Assessing the trauma patient:

- Triage refers to differentiating of trauma patients for treatment based on priority when resources are insufficient for all to be treated immediately.
- The use of a triage sheet or list may help to categorize your patient based on presenting complaint, along with standard treatment priority.
- The triage examination consists of a primary survey, in which the cardiovascular, respiratory, neurologic, and urinary systems are evaluated to identify any possible life-threatening abnormalities.
- Intravenous catheterization, emergency blood testing, and a FAST ultrasound (if available) can offer additional information to guide patient stabilization procedures.

1. Hit by a Car

Trauma can range from minor to fatal, and many injuries can be hidden. Many injuries, such as bruising of the lungs, can worsen. Diaphragmatic tears or ruptures can go unnoticed by owners for days to weeks.

By the time the owner knows something is wrong, it may be too late.

Physical exam: often in open wounds there is grease, dirt, plant material etc. Always be sure to wear gloves with any open wounds. Make note of all abrasions, lacerations, road burns, bruising on skin, roughened nails, hyphema, variable fractures, variable mental status, dyspnea, and variable degrees of shock.

If your patient is in shock it is best to determine what kind of shock as there are variable degrees, for example:

Hypovolemic or circulatory shock:
- Hemorrhage (internal or external)

Cardiogenic
- cardiac arrhythmias
- cardiac tamponade
- congestive heart failure
- drug overdose

Distributive
- Anaphylaxis,
- Obstructive (thrombosis, thromboembolism, heartworm disease, etc.)

Hypoxemic
- Anemia
- Carbon monoxide toxicity
- Methemoglobinemia
- Pulmonary disease

Sepsis (septic vs septic shock)

Metabolic
- Central venous oxygen saturation (Scvo2)

The prognosis varies with the cause, duration, and extent of the shock. The goal of the treatment of shock is to deliver blood to the tissues, bring oxygen and other nutrients as well. Again, oxygen may be administered via mask, intubation, bag or nasal. Bleeding must be controlled. Fluids and blood products will be given intravenously as needed to replace what has been lost. The rate and amount of blood to be given needs to be determined by your veterinarian. Check with your veterinarian about blood product to be used: PRBC vs. FFP vs whole blood. Several fluid boluses of both crystalloids and colloids may be necessary to improve circulation and stabilize for transport.

Airway: always assess the airway in these patients, careful visualization, palpation and auscultation and examination of the oral cavity, pharynx and neck should be performed once patient is stable. Any obstruction of the airway can be life-threatening. If the large airway (the trachea or windpipe and its 2 main branches, called the bronchi.) are completely obstructed, the animal is unable to breath and will be unconscious. If the large airways are only partially obstructed, the animals breathing will be noisy. The patient may be fearful, and its skin may appear to have a bluish tinge (cyanotic/cyanosis) due to poor oxygenation. In some cases medication such as Butorphanol, and or Acepromazine may be given to sedate and open those airways and make breathing easier. If your patient is unconscious and not breathing, if at all possible those patients need to be intubated via endotracheal tube and placed
on O2. It is helpful if available to have an ETCO2 connected to see how the patient’s lungs are functioning.

Cardiovascular and respiratory: Again, careful visualization, palpation and auscultation of the thorax bilaterally are performed. Sometimes if available a TFAST (thoracic-focused assessment with sonography for trauma) is helpful in determining fluid or air in the thorax. Listen carefully to your patient and observe their breathing patterns. Do you hear dull thoracic sounds? This could mean fluid or excessive air in the thorax due to but not limited to penetrating wound from trauma or diaphragmatic hernia from trauma, or even a hemothorax from the trauma. In some patient with a more severe trauma they could have lung lobe torsion and require immediate surgery to correct this. If no obvious signs of trauma are present you will need to look for less obvious signs like bruising of the lungs and rib fractures. In my experience when determining a pain medication for patients with respiratory trauma the most common “go to” medication seems to be hydromorphone. I actually prefer something like Fentanyl instead of Hydromorphone as Hydro tends to make the patients pant and vomit which is contra-indicatory in patients with any respiratory trauma.

