**PHYSICAL EXAMINATION OF THE MUSCULOSKELETAL SYSTEM**

**Detailed or “Hands On” Examination**

The detailed physical examination may be conducted systematically to ensure all areas are covered.

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| **NECK AND WITHERS** | Palpate the cervical vertebral area, associated musculature and nuchal ligament area. If there is damaged or painful cervical vertebrae or musculature, the forward swing phase of the front phase is affected.  Examples of cervical area damage causing lameness are fractured wing(s) of the atlas, cervical body fractures and abscesses.  Palpate and manipulate the dorsal spinous processes of the thoracic vertebrae 2 through 7 over the withers. Assess the area for pain, resulting, heat or deformity.  Altered gait may be due to local infection, saddle sores or fractured dorsal spinous processes. |
| **Thoracic Limb Examination in Full Weight-Bearing Position** | |
| **SHOULDER AND ARM** | With the horse bearing weight on the limb, palpate the forelimb. Identify the spine of the scapula as the landmark for the infraspinatus and supraspinatus muscles, the neck region of the scapula and the approximate location of the shoulder joint. The lateral tuberosity of the humerus can also be readily palpated.  Rostral to the lateral tuberosity and continuing distally are the biceps brachii, brachialis and brachialis and brachiocephalicus muscles which can be palpated and manipulated. Firm manipulation may elicit an uncomfortable response and should be compared to the opposite limb. Normally horses with chronic forelimb lameness experience pain in this region.  The triceps muscle is palpated from its attachment on the caudal border of the scapula to the olecranon. |
| **ELBOW** | The olecranon is greatly appreciated and manipulated medially and laterally. This together with the elbow joint, are readily palpable and the joint space is palpable midway between these two structures on either side of the lateral collateral ligament of the elbow. |
| **FOREARM** | The medial aspect of the radius is palpated easily since it is free of any overlying muscle. The extensor carpi radialis is palpated along its full length. The tendon of the extensor carpi radialis vertically traverses the most dorsal aspect of the carpi to its attachment on the metacarpal tuberosity. The common digital extensor muscle and tendon. The tendon continues distally over the dorsolateral surface of the carpus and down the dorsal aspect of the metacarpus to attach to the proximal, middle and distal phalanges. The tendon can be palpated proximal to the distal radius. The ulnaris lateralis muscle is identified and palpated along its full length. The flexor carpi radialis and flexor carpi ulnaris muscles are palpated from the elbow to the accessory carpal bone.  The muscle bellies of the superficial and deep digital flexors are deep to the carpal flexors and cannot be palpated accurately in the forearm but deep digital manipulation to this area to detect pain or swelling. |
| **CARPUS** | Palpate the distal radius and radial carpal as well as the middle carpal joints on the dorsal surface of the carpus. Then, palpate the tendons of the extensor carpi radialis, common digital extensor and lateral digital extensor. Palpate the carpal canal region between the accessory carpal bone and the palmaromedial aspect to the carpus to assess the superficial and deep digital flexor tendons, common digital sheath and pulse of the common digital artery. |
| **METACARPUS** | The metacarpal tuberosity is palpable on the proximodorsal aspect of the third metacarpal bone (cannon bone) and this serves as the attachment for the extensor carpi radialis tendon. The suspensory ligament is examined behind the third metacarpus between the second and fourth metacarpal bones. The proximal one third of the suspensory ligament is difficult to appreciate with the horse in the full weight-bearing position, the distal two thirds of the ligament can be palpated palmar to the splint bones, dorsal to the flexor tendons and its attachment in the sesamoid bones. The normal suspensory ligament is of uniform thickness and any deviation from this may indicate pre-existing or active damage.  The deep and superficial distal flexor tendons are palpated individually from the carpus to the level of the proximal sesamoid bones. Any indication of pain of swelling in these tendons indicates the need for further investigation to either confirm or rule out damage to the tendon, tendon sheath or subcutaneous structures. This evaluation may need further tests such as ultrasonography.  Palpate the communicating nerve branch that travels from the medial palmar nerve to the lateral palmar nerve over the palmar aspect of the superficial flexor tendon. The inadvertent pinching of this structure may elicit a pain reaction that could be misinterpreted as pain associated with the tendon. |
