Musculoskeletal Examination

Study Guide

Clinical Skills Teaching & Learning Centre

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## Glossary

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<th>Term</th>
<th>Definition</th>
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<tr>
<td><strong>Aponeurosis</strong></td>
<td>Delicate thin sheath (sheet like) structures which attach muscle to bone providing strength and durability, often acting as a shock absorber such as in the feet</td>
</tr>
<tr>
<td><strong>Bone</strong></td>
<td>Rigid organ that produces red and white blood cells, stores minerals, provides structure, protection and enables mobility</td>
</tr>
<tr>
<td><strong>Bursa</strong></td>
<td>Small sacs of synovial fluid, aids muscles or tendon movement by reducing friction</td>
</tr>
<tr>
<td><strong>Cartilage</strong></td>
<td>A resilient, smooth, elastic, rubber like padding overlying the end of bones at the joint. It is also the structural component of the rib cage, ear, nose and intervertebral discs</td>
</tr>
<tr>
<td><strong>Crepitations</strong></td>
<td>Grinding, creaking, grating, crunching or popping when a joint is moved</td>
</tr>
<tr>
<td><strong>Dorsi flexion</strong></td>
<td>Flexion of the joint towards the dorsum of the hand or foot</td>
</tr>
<tr>
<td><strong>Enthesitis</strong></td>
<td>Inflammation of the tendon or ligaments as they insert into bone</td>
</tr>
<tr>
<td><strong>Extension</strong></td>
<td>Opening the angle of a joint</td>
</tr>
<tr>
<td><strong>Fascia</strong></td>
<td>Bands of connective tissue that attach, stabilize, enclose and separate muscles (and organs). Playing a significant role in balance, posture and coordination</td>
</tr>
<tr>
<td><strong>Fluctuance</strong></td>
<td>When a swelling is displaced on applying pressure and returns when pressure removed, indicating the presence of fluid</td>
</tr>
<tr>
<td><strong>Hyperextension</strong></td>
<td>When a joint can be extended beyond the neutral position</td>
</tr>
<tr>
<td><strong>Inversion</strong></td>
<td>Turning in of the ankle towards the midline</td>
</tr>
<tr>
<td><strong>Ligaments</strong></td>
<td>Tough elastic fibrous bands commonly connecting bones to other bones. Providing support and stability, limiting the abnormal movement of joints</td>
</tr>
<tr>
<td><strong>Palmar flexion</strong></td>
<td>Wrist is flexed towards the palm</td>
</tr>
<tr>
<td><strong>Periarticular</strong></td>
<td>Around a joint</td>
</tr>
<tr>
<td><strong>Plantar flexion</strong></td>
<td>Ankle is flexed towards the sole of the foot</td>
</tr>
<tr>
<td><strong>Somatic nervous system</strong></td>
<td>Controls voluntary muscular control and reflexes</td>
</tr>
<tr>
<td><strong>Synovial membranes</strong></td>
<td>Cover the internal surface of fibrous joint capsules of synovial joints and tendon sheaths, it has many blood vessels, nerves and lymphatic vessels, providing joints with lubrication, limiting friction and cleaning joint cavities</td>
</tr>
</tbody>
</table>
Tendons

Extension of the muscle to a tough cord like structure connecting the muscle commonly to bone on either end, providing flexibility and motility. They are sparsely supplied with blood vessels and inflammation is called tendonitis.
Learning Objectives

Year 1

To link the anatomy and physiology to the Musculoskeletal (MSK) examination

To know the range of movements to be assessed in the upper and lower limbs

To be able to perform a MSK examination of the shoulder and knee and be able to translate this technique to other joints of the limbs.

Year 2

To revise the anatomy and physiology of the MSK system

To link the anatomy and physiology to the examination

To be able to perform an MSK examination including an understanding of the common abnormalities
Introduction

Musculoskeletal (MSK) examination involves assessment of how the bones, joints, tendons, ligaments and muscles work in conjunction with each other. Assessing for abnormalities including deformities, swellings and abnormal posture can aid diagnosis. In year one you became familiar with the anatomy of the MSK system, the type of joints and their range of movements and concentrated on learning to look, feel and move the joints of the upper and lower limbs, concentrating specifically on the shoulder and knee. In year two you will be introduced to examination of the spine, concentrating on palpation of the elbow and hip and be able to transfer these examination skills to the examination of the other joints of the body. You will also learn to do some additional tests to assess joints and learn some of the common abnormalities of the MSK system. There are over 200 MSK conditions affecting 1 in 4 adults (approximately 9.6 million adults and 12,000 children in the UK and accounting for 30% of GP consultations and 25% of surgical interventions (NHS England 2020).

The adult skeleton comprises of 206 bones. Of which 26 are in each foot and 27 are in each hand, therefore the hands and feet comprise of 106 of the total skeletal bones. There are also 640 skeletal muscles, connective tissue, associated nerves and blood vessels. Below is a list of the components of the MSK system, this has been covered as part of your human anatomy lectures and practices but is here as a reminder (descriptions of each are in the glossary):

- Bone
- Somatic nervous system
- Vascular system
- Fascia
- Ligaments
- Cartilage
- Tendons
- Aponeurosis
- Synovial membranes
- Synovial bursas

A patient may present with symptoms that may affect any aspect of the MSK system. Disease or injury of any of the above can affect the function of the MSK system.

General principles

A detailed history should be taken prior to the examination, take time to familiarise yourself with what is involved in history taking by having a look at the on-line resources and looking at the “Fundamentals section”.

When taking the history, the clinician must consider how the patients symptoms impact on their life as the condition my hamper or reduce movement and there for mobility and independence. For example, can a patient whose illness affects both their arms perform their activities of daily living? Disability may hamper a patient’s ability to wash themselves, cook, clean, garden or even
eat. They may no longer be able to do their hobbies, walk, drive or work, impacting their life significantly. When a complaint does not cause pain patients may only present when how they live their life becomes affected.

**Indications for performing a musculoskeletal examination**

There are many reasons for performing a musculoskeletal (MSK) examination. If a patient presents with any of the following; injury, swelling in or around the joint, pain, reduced range of movement, joint stiffness, deformity, tingling or numbness, etc. you would consider undertaking the examination. You may examine the joint associated with the presenting complaint initially and then the joint above and below.

This is to ensure that:

- Pain has not been referred from/to another joint.
- The weight has not been abnormally distributed on a joint because of problems with the joint above.
- The patient has not compensated by using one joint due to problems with another.

Alternatively, patients may require examination of all joints when a systemic cause is considered, for example, when excessive growth hormone is produced causing proliferation of cartilage, periarticular connective tissue and bone (acromegaly) or autoimmune diseases such as rheumatoid arthritis which affects multiple joints or polymyalgia which affects multiple muscles.

**The routine for joint examination is composed of:**

- Look = Inspection (look at the patient in general as well as the specific joints)
- Feel = Palpation (feel, prior to movement)
- Move = Movement of joint(s) (where possible palpate the joint whilst moving)
Surface Anatomy / Relevant Physiology

Disease or injury of any of these structures can affect the function of the MSK system. Knowing how joints move will enable you to establish if a patient has a limitation or greater degree of movement, the type of joint impacts on the degree of mobility possible.

