What is critical care nursing?

- Emergency Care - action taken in response to an emergency. The term implies emergency action directed toward the assessment, treatment, and stabilization of a patient with an urgent medical problem.

- Critical Care - The care taken or required in a response to a crisis. In Medicine, the treatment of a patient with a life-threatening or potentially life-threatening illness or injury whose condition is likely to change on a moment to moment or hour to hour basis. Such patients require intense and often constant monitoring, reassessment, and treatment.

Taken from the American Veterinary Emergency and Critical Care Technicians website (AVECCT).

Critical cases will be presented to every practice and it is important that the veterinary nurse is familiar with how to deliver effective care to these patients. They can be demanding and frustrating cases which require a great team effort.

Types of patient that may require care:
- Triage of patients
- Recovery of anaesthetic complication cases
- Post-surgical patients such as thoracotomy, portosystemic shunt ligation
- Critical medical patients such as DKA, septic peritonitis, pneumonia
- Seizuring patients
- Patients that require frequent observations

The Environment

Ideally such patients will be hospitalised in a premises that has 24 hour nursing care such as an intensive care unit. These patients are at risk of decompensating or deteriorating and it is important that there are nurses available to spot any changes.

Features of an ICU include:
1. Quiet – minimal stimulation so that patients can rest and staff can concentrate
2. Minimal traffic – aids to quietness and reduces the risk of infection
3. Spacious – may need lots of personnel around the patient at any one time
4. Clean and tidy – important from an infection control point of view and so that the team can work quickly and efficiently
5. Monitoring equipment – multiple multiparameter readers so that several patients can receive critical care monitoring
6. Lighting/darkness – ability to allow periods of rest and mimic a normal day/night
7. Appropriate temperature – also need access to heating and cooling devices so that individual patient requirements can be met
8. Separate area for cats – minimise stress and noise to critical feline patients
9. Observation of patients – variety of kennels – to include walk in kennels, oxygen kennels, cot

Several factors will influence where you choose to house your critical patient. The size of patient will ultimately determine the size of the kennel but sometimes a larger kennel may be selected if you require a lot of space for monitoring. For recumbent patient or one require constant monitoring then I would opt for a cot so that the nurse can work at waist height and access the patient from all sides.

**Observations**

The level of monitoring will depend on the individual and is likely to range from 1:1 constant monitoring to checking parameters every 4-6 hours. The case vet will determine the frequency of checks but they may need to be staged up or down as the patient progresses or deteriorates.

All observations should be recorded on a chart that is kept with the patient at all times. The hospital chart should contain the following information about the patient:

- Patient details – name, age, ID
- Case vet details – including contact information
- Weight – admit and daily
- Problem list
- Resuscitation information
- Daily SOAP
- Management of lines, tube, drains
- Nutritional plan
- Daily order – to include medications, fluids, nursing care
- Space to record parameters and clinical notes

It may be that your hospital operates several charts in the ICU for example a canine sheet, feline sheet and ventilator patient sheet. All charts should be signed off by the case vet to indicate that they have checked the patient and agreed with the scheduled medications, fluids and care to be delivered.

**Nursing the critical patient**

When we come to think about how we care for these critical patients it is important that we remember the concept of the nursing process:
The nursing care of critical patients is a cyclical process that is about continuously moving through the above 4 stages in order to move nearer to an end point. This process may be repeated up to every 15 minutes for a patient who is deteriorating or not responding to therapy. For those individuals that are more stable the process may be repeated on an hourly – 4 hourly basis.

There are 3 important body systems that will require frequent assessment and we will discuss each in more detail.

**Cardiovascular System**

- **Heart Rate**
  - This is a nonspecific parameter – it must be taken into context with the other findings from our clinical exam
  - Can be gained from auscultation, pulse or ECG
  - Tachycardia - >180 D/220 C

- **Heart Rhythm**
  - The heart rate should be compared to pulse rate
  - Pulse deficits are indicative of arrhythmias. Some examples of cardiac arrhythmias include:
    - Premature atrial contraction
    - Atrial fibrillation
    - Premature ventricular contraction
    - Ventricular tachycardia.
  - All pulse abnormalities should be confirmed by an electrocardiogram (ECG).

