When a client presents with a dog or cat the goal of the examination is to determine the location of the disease within the body for the problem. Once the location is known then limiting the list of possible causes to just a few becomes easy when considering the location, age, and breed and disease progression. A useful discussion can then occur regarding the diagnostics, treatments and prognosis for the likely disease (s) that caused the client to present with their pet. In neurology, this is especially important in because problems are often life-threatening, rapidly progressive and diagnostic testing often involves MRI of the diseased part of the nervous system. Simply observing a patient’s mentation / behavior, posture (how they support themselves against gravity) and gait (how they move) will typically allow an observed to determine the location within the nervous system. We will used video case examples to demonstrate lesions within the forebrain, vestibular system, cerebellum, spinal cord and nerve / muscle.

**Forebrain**
The forebrain consists of the cerebrum and thalamus and lesions with this area produce seizure and behavior changes like confusion, irritability (headache?), and inappropriate elimination. The forebrain receives sensory information (visual, tactile) from the opposite side of the body. A lesion on the left forebrain can result in an inability to recognize or process incoming information from the right side of the body. This phenomenon is called hemi-inattention or hemi-neglect. Strength, balance and gait are normal because these attributes are controlled by the brainstem. A patient with a left forebrain lesion might bump into things on the right, turn their head or circle only to the left and place the limbs on the right side away from midline.

**Vestibular system**
The vestibular system controls head and body position while we are at rest and moving (accelerating, decelerating). The receptors that receive information about head position, acceleration and deceleration are called the semi-circular canals and are located in the bones of the inner ear and the information is processed within the brainstem. Disease of either the nerve or brainstem can generate signs of vestibular disease which include head tilt, side-stepping (drunk appearance), and spontaneous eye movement (nystagmus). If the lesion is within the brainstem then dullness, weakness, and other nerve abnormality are often noted.

**Cerebellum**
The word cerebellum means ‘little brain’ and half the neurons of the brain are located within the cerebellum. The cerebellum is located just above the brainstem, behind the osseous tentorium within what is called the cranial caudal fossa. The role of the cerebellum is to smooth out and control movement – the cerebellum does not generate gait or strength. Lesions of the cerebellum produce a characteristic high- stepping gait and patients can have a movement associated (intention) tremor. Cerebellar lesions do not produce behavior changes or weakness although patients may hold their pelvic limbs away from midline or wide-based... A head tilt and spontaneous eye movements can be seen with cerebellum disease but are far more common with disease of the vestibular system.

**Spinal cord**
The spinal cord delivers signals from the brainstem to the nerve and muscle to generate gait. It also delivers information from peripheral receptors about limb position to the brain. A severe lesion of the spinal cord will produce paralysis whereas a mild to moderate lesion will produce weakness from failure of delivery of signals to the nerve and muscle. Poor coordination or proprioceptive ataxia of the limbs will also be noted from poor delivery of signal about limbs position to the brain. Weakness and ataxia or a disordered gait are characteristic of spinal cord disease. Spinal cord lesions often cause moderate to severe pain from compression, stretching, or inflammation of the meninges, nerve root or vertebral column structures. Consequently behavioral changes associated with pain (abnormal vocalization, slow to sit and rise, unwilling to move) or abnormal posture (arched back) are often noted. Spinal cord disease is sometimes called upper motor neuron disease. Lesions of the spinal cord cause weakness, ataxia and/or severe pain.

**Nerve / muscle**
The nerves start within the spinal cord and carry signals to activate the muscle. An intrinsic, reflexive system of nerves automatically or reflexively produces muscle tone and support against gravity. Disease of the nerve, muscle or their connection (neuromuscular junction) produces the same symptoms and is referred to as lower motor neuron disease or neuromuscular disease. Nerve / muscle disease causes weakness and less commonly paralysis and does not produce incoordination or ataxia. Whereas muscle tone is often increased with upper motor neuron disease, in lower motor disease there is reduced muscle tone. Patients might stand with their hocks
or carpi dropped or too low to the ground. A primary characteristic of this disease is a short-strided or choppy gait where the patient acts as though they are walking on egg shells. Neuromuscular disease patients are seldom painful. Coughing, gagging, a respiratory stridor, and a change in the bark might also be noted from weakness of the nerves and muscles going to the back of the throat (pharyngeal area) and voice box (larynx). Patients may appear dull if they are systemically ill from pneumonia which is commonly associated with pharyngeal disease.

### Table 1. Characteristic behaviors, gaits and postures for neurological lesions

<table>
<thead>
<tr>
<th>Location</th>
<th>Forebrain</th>
<th>Cerebellum</th>
<th>Vestibular</th>
<th>Spinal Cord</th>
<th>Nerve / Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td>Confused, seizure</td>
<td>Normal</td>
<td>Dull</td>
<td>Painful</td>
<td>Normal</td>
</tr>
<tr>
<td>Gait</td>
<td>Not weak, circling</td>
<td>High stepping</td>
<td>Side stepping</td>
<td>Unpredictable</td>
<td>Short strides</td>
</tr>
<tr>
<td>Posture</td>
<td>Head turn, limbs held out to side</td>
<td>Intention tremor</td>
<td>Head tilt</td>
<td>Normal to unable to stand</td>
<td>Normal to unable to stand</td>
</tr>
</tbody>
</table>

Note: Behavior or level of awareness can be normal with a lesion in any part of the nervous system

### References