Fixed (synarthrosis) joints have minimal or no movement, bones are connected by dense connective tissue (e.g. skull sutures). Amphiarthrosis joints are slightly mobile, they move more than fixed joints and are cartilaginous in nature such as between intervertebral disks. Synovial joints are freely movable/mobile classified by movement. Examination of the amphiarthrosis and synovial joints form a significant part of MSK examination. The different types of synovial joints of the body are as follows:

- Ellipsoid (condyloid) joint – these have two axes which permit up and down (bending and extending) and rocking side to side motions (see figure 1). Situated at the base of the fingers, carpals of the wrist and wrist joints.

- Saddle joint- is a biaxial joint allowing movement in two plains, it enables the joint to open and close and open side to side also (see figure 2). The thumb is the only example.

- Ball and socket joint- the ball at the end of a limb bone sits in a socket of another bone enabling rotatory movement of the shoulder and hip joints (see figure 3).

- Hinge joint- are like door hinges, where only a back and forth (opening and closing) movement is possible situated and the ankle, elbow and knee (see figure 4).

- Pivot joint- One bone has tapped into the other in such a way that full rotation is not possible, however a sideways and back and forth movement is possible (see figure 5). Examples are the joints at either end of the bones of the forearm (radioulnar) and the top of the neck.

- Facet joint- Synovial plane joints, situated between the articular processes of the spinal vertebrae to enable the spine to bend and extend and some limited rotation (see figure 6).
Elipsoid joint (wrist, metacarpal and sternoclavicular)

Saddle joint (carpometacarpal [thumb metatarsal phalangeal])

Ball and socket joint (shoulder and hip)

Hinge joint (elbow, fingers, knee (modified hinge), ankle, toes)

Facet joint (spinal vertebrae)

Pivot joint (radioulnar and cervical vertebrae 1&2)

You will learn the anatomy of the skeleton and the tendons, ligaments and muscles associated with them during your HARC sessions and your lectures, this section is going to concentrate on how joints should move to enable you to establish when movement is limited or exaggerated.
Anatomical movements
The range of most movements are described with the anatomical/neutral position in mind. The limbs are extended with the feet dorsiflexed to 90 degrees and the palms facing forward (see figures 7&8).

Flexion - Bending of joint away from neutral position (see figure 9)
Extension - Movement to straighten a joint towards the neutral position
Hyperextension - Occurs when the joint can be extended beyond the neutral position

Adduction - Movement of the part distal to the joint towards the midline
Abduction - Movement away from the midline (figure 10)
Opposition - A combination of flexion, abduction and rotation of carpometacarpal joint to bring thumb across the palm often to touch base of furthest fingers (figure 11)

Internal (medial) rotation - Rotation of a joint towards the body's midline

External (lateral) rotation - Rotation of a joint away from the body's midline (figure 12)

Pronation - Rotation of the forearm so that the palm faces downwards

Supination - Rotation of the forearm so that the palm faces upwards (figure 13)

Eversion – A composite movement of the ankle and foot turning outwards away from the midline
Inversion – A composite movement of the ankle and foot turning inwards towards the midline (figure 14)

A video summarising these movements can be found by searching on YouTube for “Anatomical position, planes, movements” Anatomical positions video.

Range of movements

There are a wide range of normal values. However, even in health movement can be limited due to muscle bulk, obesity or clothing.

The following are examples of normal ranges. Rheumatologists who specialise in the MSK system may use a goniometer (a hinged rod with a protractor in the centre, seen in figure 15) to measure the degree of movement possible, zero starting at the anatomical position in most cases extension (e.g. the straightened knee). This may aid in diagnosis, monitor progress and deterioration.

Cervical spine
- Lateral flexion (45°), forward flexion (45°) and extension (45°), lateral rotation (70°)

Shoulder
- Flexion (90°glenohumeral, with scapula 180°), extension (65°), internal and external rotation (90°), abduction (glenohumeral 90°, with scapula 180°) and adduction (50°)

Elbow
- Flexion (160°) and extension (180°), supination and pronation (90°)
<table>
<thead>
<tr>
<th>Joint</th>
<th>Movement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist</td>
<td>Dorsiflexion and palmar flexion (75°), radial and ulnar deviation (20°), ulnar flexion (55°) and radial flexion (20°)</td>
</tr>
<tr>
<td>Metacarpophalangeal (MCP)</td>
<td>Flexion, extension (90°), hyper extension (30°), abduction (25°) and adduction (20°)</td>
</tr>
<tr>
<td>Proximal interphalangeal (PIP)</td>
<td>Flexion and extension (120°)</td>
</tr>
<tr>
<td>Distal interphalangeal (DIP)</td>
<td>Flexion and extension (80°)</td>
</tr>
<tr>
<td>Thumbs</td>
<td>Flexion (70°), extension (60°), abduction (50°), adduction (40°), opposition (90°)</td>
</tr>
<tr>
<td>Lumbar spine</td>
<td>Flexion (50°), extension (15°), lateral flexion (20°), rotation (5°)</td>
</tr>
<tr>
<td>Thoracic spine</td>
<td>Flexion (35°), extension (25°), lateral flexion (25°), rotation (30°)</td>
</tr>
<tr>
<td>Thoracolumbar spine</td>
<td>Flexion (85°), extension (40°), lateral flexion (45°), rotation (35°)</td>
</tr>
<tr>
<td>Hip</td>
<td>Flexion (straight leg 90°, knee bent 120°), extension (30°), internal and external rotation (45°), abduction (45°) and adduction (30°)</td>
</tr>
<tr>
<td>Knee</td>
<td>Flexion (130°) and extension (15°)</td>
</tr>
<tr>
<td>Ankle</td>
<td>Dorsiflexion (20°), plantar flexion (45°), subtalar joint inversion (30°) and eversion (20°)</td>
</tr>
<tr>
<td>Metatarsophalangeal joint</td>
<td>Flexion (35°) and extension (60°)</td>
</tr>
<tr>
<td>Interphalangeal joint</td>
<td>Flexion (60°) and extension (0°)</td>
</tr>
</tbody>
</table>

Factors that influence the range of movement at a joint:

- The type of joint (ball and socket vs synarthrosis joints)
- The internal resistance within a joint (damage to structures within or supporting the joint)
- Bony structures which limit movement (arthritis can cause bony overgrowth within a joint)
- The elasticity of muscle tissue (muscle tissue that is scarred due to injury is not as elastic)
- The muscle’s ability to relax and contract to achieve the greatest range of movement (seen in neurological conditions)

You need to understand how a joint moves and its normal range of movements to establish if a joint is moving abnormally or is restricted. Comparing to the patient’s opposite joint or to yourself can assist in this assessment.
History

Versus Arthritis 2020 (previously Arthritis Research UK and Arthritis Care) states that MSK disorders are the commonest disability cause in the UK. Only by taking a comprehensive history in conjunction with an examination can you aim to make an accurate diagnosis for a patient complaining of MSK problems.

