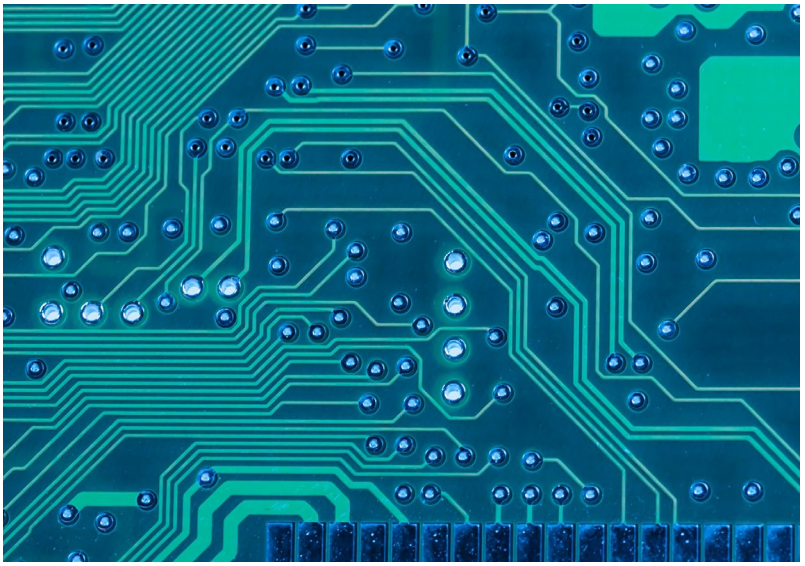
BONE and JOINT CANADA

# VIRTUAL ASSESSMENT OF MUSCULOSKELETAL CONDITIONS

## COMPLETING A CLINICAL ASSESSMENT



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# Background

This document is part of a Toolkit that has been developed to help Health Care Providers (HCPs) become more confident in their ability to complete virtual assessments for patient who are presenting with musculoskeletal (MSK) conditions. The Toolkit includes a document that provides information about how to set up a virtual assessment "Virtual Assessment of Musculoskeletal Conditions, How to set up a program to meet the needs of patients" as well as a series of tools that will help the HCP set up their practice and become familiar with the clinical assessments.

This document provides information on how to complete an assessment using visual technology e.g. camera. It includes an overview of how to complete the subjective interview and general functional assessment then address the clinical assessment options for:

a. Hip and knee
b. Spine (Low Back, Thoracic and Cervical)
c. Upper Extremity
d. Foot and ankle

A set of guiding principles were developed in the creation of the Toolkit (Appendix A). In addition, the following were identified as important principles in the development of the recommendations for a clinical assessment.

1. The Toolkit is not prescriptive, but is designed to be a resource that can be used to help HCP conduct effective virtual MSK assessments.
2. It is acknowledged that the incorporation of virtual care, including visual assessment, into MSK clinical practice is relatively new, evolving, and associated with a unique learning curve. Many of the tests are not validated through research and have been developed by HCP working with the different patient populations. They are therefore being provided as suggestions only and this document will be updated as research becomes available.
3. Not all of the techniques, tools and resources described in this document will be applicable to all MSK assessments. HCPs will be expected to rely on their expertise and judgment in developing and conducting assessments. This will include taking into considering the patient, the clinical context of the encounter, previous interactions with the health care sector (e.g. first-time assessment, follow up), availability of documentation from other HCP involved in the patient's care, and available diagnostic imaging and laboratory test results. Each HCP is responsible for meeting the regulatory requirements of their College.
4. The HCP will complete sufficient clinical assessments virtually and in-person to make appropriate recommendations on treatment or referral to another HCP.
5. The Toolkit does not address the special assessments needs of the paediatric population that cannot follow instructions.

