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Triage

Harold Davis

The word "triage" comes from the French verb trier, meaning to sort. The concept of triage finds its origin in the military, and the goals of triage in human medicine have varied over the years depending upon the situation. After World War II triage came to mean the process of identifying those soldiers most likely to return to battle after medical care. During the Korean and Vietnam conflicts the goals of triage came to mean the greatest good for the greatest number of wounded [1]. In times of disaster, the goals of triage are like those of the military: to concentrate effort and resources on saving the largest number of people possible. Daily human emergency room triage began in the 1960s and has evolved into a method to separate efficiently those patients stable enough to wait for treatment from those who require immediate medical attention. In veterinary medicine we have adopted the goals of our counterparts in the human emergency room. Thus, we prioritize cases by medical urgency when presented with multiple emergencies at the same time.

Triage occurs both by telephone and in the hospital. A client often calls the hospital seeking advice for the care of their pet; the receptionist or veterinary technician must ascertain useful information about the pet in a short period of time. Thus, the receptionist or technician should have the knowledge required to provide appropriate advice. The information obtained during the telephone conversation will also be useful in preparing for patient arrival. On initial presentation to the hospital the veterinary technician is usually first to receive the patient and therefore to perform basic triage. This person must determine whether the patient needs immediate care and, in the case of simultaneous patient arrivals, prioritize treatment based on medical need.

Telephone Triage

In theory, telephone triage requires clinic staff to determine the urgency of a pet's problem and to provide advice based on that determination. However, because the client may not possess the training to give an accurate account of the pet's problem(s), it is generally safest to recommend that the client take the pet to a veterinarian for evaluation. Particularly any patient experiencing breathing difficulty, seizures, inability or unwillingness to rise, or traumatic injury should be seen by a veterinarian without question.

At the beginning of the telephone conversation, staff should establish the animal's signalment (breed, sex, age, and approximate weight) if possible. Questions asked of the owner should be basic and straightforward using lay terminology. Questions should address the patient's level of consciousness (LOC), whether the patient is breathing easily or with difficulty, has abnormal mucous membrane color, experiencing seizures, has obviously broken or exposed bones, or has any pre-existing medical conditions (Box 1.1). Based on the owner's responses, advice can be given on first aid, assuming that the problem can be clearly defined and is simple. See Box 1.2 for a list of problems requiring immediate attention by the veterinary healthcare team.

Information gathered during the phone conversation can aid the veterinary technician in preparation for the arrival of the patient at the hospital. Knowing the animal's breed or approximate weight allows the technician to pre-select appropriate sizes for vascular catheters, fluid bags, and endotracheal tubes.

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Box 1.1 Questions Useful in Telephone Triage, and Suggested Responses

1) Is the animal breathing and conscious?
   A) If neither, institute chest compressions and mouth-to-snout; if yes to either of these, do not.
2) Is the animal having difficulty breathing?
   A) If yes, take immediately to a veterinarian.
3) What color are the mucous membranes (gums)? Do they appear their usual color?
   A) If no, what color is noted?
4) Is the animal actively experiencing a seizure?
   A) If yes, remove from danger of falling, bodies of water, or sharp objects. Take to veterinarian immediately after seizure ends, or if it lasts longer than 1–2 minutes, bring during seizure. Instruct owners to stay clear of the animal's mouth to avoid accidental bite wounds.
5) Has the animal ingested something that may be poisonous within the last two hours?
   A) If yes, take immediately to a veterinarian. In some situations, if the client cannot or will not take the pet immediately to a veterinarian, at-home emesis may be recommended.
6) Is there active bleeding, an obvious fracture, or exposed bone?
   A) Recommend clean towel over the site, pressure if spurting blood. Warn clients to be VERY CAREFUL to avoid being bitten.
7) Does the animal have any ongoing medical problems and or is it on any medications (including over the counter)?
   A) Briefly restate your understanding of the problem(s). If on medications and coming into the hospital, instruct the owner to bring all medications.