| **FETLOCK** | Palpate the palmar pouch or proximal extension of the metacarpophalangeal joint. This is located caudal to the distal end of the third metacarpal bone, dorsal to the medial and lateral branches of the suspensory ligament. The palmar pouch is dorsal to the digital flexor tendon sheath. These must be distinguished since effusion of one has a different significance than the other.  Examine the apical and abaxial aspects of the medial and lateral sesamoid bones. The medial and lateral digital arteries cross the vertical axis of the sesamoid bones and thus can be easily appreciated. Palpate the base of each of the proximal sesamoid bones and their respective medial and lateral wings of the first phalanx. Palpate the dorsal surface of the fetlock joint and the proximal and distal limits of the joint capsule attachment. Finally, palpate the area of attachment of the lateral digital extensor tendon on the proximolateral aspect of the proximal phalanx. |
| **PASTERN** | Begin by palpating the dorsal surface of the proximal phalanx, pastern joint and middle phalanx. Then, palpate the medial and lateral extensor branches of the suspensory ligament as they travel dorsally and distally to attach to the common digital extensor tendon.  Palpate the digital flexor tendons and sheath on the palmar aspect of the pastern until they disappear into the bulbs of the head. |
| **FOOT** | Examine and palpate the coronet beginning at the dorsal aspect of the foot and continuing toward both heels. Deep to the coronet and coronary cushion is the margin of the digital interphalangeal joint.  The medial and lateral collateral cartilages should be palpated and manipulated to ascertain the size, presence of pain and pliability.  Examine the shape and character of the hoof wall. Here, hoof wall loss, hemorrhage, poorly place or loose nails, cracks, rings and wall flaring can be observed. |
| **Thoracic Limb Examination in a Non-Weight Bearing Position** | |
| **SHOULDER; Proximal Arm, Elbow and Forearm** | Pick the limb up by holding at the forearm and move forward and backward to assess the range of motion of the shoulder. Place one hand over the point of the shoulder while manipulating the limb. Pull the limb laterally to assess stability of the shoulder joint.  Holding in the flexed position allows easier access of the musculature of the shoulder and proximal arm such as the biceps brachii and brachialis. Apply firm digital pressure to these tissues.  The forearm is elevated to flex the shoulder. The flexor and extensor muscles of the carpus and distal limb should be isolated and manipulated with ease in this non-weight bearing position. Palpate the olecranon and manipulate it medially and laterally. |
| **CARPUS** | Flex the carpus to appreciate the range of motion as well as to detect the presence of pain. The limb is then positioned with the pastern between the examiner’s thighs with both the horse and examiner facing forward. This opens the carpal joints leaving the hands free to palpate the distal articular surfaces of the radius as well as the proximal aspect of the second, third and fourth carpal bones.  Apply digital pressure to the joint margins to localize pain, swelling and hypertrophied synovial villi as they slip through your fingers. |
| **METACARPAL REGION** | The pastern is held with one hand and the structures of the metacarpal region are examined with the other hand. The suspensory apparatus (suspensory ligaments, inferior check ligament, superficial and deep digital flexor tendons) is relaxed in the flexed position and all the components are assessed individually.  Pressure should be applied to the metacarpal bones. The dorsal surface of the third metacarpal bone should then be manipulated. |
| **FETLOCK AND PASTERN** | Flex and extend the fetlock to determine the range of motion and presence of pain. It is important to attempt to differentiate non-painful restrictive loss of motion versus a perceived loss of motion due to pain.  Apply focal pressure using the thumb in the region of attachment of the medial and lateral components of the middle distal sesamoidean ligament.  Palpate the digital flexor tendons with the carpus flexed. |