# Instructions to Prepare Patients for a Clinical Assessment

Completing an MSK assessment requires patients to provide their subjective information as well as perform physical movements. From a clinical perspective the assessment will progress more efficiently if patients are given all necessary information prior to the assessment to allow them to prepare in advance. This includes consent forms, intake forms, validated questionnaires, written information about the assessment including instructions, Information on clothing, space and equipment as well as images and/or videos on opportunities to view and practice any tests or movements they will be required to complete in the assessment. Information on how to prepare patients for the assessment is provided in the support document "Virtual Assessment of Musculoskeletal Conditions, How to set up a program to meet the needs of patients" and tools are available within the Toolkit.

At the time of the assessment the HCP should organize their assessment based on what space, equipment, technology and assistance is available to the patient.

## Clothing

Patient clothing should allow sufficient visual inspection of the body to identify any postural deficits with good visual inspection of the joint(s) being assessed, including joint movement. The following is suggested:

### *Lower extremity*

- Shorts/loose pants that can be rolled up (if required)
- Typical shoes, including any orthoses they routinely use
- No shoes or socks for foot and ankle assessment

### *Upper extremity*

- Women: Tank top
- Males: No shirt

### *Wound*

- Bandages
- Products

### *Spine*

- Shorts/loose pants
- T-shirt/shirt that can be pulled up
- Males: No shirt (preferable)

### *Supports*

- Braces,
- Wraps,
- Tapes,
- Bandages

## Space and Equipment

The following table provides the general space and equipment that can be used to complete an assessment. Additional space and equipment can be used if available to the patient.

| Body part | | Recommendations |
|---|---|---|
| Lower extremity | Space | 8 feet (4 metres) of walking space in front of the camera (approximately 10 strides) |
| | Equipment | • Firm chair for sitting activity (with arms if safety is a concern)<br>• Firm surface to lie on (e.g. bed, yoga mat, couch)<br>• Stable waist-level support for standing activities e.g. railing, furniture, counter, kitchen sink (if required)<br>• Tape for measuring girth (e.g. swelling, muscle bulk) |
| Low back | Space | 8 feet (4 metres) of walking space in front of the camera (approximately 10 strides) |
| | Equipment | • Firm chair for sitting activity (with arms if safety a concern)<br>• Firm surface to lie on (e.g. bed, yoga mat, couch)<br>• Stable waist-level support for standing activities e.g. railing, furniture, counter, kitchen sink (if required) |
| Neck | Space | 3 feet in front of camera |
| | Equipment | Firm chair with back |
| Shoulder | Space | 5 feet in front of camera so can move arm(s) in all directions |
| | Equipment | • Wall to help with movements<br>• Small weights, household items (e.g. cans, broom stick, spatula, keys, keyboard) |
| Elbow/hand | Space | 3 feet in front of camera |
| | Equipment | • Table to rest hand(s), demonstrate movements and test passive range<br>• Small weights, household items (e.g. cans, broom stick, spatula, keys, keyboard) |

## Lighting

- For a visual assessment adequate lighting is required and needs to be positioned in a way that enhances view. E.g. camera facing a window will reduce visibility, lamp available close by in case additional lighting is required.

# Clinical Assessment

## Subjective Information

- The virtual subjective assessment should replicate an in-person assessment.
- The intake form should collect the same information as would be collected during an in-person assessment and include all information necessary for clinical decision making as part of routine care. The extent of this information may vary between health professionals. A list to consider is:
    - History of MSK problem.
    - Symptoms (including pain, stiffness, instability/locking/giving way, altered sensation).
    - Past medical and surgical history.
    - General physical condition – including walking, function, ADLs, falls and endurance.
    - Reason for the assessment and goals (if appropriate).
- Information should be collected prior to the assessment if possible and can be reviewed during the assessment to improve efficiency.
- The information can be collected using a standardized intake form that is sent, completed and returned prior to the assessment (with appropriate consent).
- Appropriate validated patient-reported outcomes measures (PROMs) should be used if possible and appropriate (see below).
- If a subjective description will be insufficient and a good quality visual is required (e.g. skin condition, wounds) then a good quality picture should be considered and shared in advance where possible. The information can be validated in the subjective assessment.
- All information should be available to the HCP at the time of the assessment.