Versus Arthritis 2020 published a “Guide to the clinical assessment of patients with MSK conditions”, in which they recommend considering five questions when taking a history, these are:

- Does the problem arise from the joint, tendon or muscle?
  - A detailed history followed by examination may highlight the presenting pain of the patient’s is actually referred pain. For example, left shoulder pain can be cardiac or diaphragmatic in origin and not related to the MSK system. A full review of systems is key to ensure you don’t miss another possible cause.
- Is the condition acute or chronic?
  - When did the symptoms start and how have they evolved?
  - Was the onset associated with a particular event? e.g. Trauma.
  - Which treatments has the condition responded to?
- Is the condition inflammatory or non-inflammatory?
  - Rheumatoid arthritis is associated with prolonged early morning stiffness, whereas osteoarthritis is often exacerbated by activity.
  - Questioning the patient on if the pain is constant, intermittent, exacerbated or relieved by anything will help consider if this is inflammatory supported by your examination findings.
  - Does the joint swell? if this is intermittent it is more likely to be an inflammatory process than a continuous swelling associated with osteoarthritis, commonly see in the interphalangeal joints. Following an examination, the ankle swelling may be found to be oedema and not MSK related.
- What is the pattern of the affected areas/ joints/ joint spaces?
  - Does this affect one or multiple and which joints for example the weight bearing joints?
  - Does it affect the same joint on both sides of the body or asymmetrical joints seen more in inflammatory conditions?
- What is the impact of the condition on the patient’s life?
  - Can the patient perform the activities of daily living, is this affecting their mental wellbeing, what are their ideas, concerns and expectations, how is this affecting their relationships.

There is a history taking study guide you may wish to explore alternatively go to your online resources and the “Fundamentals” section.
Preparation

Patient safety

• Introduce yourself
• Check the patient’s identity and allergies
• Explain what you want to do
• Gain informed consent
• Consider an appropriate chaperone
• Adequate exposure maintaining dignity
• Position the patient appropriately – consider moving and handling
• Wear Personal Protective Equipment as required.
• Wash your hands before and after you touch the patient (as per WHO guidelines)

On first meeting a patient introduce yourself, confirm that you have the correct patient with the name and date of birth, if available please check this with the name band and written documentation and the NHS/ hospital number/ first line of address.

Check the patient’s allergy status, being aware of the equipment you will be using in your examination. Ensure the procedure is explained to the patient in terms that they understand, gain informed consent and ensure that you are supervised, with a chaperone available as appropriate (perhaps not needed for a hand examination but to be considered if examining the hip). The patient’s joints which are to be examined need to be fully exposed. This enables the examiner to compare both limbs and examine the joint above and below the affected area. Depending on the joints this may mean the patient is undressed down to their underwear (spine for example). It is key to ensure informed consent is gained from the patient and that this is explained before seeking consent.

Consider moving and handling, a patient may have difficulty sitting, standing or getting on and off the examination couch for elements of this examination, you may require assistance from others or moving and handling equipment to help the patient.

Don personal protective equipment as required, especially if you are likely to come into contact with bodily fluids, for example an open fracture, wound, or patient has an additional illness that poses a risk. The key points to consider in all examinations are as follows.

Equipment

Hand wash solution
Examination couch (paper towelling for couch and covering for the patient)
Pillow to support affected limb (if needed)
Apron if body fluids are considered a risk
Disposable tape measure (if a swelling is present or a joint is swollen)
Pen torch if fluid is suspected in a swelling or around a joint
Inspection (look)

General inspection
Observation of your patient and their environment provides a generalised view of your patient’s health status and their ability to manage their everyday activities. Careful and considered observation of your patient upon meeting and greeting, may provide you with valuable signs that can guide your examination as well as support diagnosis and management. Remember patients may come in with one problem but you may spot another.

When determining general status of a patient the following questions need to be addressed:

Is the patient well or unwell? Look for signs of pain, sweating, weight loss/gain, hydration, breathlessness.

What is the patient’s demeanour? Interpret their facial expression, level of engagement, gestures, level of self-care.

What colour is the patient? Are they pale, flushed, greyish, bluish, hyper pigmented, yellow.

What coping strategies are in use? Check the environment around them for e.g. medication, mobility aids, presence of carer, continence aids.

In the environment there may be many indicators of possible MSK conditions including:

- Expression of pain in such as a facial grimace, holding a joint to support it.
- Walking aids, hoists to help transfer the patient from bed to chair, etc.
- Support devices such as grabbers to help pick things up or twist things open.
- Medications related to the MSK system such as pain relief
- Autoimmune disorders that affect the connective tissues of the joints may be noticeable on initially meeting the patient. Such as Psoriatic arthritis where patches of red raised skin with white and silvery flakes may be present particularly over joints or Scleroderma where the skin may appear thickened, ulcerated, shiny or discoloured. It is important to have a good look at the overall appearance of the patient on first meeting them.
- Is the patient gait (how they walk) normal, did they struggle to walk in or sit down for the appointment? Figure 16 shows a normal walking cycle.
Gait describes how someone walks and can tell us a lot about the difficulties the patient is experiencing. This may be specifically assessed during the examination, particularly when assessing the spine or lower limbs by asking the patient to walk turn around and walk again, but you may note Gait problems upon first meeting your patient. Figure 16 shows a normal walking cycle.

Abnormal gaits

**Antalgic gait** – a gait developed by the patient to avoid pain when walking, the stance phase of gait is shortened to avoid weight bearing relative to the swing phase. There is a lack of weight shift and weight baring laterally over the affected limb.

**Hemiplegic gait** – most commonly associated with patients following a stroke as this is an upper motor neurone injury this may cause increased tone in the flexor muscles of the upper limb and the extensor muscles of the lower limb. On the affected side the arm may be flexed and the leg extended, including the foot in plantar flexion. The patient will drag the affected limb in a semicircle due to the foot drop and extension of the leg. Sometimes know as a circumduction gait. If mild notice how the arms swing as the affected side may be limited and you may notice slight circumduction.

**Diplegic or Scissor gait** – when both legs have a level of spasticity (increased tone), causing the patient to walk with a narrow base, dragging both legs and scraping the toes. This can be seen in cerebral palsy, often the extreme tightness of the hip adductors cause the legs to cross the midline (scissor gait), these muscles are now often released via surgery to minimise this gait.

**Neuropathic or equine gait** - weakness of dorsiflexion causing foot drop caused by trauma and injury to the peroneal nerve, damage to L5 and peripheral neuropathies. The leg is lifted high so that the foot does not drag on the floor.

**Myopathic (waddling) gait** – damage to the hip abductor muscles and or the gluteal nerve, can be associated with congenital hip dislocation and arthritis of the hip. A weakness on one hip will result in an inability of the pelvis to tilt when walking causing the unaffected (contralateral side) to drop when standing on the affected limb. (See Trendelenburg’s test in additional tests at the end of the study guide). If both sides are affected this is called a waddling gait seen in muscular dystrophy.
**Ataxic Gait** – associated with cerebellar disease, this gait appears clumsy and staggering. When standing the patient may swagger side to side and back and forth, when walking they will have a wide based gait and struggle to turn without losing balance or walk heel to toe in a straight line. Patients are often misjudged by people as being intoxicated.

**Sensory or stomping gait** – associated with loss of proprioception, peripheral neuropathy and vitamin deficiencies. The patient stamps their foot as they walk to increase the sensation that their foot is in contact with the floor, particularly if walking in the dark.

**Parkinsonian gait** – also seen in side effects from drugs, the patient has rigidity and bradykinesia (slowness of movement). Patient will be stooped with head and neck forward upper limbs and flexed and fingers extended, initially walking begins with slow little steps that are difficult to initiate, then accelerate once established.

**Specific inspection**
Ensure the patient’s joints to be examined are fully exposed and that the patient is resting comfortably. This enables the examiner to compare both limbs and examine the joint above and below the affected area as well as inspecting the joint from all directions.

