

## **First Aid, Transport, Triage and CPR for Technicians**

### **Part 3 – Vital Signs – LOC and Respiratory Rate and Effort**

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Evaluation of the patient through physical findings is the “gold standard” of determining patient status. Obtaining and assessing parameters is a serial process, with the initial value acting as the baseline for the patient’s database. It is important to know what is normal for the patient, and what the parameters were from the previous shift. Establishing trends or comparing changes can be more meaningful than writing down one-time figures. The parameters should be evaluated in relation to the diagnosis, laboratory tests, history, and charted records.

#### **Level Of Consciousness**

A declining level of consciousness (LOC) is suggestive of progressive brain pathology and a worsening prognosis. The levels in declining order are alert and responsive, depressed, uncontrolled hyperexcitability, obtunded, stupor, and coma. A mentally depressed animal is conscious but slow to respond to stimuli. An unconscious patient that responds to noxious (painful) stimuli is in a stupor. The patient that is unconscious and does not respond to any stimuli is in a coma. Coma carries the worst prognosis. An animal can be conscious but have abnormal mental abilities. These mentation changes can include slow but appropriate responses to stimuli (severe depression), inappropriate responses to situations or stimuli (dementia), bizarre behavior (e.g. fly biting), and slow response with animal unaware of the stimuli (mental dullness).

Etiologies for changes in LOC or mentation include metabolic problems (e.g. liver failure or shunts, hyper or hypoglycemia, hyper or hyponatremia) hypoxia, hypotension, iatrogenic rapid elevation in serum osmolality (e.g. mannitol overdose, TPN), trauma, toxins (e.g. ethylene glycol), primary brain pathology (e.g. tumors, infection, inflammation), and drugs (e.g. sedatives, anesthetics). Any pathology can lead to brain edema or hemorrhage, resulting in an increase in intracranial pressure. When this occurs, the brain tissue is compressed and malfunctions.

#### **Assessment**

The veterinary nurse must monitor the animal's mentation and LOC. Changes in the animal's behavior, response to stimuli or posture may be significant. Unconscious patients should be tested by toe pinch periodically to detect their response to this painful stimulus. Any decline in the LOC suggests worsening pathology and warrants immediate neurologic examination and medical or surgical intervention.

The neurologic evaluation of the animal should localize and determine the progression of the pathology. Pupillary size and response to light are noted. Normal, responsive pupils or equal, miotic pupils are associated with disease within the cerebral cortex or subcortical structures. Dilated or midrange fixed pupils are most commonly due to midbrain pathology and is a grave sign. Eye position is noted, with ventral lateral strabismus (lateral gazing) indicating midbrain pathology. Nystagmus (bouncing back and forth of the eyes) is due to a problem in the vestibular system either within the ear or within the brainstem. Changes in posture, with the forelimbs and neck in extensor rigidity in the unconscious patient (called decerebrate rigidity) is a grave sign, indicating a midbrain lesion. Respiratory changes in the unconscious patient imply serious pathology.

Any change in LOC or mentation requires immediate intervention. Treatment is initiated to lower intracranial pressure in the unconscious patient. The nursing care can play a key role in the recovery of the animal.

- The head and neck should be in a level position with the body, or slightly elevated to 20 degrees above the body.
- The airway is secured in patients that cannot swallow since salivary secretions, regurgitation, or vomiting can cause airway obstruction or aspiration pneumonia.
- The carbon dioxide level should be maintained between 30-35 mmHg for optimal cerebral blood flow and when preventing or managing cerebral edema. This may require intubation and ventilation.
- The arterial oxygen must be maintained above 60 mmHg. Oxygen supplementation may be required. Nasal oxygen should be used only with caution since stimulating a sneeze during nasal catheter placement could abruptly elevated intracranial pressure. An oxygen hood or face mask is used only with careful monitoring to prevent carbon dioxide accumulation. These decisions are

- made by the veterinary team.
- The tongue is kept moist with water and the eyes lubricated.
- Jugular venipunctures are avoided.
- Usually urinary catheter placement is recommended to keep the bedding and patient clean and dry.
- Frequent and gentle physical therapy and turning is recommended to avoid pressure sores.
- The unconscious patient has higher metabolic demands and requires nutritional support during treatment.