## Patient Reported Outcome Measures (PROMs)

Questionnaires that are used in the in-person assessment can also be used virtually so that there is continued collection of data. Some considerations in the use of the questionnaire are:

1. Questionnaire should be repeated a minimum of twice. The process developed needs to ensure accessing the information over multiple time points.
2. A joint specific, disease specific and a quality of life questionnaire should be considered.
3. In Canada there are a number of mandated questionnaires that are required for specific patient populations e.g. hip and knee replacement patients. A process needs to ensure these questionnaires are used.
4. Patient satisfaction and patient experience measures are important. They need to be customized and can be used to measure the clinical experience and/or the experience with using the technology.

Patient reported outcome measures are available from a number of web site as identified in the Tools section. The common tools used are provided below.

| Generic | Hip and knee | Spine | | UE | Foot and ankle | Other |
|---|---|---|---|---|---|---|
| | | Lumbar | Cervical | | | Mental health |
| SF-36, SF-12 | Oxford Hip | Fear avoidance | Fear avoidance Beliefs Questionnaire | Disability of the Arm, Shoulder and Hand | Foot and Ankle Ability Measure | Beck Depression Inventory |
| EQ 5D | Oxford Knee | STarT back Screening Tool | Neck Disability Index | Western Ontario Shoulder Instability Index | Foot and Ankle Outcome Scores | Depression Anxiety Screening Scale |
| Patient satisfaction | Lower Extremity Functional Scale | Acute Low Back Pain Screening Questionnaire | Patient Specific Functional Scale | Western Ontario Rotator Cuff | Ankle Osteoarthritis Scale | Pain Catastrophizing Scale |
| Patient Experience | HOOS 12 | The Quebec Back Pain Disability Scale | Nurick Scale | American Shoulder and Elbow Surgeons | Oxford Ankle Foot Questionnaire for children | |
| NPRS | KOOS 12 | Oswestry Disability Index | Modified Japanese Orthopaedic Association (mJOA) Score | Shoulder Pain and Disability Index | Manchester-Oxford Foot Questionnaire | |
| | Western Ontario and McMaster Osteoarthritis index | Hendler 10-minute screening for chronic back pain | | Mayo Elbow Performance Scores | Lower Extremity Functional Scale | |
| | | The Roland Morris Disability Questionnaire | | | | |
| | | Numeric Rating Scale (NPRS), back and leg | | | | |

## Planning the Assessment

- It is important to determine each individual's mobility limitations and risks, if any, to plan the assessment and ensure safety.
- The patient's general medical health should be considered including pallor, weight/weight loss, respiratory pattern, signs of infection e.g. cold/flu
- At the start of the assessment additional information on the patient's general abilities and home situation can be obtained by reviewing with them:
    - the intake information to ensure that it aligns with the physical and cognitive abilities observed
    - the physical space including the type of chair (e.g. dining room, wheelchair)
    - general movements of limbs, such as upper extremity, if there are any concerns about neurological functioning
    - the living situation including other people present, furniture, tripping hazards, adaptive equipment and space
    - ability to follow directions/instructions to identify cognitive, vision, hearing, language difficulties to determine the amount of the self-assessment that can be completed e.g. self-palpation
    - other MSK presentations in other joints, bones or muscles that will limit the assessment or suggest a red flag e.g. multiple swollen joints, neurological changes etc.
- This information can be used to identify/determine how each of the assessment components will be performed to plan the order of the assessment and minimize excess moving around (if required).

## General Observation

Completion of the assessment will require the patient to complete movements during which information can be collected on:

- General willingness to move/engage in the assessment
- Quality of movements
- Functional abilities
- Functional limitation
- Pain behaviours

Note:

- Where possible measure function of both sides and compare.
- Watch movements in different planes to identify compensation movements.