Box 1.2 Problems Requiring Immediate Attention by the veterinary healthcare team

- Cardiopulmonary arrest (unconscious and making no regular attempts to breathe)
- Excessive bleeding
- Respiratory distress
- Weakness
- Pale mucous membranes
- Rapid abdominal distension
- Neurological abnormalities
- Inability or persistent straining to urinate
- Protracted vomiting
- Ingestion or topical exposure to toxins
- Burns
- Snake envenomation
- Perforation, wound dehiscence, or open body cavities
- Open fractures
- Prolapsed organs
- Dystocia

Owners should be instructed on safe transport of the animal. Animals that have suffered trauma are often in pain, and owners should be coached on how to approach the pet and place a makeshift muzzle using a necktie, belt, or strips of cloth. If the animal is nonambulatory, owners may be told to place the animal in a box or carrier, or to use a blanket or towel as a stretcher (Figure 1.1). The use of a blanket stretcher makes it easier to get an animal in and out of a car. If the animal is a cat, it should be brought in a cat carrier or box (with holes).

When the caller is not a regular client of the facility, the staff member should obtain the client's phone number early in the conversation in case of disconnection and make the caller aware of the address, location, or easiest directions to the clinic. The client should be informed of the clinic's payment policy.

Finally, the telephone conversation should be documented, giving a complete summary of what transpired. Logs are saved for whatever period is dictated by the regulating body. Telephone logs serve as an extension of the legal medical record.

Hospital Triage

Three major body systems are assessed during the initial triage: respiratory, cardiovascular, and neurological. Triage begins when approaching the patient. Visually assess breathing effort and pattern; presence of blood or other foreign material on or around the patient; and the patient's posture and LOC. Note if there are airway sounds audible without a stethoscope. Note whether the animal responds as you approach. If the animal is conscious, ask the owner about the patient's temperament and take the appropriate precautions regarding physical restraint or muzzling. The veterinary technician cannot rely on the client's statement that an animal "never bites," but if the client states that the patient is aggressive, the patient should be muzzled. Physical restraint and muzzling should be performed with extreme caution in patients with respiratory distress, as such steps can cause acute decompensation and respiratory arrest. If time permits, a brief history should be obtained.

Figure 1.1 (a) Placing a dog in a box for transport. (b) Using a blanket as a stretcher. The animal is placed on a blanket and the edges of the blanket used to lift the patient.

The ABCDEs

A reasonable and systematic approach to triage is the use of the ABCDEs of emergency care, which are: (A) airway, (B) breathing, (C) circulation, (D) dysfunction of the central nervous system, and (E) exposure/examination (Figure 1.2). Patients with respiratory distress or arrest, signs of hypovolemic shock or cardiac arrest, altered LOC, or ongoing seizure activity should be immediately taken to the treatment area for rapid medical attention. Conditions that affect other body systems are generally not life-threatening in and of themselves, but their effects on the three major body systems may be life-threatening. For example, a fractured femur bleeding into a limb can lead to life-threatening hypovolemia.

Airway and Breathing

Expedient respiratory system assessment and rapid correction of abnormalities are critical. First, patency of airway and breathing effort should be assessed. This is done by visualization, auscultation, and palpation. When looking at the animal, an experienced individual can determine whether the animal has increased breathing rate or effort. Some animals with respiratory distress may assume a posture with the head and neck extended and the elbows abducted (held away from the body). Additional concerning signs include absent chest wall motion, exaggerated breathing effort, flaring of the nares, and open mouth breathing in cats. A "paradoxical" breathing pattern can occur when sustained high breathing effort leads to respiratory fatigue or during upper airway obstruction; paradoxical breathing is characterized by opposing movements of the chest and abdominal walls during inspiration and expiration. Cyanosis, a blue or purplish tint to the mucous membranes, usually indicates hypoxemia and warrants immediate medical intervention. The chest wall may be palpated to assess chest wall integrity. Crepitus about the body may indicate subcutaneous emphysema, which can be caused by tracheal tears or chest wall defects.

