Triage, Life Saving Priorities

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In general, most veterinary practices have emergencies that walk through the door that they were not expecting. Everyone has heard the word "Triage", but do you really know what it means? Triage comes from the French word "trier" or "to sort".[1,2] The word was generated around the 1790's during the French revolutionary war/Napoleonic war time when men had to care for the wounded on the field. Obviously, battlefield triage is very different than hospital triage. You can only address those that can be helped.

The basis of triage is to identify the cases that need immediate care to maximize the survival of the patients that are presented to the hospital. You will have to identify the patients that are stable enough to wait and the patients that are critically ill. It is crucial to also identify those patients that are stable, but shouldn't wait in the lobby. For example, a patient that has a small laceration but is dripping blood all over the lobby.

In order to triage effectively, walk around the clinic to ensure there is an area where you can take critically ill patients and tend to them. Be prepared.[1]Where do you triage? The lobby? Is there an exam room that you can take them to? An area of the lobby? What about cats and exotics? Do you even see exotics? Do you know where the nearest exotic clinic is? Find the best place that will work for both the clinic and the patient.

It is always beneficial for the patient and the staff if there is an area of the treatment floor that is designated for a critical/emergency patient. Have catheters, fluids, oxygen administration, a crash cart/tray, blood pressure supplies, warming devices, monitoring devices (ECG), and quick diagnostic tools (microhematocrit tubes, glucometer, lactometer, I-stat™, etc.) ready to go. Having this equipment at hand can help a clinician quickly diagnose a critical patient and create a better emergency experience for both the staff and the patient. A crash cart/box/tray is the most essential tool to have at the practice. It should include catheter supplies, emergency medications (lidocaine, epinephrine, atropine, vasopressin, etc), syringes for drawing blood and emergency medications, endotracheal tubes, fluids, fluid lines, etc. Make sure the crash cart is stocked every day. Supplies are borrowed, taken, or used for other situations which can then in turn make a critical situation more complicated. Nobody wants to be running to the surgery suite for endotracheal tubes when a patient has to be intubated. Mark the crash cart to signify that it is stocked. The last thing that anyone can do to be prepared for an emergency is to make sure that everyone practices. Practice, practice, practice. In an emergency situation, the staff will make a more cohesive team if they all know where the supplies are kept, where the crash cart is, and how to stay calm.

Triage can be done in two ways. Triage can be done in person when multiple emergency patients come in at the same time or triage can happen over the phone. Receptionists are the first to see the patient when they walk into the door. It is strongly suggested to train the receptionists what is an emergency and what isn't an emergency. They are the ones to determine when to call a technician for help. When a client calls the clinic for an emergency, it is better to have medical personnel on the phone to help ask the correct questions and make sure that the emergency is a true emergency. For example, a client calls and says her cat is in the litter box all the time and thinks he is constipated. A veterinary professional may ask, "Has your pet been urinating in the box as well?" When the client says, "Well, now that you mention it, I don't remember seeing urine in the box either." If this cat is blocked, it would be considered a true emergency whereas a non-veterinary professional may have told the client to come in as an appointment the next day for constipation. DO NOT DIAGNOSE OVER THE PHONE! In the phone call, it may have been easier to say, "I know your cat is blocked, please bring it in." But unfortunately, this is illegal for technicians and

receptionists to do. State what you are concerned about to the client, “I am concerned that your cat hasn’t urinated in a long time and I would suggest that you bring him in immediately.” If the client is asking multiple questions over the phone or is getting emotional, express concern for the patient. Let them know you will answer all of their questions when they get in. Keep control of every conversation. Be aware that if the client thinks they have an emergency, then you should treat it as such.[3]

Know your clinic’s limits when it comes to emergency. Can the hospital care for a patient for 24 hours? Are you open on the weekend? Is there an overnight technician that can care for patients? Can you handle wildlife/exotic emergencies? Can the hospital perform surgery at any point in time? These are all questions to ask the clinic and the staff to help ensure preparedness for an emergency you cannot handle. It is acceptable to send a client to a different clinic if the hospital does not have the capability to handle different types of emergencies.

Always assess the most critical patient first. Remember your ABC’s (airway, breathing, circulation) and infectious/dramatic cases can be brought into the treatment room and placed in a kennel while the technician is getting a more accurate history. If the patient is very critical and needs to be brought back right away, the next step is to have a triage estimate ready.[1] This will ensure not only that the patient will be taken care of quickly, but that the owner is prepared for what the cost may be. This estimate usually is a range that can include radiographs, blood tests, intravenous catheter placement, and intravenous fluid administration. This does not include any other tests or medications that may be done after the diagnosis is made. The form also includes a CPR code. It is better to be ready for CPR than to ask the owner as CPR needs to be performed. The receptionist can go over this form if necessary. Everything should be written in a clear format so everyone understands what is included in the estimate. Communicate to the client that this is a way for their pet to get the quickest, best care possible.

