neonates that are collapsed and difficult to catheterize intravascularly. A spinal needle or regular intravenous needle is placed through the cortex into the medullary cavity of the femur, tibia or humerus. Placement of these catheters is fairly easy, especially if practiced on cadavers prior to attempts on a patient. Once in place in the medullary cavity, fluids, blood products, or drugs can be easily administered and will drip in at a very rapid rate. Intraosseus access provides a means for rapid resuscitation of the collapsed neonate, which can then be followed by intravenous catheterisation once the animal has become more stable.

**Crystalloid fluids in feline hypovolemic and septic shock**

Fluid therapy remains the mainstay of treatment of shock in cats as well as in dogs. In animals with shock, by providing large volumes of intravenous fluids, we hope to improve circulating blood volume, decrease blood viscosity, and increase venous return, thus helping to improve cardiac output. Increased tissue perfusion therefore results, which begins to reverse cellular acidosis, and provides a supply of oxygen to the cells.

There are several distinct aspects of fluid therapy in feline patients that sets them apart from dogs. The first and most important difference between the two species is that the blood volume of the normal cat (about 60 ml/kg) is smaller than that of the normal dog (about 90 ml/kg). Since the shock fluid bolus is derived from the blood volume, this means that in general fluid therapy needs to be given much more conservatively in cats than in dogs. Cats are much more susceptible to fluid overload, and great care must be taken not to produce clinical signs of excessive volume, usually respiratory distress due to the presence of a pleural effusion. Therefore, not only are the volumes administered usually lower, but boluses of fluids, especially colloids, are given much more slowly. Particular care should be taken in cats that are bradycardic, as they may not tolerate fluid administration. In general, shocky cats with tachycardia (heart rate > 200 bpm) tolerate fluid
therapy well.

Shock boluses of replacement crystalloid (Lactated Ringers, balanced electrolyte replacement solutions) of up to 90 ml/kg are administered over an hour in dogs. In cats, the intravascular blood volume is much smaller than in dogs and the total shock bolus of crystalloid is 45-60 ml/kg. Initially, 10-20 ml/kg is delivered rapidly intravenously (over 15-20 minutes) while the cat is carefully observed for a response, or for evidence that the fluid bolus is causing a problem. This dose can then be repeated if necessary till the total shock dose has been reached. If the cat begins to improve, administration may be slowed down before the total bolus has been given. The end point of resuscitation is an improvement in tissue perfusion, which is clinically recognized by an improvement in mucous membrane color, better quality pulses, a decrease in the heart rate towards normal, and improved mentation. Packed cell volume (PCV), total solids (TS), electrolytes and blood glucose should be monitored before, during, and after each fluid bolus.

The ideal crystalloid is a balanced replacement solution such as Lactated Ringer's solution. Ideally, only isotonic fluids such as balanced electrolyte replacement solutions or 0.9% saline should be given as a shock bolus. In general, hypotonic fluids such as maintenance solutions or 0.45% saline should not be administered as a bolus, because severe electrolyte derangement might result. Frequent assessment of serum electrolytes (Na, K) is important in order to facilitate selection of a fluid, and to determine whether potassium replacement is needed. Animals with ongoing fluid losses (polyuria, severe diarrhea, peritonitis, etc) usually then require ongoing fluid therapy in order to maintain a normal heart rate, pulse quality and urine output. The rate of replacement fluid therapy is determined by clinical parameters such as heart rate, blood pressure, and urine output.

Several problems may arise as a result of high crystalloid fluid replacement rates, and these problems are most severe in patients that are hypoproteinemic or those that have vasculitis. Since only about 25% of a crystalloid solution stays in the circulation in the normal state, and even less in the patient with increased vascular permeability and hypoproteinemia, interstitial fluid accumulation may occur. Safeguards against edema such as increased lymphatic drainage and decreased interstitial protein concentration may be overwhelmed, leading to fluid accumulation and edema. This edema compromises nutrient delivery to cells, and leads to impaired healing, and impaired organ function. The lungs are the organ most severely affected, potentially limiting gas exchange. In cats, pleural effusion is the most common presentation of fluid overload in patients receiving fluid therapy, and is probably caused by a combination of vascular leak and poor myocardial function.

Blood transfusions

Blood products can be very important in management of shock and severe anemia, and are often vitally helpful in management of critically ill cats. In the critically ill cat, if the PCV acutely drops below about 20%, transfusion of packed red blood cells or whole blood may significantly improve oxygen delivery to the tissues and result in a significant improvement in blood pressure. Blood transfusions are often well tolerated by critically ill cats, even if they do not tolerate other forms of fluid therapy. Plasma transfusion may be a useful source of albumin if severe hypoproteinemia occurs; especially in small patients when it is possible to administer relatively large volumes of plasma
compared to their body weight. Fresh or fresh frozen plasma may be required for management of dilutional coagulopathies or DIC.

