Practical Emergency and Critical Care Veterinary Nursing

Paul Aldridge
and Louise O'Dwyer

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I dedicate this book to my son Jacob, the brightest star in the sky
Louise O'Dwyer
For my daughters, Ella and Amber
Paul Aldridge

Companion website

This book is accompanied by a companion website:
www.wiley.com/go/aldridge/ecc_vet_nursing
The website includes:

- information charts
- video/slideshow demonstrations

Practical Emergency and Critical Care Veterinary Nursing

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Preface

Emergency and critical patients are amongst the most challenging and rewarding of cases to treat. The role of the veterinary nurse and the close relationship with patients is never more important than when nursing these cases. Nurses have a vital role in the outcome of these patients as recovery is dependent on close monitoring and assessing the response to treatment, often noticing subtle changes in clinical signs.

During the 12 years that we have both been involved in emergency care, huge steps forward have been made in both diagnostic procedures and the treatment of patients, and emergency care has become a respected discipline in itself.

We hope this book conveys our enthusiasm for this fascinating area of veterinary medicine, and inspires nurses to become more confident in their clinical skills and abilities. We hope that reading the book will not only teach new skills, but also show how an existing skill set can be applied in an emergency situation.

The layout of the book is such that it could be read completely by nurses studying towards qualifications, or equally kept close at hand within the practice as a reference work, turning to the relevant chapters as the need arises. Each chapter contains a large number of photographs obtained from real life cases, to illustrate clearly the techniques described in the text. Depending on local legislation, some techniques described (e.g. tracheostomy) will be outside the scope of what nurses are permitted to perform; however, we feel their inclusion is essential to provide an understanding of why and how these procedures

are performed, and to emphasise the areas of after care that must be closely attended to.

To accompany this book a companion website has been produced (visit **www.wiley.com/go/aldridge/ecc_vet_nursing**). Our aim was to provide access to additional resources, tables and charts that we find useful in the management of our emergency and critical patients. Where such a document exists then reference is made to it at the relevant point of the chapter.

Paul Aldridge and Louise O'Dwyer
July 2012

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Triage and Assessment of the Emergency Patient

Introduction

Throughout the management of the emergency patient a successful outcome is more likely to be achieved where prompt, appropriate action is taken as dictated by the clinical findings of observation and examination. Nowhere is this more important than on initial presentation where the patient with a life-threatening condition must be identified and receive immediate attention; this process is triage.

Triage is a system of rapidly evaluating patients and allocating treatment to those patients that are in most urgent need, or in the case of one individual case, allocating treatment to the most serious problem first. To gain this information, a rapid, efficient, clinical examination of the major body systems is carried out: respiratory, cardiovascular and central nervous system (CNS). The initial examination of each body system should concentrate on a small number of clinical signs that provide the most important information.

In human medicine, triage is well established and used in busy accident and emergency departments or at the scene of major incidents. The same principles apply in veterinary medicine, whether in a dedicated emergency out-of-hours practice or when dealing with an urgent case in a first opinion practice.

Telephone Triage

In many cases the initial contact from the owner of the emergency case will be by telephone. The veterinary nurse is often involved in establishing the urgency of the problem, and vitally whether the animal needs to attend the clinic immediately. From conversation with some owners it will become immediately obvious from the clinical signs described that the case is an emergency and should be seen as soon as possible (see Table 1.1). In other cases the nurse will need to try to determine the nature of the problem, and give advice accordingly. It may be necessary to calm the owner to elicit a concise, relevant history, and caution should be used when assessing an owner's perception of the patient's problem. If there is any doubt about the need to see an animal, it is safest to advise the owner to attend or for a veterinary surgeon to discuss the case with the owner. It is advisable that all patients with a traumatic injury should attend the clinic immediately.