Client communication is key in an emergency situation. Explain to the client why and where you are taking their pet. This can be distressing to them because they cannot be with their “family member”. Keep control of a resistant client. Focus on the patient and assure them that the staff is doing what is best for their pet. Keep updating the client frequently. Any medical or financial decisions should be made with the client. The receptionists should also always remind the other clients waiting the in the lobby that it is better to not be first in the ER.

A history should be taken quickly once the emergency patient walks in. This includes the presenting complaint, when the patient was normal last, what has been done/given already, have there been any previous medical issues, and is the patient receiving any medications or is allergic to any medications. A more thorough history can be taken after the patient is stabilized. This should only take less than five minutes!

Triaging should be prioritized in order of, respiratory compromise, cardiovascular compromise, neurologic compromise, and then other emergencies. Assess each patient’s “ABC’s”. A=Airway, B=Breathing, C=Circulation, D=disability/neuro, E= external assessment.[2,3] After assessing each, a temperature, pulse, and respiratory rate must be done to complete the primary assessment.[2] DO NOT FORGET ABOUT PAIN MANAGEMENT! Assess the patient’s airway first. Keep the patient calm, cool, and supplement oxygen if needed. Supplementing oxygen is never the wrong thing to do. Intubate the patient if it is warranted. A tracheostomy tube may be needed if an endotracheal tube is impossible. A tracheostomy tube can be made out of an endotracheal tube if the hospital does not have tracheostomy tubes available. Next, assess the patients breathing. Ascult the patient’s lungs. Are there any crackles, wheezes, harsh lung sounds, no sounds? A pulse oximeter can tell you the oxygen status of a patient. It is never good if a patient is cyanotic. Place on oxygen and minimize stress. Pink gums do not necessarily mean that the patient is stable. A patient can still have low oxygen saturation with pink gums. There are many ways oxygen can be supplemented to a patient.

A few ways are: oxygen cage, incubator, e-collar with plastic wrap on it, a cat carrier with a plastic bag over it, a mask, nasal cannulas, etc. Next, assess the patient's circulation. Start by assessing the patient's mucous membrane color, capillary refill time, pulse quality, level of consciousness, heart rate, and extremity temperature. If the blood pressure is normal, this does not mean that the patient is stable, but if the patient's blood pressure is low, this is an indicator of shock. Shock is a physical exam diagnosis. If the patient is externally hemorrhaging, stop the bleeding. Place an intravenous catheter to give fluids to replace the volume lost. If the patient is in cardiogenic shock, fluids may be contraindicated. ECG, blood pressure, bloodwork, stat chemistry values, "Big 4" (PCV/TP, BG, Lactate), should be assessed. If imaging is deemed necessary, the patient must be stable. No patient should die on the radiology table! Use sedation if needed. Remember a patient should stay calm.

If a neurology emergency comes into the clinic, assess the patient's level of consciousness. This can determine if you bring the patient to the treatment room, or place the patient in the room to be looked at by the clinician next. Ask yourself, is the patient able to walk? Did they have some sort of trauma? Are they seizing?

Lastly, perform an external assessment.[2] Look over the entire patient and check every side. Attend to any wounds, lacerations, punctures, or abrasions. Assess for any crepitus, fractures, or pain in the abdomen. Are there any skin issue? These are all things to look for when assessing the whole patient.

Infectious diseases are always something to keep in mind while triaging patients. Where would you triage an urgent infectious patient? Is the patient going to transfer that infectious disease to you? To other patients?

During this time, owners should always be on the mind of every staff member that is working with their pet. The staff should be triaging the owner as much as they are triaging the patient. Keep the owner calm, cool and informed. The more informed the owner is, the more they will feel comfortable that the staff and veterinarian are in control of the pet's health.

A secondary assessment should be done after the patient is stable.[1,2] A full physical exam, bloodwork results, imaging interpretation, and repeated ABC assessments are performed. Repeating and reassessing the ABC's are crucial because these may change quickly in any patient. Shock may reoccur, pain may surface, or other symptoms may come up. Keep the patient clean, dry, and comfortable. Change bandages and splints as needed. Always keep an eye on the patient's neuro status, pain, anxiety level, urine output, and hydration status.

In conclusion, triaging is important in any hospital setting. If prepared, emergency situations can run smoother with the hospital staff. Remember to assess the ABC's and always communicate effectively with the client. This can save your patients.

References:

1. Battaglia A, Steele A. Small Animal Emergency and Critical Care for Veterinary Technicians. 3rd Ed. St. Louis: Elsevier 2016, Chapter 12: p. 209-222.
2. Silverstein D., Hopper K. Small Animal Critical Care Medicine. 2nd Ed. St. Louis: Elsevier, 2015, Chapter 1: p. 1-5.
3. Creedon J., Davis H. Advanced Monitoring and Procedures for Small Animal Emergency and Critical Care. West Sussex: Wiley-Blackwell, 2012, Chapter 1: p. 5-10.