Whenever possible start by looking at the joint in comparison to the opposite limb, this may help you notice if the joint appears swollen or deformed compared to the other. Inspect the joints for the following:

- Scars (may indicate previous surgery or trauma)
- Rashes (may be the cause of the joint pain)
- Redness over a joint may indicate inflammation and or infection
- Swellings due to bony overgrowth, a build-up of synovial fluid or trauma
- Reduction in the bulk of the muscle (muscle wasting) due to lack of use
- Lesions or bruising may indicate underlying conditions or trauma
- General appearance compared to other joins or opposite limb, a pale, darkened or dusky tissue below the injury may indicate reduced circulation
- Note any deformity where the joint is not normally aligned due to dislocation, fractures or arthritic changes. Valgus (figure 18) deformity describes when a distal part is displaced medially and Varus (figure 18 & 19) is displacement laterally

Inspection will continue throughout the examination, particularly during movement of the limb, this may be when swellings become more apparent for example.
Figure 17 shows a patient with rheumatoid arthritis, there are swellings of the tendons over the dorsal surface of both wrists, severe muscle wasting, the metacarpophalangeal are deviated towards the ulnas and there is deformity of the fingers.

**Palpation (Feel)**

Palpate for any tenderness the patient is experiencing and assess the joint margin, related ligaments, tendons and adjacent bony structures. Remember to palpate the anterior, lateral and posterior of the joint. The more you practice on healthy joints the quicker you will identify when something is abnormal. Note any changes in temperature, especially in comparison to the opposite limb, however if there is bilateral (e.g. both right and left elbows) joint involvement compare the tissues above and below the joint. Remember always watch the patient as you examine, the patient may be in discomfort but not tell you, look for any signs of discomfort and encourage your patient to tell you if anywhere is tender to the touch as this may help formulate a diagnosis. Try to formulate a system to ensure all aspects of the joints are palpated.

**Swelling**

Palpation may continue through much of the examination. You may notice a swelling on inspection and choose to palpate this initially. Or to enable you to palpate the joint spaces, such as the metacarpophalangeal or knee joints, the patient would be asked to flex the joints to open the joint space. You may when asking the patient to adopt a position see something that warrants palpation. When palpating swellings (there is a study guide available on examination of swellings online in the fundamentals section), consider:

- Hard suggests bone
- Spongy or boggy suggests synovial thickening or fluid collecting
- Fluctuance (when a swelling is displaced on applying pressure and returns when pressure removed, indicating the presence of fluid) suggests an effusion (accumulation of fluid in an anatomic space)
- Position of the swelling, is it in the joint (articular) or around the joint (periarticular)

**Swollen joint**
Enlargement of the joint is usually due to an inflammatory process or injury to the joint and or surrounding structures, this may cause stiffness, pain, redness and warmth as well as reduce the range of movement. This may involve one or multiple joints depending on the cause. Dislocation of the joint, tearing to cartilage or ligaments, or infection of the tissues around the joint will all cause the joint to swell. Other causes can be bone cancers (breast and prostate cancer are the most common primary cancers to metastasise to the bone), soft tissue and synovial cancers. Awareness of the anatomical structure of the joint being examined and a detailed history will assist in identifying the most likely cause.

Bursa's

Are flattened sacs containing synovial fluid. Allowing movement between planes of tissue and reduce friction. Located predominantly between bony prominences, muscles or tendons their main function is to cushion and support areas where repetitive motion occurs. There are around 140 bursae within an adult, which may become painful (particularly on palpation or movement) may appear visibly swollen, warm to the touch and red in appearance. Most commonly affected are those of the shoulders, hips, elbows or knees. Figure 22 shows bursitis of the elbow, figure 21 depicts some of the bursae of the knee, there are also multiple on the posterior of the joint and figure 20 shows the subacromial bursa of the shoulder.

Crepitus

As the examination consists of look, feel, move, when assessing the joints ability to move where possible you will palpate during the movement. Palpation during movement you may note crepitation’s, described as grinding, creaking, grating, crunching or popping when a joint is moved (please see the prep presentation for a video of how this may sound). This may be felt over the joint as it moves, but may also be heard and occasionally seen. Crepitus is potentially caused by:

- Air bubbles popping in the joint (cracking knuckles)
- Tendons or ligaments snapping over bony structures, may cause pain
- Arthritis where articular cartilage has degenerated, may cause pain clicks etc. Or upon movement detect a swelling previously not seen.

Crepitation’s can be perfectly normal, however, if regular associated with a particular joint and accompanied by pain, swelling etc. it may indicate arthritis or other conditions.
**Neuro-vascular function**

To ensure that the neuro-vascular function is intact you should check the limb distal to the injury for:

- A palpable pulse
- Evidence of a peripheral nerve injury e.g. loss of sensation and power in the radial nerve distribution after a humeral fracture. This can be done crudely by simply touching the patient with your finger, however if sensation is different or absent this should be tested in more detail.
- A normal capillary refill time on the affected limb, which is less than 2 seconds.
- Temperature, using the back of your hand compare the temperature, where possible assess the temperature above and below the site to assess the level degree to which the inflammation/infection extends.

Compare each of the above on the opposite limb. Loss of neuro-vascular function should be classed as a medical emergency, **please seek senior clinician’s advice.**

**Musculature**

Evidence of wasting may be noted when comparing sides (measure limb circumferences) has there been disuse e.g.; from removal of leg cast following fracture (figure 23 of following removal of cast on right leg), lower motor neurone lesions (causing reduction or loss of nerve impulses to muscles) or joint disease, or is it a primary muscle disease?

Muscles may also bulk up from over use, this may be to compensate for other muscles not working efficiently. Is there abnormal bulk, e.g.; with body builders or muscular dystrophies (is a group of muscle diseases that results in increasing weakening and breakdown of skeletal muscles over time)?

Are there any spontaneous contractions due to muscle spasms or abnormal movements or **fasciculation** (involuntary muscle contraction and relaxation which may be visible under the skin)?

If you palpate the muscle, is there any tenderness? This could be from acute injury or some myopathies (muscle disease).
Move

**Active movements**
Active movements are when the patient performs movement without assistance. The best way to assess the range of movements the patient has in the joint you wish to examine is to demonstrate to the patient what you need them to do and ask them to copy you. As you practice you will learn to appreciate that to examine a single joints range of movement, you may need to isolate it (to stop other joints in assisting in the movement). For example, with an outstretched arm it is possible to turn your palm down to face the floor (pronation), and turn your palm up to the ceiling (supination), just by using your shoulder and not moving your elbow or wrist. This may be how patients compensate when their elbow or wrist are diseased, they will find another way. To truly assess the movements possible at each joint we may isolate the joint above or below that can assist. In clinical practice we ask the patient to bend their elbow into their side when assessing pronation and supination to prevent them also using their shoulder joint. When the patient moves their joint without assistance this is termed active movement. Patients are often asked to actively move their upper limbs and the spine is only ever moved actively. As mentioned earlier whenever possible palpating the joints whilst the patient moves may assist you identify clicks and scraping within the joint itself. This is particularly important if the patient experiences pain during the movement as you may be able to identify the exact point were the pain is.