### Joint/area Inspection

- A visual inspection of the posture, joint and surrounding area can identify:
  - Swelling
  - Redness
  - Deformity including postural deformity
  - Skin quality
  - Wound status
  - Muscle atrophy
  - Vascular changes, hair loss, skin tone, colour (e.g. gangrene)
- A visual inspection is in 2D. A 3D image will need to be considered and will require moving the camera or the body area being inspected.
- For a detailed visual inspection, a close camera position and additional lighting on the specific joint may be required.
- If it is difficult to visualize the joint, ask the patient or family member present to take a photograph of the area and consider a second photograph of another area for comparison (e.g. left and right feet). The picture can be shared using a secure platform with appropriate consent. Opportunities to enlarge the picture should be considered.
- Products such as creams, bandages and/or other products should be noted.

### Temperature

- The temperature cannot be measured objectively without a wearable device.
- Relative differences in temperature can be assessed by asking patient or care partner to place the back of their hands on the body part area (ideally one hand per side simultaneously).

## Range of Motion (ROM)

Consider the following when assessing ROM:

- ROM can be assessed through a functional activity or movement of individual joint(s).
- With functional movements, consider the movements of all the joints during the same movement rather than repeating for different joints.
- With individualized or isolated movement, consider the benefits of stabilizing the other joints so there is no compensatory movement (e.g. knee flexion in sitting).
- Provide clear instruction verbally and demonstrate the movement if visual cues help the patient.
- Record the active range and the position it was evaluated in including the equipment if it will affect the range (e.g. knee flexion while sitting in dining room chair).
- For passive ROM, if possible, instruct the individual to put passive tension on the joint.
- Documentation on how the ROM was measured will facilitate the ability to repeat the test in the same position on future re assessment(s).

- Consider the camera angles and make note in the documentation if it will be important for a re-assessment (e.g. sagittal or coronal view).
- Choice of testing position will affect the accuracy of the results and the time to complete the assessment. Therefore consider:
    - Safety including balance and risk of falls
    - Difficulty and time to move between different surfaces
    - Difficulty changing the camera angle from front to side etc.

## *Measurement of ROM*

- The following table identifies the ways to measure ROM. Each has benefits and drawbacks related to the accuracy and the time to get the measurement. Select the technique that provides the optimal level of information to determine and inform treatment. A screen shot can be taken if this will assist in measurement for future care.

| Measurement | Benefits | Drawbacks | Notes |
|---|---|---|---|
| **Visual (eye ball)** | Easy to complete<br>Minimal time requirements<br><br>NB: Option to use computer screen to measure gross ROM for shoulder e.g. upper corner Approx. 135 degrees | Lacks accuracy | If accuracy is not required as changes in ROM over serial assessment are not expected, gross changes are expected, or assessing relative motion compared to contralateral side |
| **Place a goniometer on the computer screen** | Increased accuracy with a good camera angle and picture.<br>Moderate time requirements. | Increased time to position patient to get a good camera angle and picture.<br>Reduced ability to compare during re test | If changes to ROM over time are expected, and more accurate measurement is required |
| **Built in/ on screen goniometer e.g. Protractor extension for Chrome** | Increased accuracy.<br>Moderate time requirements. | Increased time as have to position patient and access to the protractor tool | If changes to ROM over time are expected and accurate measurement is required |

## Strength

In an in-person assessment strength testing can be completed using gross movement patterns for function as well as specific testing of individual muscles, which can be tested in different positions to ensure full function. In a virtual assessment strength testing is limited and the following should be considered:

- Subjective information on what is limiting the movement (e.g. pain, ROM, fatigue etc.)
- Choosing the position to test strength and function will be dependent on the movement being tested and should address compensatory movements.
- Neurological assessment and endurance can be measured by repetition.
- Testing both sides will allow for comparison.
- Documentation on how the strength was measured will facilitate the ability to repeat the test in the same position on future re assessment(s).