Environmental Emergencies in Veterinary Medicine

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Environmental Emergencies happen every day in the veterinary practice setting. Depending on the area in which you live, there are different environmental emergencies that may occur. Some examples of these emergencies are heat stroke, near drowning, spider bites, insect bites, snake bites, toxins, hypothermia, or smoke inhalation, just to name a few.
In this lecture, we will go through what each emergency is defined as, the pathophysiology, and how to treat the emergency.

Heat Stroke

Heat stroke is defined as a condition where the patient has either exercised too much and is overheating or the patient was in a hot environment for a prolonged period of time and could not regulate their core body temperature.

The pathophysiology of heat stroke can get a little complicated. As veterinary professionals, we must not confuse heat stroke with a true fever. Heat stroke happens when a patient cannot dissipate its own body heat anymore due to overexertion or exposure to intense heat for an extended period of time. Overweight patients, brachiocephalic breeds, patients with upper airway problems, patients with prolonged seizures, and certain breeds like Labradors, can be more likely to get heatstroke. The hypothalamus is responsible for temperature regulation of the body. Once a patient's core body temperature gets above 105 degrees Fahrenheit, the patient's central nervous system/hypothalamus can start to function irregularly. This can affect how the patient can regulate its own body temperature.
70% of a patient's heat loss occurs by radiation and convection via skin. When a patient gets this hot, cardiac output increases and peripheral vasodilation occurs. The body is trying to move heat to the surface of the skin to attempt to dissipate it. Panting will also occur because the body is attempting to evaporate the heat through the respiratory tract. As a result, the gastrointestinal tract is the first organ to experience decreased blood supply. This will then cause diarrhea. Dehydration also occurs as the patient is losing body water through panting and excessive salivation. The inflammatory cascade then activates, along with hemostatic processes. This can cause Systemic Inflammatory Response Syndrome (SIRS), which then progresses to Multiple organ dysfunction syndrome (MODS). The combination of dehydration and possible sepsis can lead to dissemination intravascular coagulopathy (DIC). Patients that present with severe heatstroke have a grave prognosis if their body temperature exceeds 106 degrees over an extended period of time.

When a patient arrives with heatstroke, it is important to get their core body temperature down in a slow, controlled manner. If the body cools down too quickly, this can result in cerebral edema. Cerebral edema can cause the patient to not raise internal body temperate back to normal. Intravenous fluids, at room temperature, should be started immediately. Room temperature water with a fan blowing on the patient is an effective way to cool the patient and bring internal temperature down. Putting alcohol on the patient's paw pads, or even their whole body, is not an effective way to cool down the patient. Alcohol and ice baths can cause vasoconstriction and move all the body heat back to the core, which in turn,

will not cool the patient down and can cause further complications. Cool water enemas, cool gastric lavage, and cool peritoneal lavage can also be somewhat effective in cooling a patient down from extreme heatstroke. Gastric lavage does run the risk of the patient developing aspiration pneumonia. Shaving a very long-haired patient could also be of benefit. Active cooling should stop when a patient's rectal temperature becomes 103 degrees.

Hypothermia

Hypothermia is defined when a patient's body temperature drops below 99 degrees. This can be primary hypothermia, also called accidental, or secondary hypothermia, caused by a systemic disease process.

The Hypothalamus is the thermoregulator organ in the body. There are also thermoreceptors that are present in the skin, spinal cord, abdominal viscera, and veins. Hypothermia can cause multiple effects in the body. Cooler body temperatures can thicken blood viscosity, decrease cardiac output, cause bradycardia, cause coagulopathies, decrease respiratory rate, impair wound healing, or decrease metabolism. Patients that are thin, exposed to extreme cold, or under anesthesia for an extended period of time, are more likely to become hypothermic. When the cold receptors are activated in cold environments, vasoconstriction and piloerection occurs in order to help minimize heat loss. If this doesn't work to keep the body warm, the body tries to warm itself by shivering. Shivering is increased skeletal muscle activity, which in turn, increases body temperature.

Treatment of hypothermia depends on how severe the hypothermia is and what caused the hypothermia in the first place. There are three types of rewarming: active rewarming, external passive rewarming, and active external rewarming. Active rewarming includes warming the main core of the body. This can include warmed intravenous fluids, warm water enemas, warm peritoneal lavage with isotonic crystalloid fluids, warm urinary bladder lavage, or warm humidified inhaled air. External Passive rewarming is the use of blankets and the patient's own body warming techniques to help increase core body temperature. Active external rewarming is the use of warm water blankets, warm water bottles, and warm forced air. Intravenous fluids should be initiated once a patient is admitted with hypothermia. Dehydration can occur during a hypothermic event.