Table 1.1 Examples of owner-reported clinical signs that warrant immediate attendance at clinic

• Respiratory distress • Severe coughing • Weakness or collapse • Neurological abnormalities • Ataxia • Non-weight-bearing lameness • Severe pain	• Abdominal distension • Persistent vomiting or diarrhoea • Inability to urinate • Bleeding from body orifices • Profuse bleeding from wounds • Ingestion of toxins • Dystocia

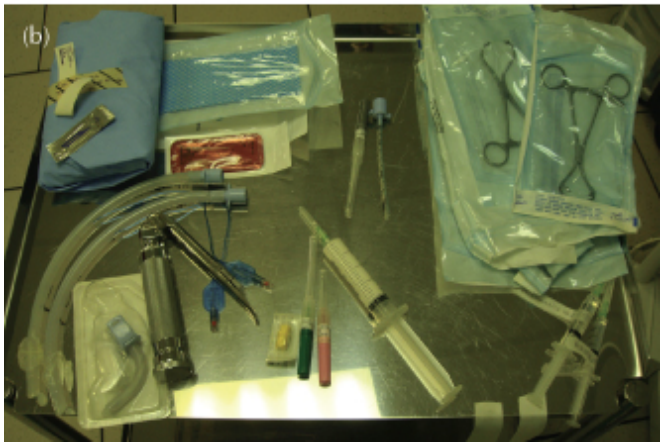
The owner should be questioned as to the signalment of the patient (breed, age, sex and approximate weight) and given clear and concise directions as to where they are to attend (this is especially important where phone lines are diverted out of hours and owners maybe unaware their call has been diverted to another site or clinic) and an estimated time of arrival obtained.

Advice may need to be given on transportation of the animal, especially following trauma. If an animal is unable to walk it may need to be carried; it is preferable for a trauma victim to be carried on a board or something rigid, rather than a blanket (see Figure 1.1). In the case of active bleeding, direct pressure on to a clean cloth is safer than the owner applying a tourniquet. Always warn the owner that the animal may be aggressive due to pain.

Figure 1.1 Transport.

Knowing the nature of the problem, along with the signalment of the animal, allows a great deal of preparation to occur prior to the patient's arrival (see Figure 1.2); this can save valuable time when initiating stabilisation. For example, equipment for supplementing oxygen or obtaining vascular access can be prepared, or advice can be sought regarding toxic levels, appropriate management and antidotes in cases of intoxication.

Figure 1.2 (a) Preparing for the arrival of a patient. Information gathered during telephone triage allows equipment to be prepared and so save time once the patient has arrived; in this case a dog with a pharyngeal foreign body. (b) Close-up of the trolley in (a). Equipment includes intravenous access, endotracheal tubes, laryngoscope, surgical kit, tracheostomy tubes, etc.



Hospital Triage

On arrival at the clinic the major body systems are assessed during the triage, and a brief ‘capsular’ history obtained from the owner (see Table 1.2). See website documents: Triage assessment sheet.

Table 1.2 Questions asked of owners to obtain a ‘capsular history’

• Signalment (age, sex, neutered, breed) • Vaccination history	• Duration of presenting complaint • Current medication

During assessment, any abnormality detected with a major body system is likely to be life-threatening; therefore measures are immediately taken to start stabilising that

condition, prior to completing the rest of the examination. The aim is not to reach a definitive diagnosis, but to start treatment of life-threatening conditions. So, for example, if an animal is immediately noted to be in respiratory distress, oxygen is administered before any other part of the examination is carried out.

Patients with certain presentations should be taken to the treatment area immediately, regardless of major body system findings (see Table 1.3; Figure 1.3).

Table 1.3 Examples of presenting conditions that should be taken immediately to the treatment area on arrival

• Seizures • Trauma • Prolapsed organs • Dystocia	• Ingestion of toxins • Excessive bleeding • Open fractures • Burns (see Figure 1.3)

Figure 1.3 Severe burns on a puppy, an example of a patient that should be taken directly to the treatment area.

A useful path to follow in the initial assessment of major body systems is ABCD, where:

A: Airway

B: Breathing

C: Circulation

D: Dysfunction of the CNS.