**Passive movements**
This is when a movement is done with the assistance of the clinician examining the patient. This may be to:

- Support the weight of the patient’s limb (frequently done when assessing the lower limb joints of the hip and knee).
- When the patient struggles to understand the movement required and needs tactile guidance.
- The range of movement appears reduced, perhaps due to pain, which is eased if the weight of the limb is supported by the examiner and generates a greater degree of movement.
- The joint is normal but the muscle control or strength is inhibited. By assisting and noting a full range of movement this helps identify that the joint is not the cause of the reduced movement.

Articular disorders within the joint itself will normally limit movement both actively and passively, whereas peri-articular disorders affecting the tendons, ligaments and or bursa cause limitation particularly during active movements as this will increase the pain. Be mindful that as well as limitation in joints there may be increased mobility due to ligament damage (see assessment of anterior and posterior draw sign in additional tests), or a patient is hyper mobile which if extreme when calculated using the Beighton’s scoring system lead to diagnoses of hyper mobility disorders such as Ehlers-Danlos syndrome (Ehlers-Danlos syndrome and Beighton’s scoring system).
Bear in mind that symptoms or signs may not always be caused by the joint itself, but may be due to problems with bone, tendons, ligaments, soft tissues, muscles or nerves. If a joint cannot be moved fully without assistance it is more likely to be as a result of damage to the muscles, tendons or nerve supply used to perform that action.

**Examination of upper limb joints**

Inspect both hands and wrists as one.
Inspect the front, back and sides of all joints, comparing sides and palpating joints between finger and thumb, don’t forget to support the joint whilst palpating, taking the weight of the patient’s limb where possible.

**Interphalangeal joints (IP’s)**

Palpate the interphalangeal joints individually between finger and thumb
DIP is the distal interphalangeal joint
PIP is the proximal interphalangeal joint. (fig 24)

**Metacarpophalangeal joints (MCP’s)**

Use a similar technique to palpate the metacarpophalangeal joints (see figure 25). With the patient’s palms facing down, support the palms with your fingers. Place your thumbs on dorsal metacarpophalangeal surface and gently palpate, observing for abnormalities and pain.

It is always best to demonstrate movements first so that the patient understands what is required. If the patient complains of pain or movement is limited, palpate during movement to note any palpable abnormalities such as crepitus.

**Finger movements**

- Flexion (figure 27)
- Extension (figure 26)
- Abduction (figure 26)
- Adduction

Figure 26 shows the fingers spread away from each other (abduction) if they were side to side this would be adduction.
Thumb movements

- Flexion (bringing the thumb across the palm, figure 29)
- Extension (taking the thumb out to the side, figure 28)
- Abduction (lifting the thumb up and away from the palm, figure 31)
- Adduction (bringing thumb alongside palm, see figure 30)
- Opposition (thumb is drawn across the palm until tip is at base of little finger, see figure 32), often assessed by asking patient to touch thumb to tip of each finger.
Examination of the wrists

Compare one wrist with the other, in appearance and whilst moving. With the patient’s palms facing down, support the palmar aspect of their wrist with your fingers, if possible ask your patient to flex their palm downwards, this will open up the joint space and aid palpation of the joint. Place your thumbs on the dorsal aspect of the wrist surface and gently palpate, observing for abnormality or discomfort (see figure 33).

Wrist movements

The forearm is straight with elbow tucked into the side of the patient

- Palmar flexion (see figure 35) wrist is tipped down so palm is down this opens up the joint and is often adopted for palpation.
- Dorsiflexion (extension) where wrist is cocked back to show palmar surface (see figure 34).
- Ulnar flexion, (see figure 36) elbow and shoulder remain stable but wrist is tipped towards little finger.
- Radial flexion, without use of elbows or shoulders wrist is tipped towards the thumb, (see figure 37).
Examination of the forearm

Inspect both forearms from all aspects then isolate the forearm by asking the patient to put their arm against their body with the elbow bent or asking the patient to “bring your elbows into your sides”. The radius rotates around the stable ulnar to achieve these movements.

**Pronation** is rotating the arm through 90 degrees so that the palm faces downwards. (see 39)

**Supination** is rotating so that the palm faces upwards, observe for pain, discomfort, or reduced range of movement. (see figure 38)

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Examination of the elbow

Inspect the elbow joint from the front, sides and behind, with the elbow flexed approximately 70° the joint space is more palpable and you can identify anatomical features such as the olecranon process and epicondyles on the side and back of the elbow (see 41). On the inside of the elbow (the antecubital fossa) you will feel the biceps tendon as the patient bends the elbow. Figure 40 demonstrates how thumbs palpate the joint space whilst the finger tips palpate the antecubital fossa.

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Movement of the elbow

Figure 42 demonstrates how bringing the hand towards the shoulder demonstrates flexion at the elbow and back to the neutral position is extension.

- Flexion
- Extension
Examination of the shoulder

Inspect the shoulder joint from the front, side and back. Inspect the shoulder contour for abnormalities or inequalities in symmetry. Feel for tenderness and swelling, check for crepitus during motion (some crepitus may be normal for that patient). Familiarise yourself with normal anatomy by practising palpating the normal structures of the shoulder (figure 43). Start at the sternoclavicular joint moving towards the clavicle to the acromioclavicular joint and down beneath to the coracoid process. The coracoid process may be more easily identified if you palpate under the clavicle close to the shoulder and ask the patient to move their arm forwards and backwards slightly. Move to the end of the shoulder and identify the humerus and greater tuberosity and finally palpate the scapula on the back of the patient (the dorsal aspect) notice the scapular spine and the supra and infraspinous fossa’s or hollows above and beneath it. Note any swellings, tenderness or crepitation’s during movement.

![Figure 49 Shoulder skeleton](image)

Movements of the shoulder

- Flexion – 90° is attributable to the glenohumeral joint, when the arm is taken above this point the scapula assists in the movement (180°), see from side view in figure 45). Flexion above the aerial view see in figure 44 would require movement of the scapula
- Extension – arm returns to side and taken behind patient 65° (see figure 40)
• Abduction (taking shoulder laterally, shoulder rotation assists beyond 90 degrees)
• Adduction bringing the arm back to the side and across the chest wall (see figure 46)

• Internal rotation (medial rotation)–involves moving the flexed forearm across the front of the body. The movement is limited by the chest wall. (see figure 47)
• External rotation (lateral rotation)–the flexed forearm is moved outwards.
Alternatively, you can assess all movements of the shoulder by asking the patient to (see 48) place the back of the hand on the opposite shoulder (a. external rotation, extension and adduction) or their palm on the back of their head (b. internal rotation, flexion and adduction). This can be assessed in both shoulders simultaneously by asking the patient’s to “place your hands behind your back” and “place your hands behind your head”. How high up the patients can move their hands up their back from the waist is a good measure of the degree of internal rotation they have. If the patient cannot do this then the movements have to be broken down as described above.

![Figure 54 Internal & external rotation](image)

**Examination of the spine (see figure 49)**
Ask the patient to undress down to their underwear, inspect from the front, sides and behind ideally with patient sitting and standing. In particular inspect for:

- Scoliosis (thoracic and or lumbar spine curve laterally forming an S or a C shape). See figure 50 and 51 for images of scoliosis, notice how scapula are displaced in the photo and creases are asymmetrical.
• Kyphosis (thoracic spine curves giving a round shouldered or hunched appearance). See figure 51 for abnormal kyphosis.
• Lordosis (lumber spine curves pushing abdomen out, seen in late stages of pregnancy) can also be seen in figure 51.