Drowning

Drowning is defined when a liquid is forced into the lungs, causing respiratory impairment.

Drowning occurs most often when a patient is submerged in water and is unable to get to the surface for air. Patients will then aspirate the water and then experience hypoxemia. According to Silverstein and Hopper, patients that survive have aspirated less than 22mls/kg of water. Depending on the type of water or fluid aspirated, electrolyte imbalances can occur. Saltwater aspiration is usually more severe. The more hypertonic fluid pulls water from the circulation into the alveoli, which can reduce lung compliance. Drowning can result in cerebral hypoxia and eventually death.

Treatment for drowning victims can be a multimodal approach. A catheter and intravenous fluids should be initiated immediately. Intravenous fluids can help with the perfusion of the organs as well as keeping the cardiovascular system stable. Oxygen should also

be administered as quickly as possible. Acid/base status should be assessed and an arterial blood gas should be performed. Blood pressure should also be performed. Cerebral edema can occur in drowning patients. It is crucial to evaluate blood pressure and heart rate for Cushing's reflex. Mannitol can be given to reduce cerebral edema. Mechanical ventilation may be appropriate for these patients if their blood gas values indicate it. Prognosis is based upon how long the patient was under the water and how much liquid it has aspirated.

Spider Bites

There are multiple different venomous spiders found in the United States. Two of the most common are the Brown Recluse and the Black Widow. Unfortunately, spider bites are most often diagnosed based on signs alone, unless the spider was actively seen biting the patient. Black Widow Spider bites present clinical signs including restlessness, tachypnea, heightened anxiety, painful muscle rigidity, and possible shock. Brown Recluse spider bites present clinical signs of a bullseye-type lesion on the body, pain at the site, or a necrotic area where the spider bite occurred. Systemic signs may occur that would include thrombocytopenia, hemolysis, and disseminated intravascular coagulopathy. If systemic signs do occur, the patient may present with fever, vomiting, hemoglobinuria, renal failure, and septic shock.

Black widow spiders carry a neurotoxin called alpha-latrotoxin. Alpha-latrotoxin releases neurotransmitters from the terminals. This process depletes the amount of synaptic vesicle contents which then blocks neurons from firing appropriately. Dopamine, Acetylcholine, noradrenaline, and glutamate systems are all sensitive to the toxin and will not function appropriately.

Brown Recluse spider venom has enzymes, like Sphingomyelinase D, that are known to cause hemolysis. Other enzymes are present in venom that degrade fibrinogen, collagen, fibroectin, gelatin, elastin, and basement membranes of the cell. These enzymes can cause local tissue necrosis and eventually systemic signs.

Treatment of the Black Widow spider bite can be complicated. Antivenin is made commercially in the lyophilized form. This means it is inexpensive and has a long shelf life. Antivenin should be given as soon as possible when a patient presents with a Black Widow spider bite. Anaphylaxis can occur so antivenin should be administered slowly. Diphenydramine can be a pre-treatment before antivenin administration. Theories exist whether calcium gluconate can help with the treatment of muscle spasms and decrease the pain of spider envenomation.

Treatment of a Brown Recluse spider bite should include an ice pack to the area of the bite. Some studies have shown that Sphingomyelinase D is temperature sensitive and ice will help limit tissue necrosis. Keep the area clean and dry to prevent infection. Steroids can help decrease hemolysis. Pain medication should be used as needed. Once systemic signs occur, treatment of those individual signs should be initiated.

Snake Bites

There are two families of venomous snakes in North America: the Elapidae (coral snakes), and the Crotalida (pit vipers or rattlesnakes, copperheads, or cottonmouth moccasins).

Coral snake envenomation signs include neurotoxic effects. The enzymes in snake venom are responsible for immobilization of their prey. It blocks the synaptic transmission in the neuron at the acetylcholine receptor site which can cause skeletal muscle paralysis and respiratory paralysis. Cardiac arrhythmias have also been seen but are not common.

Crotalid snakes have the ability to control the amount of venom they choose to deliver. 25% of Crotalid bites are “dry” bites, meaning that no venom was delivered. Crotalid bites are the more severe of the two types of snake bites. Puncture wounds at the site of the bite are usually oozing. If swelling is present an hour after the bite, there is a good chance that the patient experienced a venomous bite instead of a “dry” bite. Tissue damage does occur at the site of the bite. The protein venom metalloproteinases, or VMPs, are what causes the tissue damage and inflammation. VMPs then activate pro-tumor necrosis factor, TNF alpha, which results in further tissue breakdown and damage. Some rattlesnakes also have a neurotoxin associated with their venom. This neurotoxin blocks the calcium channels which then prevents the release of acetylcholine, thus preventing the activation of acetylcholine receptors. This prevents muscle contraction. Some other clinical signs that can be seen with snake envenomation are vomiting, diarrhea, incontinence of the urinary bladder, and lethargy. Rattlesnake venom also contains kininogenases. These kininogenases act on plasma globulins and form bradykinins. This process vasodilates vessels and causes hypotension. Swelling and edema can form at the location of the bite. Lymphadenopathy can also occur because the venom can travel via the lymphatic system.