A and B: Respiratory System

Emergencies involving the respiratory system require rapid assessment, cautious restraint and prompt measures to start stabilisation. Assessment of the respiratory system should begin as the patient is approached by observing their posture, respiratory effort and pattern, and whether any airway sounds are clearly audible.

In the normal patient, both cats and dogs have a respiratory rate of approximately 10–20 breaths per minute (bpm), ventilation involves very little chest movement, and the chest wall and abdomen move out and in together. Whilst open mouth breathing and panting in a dog is considered normal, the same in a cat is always considered to indicate respiratory distress and oxygen supplementation is indicated.

The respiratory system of the patient is assessed by observation, auscultation and palpation.

Airway

In a collapsed patient, assess if the airway is patent by listening for breathing, and looking in the mouth for any obstruction (blood, vomit, foreign bodies). Facial injuries or cervical bite wounds can interfere with the airway by disrupting the larynx or trachea.

Breathing

Observation

The patient should be closely observed before moving on to auscultation with a stethoscope. Often, observation alone is enough to determine a respiratory problem exists and dictate the animal should be moved to the treatment area to start stabilisation. Observation should focus on:

- *Respiratory rate:* an increased respiratory rate is termed tachypnoea. If a patient is judged to be tachypnoeic, the focus should then move to whether there is increased respiratory effort. If there appears to be no increased effort, the tachypnoea may be caused by fear, stress, pyrexia or pain.
- *Respiratory effort:* animals with increased respiratory effort will often alter their body posture to assist them in their efforts to ventilate adequately. The typical picture is of flared nostrils, extended neck and abducted elbows as the animal struggles to draw air in. There will often also be exaggerated chest wall movement and abdominal effort, where the muscles of the abdominal wall are brought into play to assist with breathing. In severe respiratory effort there maybe ‘paradoxical’ movement of the abdominal wall; where the abdomen moves inwards on inspiration.
- *Respiratory pattern:* in the normal breathing cycle, the time taken for inspiration is similar in length to expiration. Where alterations in this ratio occur it may give clues to the level of the respiratory tract at which a problem is present (see Chapter 9).
- *Symmetrical movement of the chest wall:* rib fractures, and ‘flail chest’ segments may cause asymmetrical movement of the chest wall.

Auscultation

Listening to the patient before using a stethoscope may reveal abnormal respiratory noises such as stertor, or stridor. Stertor refers to ‘snoring’ types of noise, often caused by vibration of excessive soft tissue in the oropharynx. While this is normal in some breeds of dog, in other patients it may be a sign of inflammation. Stridor is a high-pitched whistling sound, usually associated with air moving rapidly through a narrowed opening.

Auscultation in association with a respiratory pattern is vital in helping to localise the region of the respiratory tract affected (see Chapter 9).

A stethoscope should then be used to ausculate the chest wall, comparing identical areas on the left side of the chest to the right side, and similarly comparing ventral lung fields to dorsal. This comparison allows abnormalities to be more easily detected. Breath sounds may be reduced or absent where pleural disease exists (pneumothorax, pleural effusion, diaphragm rupture), or increased sounds where airway disease is present. The presence of wheezes suggests airway narrowing, and ‘crackles’ suggest the presence of fluid in alveoli.

Palpation

Gentle palpation of the chest wall may be useful for detecting obvious trauma or subcutaneous emphysema. Subcutaneous emphysema is a build up of air below the skin, and can be associated chest wall defects or tracheal trauma (see Figure 1.4).

Figure 1.4 Pronounced subcutaneous emphysema in a cat following thoracic trauma from an airgun pellet.

Definitive treatment for the cause of respiratory compromise should be provided as soon as possible. Careful auscultation and observation of the breathing pattern will often determine the location of the cause of dyspnoea, be it upper or lower airway, or pleural space disease. This can be essential, as often dyspnoeic animals have little or no physiological reserve. The ability to establish a working diagnosis based on history and examination alone is often the difference between life and death in dyspnoeic animals.