- **ECG**
  - Various types of machine for various situations
  - Measure electrical activity of the heart
  - Measurements can be done from a paper trace to evaluate
  - Essential in a ‘crash’ scenario to monitor heart activity

- **Mucous membranes and capillary refill time**
  - The normal mucous membrane colour is salmon pink
  - In diseased states the mm colour may be:
    - Yellow – liver disease, haemolysis
- Pale/white – anaemia, shock, blood loss
- Brick red – Sepsis, polycythaemia, hyperthermia, carbon monoxide toxicity
- Blue – hypoxia
  - Capillary refill time (CRT) is an indication of peripheral perfusion and should not be thought of as an indicator of blood pressure.
  - Prolonged CRT is due to vasoconstriction

- CVP
  - The hydrostatic or luminal pressure in the vena cava. CVP is affected by circulatory mean systemic pressure and venous return. Its measurement provides information:
    - The heart’s ability to function as a pump
    - Blood volume in relation to volume capacity
    - Vasomotor tone
  - Useful in patients with renal failure, heart failure and shock
  - Normal – 0-10 cmH20
    - <0 = hypovolaemia
    - >10 = hypervolaemia

- BP
  - Invasive blood pressure
    - Machine reading – diastolic, systolic and mean
    - Placement of arterial catheter, transducer and multi-parameter reader
    - Flush every hour or a continuous flush system
    - Very reliable reading
  - Non-invasive blood pressure
    - Oscillometric – Machine reading - Diastolic, systolic and mean
    - Doppler – Manual reading, systolic
    - Cuff size = 40% circumference of the leg
    - Not as reliable
  - Normal
    - Systolic 100-160 mmHg
    - Diastolic 50-100 mmHg
    - Mean 70-120 mmHg
  - Hypotension <80 mmHg systolic
    - Fluid therapy
    - Colloids
  - Hypertension >160 mmHg systolic
    - Antihypertensive drug therapy
    - Remove the underlying cause

Respiratory System

- Respiratory Rate
  - Normal 8 - 20 bpm
  - Bradypnoea is a slow rate without regard to tidal volume. Apnoea is the absence of any ventilatory effort.
- Intracranial space occupying lesions
- Drug induced
- Hypo- or severe hypercapnia
- Respiratory centre dysfunction.
  - Tachypnoea is a fast rate without regard to volume.
    - Hypoxia
    - Hypercapnia
    - Hyperthermia
    - Pain
    - Metabolic

- Respiratory Pattern
  - Prolonged inspiration
    - Upper airway problem
  - Prolonged expiration
    - Lower airway problem

- Auscultation
  - The entire lung field should be auscultated and all abnormal lung sounds should be localized and characterized.
  - Crackles are indicative of bronchopulmonary disease such as pulmonary oedema.
  - Expiratory wheezes are due to asthma.
  - Muffled lung sounds ventrally may indicate a pleural effusion and dorsally a pneumothorax.

- Arterial blood gases
  - PaCO2 measures the patient's ability to ventilate.
    - Normal is 35 - 45mmHg.
    - <35 mmHg (hypocapnia) is indicative of hyperventilation.
    - >45 mmHg (hypercapnia) is indicative of hypoventilation.
  - PaO2 measures the patient's ability to oxygenate the blood.
    - Normal range is 80 - 110mmHg
    - <60 mmHg is considered hypoxemic and therapy may be started at this point.

- SP02
  - Pulse oximetry is another method for assessing oxygenation.
  - It provides non-invasive and continuous information about the percent of oxygen bound to haemoglobin
  - Oxygen saturation is the ratio of oxy-haemoglobin to deoxyhaemoglobin.
  - Normal SPO2 should be greater than 95%.

- Oxygen therapy
Non-invasive:
- Flow by – mask
- 02 kennel
- Nasal prongs

Invasive:
- Nasal catheters
- Transtracheal
- Endotracheal

Nebulisation

- Capnography
  - Gives us an idea of ventilation
    - Normal 35-45 mmHg
    - > 50mmHg Hypercapnia
    - < 30mmHg Hypocapnia
  - Normal ET CO2 is approximately 1 - 4 mm Hg less than the PaCO2
  - We are able to gain information about the way that the patient is ventilating from the etC02 trace
  - Factors affecting measurements:
    - gas leaks
    - sensor obstruction
    - taking readings during the early part of exhalation

Neurological Status

- Mentation
  - Assess every hour – 4 hours depending on patient – Ideally we should assess the level of mentation every time we interact with the patient
  - Coma score – looks at consciousness, motor activity and brainstem reflexes
  - A drop in the score can be suggestive of a deterioration
  - Why may mentation be altered? Have we ruled out other reasons that could be contributing towards the change in mentation

- Consciousness
  - Normal
  - Obtunded- mild to moderate reduction in alertness and often appears drowsy, but is easily aroused
  - Stuporous - characterized by a deep sleep that is only responsive to vigorous or painful stimuli, once the stimulus is removed the patient returns to its sleep-like state
  - Comatosed - totally unresponsive even to painful stimuli

- Posture
  - Is the patient ambulatory? If not which legs are affected?
  - Common pastures that can be seen in neurological patients:
- **Opisthotonos** is a form of spasm in which the head is bent backwards and the body bowed forward.
- **Schiff-Sherrington** - due to a severe spinal cord injury. The patient's front limbs are in extensor rigidity and the rear limbs are relaxed. The patient has a normal level of consciousness. Prognosis is poor
- **Decerebellate rigidity** - occurs with severe cerebellar injury. The patient's front limbs are in extensor rigidity while the rear limbs are flexed. The patient has altered mentation. The prognosis is fair for this posture.
- **Decerebrate rigidity** - due to a severe brain stem injury. Extensor rigidity is present in both front and rear limbs. The patient is unconscious. The prognosis is poor for this posture.