### *Muscle Grading System*

- In a virtual assessment muscle strength can be tested against gravity (0 – 3) using the Oxford Muscle grading scale
- Grades 4 and 5 requires resistance which can be tested by:

| Measurement | Benefits | Drawbacks | Notes |
|---|---|---|---|
| **Patient applies resistance** | Easy to complete.<br>Minimal time requirements. | Cannot be quantified.<br>Lacks accuracy. | If accuracy is not required as changes are not expected or gross changes are expected |
| **Use weights (light, moderate, heavy)** | Quantifiable.<br>Easy to complete if the equipment is available. | Access to weights that can be attached.<br>Increased time to attach weights. | If accuracy is required to measure increased strength / endurance. |
| **Use elastic resistance bands (colour ranges)** | Can be set prior to the assessment.<br>Easy to complete. if patient familiar with using elastic resistance band | Cannot be quantified.<br>Lacks accuracy.<br>Timing if patient unfamiliar with elastic resistance band. | Patient needs experience with using elastic resistance band for good performance. |
| **Functional task (see below for examples)** | Quantifiable.<br>Easy to complete.<br>No equipment required. | Safety.<br>For lower extremity tested in weight bearing. | Increased accuracy to measure strength/ endurance |

## *Modified Virtual Muscle Grading System*[1]

The following tables provide an example of how to complete strength testing in a virtual assessment. This information is not validated and is being provided as an example only. In considering the table the following should be noted in the assessment and recorded in the documentation:

- a "V" is used to clarify that the measurement was made virtually and as such may not be as accurate as an in-person assessment
- 0 – 2 are scored as <3 V

## *Scoring*

| Standard Grade | Movement | Modified Virtual Grading (V) | Clinical Action |
|---|---|---|---|
| **0** | No contraction observed | **<3-V** | Depending on clinical/functional significance, timely in-person assessment and/or further diagnostic investigations are recommended. Appropriate restrictions and splint(s) as indicated. |
| **1** | Evidence of slight contractility without joint motion | | |
| **2** | Complete range of motion with gravity eliminated | | |
| **3** | Complete range of motion against gravity | **3-V** | As above and as indicted targeted rehabilitation of affected muscle group(s) depending on functional significance. Appropriate restrictions and splint(s) as indicated. |
| **4** | Complete range of motion against gravity with some resistance | **4-V** | As above and as indicted targeted rehabilitation to improve functional strength of affected muscle group(s). Appropriate limitations and functional splinting as indicated. |
| **5** | Complete range of motion against gravity with full resistance or functional range and functional resistance | **5-V** | None |

[1] Used and adapted with approval "Low Back Pain Rapid Access Clinic: Virtual Assessment and Education Toolkit" https://www.lowbackrac.ca/uploads/1/3/1/2/13123559/final_doc_august_9_2020_lb_rac_virtual_care_toolkit.pdf Accessed March 9, 2021

## *Scoring Description*

The table below provides examples of how an assessment would be completed to be registered with the scoring above. This testing is not validated and is being provided as an example only.