Assessment questions the triage technician should consider include:

- Is the patient having difficulty breathing?
- Are breath sounds audible?
- Are facial injuries interfering with the airway?
- Has a bite wound disrupted the larynx or trachea?
- Is subcutaneous emphysema present?
- What color are the mucous membranes?
- Does respiratory distress get worse with patient position change?
- Is there evidence of thoracic penetration or an unstable chest wall segment?

Circulation

Many of the signs suggestive of decreased cardiac output are a result of a compensatory sympathetic reflex, which helps maintain arterial blood pressure. Clinical signs suggestive of decreased cardiac output include tachycardia, pale or gray mucous membranes, prolonged capillary refill time, poor pulse quality, cool extremities, and decreased mentation. Decreased cardiac output may be due to hypovolemia from blood or other fluid loss (internally or externally; active or historical), trauma, or cardiac disease.

Circulation is assessed by visualization, palpation, and auscultation if using a stethoscope. The focus of the cardiovascular assessment is the six perfusion parameters (Box 1.3).

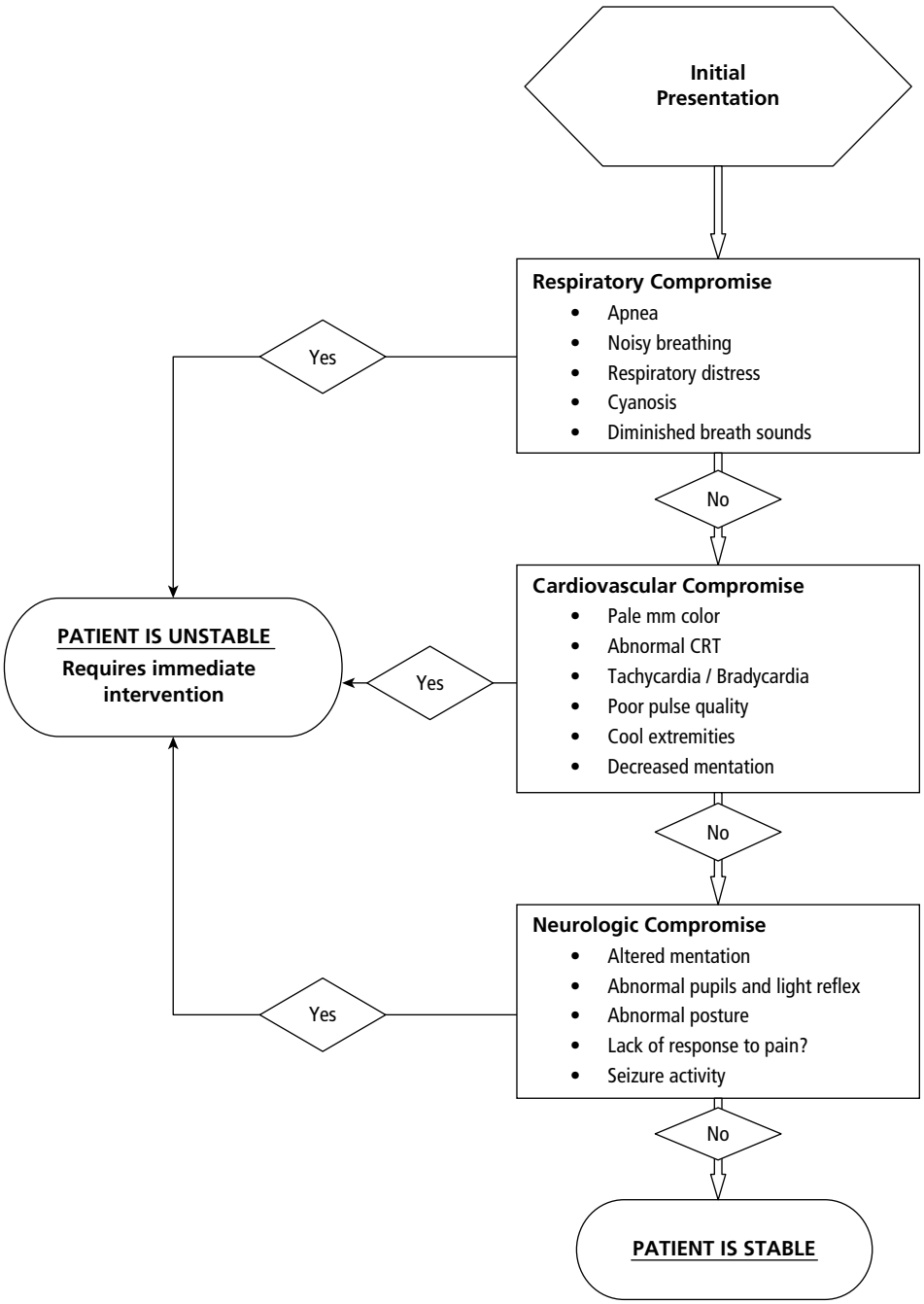

Figure 1.2 Triage algorithm. CRT, capillary refill time; mm, mucous membranes.

Box 1.3 The Six Perfusion Parameters

- Mentation
- Mucous membrane color
- Capillary refill time
- Heart rate
- Pulse quality
- Extremity temperature

Mentation

As previously mentioned, evaluation of mentation starts from afar. The patient's attitude is evaluated without stimulation. A reduced level of mentation is indicated by a loss of interest in the surrounding environment and diminished or absent responses to stimuli such as noise and touch. This can be described as obtundation or depression. As depression implies an assessment of the animal's emotional state, obtundation may be a more appropriate term.

If there is a loss of consciousness, mentation is either stuporous or comatose. Stupor refers to a patient that is unconscious and responsive only to noxious stimuli. Coma refers to a completely unconscious, non-responsive state. Most unconscious animals require intubation to protect their airway.

An altered level of mentation can be the result of primary intracranial disease or significant systemic abnormalities such as hypoperfusion or hypoglycemia. Any abnormality in mentation should be considered serious and a complete triage examination is warranted immediately.

Mucous Membrane Color