Treatment for Coral snake envenomation is mainly supportive care. This care involves Intravenous fluids, pain medication if needed, care for a possible paralyzed patient, and measures to prevent aspiration pneumonia.

Treatment for Crotalid snake bites is dependent whether the veterinary clinic has antivenom. Antivenom comes in two types: Antivenin Crotalidae Polyvalent (ACP) and Crotalidae Polyvalent Immune Fab (CroFab). Anaphylaxis can occur while giving antivenom however, it is rare. These patients should be hospitalized until symptoms resolve. NSAIDs and Steroids are contraindicated in these patients.

Insect Bites

Not every one of our patients are hypersensitive to insect bites. Some insects that may pose more of a problem for patients are bees, wasps, hornets, and some types of ants. These bites can cause an anaphylactic reaction.

There are two types of anaphylactic reactions: the classic pathway and the alternative pathway. In the classic pathway, patients are usually exposed to the sensitivity agent for the second time. IgE is then produced and then binds to mast cells and basophils. Cross-linking of IgE occurs and the cell releases histamine, heparin, tryptase, and a few other mediators. In the alternative pathway, platelet-activating factor (PAF) is responsible for the degranulation of the cell, not histamine. Degranulation of the cell occurs and interactions between mediators and organs can cause the clinical signs that include erythema, pruritus, and urticaria. Some reactions can include vomiting, diarrhea, tachycardia, respiratory distress, hypotension, shock, and death.

Treatment of anaphylaxis is based on clinical signs and how severe the anaphylactic reaction is. In less severe reactions, antihistamines alone could treat the anaphylactic reaction.

In more severe reactions, epinephrine, glucocorticoids, bronchodilators, vasopressors, and possibly anticholinergics may be used. Epinephrine is considered the number one treatment for anaphylaxis. It can cause α-adrenergic effects, β_1-adrenergic effects, and β_2-adrenergic effects. Fluid therapy should be used in patients with hypotension caused by vessels that are vasodilated and "leaky" due to the cytokine and histamine release. In very severe reactions, vasopressors and anticholinergics should be used if epinephrine and fluids are not enough to improve the hypotension. Prognosis of these patients depends on how severe the allergic reaction is.

Smoke Inhalation

Smoke inhalation injury usually occurs when a patient is in a house fire or some type of fire situation.

Inhaling smoke can be very detrimental to mucous membranes. It can irritate and burn those membranes. This also depends on what is burning in the house. These patients can have internal chemical burns due to the toxic gasses that are released. The two gasses that are common in house fires are carbon monoxide and hydrogen cyanide. Carbon monoxide can go undetected because it is odorless and colorless. Carbon monoxide binds to hemoglobin but takes oxygen's place on the hemoglobin. When carbon monoxide is present on the hemoglobin, oxygen cannot be perfused to the other organs of the body, resulting in tissue hypoxia. If a pulse oximeter reading on these patients is taken, it may result in a 100% reading. This is because 100% of the hemoglobin receptors are taken. It doesn't matter if it is oxygen or carbon monoxide. Hydrogen cyanide disturbs the oxidative phosphorylation process, leading to decreased ATP production and increased lactic acid production. Patients that had increased exposure to hydrogen cyanide can present with vomiting, tachycardia, arrhythmias and neurologic dysfunction. These patients may also present with ocular problems such as ulcers and thermal burns.

Treatment of these patients should immediately include an intravenous catheter and fluid therapy combined with oxygen therapy. Bronchodilators can also be used to decrease bronchospasm that may be due to irritation. The patient should also be treated for any thermal injuries the fire may have caused. It is imperative that the entire patient, not excluding the bottoms of paw pads, eyes, ears, and inside the mouth, be checked. Smoke inhilation patient's prognosis is all dependent on how long the patient was in the fire and how much smoke they did inhale.

Common Toxins

There are so many toxins that can affect our patients. In this lecture, I am only going to go through a few. These will include chocolate, grapes/raisins,

<u>Food:</u>

<u>Chocolate</u>: Clinical signs are caused by theobromide and caffeine and include vomiting and diarrhea, tachycardia, muscle tremors, seizures, coma and death. Decontamination and administrating activated charcoal are first steps, and IV fluid administration if clinical signs warrant. Medications like propranolol to decrease heart rate may be necessary.

