PRINCIPLES OF ECC NURSING, PART 1

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In emergency medicine, it is rare that a patient presentation follows a standard "subjective, objective, assessment, plan" (SOAP) format. Most often it's plan, then assessment, followed by subjective and objective. ER docs and techs don't have time to write down a history, or give detailed dictations about a physical before instituting treatment. So our thinking must be a little different. How do we rapidly identify patients that need care immediately? After that, how do we rapidly institute life-saving measures proven to reduce morbidity and mortality? What diagnostics and treatments will lead us there? This lecture will outline the first five minutes of a critical case, so that ER techs can better anticipate what a doctor may want and save more lives!

Telephone Triage

Knowing what is coming in is half the battle! If an owner calls and says his Great Dane has tried to vomit several times and his belly looks big … tah dah! You know there is a bloat coming in!

Over the Phone Triage Tips:

- Always recommend coming into the veterinary hospital
- Give limited information about possible disease processes
- Keep owners calm
- Give owners quick, accurate directions
- Be ready to give street and freeway directions
- Advise the owner of wait times
- Tell the owner to be careful if the pet is painful

Once They Arrive

Taking 30 seconds to find out why they arrived is crucial. No sense in thawing plasma for a dog that is pale and might have been into the rat bait, when it turns out it's immune-mediated hemolytic anemia (IMHA)!

The 30-Second History

- What is the animal here for?
- When did it start?
- Get specifics, such as color of the vomit, if there is rat bait in the house, etc.
- Determine if there are any preexisting medical conditions.
- Determine if there are any allergies.
- Determine what medications the pet is currently on, if any.

Triage

Once the animal arrives and a brief history is taken, we need to decide if it is critical or not! Triage is derived from a French word that means "to sort." It is a rough categorizing of patients into various categories, identifying which patients should be seen immediately, within hours, or within days, or which patients have expired. It is a somewhat rough system, being implemented in the trenches of World War I. However, sometimes veterinary ER's feel like MASH units! So this system fits perfectly!

Triage Levels

- Critical: Causing death within minutes
  - Respiratory emergencies
  - Cardiac emergencies
  - Life-threatening hemorrhage

- Emergent: Causing death within hours
  - Shock
  - Hemorrhage
  - Severe sepsis
  - Urethral obstructions
  - Compromised trauma patients (w/o hemorrhage)
  - Intractable vomiting

- Urgent: Causing death within days
  Untreated infections
  Dehydration

- Nonurgent: No risk of immediate death
  Self-contained clean wounds
  Dermatological problems

- Dead: Self-explanatory

Like a boy scout … be prepared! Every ER should have a crash area. This is a wet-table or treatment table where the sickest patients go. All of the monitors and emergency equipment should live there. Stable patients can be brought there as well, but bringing critical patients to the crash table every time creates the muscle memory necessary to have a good flow in an emergency. Flow will increase the efficiency of treatment.

Items in a crash-ready area include:

- Blood pressure equipment: Doppler, cuffs, sphygmomanometer, ultrasound gel
- Clean clippers
- IV fluids
- Catheters
- Syringes
- Needles
- Scrub
- Tape
- ECG machine
- Anesthesia machine for flow by oxygen
- Back boards
- Bandage supplies
- Good-quality lighting

What happens in the back: Once the pet has been triaged, deemed critical, and brought to the crash table, we need to perform a primary survey. Now these are often team approaches, where one technician is taking vitals and the other is starting treatments and diagnostics. This is how the system works best.

Primary Survey: TPR + ABC's + Mentation + BP
We always take TPRs on patients when they come in. That gives us a rectal temperature, heart or pulse rate, respiration rate *and* effort, and often MM/CRT parameters. The ABC's add a little more to the picture. I think also adding mentation as a parameter gets us to think that patients in shock may not be receiving adequate cerebral perfusion and be obtunded. Also I think a blood pressure is mandatory on every critical patient.

Airway: Assess for dyspnea:
Upper airway: Stridor, stertor, cyanosis
Lower airway: Wheezing, expiratory effort
Pleural: Short, choppy breaths
MINIMAL stress to an animal who is having trouble breathing!

Breathing: Assess rate and character and auscultate for wheezes/crackles

Circulation: Pulse quality; feel both femoral and distal pulses
Auscultate for any murmurs

Mentation: Is the patient:
A: Alert
V: Responsive to verbal stimulation
P: Responsive to painful stimulation
U: Unconscious

The patient with a derangement in one of these parameters may be in shock. Signs of shock include tachycardia, bradycardia, hypothermia, hypotension, hypertension, obtundation, and tachypnea.

Shock
"Shock" is a term used to describe inadequate tissue oxygenation and perfusion. There can be many types of shock, but the end result is the same. Cells, tissues, and/or organs are dying without oxygen and nutrients. Treatment involves increasing and enhancing perfusion.

Types of Shock

- Cardiogenic
- Distributive/obstructive
- Hypovolemic
- Metabolic
- Hypoxemic

Cardiogenic shock refers to "pump" failure, that is, when the patient cannot adequately pump blood to the organs that need it. This most often occurs in heart failure as well and can involve fluid accumulation in the abdomen, pleural/pericardia space, or pulmonary parenchyma.