After assuring it is safe to do so, evaluate the mucous membranes by examining the color of the gums (Figure 1.3). As an alternative in the fractious animal or patients with pigmented gums, one may examine the conjunctiva, penis, or the vulva. The normal pink color is a result of oxygenated hemoglobin in red blood cells in the capillary bed. Mucous membrane color may vary with circulation-related problems. Pale or white mucous membranes are a consequence of a reduced quantity of red blood cells perfusing the capillary beds of the mucosal tissue. This can be the result of vasoconstriction in compensation to circulatory shock or severe anemia. This abnormality in combination with other evidence of poor perfusion or inadequate tissue oxygenation warrants emergency intervention. Vasodilation increases the flow of blood through the mucous membranes making them a deep pink to red color. Vasodilation may be an appropriate response as seen in a hyperthermic animal following exercise, or it can be pathological as seen in vasodilatory shock. Patients with vasodilatory shock commonly present with concurrent hypovolemia and so on presentation may have pale mucous membranes that turn dark pink or red after adequate fluid resuscitation.

Figure 1.3 Assessing a patient's mucous membrane color.

Cyanotic or blue mucous membranes are an indicator of severe hypoxemia. The absence of cyanosis does not rule out hypoxemia. Icteric or yellow mucous membranes are due to the breakdown of red cells (hemolysis) or hepatobiliary disease. Methemoglobinemia results in brown or chocolate-colored mucous membranes.

Capillary Refill Time

Capillary refill time (CRT), the time it takes for mucous membranes to regain their color following blanching by digital pressure, reflects degree of local blood flow. When perfusion is normal, CRT is one or two seconds. Vasoconstriction reduces the flow of blood through the mucous membranes via arteriolar and precapillary sphincter contraction and it will take longer for the color to return to the tissue after blanching. In severe vasoconstriction the mucous membranes can appear white, and it can be impossible to appreciate any CRT. In patients with vasodilation the CRT can be more rapid than normal as there is less resistance to blood flow and the capillary beds rapidly refill with blood after the digital pressure is removed. A slow CRT is always a concern and suggests poor perfusion. A rapid CRT in conjunction with other perfusion abnormalities can suggest vasodilatory shock.