- Milk Chocolate: wt (#) x 0.3 = oz needed for reaction
- Dark Chocolate: wt (#) x 0.12 = oz needed for reaction

- Baking Chocolate: wt (#) x 0.04 = oz needed for reaction

Grapes/Raisins: Unfortunately, the mechanism of action and toxic agent is unknown. These can cause gastrointestinal irritation as well as renal toxicity. The majority of dogs show clinical signs of vomiting within 24 hours of ingestion. Renal bloodwork changes occur within 24 hours of ingestion, and declines around 48-72 hours. Decreased urine output and lethargy can occur after 5 days. When a patient first presents with grape toxicity, vomiting can be induced. Activated charcoal can be given, but there is limited evidence on if it actually is effective. IV fluids help preserve the kidneys. Chemistry values should be monitored. If AKI persists, dialysis could be considered.

Xylitol: Xylitol is a sugar substitute showing up in multiple products and people are using it more in baking and cooking over sugar. Xylitol can cause an insulin release in dogs leading to hypoglycemia. Patients can come in Higher doses can lead to hepatic failure. The effect of Xylitol on cats is unknown. When patients come in that have ingested xylitol, vomiting may or may not be effective depending on when they ingested the toxin. Xylitol is absorbed into the body very quickly. Intravenous Dextrose, even in asymptomatic patients, can ensure that patients will not become hypoglycemic. Liver and GI protectants should also be used.

Medications:

Acetaminophen: Cats have an increased sensitivity to acetaminophen. The metabolism of the drug in both dogs and cats can lead to hepatic failure. GI signs occur first followed by facial edema and cyanosis. Acetaminophen also causes methemoglobinemia (hemoglobin is damaged and hangs on to oxygen instead of releasing it to tissues) which is characterized by brown mucus membranes and chocolate brown blood. Hypoxia occurs in these patients. Heinz bodies can form on red blood cells causing them to be destroyed, and anemia can also occur. Overdose is treated first with decontamination and charcoal. The treatment for acetaminophen is N-Acetylcysteine (140mg/kg loading dose, 70mg/kg q6h for 7 treatments) and can be administered either IV (filter recommended) or PO. N-Acetlycysteine should be diluted to a 5% solution before patient administration. Treatment is rounded out with vitamin C (thought to reduce methemoglobinemia), GI protectants, oxygen and supportive care.

- Cats: 5-10mg/kg toxic dose
- Dogs: >50mg/kg toxic dose
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NSAIDS: Clinical signs often include, vomiting, and diarrhea and can lead to GI ulceration. At higher doses, renal toxicity can occur. In both cases, decontamination, activated charcoal and Gi protectants are recommended. Treatment also includes IV fluids and possibly Misoprostol to protect against GI ulceration. Chronic use of NSAIDS in patients can result in liver damage.

Rodenticides:

There are multiple different types of rodenticides so it is essential to know what type of rodenticide that the pet has ingested. Always encourage the client to bring in the packaging that the rodenticide came in. Color and consistency of the rodenticide cannot always used because most rodenticides come in a green color and have the same consistency. The three major types of rodenticides are anticoagulant rodenticides, cholecalciferol rodenticides, and bromethalin rodenticides.

- Anticoagulant rodenticides:
  Anticoagulant rodenticides inhibit the activity of vitamin K. Vitamin K is required to fully activate coagulation factors II, VII, IX, and X. When a patient cannot activate coagulation factors, clinical signs of bleeding are observed. Patients come in with a history of possibly coughing up blood, having nasal bleeding, or lacerations that will not stop bleeding. Other clinical signs can include lethargy, anorexia, weakness, and shock. PT/PTT should be tested when anticoagulant rodenticide is expected. PT/PTT will be elevated. Vitamin K is the typical treatment for anticoagulant rodenticide. If bleeding is already occurring, blood products should be used. Vitamin K is a fat-soluble vitamin, so it is best absorbed orally with food. If the patient is not eating, it can be given subcutaneously.
- Cholecalciferol rodenticides:
  Cholecalciferol is Vitamin D3 and ingestion results in hypercalcemia and hyperphosphatemia. This will lead to PU/PD, GI signs, muscle weakness and renal failure. If the patient is seen quickly, emesis and repeated doses of activated charcoal should be used. IV Sodium Chloride should be given for a few days. This reduces calcium reabsorption in the renal tubules and enhances urinary calcium excretion.
- Bromethalin rodenticides:
  Bromethalin is metabolized by the liver to a more toxic product desmethyl bromethalin. Both products are lipid soluble so the bromethalin accumulates in the brain and fat. Brain edema and lipid peroxidation occur and can cause cellular damage and necrosis. Patients may present with ataxia, hind limb paresis, paralysis, seizures, tremors, hyperexcitability hyperthermia, circling, CNS depression and death. Stimulating Emesis and activated charcoal are best for decontamination. If the patient is already neurologic, emesis would not be effective. Once the patient develops clinical signs, prognosis is guarded to grave. Lipid emulsion therapy early in the course of toxicity has been proposed as a possible “antidote” for this toxin.