Blood products should be warmed close to body temperature prior to administration, and should not be microwaved or placed in excessively hot water to warm, because of risks of causing hemolysis. Blood products should be administered using special filters to remove any small clots that may have formed. Each transfusion should take about one to two hours to complete.

Specific blood groups exist in both dogs and cats, based on the presence of antigens on the surface of the red blood cells. Cats have three blood types, A, B, and AB, which is relatively rare. Most domestic short-hair cats are type A. Cats differ from dogs in that naturally-occurring antibodies exist against other blood types. Thus, a type B cat is born with antibodies against type A erythrocytes, and will have a serious transfusion reaction if given type A blood, even if he was never previously transfused. Similarly, type A cats have antibodies against type B erythrocytes, although the transfusion reactions seen here are not so severe. Thus, all cats must be blood typed prior to transfusion.

Transfusion reactions can be classified as immune-mediated and non-immune-mediated. Immune-mediated transfusion reactions are most often hemolytic, as antibodies in the recipient react with antigens on the donor cells. In type B cats inadvertently transfused with type A blood, sudden collapse and death can occur after administration of only a few drops of blood. Respiratory signs, including tachypnea and pulmonary edema, or sudden death, are the most common signs of a transfusion reaction in cats. Other signs of transfusion reactions include: anxiety, restlessness; urticaria, pruritus, facial edema; muscle tremors; nausea, salivation, vomiting; hemoglobinemia, hemoglobinuria; bilirubinemia, bilirubinuria; fever; anuria/renal failure; or seizures.

If a transfusion reaction is suspected, the transfusion should be immediately discontinued, and the patient monitored for resolution of the signs. The most severe reactions may require treatment with antihistamines or corticosteroids. Mild fever, tachypnea, nausea and vomiting may simply be an indication that the transfusion was being administered too fast, and it may be possible to re-start the blood transfusion at a slower rate.

**Cardiovascular monitoring for cats in shock:**

**Doppler measurement of arterial blood pressure**

Doppler pulse detection systems either detect the flow of blood through a vessel or detect motion in the wall of the artery. The most commonly used system in veterinary medicine detects the flow of blood through vessels, and is typically used to measure only the systolic blood pressure. Arterial flow is detected using ultrasound waves, and is heard as an audible signal from the Doppler amplifier speaker. A cuff is inflated around the limb, until it occludes arterial blood flow, and then gradually deflated. To obtain accurate readings, the cuff must be of the correct size. The pressure at which flow returns is the systolic pressure, measured on an attached sphygmomanometer. For accuracy, the measure should be repeated several times until consistent readings are obtained.
With a little practice, a systolic pressure reading is relatively easy to obtain using Doppler ultrasound. Such readings have been documented to be approximately 15 mm Hg lower than those obtained by direct measurement of pressures in the femoral artery. Readings can usually be obtained in cats and in moderately hypotensive animals, thus the Doppler can be expected to provide some indication of systolic blood pressure even in compromised animals in which other methods have failed. The measurement is non-invasive and well tolerated by all but the most aggressive patients.

The main disadvantages of Doppler are two-fold. Most importantly, only a systolic pressure reading is usually obtained. While the systolic pressure is a useful piece of information, the mean arterial pressure provides the most physiologically important indicator of tissue perfusion at the capillary level. Since the mean pressure is most closely related to the diastolic pressure, knowledge of only systolic pressure may be misleading if diastolic pressure is low. In such patients, a low normal systolic pressure may lull the clinician into a false sense of security, since mean pressure may still be significantly below the desired range. The second disadvantage of Doppler is the necessity to hold the flow detector crystal in place over the artery for relatively prolonged periods of time, especially if repeated measures are desired. The artery can be difficult to locate in cats or poorly perfused patients, and such attempts can be time-consuming and frustrating.

Oscillometric blood pressure measurement

A number of automated devices are available for measurement of arterial blood pressure using oscillometric techniques. Arterial blood pressure is measured using a compression cuff, which is wrapped around a limb or the tail, and automatically inflated to various pressures. At each cuff pressure, oscillations within the cuff caused by the pulse are detected. The pressure at which oscillations are first detected is the systolic pressure, that at which the amplitude of the oscillation is maximal is the mean pressure, and the pressure at which the oscillations decrease rapidly is the diastolic pressure. Thus, the mean arterial pressure is the most accurate reading obtained by this type of device.

Oscillometric instruments are useful for clinical assessment of patients with either hypotension of hypertension. The cuff is well tolerated, non-invasive, and safe. The readings give trends that are accurate enough to provide clinically relevant information, especially if the machine is concurrently reading an accurate heart rate. The machine can be set to automatically cycle repeatedly, and can be set to alarm for low or high pressures. The operator does not need to exactly locate the artery for each reading, but merely to place a marker on the cuff in the general anatomic location of the artery. Range markers are printed on each size cuff for easy election of the appropriate size for each patient.