• Alignment of the neck and shoulder symmetry, look at the scoliosis in figure 51 note one shoulder is higher than the other and in the kyphosis image the neck is forward.
• Unusual skin creases, indentations, pigmentations, abnormal hair growth (could indicate spina bifida (see figures 52 & 53)

Palpation of the spine

• Palpate the shoulder and neck muscles for tenderness
• Palpate each of the spinal processes noting any prominence or steps
• Palpate the paraspinal muscles for tenderness or spasm (this would feel firmer and could indicate a herniated disc)
• Palpate the sacroiliac joints for tenderness, especially if patient complains of lower back pain (patient lies prone, palpate with thumbs ran down from iliac crest, for a video on this ether click the following link or in YouTube search “sacroiliac joint, posterior landmarks palpation” palpation of sacroiliac joint video.

Cervical spine movements

Lateral flexion - ask the patient to touch their ears to their shoulders, without raising the shoulders, normal lateral flexion is approx. 45 degrees. (see figure 54)

Flexion - ask the patient to touch their chin to their chest, normal flexion is about 45 degrees
Extension - ask the patient to look upwards and back, normal extension is about 45 degrees (see figure 55)

![Extension diagram]

Then cervical rotation - ask the patient to look back over each shoulder in turn, keeping the spine, or shoulders in the same position, normal rotation is approx. 70 degrees. (see figure 56)

![Rotation diagram]

**Thoracolumbar spine movements**
The patient should have legs exposed during spinal assessment as patient may bend knees to assist them, see figure 57 for the movements of the spine to be assessed.
Flexion - ask the patient to bend forward as if trying to touch their toes. This may exaggerate scoliosis as the patient leans to one side or make a raised rib cage more obvious. Pain during this movement may indicate nerve impingement or a herniated disc.

Extension - ask the patient to lean backwards, you may need to support them during this movement. Pain can indicate spinal stenosis or degenerative disease of the cartilage or spinal joints. The patient may not achieve this movement if they have neck pain.

Lateral flexion – ask the patient to place their hand on outer thigh and run hand down each side without leaning forward, in scoliosis degree of movement may differ

Rotation – ask the patient to sit to stabilise the pelvis and to turn to look behind them whilst keeping their head still.

Examination of the lower limb joints
The lower limbs bear the weight of the entire body. It is quite common for patients to present with problems with a specific joint when it is an entirely different joint which is the root cause.

It is imperative that the lower limb is inspected as a whole and compared to the other leg, look for:

- The position of the joints, the knee may externally rotate when a hip joint is broken or diseased for example.
- Muscle bulk, obvious deformity, scars and swellings etc.
- Pelvic tilting which can occur if the patient is trying to avoid weight bearing on the affected side, as joints should be at the same level as one another.

Examination of the hip
The hip joint is not visible externally, but inspect (ideally with patient standing) for any obvious deformities.

If you are palpating for joint tenderness it is only possible just distal to the midpoint of the inguinal ligament, ensure you also palpate the soft tissues around the area for tenderness.
Palpate bony prominences such as anterior superior iliac spine and iliac crest to ensure they are anatomically comparable (see figure 58).
The sacroiliac joint can cause pain, and patients may present complaining of hip or lower back pain. The joint can be palpated with the patient lying on their front.

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**Movement of the Hip Joint**

- Flexion – approx. 120° (patient lies supine and the knee is flexed, see figure 60)
- Extension (hyper extension, see figure 59) – approx. 30° (ensure pelvis does not tilt to assist greater movement, by placing your hand on it)

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*Figure 64 Surface anatomy of the pelvis*

*Figure 65 Hyperextension of the hip*

*Figure 66 Flexion of the hip*
• Abduction – approx. 45° support leg if necessary, see figure 61
• Adduction – approx. 30° support leg if necessary (placing hand on hip to ensure spine does not rotate to assist movement)

Figure 67 Ab/adduction of the hip

• Internal rotation – approx. 45° with knee and hip flexed the hold the knee with one hand and the heel in the other, move the foot laterally (see figure 62).
• External rotation – approx. 45° with knee and hip flexed the hold the knee with one hand and the heel in the other, move the foot medially (see figure 63).

Figure 68 Internal rotation of the hip
Figure 69 External rotation of the hip

Examination of the Knee

When inspecting the knee, compare both knees whilst the patient is supine and standing. Observe for swellings, which may only be detected by a loss of the medial and or lateral dimples suggestive of an effusion.

Palpate for:
• The presence of the patella and its mobility, increased calcification is common following knee injury.
• Collateral ligaments
• The joint line for tenderness, this best done with the knee in flexion
Palpate the patella and tibial tuberosity, compare like for like to note obvious abnormalities such as growths or effusions, palpate up from the tibia to identify the patella tendon, on either side of the tendon with the knee bent you should be able to identify the joint space (tibial plateau) to ensure the space is well defined (see figures 66 & 67). Feel both medial and lateral epicondyles (see 64 & 65) the bony prominences either side of the femur at the knee, which are the attachments of the collateral ligaments. By bending and straightening your own knee you may be able to identify these ligaments on yourself, palpate this area to check for tenderness or swelling of the ligaments, which can indicate tears. Alternatively, drop down laterally from knee
joint space to identify the fibula head which is the attachment for the lateral collateral ligament, move fingers up to feel the ligament itself, it should feel like a thick cord. Palpate behind the knee for tenderness and inflammation which may indicate damage to a hamstring tendon, the attach to the muscles of the thigh and down to the tibia and fibula. As you can see from figures 66 and 67 the anterior and posterior of the knee are often palpated simultaneously.

Movements of the knee
See figure 68 for movements of the knee.

- Flexion - approx. 130°, palpate over the patella whilst the patient bends the knee bringing their foot towards their buttocks. The foot should be off the bed during assessment.
- Extension - 0°palpate over the patella whilst the patient straightens the knee. The foot should be off the bed during assessment.
- Hyperextension – approx. 15°, ask the patient to push the back of their knee into the bed, the foot may lift of the bed if hyperextension is present.
Examination of the ankle and foot

Inspect the foot including arches and ankles ideally with the patient standing and more carefully with the patient supine.

Look for thickened areas of tissue and callous formation on the feet which may indicate abnormal gait.

Look at the shoes for abnormal wear or stretching, excessive shoe wear indicates where the weight is placed as the patient walks. Problems with gait may be the result of problems at the foot, conversely problems with the lower spine, hip, knee or ankle can cause abnormal gait and be reflected how shoes wear out or callous formation (see figure 69), frequently seen beneath the metatarsals (balls of the foot) or the heel (the calcaneus). Inspection of how someone walks, stands (see normal stance in 70), the appearance of the soles of the feet and shoes is key to recognising sometimes subtle changes to gait.

Palpate for tenderness, at the toes, the mid foot, the ankle joint (see figures 71 to 74) and the Achilles tendon. Any tenderness noted should be palpated further, similar to the hand palpate the affected metatarsal joint for example, seen in figure 71. Palpation in between the metatarsal heads is important as nerve swelling can cause pain in this region (Morton’s Neuromas) The 2nd metatarsal being a common stress fracture site due to the degree it weight bares during normal
gait, move up each toe in turn and along all the bones of the foot. Once the ankle joint spaces are palpated move your thumbs or fingers to above the heel bone (calcaneus) to palpate the Achilles tendon, this may feel thicker and extremely painful to the touch if inflamed.