A study was undertaken to evaluate the relationship between a standardized method of evaluating CRT and various clinical parameters in hospitalized dogs. The authors found that a CRT following blanching for four seconds may provide insight into the hydration status and hemodynamic stability of canine patients [2]. This study may also serve as a basis for establishing a standardized method for evaluating CRT (Box 1.4). It should be noted that a four-second pressing time was used to minimize fluctuations in pressure application time. The gingival mucosa was avoided due to the potential inflammatory changes associated with gingivitis, which may alter CRT. A stopwatch was used to ensure reliability. Avoid immediate (within two minutes) repeating of CRT measurement at the same location as refills may be falsely shortened on subsequent evaluations (presumably due to warming of the site from repeated contact and subsequent vasodilation).

Box 1.4 Standardized Method for Measuring or Assessing Capillary Refill Time

- Use inner lip oral mucosa taking care not to restrict blood flow when everting lip
- Moderate direct pressure is applied for 4 seconds
- Use a stopwatch to determine the time for return of color to the capillary bed
- Avoid immediate (within 2 minutes) measurement of the same site

Heart Rate

Heart rate is a nonspecific parameter. It is usually measured by auscultation of the heart, palpation of the cardiac apex beat, or palpation over an artery. The normal heart rate of a dog varies with body size. In general, large breed adult dogs have resting heart rates of 60–140 beats per minute (bpm), medium adult dogs 70–160 bpm, and small dogs and puppies 100–180 bpm. Normal feline heart rate at a veterinary hospital is usually 160–220 bpm. When arterial blood pressure is threatened either by a drop in stroke volume or because of vasodilation, a baroreceptor-mediated increase in sympathetic tone results in a reflex tachycardia. As tachycardia is a normal response to anxiety, excitement, and exercise, it is a common physical examination finding. The presence of tachycardia in conjunction with other signs of abnormal perfusion (e.g. abnormal mentation, mucous membrane color, CRT) suggests hemodynamic compromise.

Tachycardia is the appropriate and expected response to circulatory shock. The presence of normocardia or bradycardia in canine shock patients (i.e. patients with abnormalities in the other five parameters) is of concern as it suggests decompensated shock and may be associated with greater severity of illness and a poorer prognosis. Feline shock patients often present without tachycardia, and this is not considered to have the same prognostic relevance that it does in dogs.

Auscultable arrhythmias may or may not require immediate medical therapy. Femoral pulse evaluation should be performed simultaneously with auscultation for both time efficiency and recognition of pulse deficits. Arrhythmias without any other signs of poor perfusion are less concerning but these patients should always be prioritized for a secondary evaluation including an electrocardiogram (ECG), as the physical assessment of these abnormalities is limited.

Pulse Quality

Pulse quality is subjectively determined by the digital palpation of the femoral pulse. Obvious abnormalities in pulse quality are concerning, and if present in conjunction with other signs of poor perfusion, the patient should receive immediate medical attention. Unfortunately, patients can have considerable hemodynamic compromise without palpable changes in pulse quality. As a result, the palpation of an adequate femoral pulse cannot be used to indicate a stable patient.

The pulse quality is determined by the difference between diastolic and systolic arterial blood pressure, as well as the duration of the pulse and the size of the vessel. The greater the diastolic–systolic difference, the "stronger" the pulse will feel. For example, a normal arterial blood pressure would be a systolic blood pressure of 120 mmHg, a mean of 85 mmHg, and a diastolic of 70 mmHg. The systolic–diastolic pressure difference (pulse pressure) in this example is 50 mmHg. If there is a fall in blood pressure such that the patient is hypotensive with a systolic pressure of 90 mmHg, mean of 55 mmHg, and diastolic of 40 mmHg, the pulse pressure would still reflect a systolic–diastolic difference of 50 mmHg. The examiner may be challenged to detect any change in pulse quality in such case.

Vasoconstriction tends to diminish palpable pulse quality, leading to the "thready pulse." In contrast, vasodilation increases vessel size and compliance. In addition, vasodilated patients may have an increased stroke volume such that the pulse quality is often appreciated to be normal or exaggerated ("bounding") in these patients.