Abdomen: This is to include examination of the inguinal area, and caudal thoracic and Para lumbar regions. This examination includes visualization, palpation, percussion and auscultation for bowel sounds, possible clipping of hair for the detection of bruises, and punctures and lacerations. AFAST (abdominal focused assessment with sonography for trauma) if available is a great way to determine of there is excessive fluid on the abdomen and to be able to differentiate if the bladder is in tact. It may take several hours for specific signs of an injury to an abdominal organ to appear. If fluid is present, your veterinarian may ask you to prep the site for a needle to be inserted to remove some of that fluid for cytology. If a rupture of an organ is suspected you can run a PCV/TP on the fluid and compare it to the initial venous PCV/TP for comparison.

Spinal evaluation: From C1 to the last coccygeal vertebra. Be very careful when evaluating the spine. Make sure adequate pain medication has been administered. There are times when assessing the spine for injuries that patient will have a reaction and “jump” due to the pain and cause further injury. Most of the time your veterinarian will need to do a neurologic exam prior to pain medication being given. Always check with your veterinarian before administering any fluids or medications.

Head: including eyes, ears, nose, all cranial nerves and mouth, including the teeth and tongue. If there are injuries to the eyes it is not contra-indicatory to perform pressure if trauma is not too severe. It is almost always safe to lubricate those eyes to protect them until further diagnostics can be performed.
Pelvis: to include the perianal and rectal area, perineum and external genitalia for male and female both. If fractures are present, give adequate pain medications for your patient before attempting to stabilize for transport.

Limbs: pelvic extremities along with pectorals, skin, muscle, tendons and bones. Taking radiographs of your patient can be a good tool in assessment of broken limbs. If you find a broken limb on your patient, please ask your veterinarian to approve appropriate pain medications before wrapping or stabilizing those limbs.

Depending on the extent of injuries it is always safest to stabilize and refer over to a 24 hour facility with a surgeon and/or criticalist

2. Dog Bites

When larger dogs fight, wounds are usually obvious: skin lacerations, bleeding wounds, and bruising. Cuts and wounds should be covered with something clean. If there’s active bleeding, apply gentle but firm pressure.

Side note: When an animal presents with blood on it, please be sure to wear appropriate PPE and avoid direct contact with the blood until it is determined that it is in fact from the patient and not a human.

When small dogs and cats get bitten, the wounds are often not visible – but there may be crushed ribs, broken bones, and abdominal organ damage. To prevent further damage, transport them with as little movement as possible.

Applying a muzzle is a good idea due to the fact that animals that have been in fights have a heightened sensitivity and anxiety.

As with all trauma patients examine the airway, breathing and circulation first, access for shock. If there is a life threatening abnormality, address this first as always

Radiographs: should be taken to evaluate if thoracic or abdominal trauma is suspected even if there are no wounds present. Watch for crushing injuries

Ultrasound: AFAST (abdominal focused assessment with sonography for trauma) and TFAST (thoracic focused assessment with sonography for trauma) may be beneficial to determine if there is free fluid in the abdomen or thorax. It can also assess if the bladder is in tact as well.

Laboratory: PCV/TP, BUN, creatinine, lactate and glucose should all be evaluated on bite wound victims.

- A high lactate can be an indicator of poor perfusion on the cellular level.
  Normal lactate ranges from 0.6 mmol/L to 2.9 mmol/L
• A low PCV could be a prognostic indicator of blood loss through hemorrhage.

Possible culture on open wounds

Cover all wounds appropriately and transfer to 24 hour care service

3. Traumatic Brain Injuries

Traumatic brain injury (TBI) is common in dogs and cats, with motor vehicle accidents, animal interactions, and unknown causes being the most commonly seen.