| **FOOT** | Palpate the space between the proximal toe wall underlying the digital cushion and extensor process of the distal phalanx. A depression in this area is strongly suggestive of an abnormal shift of the position of the distal (third) phalanx within the hoof capsule and hence laminitis.  Palpate toward the heel to appreciate the coronet, collateral cartilages and bulbs of the heel.  Note the type, design and approximate weight of the shoe. If the shoe has been removed, examine the preexisting nail holes, character of the hoof wall, white line and adjoining sole.  Determine the degree of concavity of the sole and digitally determine its strength and thickness. Examine the frog and bulbs of the heels because this area is commonly injured in racehorses due to overreaching.  Hoof testers and percussion help to identify pain in this region. Hoof testers are used to determine both the presence of pain and strength of the hoof. Begin by applying the testers across the medial bar and heel wall, and continue across the foot at 2.5cm intervals until the lateral heel wall is reached.  Lightly pare the sole and white line with a hoof knife to remove only superficial material. Examine for cracks, bruises and hoof wall separation. |
| **BACK AND CROUP** | Begin palpation caudal to the withers by placing the thumb and middle fingers on the latissimus dorsi and place the index finger over the dorsal spinous process. Apply light pressure from the withers to the tail to detect any bony prominences or pain.  Sensitive areas should be re-examined comparing the left and right sides. |
| **Pelvic Limb Examination in a Weight Bearing Position** | |
| **HIP AND THIGH** | Palpate and apply digital pressure to the gluteal musculature. Identify and grasp both tubera coxae and gently rock the horse. Pelvic fractures and abnormal stifle motion may be detected as the horse flexes and extends the hind limb. Manipulate the tuber ischii. Palpate the semimembranosus and semitendinosus. Palpate the biceps femoris and quadriceps to the patellar region. Finally, palpate the medial aspect of the thigh and groin musculature. |
| **STIFLE** | Palpate the medial, lateral and middle patellar ligaments to the base of the patella. The fat pad may make is difficult to appreciate the mild effusion of the joint. Appreciate the patellar motion by grasping the patella and patellar complementary cartilage and rocking the horse. |
| **GASKIN** | Apply digital pressure across the proximal tibia. Any pain in this region is indicative of a non-displaced incomplete spiral fracture of the tibia. Palpate the flexor muscles of the hock and extensors of the digit from the proximal tibia to the hock. Identify the Achilles tendon of the superficial digital flexor and gastrocnemius and palpate the structures to the level of the tuber calcis. |
| **HOCK** | Locate the malleolus of the distal tibia to identify the tarsal structures. Palpate the dorsal surface of the tibiotarsal joint and tendons of the long and lateral digital extensors. Individually palpate the medial and lateral collateral ligaments of the tibiotarsal joint.  Visually and manually evaluate the distal medial aspect of the hock since changes may reflect degenerative joint disease.  The plantar aspect of the hock is evaluated by first identifying the tuber calcis. The plantar ligament is appreciated by palpating the area between the superficial digital flexor tendon and plantar aspect of the fibular tarsal bone. |
| **DISTAL LIMB AND FOOT** | The distal hind limb and foot are examined in the same fashion as the forelimb and forefoot. The only two anatomic differences are that the lateral digital extensor tendon joins the long digital extensor tendon over the proximal fourth of the metatarsus and the great metatarsal artery can be palpated between the third and fourth metatarsal. |
| **Pelvic Limb Examination in a Non-Weight Bearing Position** | |
| **HIP, THIGH, STIFLE AND GASKIN** | Pick up the hindlimb by grasping the plantar aspect of the metatarsus. Evaluate the ease of movement and assess the hip, pelvis, stifle, hock and to a lesser extent, the fetlock joint.  Pull the limb forward and backward to flex and extend the hip joint. Raise the limb laterally to examine stability of the hip joint. Deeper and isolated palpation of the quadriceps, semimembranosus and semitendinosus muscles is repeated in a flexed position to detect pain, swelling and thickening of the muscles. Palpate the gaskin in a similar fashion. |
| **HOCK** | Re-examine the Achilles tendon and deep digital flexor tendon and its associated sheath just proximal to the tuber calcis. Apply pressure to the underlying plantar ligaments. Palpate the medial and lateral sets of the collateral ligament of the tibiotarsal joint. The cunean tendon can be visualized easily and palpated as it crosses the hock. |
| **DISTAL LIMB AND FOOT** | The distal portion of the hind limb is examined in the same way as the forelimb. The distal joint and feet are inspected and manipulated carefully. Apply flexion to the fetlock joint by grasping the toe region and bending toward the fetlock. The hind feet |