Studies have looked at the relationship between peripheral pulse palpation and Doppler systolic blood pressures in dogs and cats. In one dog study the authors concluded that absent metatarsal pulses are highly specific in the diagnosis of hypotension. However, dogs with palpable metatarsal pulses can still be hypotensive [3]. In a cat study it was concluded that peripheral pulse quality assessment by emergency room veterinarians correlates with systolic blood pressure. With progressive decreases in blood pressure, metatarsal pulses will disappear and it is only with severe hypotension that femoral pulses are absent [4]. In the case of peripheral pulse abnormities (weak or absent), the index of suspicion for hypotension is high. Conversely, the presence of palpable pulses does not rule out hypotension. Palpation of pulses does not replace the need for an actual blood pressure measurement. Other perfusion parameters should be taken into consideration when assessing peripheral pulses.

Extremity Temperature Compared with Core

The sympathetically mediated vasoconstriction that occurs in response to a fall in cardiac output tends to shunt blood from venous capacitance vessels to the central circulation, preserving blood flow to vital organs at the expense of less vital tissue. This reduction in peripheral circulation will cause a fall in extremity temperature in comparison with core body temperature. If the patient is generally hypothermic, cool extremities that are essentially the same temperature as the rest of the animal does not indicate an abnormality in perfusion. For this reason, extremity temperature (evaluated by manual palpation of the paws and distal limbs) should be interpreted with reference to the measured rectal temperature. Vasodilation is generally associated with warm extremities if the patient is fluid resuscitated.

There has been renewed interest in veterinary medicine to the measurement of toe web and rectal temperature difference in the assessment of perfusion. Its use in the veterinary patient was first described in the late 1970s. Toe web temperature had been shown to decrease far below body

(rectal) temperature during hemorrhagic shock and to return toward body temperature following fluid resuscitation [5]. In the more a recent study looking at rectal–interdigital temperature gradient (RITG) as a diagnostic marker of shock in dogs, RITG was determined by taking a rectal temperature (with a standard, sheathed, battery-operated rectal thermometer). The interdigital temperature was taken with the same thermometer between the third and fourth digit on a pelvic limb. The digits were manually pressed together. Based on the study results, a gradient of 8.5°F may be used as a screen for circulatory shock, and a cutoff of 11.6°F would indicate high suspicion for circulatory shock [6]. The cutoffs used were based on an ambient temperature of 74°F. While the use of RITG should not replace more traditional methods of assessing perfusion, it may serve as an additional tool for the assessment of circulatory shock.

Assessment questions the triage technician should consider include:

- Is there evidence of hemorrhage?
- Is there swelling associated with an extremity fracture?
- Are the mucous membranes pale or injected (deep red)?
- Is the capillary refill prolonged?
- Are the femoral pulses weak and rapid?
- Are the extremities cold/is there increased RITG?

Dysfunction or Disability of the Neurologic System

Dysfunction or disability refers to the neurologic status of the patient. This may be assessed through visualization and palpation. A cursory neurologic examination is performed focusing on the patient's LOC/mentation, pupils (size and response to light), posture, and response to pain (deep tested only if the patient lacks superficial pain perception). Depressed mentation may be a result of poor oxygen delivery or trauma to the brain. Seizure activity may be due to intra- or extracranial causes.

A patient with known or suspected trauma that is recumbent, has an abnormal posture, or is not seen to ambulate or make voluntary movements, should be assumed to have spinal trauma and stabilized on a backboard (Figure 1.4) until proven otherwise.

Assessment questions the triage technician should consider include:

- Is the animal bright, alert, and responsive or obtunded (depressed but rousable), stuporous (roused only with painful stimulation), or comatose?
- Are the pupils dilated, constricted, of equal size, and responsive to light?
- What is the posture of the animal?
- Are there any abnormal breathing patterns?
- Does the animal respond to painful stimuli?
- Is there obvious seizure activity?

Figure 1.4 A patient with suspected head and spinal trauma restrained on a backboard. The cranial end of the board is elevated slightly because of suspected increased intracranial pressure.