- Valvular disease
- Cardiomyopathy
- Infectious diseases (endocarditis, etc.)

Distributive/obstructive shock occurs with massive vasodilation or obstruction to blood flow, which creates a relative hypotension and ineffective circulating volume. No blood loss has occurred, but there is lack of vessel wall tone (vasodilation) or obstruction to blood flow and blood pooling (GDV), inhibiting organ perfusion.

- Sepsis
- Anaphylaxis
- GDV
- Pericardial tamponade

Hypovolemic shock occurs when there is a drop in the effective circulating volume. This loss of volume can be from loss of plasma fluid (dehydration) or blood (hemorrhage). Either way, the lack of fluid inhibits oxygen delivery to organs.

- Trauma
- Hemorrhage
- Anemia
- Severe dehydration

Metabolic shock refers to lack of essential nutrients getting to organs. The easiest example is hypoglycemia. Blood can flow to organs, but is not carrying glucose, and organs cannot survive without this essential source of energy.

- Sepsis
- Puppy hypoglycemia
- Insulin overdose
- Insulinoma

Hypoxemic shock refers to lack of blood oxygen or oxygen-carrying cells, which causes end-organ ischemia. Anemia and/or hemorrhage are the best examples of this, although pulmonary disease can cause this as well.

Stages of shock

- Compensated
- Early decompensated
- Late decompensated

Stages of Shock	HR	RR	BP	Mentation	Pulse Quality
Compensatory	Elevated	Normal to elevated	Normal	Normal	Normal to "twangy" (Hyperdynamic)
Early decompensatory	Elevated	Normal to elevated	Low	Depressed	Weak/thready
Late decompensatory	Decreased	Low	Low	Depressed/comatose	Weak/thready/absent

Diagnostics and Treatment
After all of this information has been assessed and processed, we will proceed to diagnostics and treatments:

- Minimum database
- Fluid therapy
- Analgesics

Minimum Database
The minimum database is a collection of tests aimed at figuring out whether the patient is going to crash quickly. The database often includes blood glucose, BUN, venous blood gas, electrolytes, lactate, and PCV/TS.

- **Blood glucose**: If blood glucose is low, the patient could crash. Is the patient a puppy? Is the patient diabetic? If blood glucose is high, the patient could be sick, but is not likely to crash.
- **BUN**: If BUN is very high, it could potentially mean renal failure or severe dehydration. Whether it is high or low, the patient is not likely to crash immediately.
- **Venous blood gas**: If pH is low and patient is acidotic, this could cause cardiac arrhythmias. Shock and toxins will cause metabolic acidosis.
- **Electrolytes**: If sodium is quite high or low, the patient could have neurologic issues such as seizures. Chloride often follows sodium. Very high or low potassium levels could cause death.
- **Lactate:** Very high lactate level indicates shock. Low lactate is not really important.
- **PCV/TS:** High PCV and high TS indicate dehydration. Low PCV indicates anemia. Low TS (< 5.5 g/dL) in trauma may indicate hemorrhage.

Fluid Therapy
The goal is to increase effective circulating volume to maximize organ perfusion. Fluid options include:

- **Crystalloids**: Normosol-R, Lactated Ringer's, PlasmaLyte, 0.9% NaCL
  - Buffered solutions: LRS, P-lyte, etc., are preferred for resuscitation.
  - These are water-based solutions. More volume is required to increase intravascular volume. After 1 hour, 70% to 80% of these solutions have moved into the interstitial space.

- **Colloids**: Hetastarch, Dextran
  - Large sugar molecules suspended in a crystalloid. Large molecules mean more pressure. Less volume is needed to increase intravascular volume. Because they are large molecules, they do not rapidly disperse to the interstitial space.
- **Hypertonic solutions**: 7.5% NaCL
  - Technically these are crystalloids. They pull water from interstitial and intracellular spaces to increase intravascular volume. Use smallest amount needed to augment volume.
- **Blood products**: Only plasma/albumin solutions are colloids. Packed red blood cells (RBCs) should not change blood pressure.
  - If patient has a perfusion deficit, such as tachycardia, weak pulse, hypotension, or normotension with tachycardia, the patient needs a bolus. Slowly administering crystalloid products will result in a less than desired result. Bolus means < 15 minutes of administration.

Tips
Use a pressure bag. Only set IV pump on 999 ml/hr if < 250 mls of fluid.