C: Cardiovascular

During initial assessment of the cardiovascular system, the aim is to gauge the effectiveness of the heart in pumping blood to perfuse body tissues, and also whether that perfusion is delivering oxygen to the tissues. Poor perfusion leads to reduced oxygen delivery to tissues, known as ‘shock’. Left uncorrected, shock will lead to cell death, and greatly increased morbidity and mortality in emergency patients.

Decreased cardiac output may be due to reduced circulating volume (hypovolaemia), or be due to heart failure and arrhythmias.

There is no direct method of measuring the amount of oxygen delivered to tissues; examination concentrates indicators of cardiovascular performance, or perfusion parameters. Many of the signs used to detect reduced cardiac output and poor perfusion arise as a result of compensatory measures by the body; measures aimed at preserving blood flow to the heart and brain at the expense of other tissues such as skin, gastrointestinal tract, muscles and kidneys. Compensatory measures include increased heart rate and contractility, and vasoconstriction of arterioles leading to capillary beds in less 'vital' tissues.

Mucous Membranes

Mucous membranes are normally pink in colour; this is most commonly assessed on the gums. Cats' mucous membranes tend to be lighter in colour than dogs'. Commonly seen changes in mucous membrane colour are outlined in Table 1.4 (see Figure 1.5).

Table 1.4 Commonly observed colour changes in mucous membranes and their possible causes (see Figure 1.5)

Colour observed	Possible cause
Pale, white or grey	Poor perfusion, or anaemia
'Brick red' or 'injected'	Vasodilation, systemic inflammatory response
Blue or purple	Cyanosis: low oxygen saturation of haemoglobin
Yellow	Increased blood bilirubin levels
Brown	Formation of methaemoglobin, e.g. paracetamol poisoning
Cherry red	Carbon monoxide poisoning

Figure 1.5 (a) Pale mucous membranes in an anaemic animal. (b) Brick red mucous membranes in a patient with systemic inflammatory response. (c) Blue tinged mucous membranes in a cyanotic cat. (d) Icteric mucous membranes. The yellow colour is caused by raised levels of bilirubin.

Capillary Refill Time

Capillary refill time (CRT) is again assessed on the gums. Digital pressure is applied with a fingertip to blanche the mucous membrane, and then when the finger is removed, the time taken for colour to return is measured. A normal CRT is 1–1.75 s.

A prolonged refill time may be due to decreased cardiac output and vasoconstriction causing reduced peripheral perfusion.

A rapid capillary refill is likely due to increased perfusion of the mucous membrane caused by vasodilation, which can indicate systemic inflammation.

Pulse

Palpation of femoral and distal (metatarsal) pulses will reveal pulse rate and rhythm, and also gives an impression of stroke volume (the amount of blood pumped with each beat).

Pulses should be easily palpated (except in obese animals), and should feel ‘full’; terms such as these refer to the quality of the pulse, which may take some practice to appreciate. When judging the quality of the pulse the force and the duration of the pulse need to be assessed. The pulse is a wave of blood travelling down the artery that represents the output of the heart. If the duration of the wave, as well as its height is considered, a better idea of stroke volume is gained. As cardiac output drops, it becomes more difficult to palpate the metatarsal pulse.

Irregular pulses may be due to cardiac arrhythmias, or conditions such as pericardial effusion.

Heart

Auscultation of the heart should be carried out at the same time as palpating an artery, this allows any pulse deficits (an audible heart beat without an output) to be detected. The heart rate can be counted (see Table 1.5). A rapid heart rate (tachycardia) may be detected with cardiac disease, cardiac arrhythmias, sepsis or shock due to reduced blood volume. It must be remembered that whilst tachycardia is a normal finding in hypovolaemic dogs, cats often develop a slow heart rate (bradycardia) if hypovolaemic.

Table 1.5 Changes in heart rate and their possible causes

Normal heart rates	**Dogs:** 60–100 bpm (depending on size) **Cats:** 160–200 bpm (higher if stressed)

Causes of tachycardia	Cardiac disease Cardiac tachyarrhythmias Sepsis Hypovolaemic shock Fear Stress Pain
Causes of bradycardia	Hyperkalaemia Increased intracranial pressure Cardiac arrhythmias Hypovolaemic shock in cats

Heart sounds are often very quiet in severe hypovolaemia, and muffled where pericardial effusions are present. Any audible murmurs should be noted.