When treating a patient with an acute head injury, both the extracranial and intracranial priorities must be considered. Identification of life-threatening extracranial injuries such as hemorrhage, penetrating thoracic or abdominal wounds, airway obstruction and compromised oxygen, ventilation, or volume status is of extreme importance. Once the life-threatening extracranial issues have been addressed, intracranial priorities should include maintenance of adequate cerebral perfusion pressure (cpp), ensuring adequate oxygen delivery to the brain, and treatment of acute intracranial hypertension, as well as continued monitoring of neurological status (MGCS).

Identification and management of extracranial disorders such as systemic hypotension, hypoxemia, and hypoventilation, should be your first priority.

Systemic abnormalities can include but are not limited to:

• Hypotension
• Hypoxemia
• Hyper/hypoglycemia
• Hyper/hypo capnia
• Hyperthermia
• Acid/Base and electrolyte disturbances

Mannitol (0.5 – 1.5 g/kg IV) is effective in treating intracranial hypertension, but it can compromise cerebral perfusion if its osmotic diuretic effects are not treated rapidly with intravascular volume replacement.

Hypertonic saline (7.5% NaCl 2-5 ml/kg IV) is effective in treating intracranial hypertension and is less likely to lead to hypovolemia and decreased cerebral perfusion.

Brain cell death is due to both primary and secondary injuries. Your treatment goals are systemic health, mean arterial pressure, and possibly imagining if necessary.
Once stabilization has occurred it is best to transfer this patient to a 24 hour facility for continued care as most of these cases need aggressive therapy.

5. **Traumatic Spinal Cord Injuries**

Traumatic injury to the spinal cord is common in domestic animals and may result from vascular, infectious, inflammatory, degenerative, neoplastic, and or traumatic processes.

When a patient presents to the veterinarian, a thorough history should be obtained. If a fracture or luxation is suspected, the goal is to decrease activity that could further damage the spinal cord. A non-ambulatory patient should be placed on a flat board and strapped down to prevent further movement. Sedation and/or analgesia may be required in anxious or painful patients. Strict cage rest and medications may be all the ambulatory patient requires.

When external trauma to the spine has occurred secondary to being hit by a car, fall from a high place, or severe bite wound, it is necessary to radiograph the entire spinal column immediately upon stabilization, and a general neurological exam has been performed.

A complete neurologic exam should be performed unless it is likely to injure the patient further. The goal of the examination is to identify neurologic function and determine functional integrity of the spine.

Small dogs with long backs -- such as dachshunds, corgis, and basset hounds -- are prone to these injuries.

Symptoms can range from pain to total paralysis. Weight management is critical.

If the patient has paralysis, corrective action needs to be taken as quickly as possible. Pain and bladder management are essential.

These patients more often than not need surgical intervention and several days of post operative and pain and bladder management.

It is best to refer this patient to a neurologist for further diagnostics and potential surgery.

Animals that are presented on emergency/trauma basis should be sorted according to treatment priority when resources are limited. High priority patients—those in which abnormalities are identified during the primary triage—should receive immediate stabilizing interventions, and lower priority patients are treated in order of arrival to
the hospital. Client consent should be obtained early in the triage process to
determine where the owners stand emotionally and financially. Additionally,
decisions about cardiopulmonary resuscitation orders, such as whether resuscitation
is desired, should be obtained immediately upon presentation. Stabilizing treatments
are aimed at correction of life-threatening abnormalities identified during the primary
triage and generally involve treatment of shock, hypoxemia, and nervous system
dysfunction. Once your patient has been stabilized, a complete secondary
examination should be performed, which includes a reevaluation of the systems in
the primary triage. Once our patient is stable you can then refer to a 24 hour facility.

- References: Emergency Procedures for the Small Animal Veterinarian; Signe J Plunkett
  DVM
- Small Animal Critical Care Management Second Edition: Deborah C. Silverstein. Kate
  Hopper