**Movement of the ankle and foot**

Movements of the ankle (see figure 75):

- Dorsiflexion - normal approx. 20 degrees. Ask the person to bend the foot upwards.
- Plantar flexion plantar- normal approx. 50 degrees. Ask the person to bend their foot down into
- Inversion (pronation), isolate the heel by holding firmly, gently twist the mid foot laterally.
- Eversion (supination), isolate the heel by holding firmly, gently twist the mid foot medially.
Over inversion (pronation) or eversion (supination) can put pressure on other joints of the foot, ankle and knee looking at the wear in the shoes may help to identify this (see figure 76).

- Ask the patient to flex and extend the toes (remember the big toe can usually move independently of the others, compare to the other side).

**Additional Tests / Special Tests**

**Upper limb**

**Gaenslen’s test (squeeze test)**

Squeezing across the palm/knuckles (metacarpophalangeal joints) may elicit tenderness or paraesthesia (burning or prickling sensation) if so specifically palpate the areas of tenderness. Associated with neuroma (thickening of tissues surrounding the nerves to the fingers), fractures and neuropathy, can indicate high disease activity in rheumatoid arthritis patients. (see figure 77)

**Phalen manoeuvre**

The patient is asked to hold their wrists in complete palmar flexion, pushing the dorsal surfaces together for 30 to 60 seconds, this increases the pressure in the carpal tunnel, burning, tingling or numbness over thumb index middle and ring fingers indicates a positive test. Indicating probable carpal tunnel syndrome. (see figure 78)
**Golfers Elbow** (medial epicondylitis)

With the patient seated or standing, flex the elbow, supinate the hand, and then extend the elbow. Pain over the medial epicondyle is suggestive of golfer’s elbow. (some clinicians will ask the patient to make a fist throughout the manoeuvre. A positive test would be if the patient complains of pain or discomfort along the medial aspect of the elbow in the region of the medical epicondyle. (see figure 79)

**Tennis elbow** (lateral epicondylitis)

Flex the elbow and fully pronate the hand. Now extend the elbow. Pain over the lateral epicondyle is associated with tennis elbow. Both tennis and golfer’s elbow are associated with repetitive strain resulting in inflammation of the tendons and muscles. (see figure 80)

**Anterior apprehension test** Mechanism of clinical signs (2008)

Assesses the glenohumeral joins stability. With the patient sitting or lying supine, the shoulder is placed into a 90° abduction, 90°external rotation and 90°elbow flexion. The examiner applies pressure to the posterior aspect of the proximal humerus and attempts to move the humeral head anteriorly, see 81. The test is positive if the patient experiences apprehension due to impending subluxation or dislocation of the glenohumeral joint.

**Apprehension-relocation test** Mechanism of clinical signs (2008)

Performed following the apprehension test patient is in same position as above but examiner applies pressure to the anterior aspect of the proximal humerus and attempts
to move the humeral head posteriorly. The test is positive if the patient experiences relief of apprehension (i.e. no longer feels impending sense of shoulder dislocation). See figure 82)

**Neer impingement test**

Indicates rotator cuff injury (group of four muscles and tendons that stabilise the shoulder and assist movement). Passively abduct the affected arm to 90 degrees, the arm is then passively moved in towards the chest (internally rotated). A positive test would be if this causes pain. (see figure 83)

**Empty can (EMT) full can (FCT) test**

Shoulder and elbow are both flexed to 90°, and the shoulder gently internally rotated until either the patient complains of pain or the scapula is felt to begin to move. If neither occurs examiner pushes down on patients’ forearm. This may be repeated in external rotation. Pain is considered a positive test indicating damage to the rotator cuff. (see figure 84)

**Spine**

**Modified Schober’s test**

Modified Schober’s test is performed to measure the ability of lumbar flexion. With the patient standing upright, take note of the point between the Dimples of Venus (A on figure 85), some clinicians will place a finger or a measuring tape on this point, (occasionally some will draw this point however you have to gain consent for this from the patient) then note a second spot 10cm above the first. Ask the patient to reach towards their toes as far as they are able. The 10cm distance between the 2 spots/ lines should increase by more than 5 cm in the normal person (B on figure 85). The most common cause of decreased flexion tends to be ankylosing spondylitis, a positive modified Schober's test may indicate this.
Straight leg raise

If a patient complains of lower back pain, you may assess to see if the pain is caused by a herniated disc, this is done by performing a straight leg raise. With the patient lying supine or on their back, the examiner lifts the patient’s leg while the knee is straight.

If the patient experiences sciatic pain (pain radiates down sciatic nerve, often felt in the buttocks) when the straight leg is at an angle between 30 and 70 degrees or the pain extends beyond the knee, the test is positive and a radiculopathy (pinched nerve) or herniated disc is the most likely cause of pain. (see figure 86)

Lower limb
True leg length

Inequality of leg length can indicate gait abnormalities, ultimately resulting in degenerative arthritis, abnormalities of any of the joints or bones of the lower limb may impact on leg length.

True leg length is measured from anterior superior iliac spine to medial malleolus. True leg length differences are often due to hip disease on the shorter side. 1-1.5cm difference is classed as normal, anything greater would be abnormal.

Ensure you use the same point on each limb to ensure consistency. (see figure 87)

Trendelenburg test

Looks for weakness in the gluteus medius muscles during unilateral weight bearing. Standing behind the patient to observe the pelvis the patient is asked to raise their foot off the floor on the affected side. Normally the lifted side would raise, a weakened gluteus medius results in a positive sign is indicated if the pelvis drops towards the affected side that is no longer weight baring. Other causes of a positive Trendelenburg are: hip instability or subluxation, hip osteoarthritis, initially post hip replacement, superior gluteal nerve palsy and lower back pain. (see figure 88)
Fabers (Patrick) test
May alert the clinician to possible hip pathology or sacroiliac joint dysfunction. The examiner places the test limb in flexion, abduction and external rotation so that the foot of the test limb rests on the patients opposite knee. The examiner then passively presses the test limb toward the couch while applying stabilising counter pressure on the opposite ilium. The test is positive if there is noted pain in the back or the tested limb, or if the tested limb remains in a plane above the opposite limb. Can indicate tightness of the hip flexors, abductors or joint capsule of the hip. (see figure 89)

Anterior draw sign
Knee flexed at 90° clinician sits on patients’ foot to stabilise the leg. Fingers placed at the back of the knee and thumbs either side of the patella tendon on the tibia pulls forward. Movement of the tibia more than 1cms indicates damage to the anterior cruciate ligament (see figure 90).

Lachman’s test
Similar to the anterior draw sign but the knee is flexed to 15-30° and the thigh is stabilised by the examiner pushing on the thigh just above the knee towards the couch as the lower limb is pulled forward (see figure 91).
**Posterior draw sign**
Same position as before but clinician pushes backwards, 1 cm or greater indicates damage to the posterior cruciate ligament. (see figure 92)

![Figure 92 Posterior draw test](image)

**Collateral ligaments assessment**
The knee is flexed to 20°-30°, with the thigh held in one hand and the calf in the other (see figure 93). The clinician pushes the calf laterally (outwards) and the thigh medially (inwards) this applies stress to the medial collateral ligaments. Movement of the lower limb laterally would indicate damage to the medial collateral ligament.