- **Pupils**
  - Normally pupils should be equal in size and have a direct and consensual response to light
  - If the pupils are fixed in a midpoint position and unresponsive to light a severe midbrain lesion is suspected and the prognosis should be considered guarded.
- Other common findings:
  - Strabismus
  - Anisocoria
  - Miosis
  - Mydriasis

**Other Nursing considerations:**

**Fluids balance**

Ins should match outs. Patients need to have a maintenance fluid requirement calculate for the individual and this should also take into account any deficits that may be underlying. Hydration status should be check twice daily to ensure that we are meeting the patient's requirements. Electrolyte disturbances may mean that a specific crystalloid is chosen but this will depend on the case vets decision. For polydipsic patients we can measure water intake and quantify how much the patient is drinking in a 24 hour period.

**Lab work**

Frequent blood samples may be required to be taken to monitor trends closely. PCV and TS, acid base analysis and measurement of electrolytes are common tests that are run in the critical patient. A minimum data base will often consist of the above
(inc glucose and lactate) and then further test may be run up to every several hours if we need to monitor a parameter closely such as a high sodium. Other tests that can be useful in the critical patient include serum biochemistry, complete blood count (haematology), blood smear examination, urinalysis, faecal analysis (lungworm), coagulation profile and blood typing.

Nutrition

This is always a difficult task in the critical patient. It is beyond the scope of this tutorial to discuss nutrition in depth so please refer to other online tutorials. Aims should be made to meet the patient’s RER. If they have not met it for 3 days or are unlikely to meet it then assisted feeding measures should be taken. This can range from hand feeding to total parenteral nutrition. Feeding tube selection will depend upon the patient’s disease process and whether they are stable enough to undergo anaesthesia. If a decision to give parenteral nutrition is made then the patient will require a central venous catheter.

Pain and stress

It is very important not to confuse the two. This can sometimes be extremely difficult in a sick patient. Pain score systems should be used so that pain can be assessed and managed. Ideally a multimodal approach will be taken so that we can provide holistic analgesia. Opioids, constant rate infusions and regional analgesia are all useful in critical patients. Paracetamol can be a useful adjunct in canine patients. If there is any concern that a patient is in pain then analgesia should be trialled. Stress should be minimised by handling patients carefully and considerately. Cats should have boxes to hide in and ideally be housed in a separate area to dogs. Nurses should work at creating a patient bond by providing time periods of TLC and grooming.

Positioning and physiotherapy

Recumbent patients need to be managed by turning frequently (every 2 – 4 hours) and ideally propping them up in sternal so that both lungs can expand. Foam wedges, pillows and duvets are useful for padding out beds. Massage, passive and active range of movement routines can be adopted to keep patients supple and to promote blood/lymph flow. Once patients are ambulatory then physio sessions can be extended to include sling walks, balancing exercises and even hydrotherapy.
Maintaining normothermia

We should aim to keep all patients normothermic. This can be achieved via a variety of methods. We only tend to actively cool hyperthermic patients that have temperatures approaching 41 degrees. This can be done by dousing patients with cold water. Care should be taken with wet towels as if these are laid over the patient then they can trap hot air and actually insulate the patient! Other methods of active cooling can be cool water enemas and bladder lavage. Cool fluids and fans can be useful in cases where the temperature is only mildly elevated. Patients should be cooled to 39.5 degrees Celsius and then efforts should be stopped as the patient's temperature is likely to continue to decrease that last degree itself.

Hypothermic patients should be warmed slowly to about 37 degrees Celsius. During this process there can be a change in perfusion and therefore blood pressure so be careful if your patient is hypotensive to start with. Warm air blankets, incubators and bubble wrap can be used. Care should be taken with heat mats, hot hands and wheat bags as there is no way of controlling how hot these get and if they are in direct contact with the patient which is not moving much then they can cause skin burns. Warm water enemas, bladder lavage and warmed fluids can also help in severely cold patients.

Infection Control

This is VITAL in the critical patient. Hand hygiene should be of a gold standard. These patients will be at risk of nosocomial infections due to their immunocompromise, multiple indwelling tubes/drains/lines and their disease process. It is vital that we handle these patients in a hygienic manner. If they become wet or soiled then they can develop skins sores/scalding and so they should be kept clean and dry at all times. Equipment should be cleaned in between each patient. Barrier nursing should be adopted if there are concerns that the patient may contract something or if there is a risk to personnel or other patients.