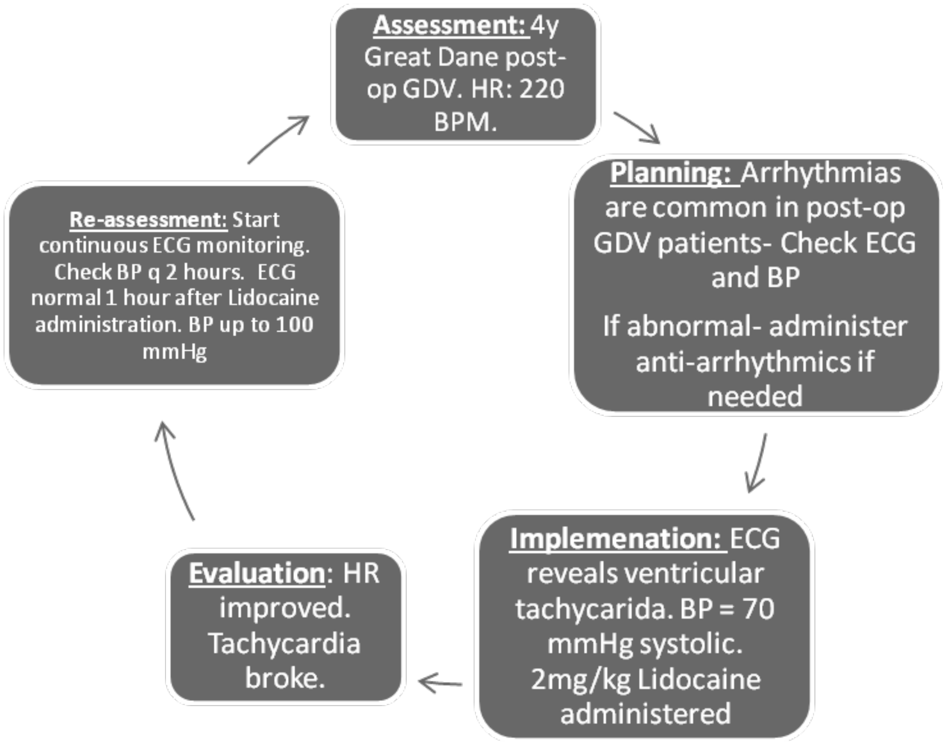
Idea behind treatments in ECC: Assess, Treat, Reassess, retreat. If a patient receives a fluid bolus, and still does not look good, recheck all parameters. Lactate is a great tool to monitor fluid therapy. Give enough until lactate starts to respond.

Analgesic Therapy
The analgesics that are best used in the acute care setting are the opioid medications. Butorphanol is widely regarded as a poor analgesic. Buprenorphine is a weak to intermediate strength analgesic, takes 30 to 45 minutes for peak effect, and is difficult to reverse if there is any problem. The pure mu opioid analgesics are the best fit for critical care. Morphine, hydromorphone, oxymorphone and fentanyl all have relatively short onset of action and strong analgesic effects and readily respond to naloxone reversal. Fentanyl has the option of being titratable, via a CRI, to effect. And it is quickly metabolized when the CRI is stopped. Pain contributes to shock via stimulation of the sympathetic nervous system. Withholding pain medication until the patient is more stable is not necessary. The pure mu opioid medications have very few side effects and are regarded as cardiovascularly sparing at published doses.

The TPR-Plus
In critical care, the simple T-P-R is not enough to globally assess the patient. A typical TPR (temperature, pulse, respiration) involves taking a rectal temp, taking a femoral pulse rate, and counting the respiration rate. This fails to do several things: compare the pulse rate with the ausculted heart rate (HR), auscult heart and lungs, and fully assess perfusion. The components of the TPR-Plus are:

- Mentation: Assess mentation using the AVPU mnemonic: **A**lert, responds to **V**erbal stimuli, responds to **P**ainful stimuli, **U**nresponsive. This procedure is done in order.
- Perfusion: HR ausculted, pulse rate palpated in *two* spots, limb temperature, rectal temperature, MM/CRT, hydration status (eyeball position, skin tent). Ausculting the HR and feeling the pulse helps you compare the two and eliminates any potential arrhythmias; palpating a femoral *and* dorsal pedal pulse can be a crude assessment of perfusion. Typically, the dorsal pedal pulse (being more distal) will disappear in hypoperfused states faster than the larger, more proximal femoral artery would. Rectal temperature can assist you in assessing perfusion, as shock will shunt blood to core organs and away from the GI tract, resulting in hypothermia. Mucous membranes and capillary refill time can provide another crude estimator of perfusion and hydration. An extremely quick or delayed CRT can correspond to shock, and along with a pronounced skin tent, enopthalmos (sunken eyes), tacky MM's, and a prolonged CRT can assist you in assessing severe dehydration.
- Cardiac/respiratory system evaluation: Auscultating the heart and lungs can aid in identifying heart murmurs, arrhythmias, and harsh lung sounds indicating possible pneumonia, airway disease or obstruction, and pulmonary edema or pleural space disease. In addition, the respiratory rate and character should be evaluated. Tachypnea or Bradypnea can indicate serious disease. A patient with severe respiratory disease will display an orthopneic respiratory pattern (elbows abducted, neck extended, barrel chest, abdominal effort), and patients with pleural space disease will display a paradoxical breathing pattern (inspiration causes opposite abdominal movement, and vice versa).

Wow! And that's just the TPR! Additional systems that should be evaluated for abnormalities in a critical patient include:



- Musculoskeletal system: fractures, wounds, trauma
- Neurologic system: ataxia, paralysis, seizures, head trauma, vestibular disease
- Renal/urogenital: presence of lower urinary tract obstruction, acute kidney injury
- Endocrine: signs of DKA, Addison's disease

References available upon request.