Because oscillometric instruments detect oscillations within the leg, they are affected greatly by movement of the animal. Any voluntary movement or shivering will prevent it from obtaining a reading. Irregularities of the pulse will also "confuse" this machine, thus cardiac arrhythmias may render it less accurate or ineffective. Similarly, if the patient is very hypotensive or hypoperfused, this device will often be unable to obtain a signal.
Central venous pressure monitoring

Central venous pressure (CVP) monitoring provides very different information from that obtained by arterial pressure monitoring. The venous system is the capacitance system; that is, the part of the circulatory system that holds most of the reserve blood volume. Changes in CVP provide information about the degree of filling of the great vessels. The CVP is usually low in cats (0-5 cm H₂O), but it may increase if the capacitance of the great vessels is exceeded, either by absolute overload of the circulation (e.g., in oliguric renal failure) or by relative circulatory overload (e.g., in heart failure, where the heart is unable to pump forward all of the blood that is returned to it). This technique is therefore most useful for monitoring animals that have a risk of fluid overload, such as the animal with heart disease that requires fluid administration. In general, intravenous fluids can be safely administered as long as there is no rise in central venous pressure, although caution should be exercised, and other parameters such as lung auscultation should also be monitored. Once a rise in central venous pressure occurs, fluid administration should be decreased or suspended. Central venous pressure may be elevated if there is increased intra-thoracic pressure, such as in tension pneumothorax or positive pressure ventilation. Similarly, central venous pressure increases in the patient with pericardial disease such as restrictive pericarditis or pericardial tamponade.

To measure central venous pressure, a catheter is placed in the jugular vein to the level of the cranial vena cava. The catheter should not reach all the way into the right atrium. It is bandaged in place, and is attached to a water manometer or a pressure transducer. The manometer is filled with saline via a 3-way stopcock, and zeroed at the level of the right atrium. Saline is allowed to flow from the manometer into the catheter until it equilibrates with venous pressure, and central venous pressure is read from the water manometer. Repeated measurements are then obtained. Central venous pressure can also be measured using a direct pressure transducer attached to a physiologic monitor, which then provides continuous measurements and a visible CVP waveform.

There are a few disadvantages to central venous pressure measurement. The catheter must be placed in the jugular vein, and must be long enough to reach into the intra-thoracic vena cava. Coagulopathies and thrombocytopenia are relative contraindications to placement of such catheters. Kinking or clotting of blood in the catheter can lead to erroneously high measurements. Changes in position of the animal for different measurements will also affect the reading, thus it is important to ensure that the animal be restrained in the same position each time a measurement is obtained. While central venous pressure measurements are very useful, they are not absolute. The clinician must remember to combine such information with physical examination findings and a careful overall assessment of the animal.

Catecholamines

If the cat does not respond to fluid therapy, or for those in which fluid therapy is contraindicated, continuous infusions of catecholamines are an important way to support the circulation and improve tissue perfusion. Numerous drugs are available, but the most widely used inotropic and pressor drug for cats is dopamine. Dopamine is well tolerated by the majority of cats and at low to moderate doses does not appear to have many negative effects in this species. Beta receptor agonist doses (5-8 ug/kg/min CRI) are often effective and helpful, while alpha receptor agonist doses (8-15
ug/kg/min) may be needed in severely affected patients. Other catecholamines such as dobutamine, epinephrine or norepinephrine may be needed occasionally, but should represent a “second line” only if dopamine is ineffective.

Doppler monitoring of blood pressure provides important information to guide catecholamine administration. Efforts should be made to maintain systolic blood pressures above 90 mmHg in awake cats (normal = 110-150 mmHg). Addition of dopamine to patient management should be considered if:

- Doppler values are less than 80 mmHg in spite of adequate fluid resuscitation
- Doppler values are less than 80 mmHg and fluids cannot be administered fast enough to correct hypotension
- Fluid administration is probably necessary, but the presence of lung disease or pleural effusion is limiting the ability to administer more fluids
- Central venous pressure is greater than 5 cmH2O, and hypotension is persisting

Note: if you are in doubt about whether a feline patient needs dopamine – then it probably does!! Err on the side of using rather than not using the drug. Dopamine is started at a rate of 5 ug/kg/min, then doppler measurements of blood pressure are obtained every 15 minutes. The drug dose can be increased in increments of 2.5 ug/kg/min up to 15 ug/kg/min, until the blood pressure improves. Dopamine should be made up diluted in fluids, at a concentration that can be delivered at a very slow fluid rate (1-3 ml/hr), in order to prevent worsening fluid overload in small feline patients. The cat should be maintained on the minimum dose of dopamine required to keep the systolic blood pressure above 90 mmHg. Dopamine is then weaned gradually based on the response of the cat and repeated measurements of blood pressure.

REFERENCES AVAILABLE ON REQUEST