### **Respiratory Rate, Effort And Breathing Patterns**

Respiration is the exchange of oxygen and carbon dioxide between the air and the tissues. The lung, with its network of capillaries and alveoli, is the primary site of gas exchange with the blood. With the lungs, the airway, larynx, pharynx, and nasal passages comprise the respiratory tract. Other functions of the respiratory tract include controlling acid-base balance, defending against inhalation of foreign particles, and filtering the circulation. The brain and respiratory muscles (intercostal muscles and diaphragm) determine the rate, pattern and effort of breathing. Normally the diaphragm is responsible for 80-90 % of the work of breathing when the animal is resting.

The rate and effort of breathing can be affected by pathology of the respiratory tract, respiratory center of the brain or respiratory muscles. When blood carbon dioxide (CO<sub>2</sub>) increases or bicarbonate decreases, the brain responds by increasing pulmonary ventilation in an effort to exhale CO<sub>2</sub> and normalize the pH. Chemoreceptors in the carotid bodies detect increased CO<sub>2</sub> levels and stimulate the respiratory center. When CO<sub>2</sub> levels decrease, the stimulus for ventilation is removed. In addition, a decrease in blood oxygen (O<sub>2</sub>) content or pH is detected by carotid chemoreceptors and stimulates ventilation through the respiratory center.

#### ***Assessment***

Clinical signs of respiratory distress change as the disease progresses. The first subtle sign of respiratory distress is an increase in the respiratory rate. This is followed by a change in respiratory pattern, determined by the site of the pathology. As the distress progresses, the animal will then assume postural positions of relief, followed by open mouth and labored breathing. Cyanosis is a very late sign (PaO<sub>2</sub><60 mmHg) often followed quickly by death.

Respiratory patterns guide the veterinary team to localize the anatomical site of disease for life-saving intervention. Loud breathing or stridor (heard without the aid of a stethoscope) indicates large airway disease (nasal passages, larynx/pharynx, trachea). Inspiratory stridor directs investigation of the extrathoracic airways, especially the larynx. Expiratory stridor is usually due to intrathoracic tracheal changes. For diseases of the lung parenchyma and pleural space, it should be noted whether the chest and abdomen are moving in the same direction (most likely lung parenchymal disease) or are moving in opposition of one another (most likely pleural space disease). An expiratory push with the diaphragm, with a short inspiration, directs attention to the small airways.

Auscultation can help distinguish pleural disease from lung disease. Moist lung sounds suggest fluid in the lung tissues. Dry, coarse sounds on inspiration and expiration suggest fibrosis of the lung. Absence of lung sounds suggests that air or fluid in the pleural space is dampening airway noises.

As the work of breathing progresses, the animal will assume a posture to assist their efforts. Cats often sit crouched with their sternum elevated from the surface and dogs extend their neck, abduct their elbows and arch their back. Respiratory rates below 8 or above 30 are considered abnormal.

Any change in breathing pattern or effort warrants immediate notification of the veterinarian. The veterinary technician should administer oxygen until a complete assessment can be made. If an upper airway foreign body is suspected, the nurse can examine the mouth and prepare to retrieve the foreign body with a pair of sponge forceps. When the breathing pattern suggests pleural space disease, the technician should prepare for thoracentesis and possibly chest tube placement by the veterinary team.

When respiratory distress is severe, endotracheal tubes and a laryngoscope should be placed by the veterinarian. The veterinarian may need to rapidly anesthetize and intubate the animal to gain control of the airway, minimize the work of breathing, and provide oxygenation and ventilation. In the event that the animal stops breathing, the technician should rapidly intubate and ventilate with 100% oxygen and equipment for a thoracocentesis, chest tube or tracheotomy made ready as directed by the veterinarian.