When the clinician pushes on the inside of the thigh laterally (outwards) and the hand on the outer calf (lateral aspect) applies pressure on the lateral calf and pushes medially this would identify damage to lateral collateral ligament if movement is seen.

Figure 93 shows assessment of the medial collateral ligaments. If hand on calf moves to inner aspect of thigh and hand on thigh moves to lateral aspect of calf this would assess the lateral collateral ligament.

**Bulge test**
A knee effusion is caused by excess build-up of synovial fluid accumulating in or around the knee joint, caused by arthritis, injury to surrounding tissues, or inflammation of the bursae of the knee. See figure 94 where the patient’s right knee is visible swollen with loss of the natural indentations either side of the patella.

![Figure 93 Collateral ligament assessment](image)

![Figure 94 Knee effusion](image)
On the affected knee the examiner initially stokes upwards on the side of the patient's knee (displacing any fluid up and across the anterior aspect of the knee. By sliding the hand down the opposite side of the knee you may see fluid bulge back towards the knee where the fluid was initially displaced (see figure 95).

**Patella tap**

The fluid of the effusion is displaced by placing your hand just above the knee and gently sliding your hand distally (see the middle image in figure 96). By tapping the patella, you may note a distinct bounce to the patella due to the fluid beneath it, you may also see slight bulging of the fluid either side (laterally to the patella).

Please watch the following video showing assessment of a knee effusion on the Versus Arthritis web examination of knee effusion this video includes assessment of knee ligaments. (see figures 96)

**Anterior drawer of the ankle**

Examines the integrity of the anterior talofibular ligament. The patient lies supine. The examiner grasps the test heel with one hand and applies a posterior force to the tibia with the other hand, while drawing the heel forward. Laxity is compared with the opposite (uninjured) ankle. A positive test is indicated by a difference of 2mm subluxation compared with the opposite side or visible dimpling of the anterior skin of the affected ankle (suction sign), (see figure 97)
Thompson (also called Simmonds) test

Used to test the integrity of the Achilles tendon. The patient lies prone (image shows patient kneeling, level of mobility will dictate position) with the test extremity hanging of the examination couch allowing, the foot to relax into dorsiflexion. The examiner then squeezes the gastrocnemius/soleus complex (calf muscles). A normal response is a slight plantar flexion of the foot indicating an intact Achilles. (see figure 98)

Morton’s test (squeeze test)

Squeezing across the metatarsals just beneath the toes may elicit tenderness, if so palpate the area of tenderness or paraesthesia elicited. Tenderness may be caused by Morton’s neuroma (thickening of tissues surrounding the nerves to the toes), stress fracture or neuropathy. (see figure 99). A click maybe felt where the enlarged nerve squeezes out from between the metatarsal heads.

Figure 98 Thompson test

Figure 99 Morton’s test
Versus Arthritis examination videos of the regional examination of the musculoskeletal system (REMs).

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The School of Medicine has kindly been granted permission for you to view the following videos, the resources you have available to you in your prep presentation and the teaching session is sufficient for year two, however these videos will give greater detail and help build your knowledge. Below each video is described so you can decide if you would benefit from watching them.

Upper limb

Examination of wrist and hands examination of the hands and wrist starts by inspecting elbows, then hands talks about nail signs, please see our guide on nail signs in your online resources, in the “fundamentals” section. Assess sensation and temp & pulses, demonstrates squeeze test and Phalen’s test (see special and additional test section above) shows dips, wrist, and palms against and dorsal against to assess wrist, test power as well.

Examination of elbow examination of the elbow good inspection, temp assessment, palpation of olecranon and epicondyles and movement actively then passively whilst palpatating.

Examination of shoulder examination of the shoulder good inspection, temp assessment, showed palpatating bony prominences and of musculature, assesses all movements actively and passively, also palpatates shoulder at back when abducting to see if it moves to much to compensate for lack of movement in the shoulder.

Spine

For spine examination video examination of the spine this includes straight leg raise (see additional test section above).

Lower limb

Examination of the hip examination of the hip discusses and demonstrates measurement of true leg length, Tomas test and Trendelenburg (see additional tests section above), does palpation, hip rotation and flexion but they are only movements assessed this study guide includes the remainder.

Examination of the knee examination of the knee talks about Valgus and Varus (see inspection above), and muscle wasting (see inspection above), assesses temperature, palpatates superior and inferior boarder of knee around patella and palpates posterior surface for popliteal swellings. Does good demonstration of patella tap, bulge test, (see additional tests section above) palpates joint line and patella tendon and ligaments and hamstrings, assesses movements actively and passively while palpatating, shows anterior draw test and collateral ligament assessments (see additional section above), inspects standing as well.
Examination of the foot and ankle  

**examination of the foot and ankle** good inspection of entire foot including looking at shoes (see examination of foot and ankle), assesses temperatures, assessed foot pulses, demonstrates palpation and squeeze test (see additional tests section above) does all movement. Inspected when standing and looked at arches, looked at Achilles to identify any thickening of Achilles tendon and for Varus and Valgus.

**Documentation**

In [Good medical practice](#), the GMC says you ‘must record your work clearly, accurately and legibly.’ Clinical records fulfil several important functions. (This will be covered in later years)

- A reminder of what happened during a consultation, actions, steps taken and outcomes.
- Informing colleagues who may see the patient subsequently and supporting continuity of care.
- Providing evidence of the standard of care provided.

Document of findings should describe exactly where an abnormality, symptom or sign was discovered, referring to the joint or area of the joint affected in sufficient detail that those not present can easily identify what has been recorded when they examine the patient. When referring to a specific digit, they are numbered 1 as thumb and great toe (big toe), little finger and toe would be number 5. For example, “inflammation was noted on the 2\textsuperscript{nd} distal phalanx of the left hand”. By second year you should be able to refer to the anatomical position an abnormality was seen on inspection or palpated (anterior to the joint etc.). You should also be able to not the degree of movement possible during active and passive movement and if any was noted on palpation during movement. An example may be “inflammation was noted on the right knee with loss of normal anatomical dimples medially and laterally. The bulge test was performed with considerable movement of the patella noted”. Think should you have noted if the joint was warmer to the touch compared to surrounding tissues or the unaffected knee? How was the patient standing, where they weight baring, was their gait affected? After reading this guide hopefully you now appreciate there is a great deal you are able to assess when examining a joint and to feedback to your supervisor, remember “practice makes permanent” so ask your supervisor to give you feedback on anything you can improve upon.

**Be sure to report any abnormal findings to your**
Bibliography & Further Reading

- Swellings study guide
- Go to “Versus Arthritis” website https://www.versusarthritis.org/about-arthritis/. On top banner click on About Arthritis and Scroll to the bottom to Health professionals and students. You can then click on Clinical assessment of patients with MSK conditions in which a tab entitled “the MSK examination; REM including videos is which contains videos on”, Examination of the hands and wrist, elbow, shoulder, hip, knee, foot & ankle and the spine.
- For videos on examining a knee effusion, arthritis of the hands and feet to gain a good insight into examination of a patient with clinical findings. Knee videos demonstrate additional tests as well: https://www.versusarthritis.org/about-arthritis/healthcare-professionals/clinical-assessment-of-patients-with-musculoskeletal-conditions/clinical-findings-in-patients/

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