Pesticides/Antiparasitics:

- Permethrins
  These are generally used as topical medications for flea repellants. When a patient comes in with pyrethrin toxicity, the first treatment should be to bathe them with a dish soap to cut through the medication to remove it. Muscle relaxants can assist with decreasing the muscle tremors that a patient usually presents with. IV lipid emulsion has been used and seems to help with the muscle tremors of patients. There is limited studies on the use of lipids with pyrethrins. The most common pyrethroid that the ASPCA poison control center received questions about from Florida was Etofenprox.
- Ivermectin
  Ivermectin is another antiparasitic that is used for endo and ecto parasites in dogs and cats. It is available over-the counter in oral and injectable form. Patients that experience ivermectin toxicity usually present with ataxia, paralysis, bradycardia, blindness, coma, or are dead upon arrival. Ivermectin, in high doses, crosses the blood brain barrier and enters the CNS and prevents neuron depolarization. Treatment consists of decontamination, multiple doses of activated charcoal, IV lipids can also be used since

ivermectin is lipid soluble. Do not use benzodiazepines to treat seizures as this may not help the seizures.

Plants:

- Sago Palm are found usually in tropical areas. All parts of this plant are toxic, and we mostly see feline patients for this toxicity. Cycasin is the most toxic element of the plant. Cycasin can cause hepatotoxicity and is also a GI irritant. It can also cause cerebellar necrosis which can cause ataxia. These patients will come in with vomiting, diarrhea, melena, icterus, ataxia, and possibly seizures and death. There is no antidote, so emesis, activated charcoal, IV fluids, and GI protectants will be needed. Sometimes, even with treatment, the patient may need long life hepatic support.
- Lilies are found in many gardens and especially in many bouquets around Easter time. All parts of the lily are toxic. If a patient even just nibbles on a leaf of a lily, it can cause toxic effects. These patients will present with vomiting, depression, and eventually renal failure. If patients are exposed for an extended period of time, they can present with CNS signs can occur which include ataxia, head pressing, and seizures. Treatment includes emesis, if possible, IV fluids, activated charcoal, and hemodialysis. Kidney values should be monitored daily for 48 to 72 hours.
- Marijuana is starting to become legal in more states and comes in many forms. Pets are exposed via ingestion and second hand smoke. The active ingredient in marijuana is tetrahydrocannabinol (THC). THC is a depressant that interacts with many neurotransmitters. Patients will present to the hospital with mental depression, hyperesthesia, ataxia, tremors, mydriasis or miosis, hypothermia, bradycardia, and respiratory depression. Patients will also be known to “dribble urine” and act like they are falling asleep standing up. With more marijuana being laced with more potent medications, you can often see patients coming in with more profound clinical signs leading to coma and possibly death. If a patient comes in quickly after ingestions, emesis can be initiated. Do not induce vomiting if neurologic signs are already present. Activated charcoal can be given with repeated doses. Treatment after decontamination consists of IV fluids and supportive care. THC is a lipid soluble toxin, so IV lipids can be used to possibly speed up recovery.

Critical Thinking Skills

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Every good veterinary technician needs to have some critical thinking skills in order to properly care for their patients. Critical thinking is defined as the ability to make a decision on the basis of thorough consideration of data discovered through investigation, analysis, and evaluation. Critical thinking is not something that everyone is born with. It is a skill that must be learned, practiced, and implemented in every day practice. When working with patients on the floor they never "follow the book".

Most veterinary technicians love the technical aspect of the job. Placing IV catheters, drawing blood, placing central lines, and taking radiographs are "fun" but few technicians want to put the work in to master physiology, pharmacology, understanding diseases, and watching for subtle changes in any patient. These skills set good veterinary technicians from amazing veterinary technicians.

Nursing requires critical thinking all the time. Every veterinary technician must understand the equipment, working parts of catheters, central lines, and how to administer medications and what they react with. Nursing also requires interpersonal skills and their development as one interacts not only with fellow nurses and technicians but also veterinarians, assistants, client services, and especially pet owners.

There are multiple parts to critical thinking. These parts consist of: gathering of information or assessing a situation, focus, remembering, organizing, analyzing, generating, integrating, and evaluating.

- Assessing a situation is simply data collection. Data can be gained from many sources throughout the hospital. A veterinary technician must perform a physical exam on each patient at the beginning of their shift to gain more information about that patient.
- Focus on the task at hand and remember all the facts about that patient. Try not to get two patients confused.
- Organize the information that you have just received and analyze that data. Ask yourself questions about the treatment of that patient.
- Generate and integrate some thoughts about the treatment of that patient. What nursing techniques can you do to benefit that patient's care?
- Evaluate what nursing techniques worked, and what did not. Is that patient improving? The nursing team is critical to all aspects of patient care and the nursing process must reflect this.