Exposure/Examination

In people, skin exposure is an essential aspect of patient evaluation since clothing can hide serious injuries or abnormalities. The same is true for animals, which require fuller examination once airway, breathing, circulation, and neurologic status are evaluated and stabilized. Once an animal is considered safe for movement, the removal of blankets or harnesses, and turning the lateral patient to examine its other side are important. Any source of ongoing harm is removed, such as by bathing the cat with topical permethrin application. Emesis may be induced if the animal recently ingested a toxin.

Finally, a rapid, whole-body examination is performed. The goal is to determine and address any additional problems.

Assessment questions the triage technician should consider include:

- Are there lacerations, wounds, or punctures?
- Is there bruising and is it getting worse?
- Are there palpable fractures?
- Is the abdomen apparently painful or distended?
- Is there evidence of debilitation or other signs of disease?

Body Temperature

Body temperature is not addressed in the standard ABCs and may not be required for the assessment of every patient. Extremes of body temperature are, however, an indication for urgent medical attention and as a result the temperature of at-risk patients should be measured during assessment.

Point-of-Care Ultrasound

Over the past two decades, bedside ultrasonography has become mainstream in the human emergency department [7]. It is an important skill that positively impacts

patient outcomes. Point-of-care ultrasound (POCUS; see Chapter 6) is also beneficial in the veterinary emergency room [8], including during triage [9]. Abdominal point-of-care ultrasound is used in the detection of free fluid in the abdomen (see Chapter 39). There are reports in the veterinary literature that the size of the caudal vena cava can be assessed via ultrasound and aid in diagnosis of hypovolemia in dogs [10]. Thoracic point-of-care ultrasound is used to assess the pleural cavity, looking for free fluid in the pleural and pericardial spaces (see Chapter 17) and for signs consistent with a pneumothorax [11] (see Chapter 27).

In 2007, it was suggested that the training for human emergency and critical care professionals in ultrasound should use the ABCDE and head-to-toe approach. Critical care problems are approached primarily according to the ABCDE or the head-to-toe sequence based on physiological priority. The idea was that introductory ultrasound training should always follow the same pathways and priorities, thus addressing findings in the real order of importance [12]. This POCUS approach or protocol is known as FAST-ABCDE (FAST including airway-breathing-circulation-disabilities/deficits and exposure). FAST-ABCDE is more comprehensive in evaluating patients for life-threating problems (Figure 1.5). The human ABCDE protocol has been adapted for the veterinary patient and studied in dogs [13]; it is called VetFAST ABCDE. The VetFAST ABCDE identifies problems related to airway, breathing, circulation, disability, and exposure (Figure 1.6). The study found that the VetFAST ABCDE protocol in dogs suffering from trauma is feasible, can detect cavitary effusion and pneumothorax with a higher diagnostic accuracy than radiographs, and can detect lesions outside the scope of traditional veterinary ultrasound exams [13].

Airway:
- Airway patency
- Laryngeal/tracheal trauma

Breathing:
- Pulmonary embolism
- Alveolar–interstitial syndrome
- Diaphragmatic lesions

Circulation:
- Intravascular volume estimation
- Cardiac function

Disability:
- Neurological impairment

Exposure:
- Among other injuries in a repeated manner

Figure 1.5 Potential problems [8] identified with the FAST ABCDE protocol.

Airway:
- Tracheal incongruity
- Tracheal collapse

Breathing:
- Pneumothorax
- Lung contusion
- Pleural effusion
- Diaphragmatic hernia
- Alveolar–interstitial syndrome

Circulation:
- Abdominal effusion
- Pericardial effusion
- Cardiac tamponade
- Systolic impairment
- Retroperitoneal effusion
- Caudal vena cava collapse

Disability:
- Presumed increased intracranial pressure

Exposure:
- Worsening or new development of injuries

Figure 1.6 Potential problems [8] identified with the VetFAST ABCDE protocol.

Summary

In some emergencies, minutes count. The triage performed by the veterinary technician should be rapid and efficient. The goal is rapid recognition of and intervention for life-threatening conditions such as hypoxemia and inadequate perfusion. A systematic approach to patient assessment is essential for the best possible patient outcome.

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