If indicators of poor tissue perfusion are detected on triage, stabilisation measures need to be taken immediately. Continued poor perfusion leads to cell death and release of free radicals and inflammatory mediators.

Most animals with abnormal perfusion have some degree of hypovolaemia. Recognising hypovolaemia based on the physical examination of perfusion parameters is an essential skill (see Table 1.6). With practice, the degree of hypovolaemia present can be estimated, and the same parameters used to measure response to treatment (see Chapter 3).

Table 1.6 Changes in perfusion parameters seen in hypovolaemia

Clinical parameter	Mild hypovolaemia	Moderate hypovolaemia	Severe hypovolaemia
Heart rate*	120–140	140–170	170–220
Mucous membrane	Normal, or pinker	Pale pink	Pale/white/grey
Capillary refill	Brisk (<1 s)	Normal (1–2 s)	Slow or not detectable
Pulse amplitude	Increased	Decreased	Very decreased
Pulse duration	Mildly reduced	Reduced	Very reduced

* Heart rates refer to dogs, cats often have a slow heart rate when hypovolaemic.

D: Dysfunction of the Central Nervous System

The CNS should be briefly assessed through observation and palpation. Observation should begin as soon as the patient is approached: posture, level of consciousness, and interaction or response to their surroundings should be noted. The patient should be ambulatory with normal gait and proprioception. (Any patient that is in lateral recumbency, non-responsive or showing neurological abnormailities such as twitching or seizure activity should be triaged immediately and taken to the treatment area for further assessment.)

Depressed mentation can be due to poor oxygen delivery to the brain, but if this seems more severe than would be indicated by examination of the respiratory and circulatory system, then the suspicion of CNS involvement is increased.

The patient's pupils should be assessed to ensure they are symmetrical and equal in size, that a pupillary light reflex (PLR) is present (see Chapter 15) and that there is no obvious dilation (mydriasis) or constriction (miosis).

Following assessment of the major body systems, a brief examination of the rest of the body should be performed.

Abdominal Palpation

After examination of the major body systems, the abdomen can be palpated. Palpation should reveal any abdominal distension or pain. Where distension is present it may be possible to differentiate between gaseous distension and fluid effusion. The caudal abdomen should be checked to ensure the urinary bladder is not distended.

Body Temperature

Core body temperature is usually assessed by a rectal thermometer reading. Readings taken may actually be lower than core temperature if the thermometer tip is within faeces or gas in the rectum.

High body temperatures are common in emergency presentations. Pyrexia is an increase in body temperature above the normal range (due to an increase in the body temperature regulatory set point, so the body is still controlling the body temperature) commonly seen with infection. Hyperthermia is an increase in temperature over and above the regulatory set-point. This occurs due to excessive heat production (e.g. from muscle activity in a seizuring animal) or an inability to thermoregulate (e.g. inability to pant in a dog with laryngeal paralysis). Body temperatures over 40°C (104°F) are of concern; temperatures of over 42°C (107°F) are life-threatening.

Low core body temperature can be associated with hypovolaemia. If a reading of 36°C or below is obtained, the patient should be assessed again to double check no other signs of poor perfusion are present.

Comparing the core body temperature with the temperature of the patient's extremity can be another indicator of poor perfusion. The patient's rectal temperature is compared with a reading obtained from the web of the toes. While the extremities are expected to be at a lower temperature, a difference of greater than 4°C often indicates reduced blood flow, and hence reduced transfer of heat to the extremities.

Summary of Triage

Triage aims to evaluate the major body systems quickly, allowing rapid intervention where hypoxia, poor perfusion and other life-threatening conditions are detected. The same skills can then be applied to ensuring the patient is responding to administered treatment.

Once admitted to the clinic, a standard protocol should be followed: oxygen supplementation where required, an intravenous catheter is placed and a 'minimum database' is