The more you go through this process, the easier it gets. Each case is an opportunity to learn. Encourage your team to go through physiology and pharmacology while rounding, then everyone can be on the same page when it comes to that patient.

In order to encourage the team to think critically, one must understand the problem and how to solve it. Questions must be encouraged. NO QUESTION IS A DUMB QUESTION! Encourage a learning environment with your team, and do not single out or embarrass a single team member. As employees grow accustomed to these question and answer sessions, they will soon see them not as punishment, but look forward to the opportunity to learn and grow in their job.

A good way to help staff critically think, is with rounds. Ask questions during rounds and if rounds are not occurring, then make hypothetical cases during down time. Some examples could be: What is happening in that patient that requires this medication? Why are they doing this treatment now? How does passive-range-of-motion help this patient? Should we keep blood sampling on this patient? What reacts with this medication? Most staff will be comfortable with what needs to be done for this patient, but few will understand why.

No patient is going to follow the book. I encourage all veterinary technicians to ask “Why”. Medicine is complex and using critical thinking skills can help veterinary technicians understand what to do with that critical case while working with the clinician.

Anticipating what the clinician and patient may need is crucial to make a great veterinary technician. Anticipate results of vital signs every time treatments are performed on a patient. Troubleshooting why a result is different than 2 hours before is crucial to the well-being of that patient. If their blood pressure is elevated, find out why. Is it a different size blood pressure cuff? Do they need to go outside to urinate? Are they painful? Are you taking a blood pressure on a different leg? Utilizing your critical thinking skills is important so every patient has the best chance of getting out of the ICU. Writing down numbers on a treatment sheet is not helping anyone, especially the patient.

As a technician, you may not have the authority to change orders, add medications, or make a diagnosis, but those limits do not mean that you should not educate yourself in all of those areas. When medical orders are made, ask yourself why? Why are we using this antibiotic over that one? Why is this patient having an arrhythmia now? Why is the blood pressure dropping in this situation and can I do anything about it? Why are we giving a fluid bolus now? As you learn more you will be better about anticipating these changes in the next patient that you treat and you will be prepared. When the doctor orders that fluid bolus you will be ready. You will know that the blood pressure is dropping and be ready with the treatment.

The most important monitoring tool in the hospital is a veterinary technician. You can have the most fancy, expensive equipment, but having a veterinary technician to OBSERVE the patient is the most important. You, the technician, can anticipate what is coming next. A monitor can only tell you what is happening right now. As you progress in your career, remember what has happened in the past. Collect anesthesia records and case reports of interesting diseases and experiences to help you remember them. Rely on your observations. Are the gums less pink than they were an hour ago? Do those pulses feel weaker than when the dog came in? Is that

breathing pattern different? These are clues that no monitoring equipment will be able to detect. A skilled technician can never be replaced if they are using their critical thinking skills.

Encourage everyone in the clinic to practice their critical thinking skills. Teaching critical thinking is vital to the job satisfaction of the staff. It teaches technicians to become proactive and not reactive. Technicians should be empowered to think critically with every patient that walks into the door.
This process is something that must be built in to a clinic's culture. Information withholding, bullying, and horizontal violence are all too common in veterinary practices and spell death to critical thinking. When staff are afraid to speak up, afraid to ask questions and afraid to make mistakes, progress cannot be made. When only one person knows how to take dental radiographs or place difficult catheters the entire practice suffers. Critical thinking must be taught and practiced. While difficult, senior staff members must step back and allow employees to think for themselves. If a new technician or nurse is struggling with a question or technical skill, the instinct is to step in and do it for them for the sake of time. This is taking away a potential learning opportunity. If they cannot answer a question, reword it or ask another question with a similar theme to try to get them to the answer. This process takes energy and patience, but the best leaders and teachers are willing to help others grow to be their best. Fight bullying by structuring learning expectations so that everyone is involved with teaching. Reward not only the learning and progression of staff but also reward those who are teaching. Again, a culture change needs to occur and all teams need to be on board with the process and the goals, but the outcome is beneficial to the team as well as the financial gain of the hospital. Engaged employees stay longer and contribute more than just their hours in the clinic.

Encourage every technician on the staff to learn about their favorite disease. The more that person learns, the more everyone on the staff learns. Ask questions, participate in case rounds, attend all of the continuing education that you can. Don't just do it "because you have too." Use your brain. If veterinary technicians don't learn something new everyday, they will eventually leave the practice because they get bored. Cultivate and grow your critical thinking skills and you will be the best resource in your practice.

CASE STUDIES!