| Grade | Definition | Description |
|---|---|---|
| **<3V** | Unable to move actively through full ROM against gravity | • If the muscle is less than 3, further virtual distinction is not feasible or reliable (see quick reference table).<br>• If the patient cannot actively achieve functional range against gravity, the patient should be asked what stops them from moving further.<br>• If it is pain (i.e., there was good initiation of movement and sudden giving way), the limitation is more likely due to pain inhibition and not likely through weakness.<br>• If they do not report pain limitation, the patient should be asked to assist the affected limb passively (where possible) to see if more range is achievable.<br>• If more range is achievable passively, the grade = <3. If not, the limitation is structural, so the muscle is at least a 3.<br>• If unable to determine, record as such, and recommend timely in-person and/or other HCP assessment for functionally significant findings e.g. myotome(s). |
| **3V** | Able to move actively through full available range against gravity without additional resistance | If the patient achieves full functional range against gravity.<br>**OR**<br>Is able to lift through some range against gravity to a pain limited point.<br>**OR**<br>Is able to lift through some range against gravity to a structurally limited point.<br>**BUT**<br>The patient cannot move against gravity with resistance. |
| **4V** | Able to move actively through full available range against gravity with some resistance | The muscle takes some resistance against gravity.<br>**AND**<br>Shows evidence of weakness compared to the normal side (deviation, compensation, trembling, patient perception of a difference R to L with self-resistance, inability to sustain resistance on the affected side, or describes a subjective functional limitation which can be attributed to weakness in this muscle).<br><br>Describe in the documentation why a grade of 4 was assigned (e.g., lifted 1kg weight but fatigued compared to the other side with repetition). |
| **5V** | Full active range of motion against gravity with full resistance | The muscle can take normal resistance against gravity (isometric hold or repetitions with a reasonable functional weight for specific patient need or body weight, and patient indicates normal ability with functional activities involving this muscle).<br><br>Description on how this was determined should be included in the documentation. |

## Palpation

Palpation is used in all MSK assessments and cannot be replicated by the HCP in a virtual assessment. However, many patients can complete a self-palpation which may provide additional information to help with the decision on the need for future interventions.

- Self-palpation is an opportunity for patients to identify symptoms such as swelling, tenderness and location of pain.
- Self-palpation can be used when exact location of pain is required e.g. MCL.
- Images, videos or demonstration on a joint model or self-demonstration including landmarks can be used to show the patient where to palpate
- Images can be included in materials sent to the patient and encourage them to practice in advance (if appropriate).
- Patient may need to be helped with the language/descriptors for palpation. E.g. does it feel tight? Tender? Knotted? etc.
- Self-palpation may not be necessary if the decision on the need for future interventions can be made without it.
- Self-palpation will not be appropriate for some patients such as those who present with:
    - Inability to see the instructions (diagrams)
    - Inability to follow instructions
    - Inability to identify landmarks on the body
    - Apparent increased sensitization to touch/pain
    - Obvious swelling
    - Fragile skin condition such as rash or unhealed wound
    - Painful or sensitive skin condition due to neurological changes, skin condition or or allodynia

## Neurological Assessment

### *Motor Function*

The functional movement tests can be used in the virtual assessment to identify issues with the motor system. If there is concern about red flags then the findings need to be considered in conjunction with subjective information (e.g. balance issues, progressive or generalized lower extremity weakness, bowel or bladder changes) and might warrant an in person clinical assessment depending on clinical context.

Additional information about specific testing of the myotomes is covered in Chapter 2: Low Back, Thoracic and Cervical Assessment.

## *Sensory Function*

The ability to identify sensory limitations are limited in a virtual assessment therefore if accurate information on sensory input is required a comprehensive assessment will likely need to be completed during an in-person assessment.

Virtual dermatomal and peripheral nerve extremity screening can be performed by light touch assessment having patients touch the corresponding dermatome and compare sensation to the contralateral side.

Additional information about specific testing of the dermatomes is covered in Chapter 2: Low Back, Thoracic and Cervical Assessment.

## Functional Tests for the Lower Extremity and Spine

Functional tests can be used to provide information on general functional abilities and limitations (e.g. Activities of Daily Living) as well as for ROM, strength and endurance. In the lower extremity functional tests will provide information on all the lower extremity joints and muscles as well as the low back. When completing functional tests in the lower extremity the following should be considered:

- There is a range of functional tests available, and the most appropriate tests for a given assessment should include consideration of an individual patient's clinical profile and reported functional tolerances.
- If safety is a concern, having a caregiver or family member present may be required during the tests e.g. for balance tests especially if the patient reports a history or fear of falling.
- Endurance can be measured by the number of repetitions of the functional activity

Where tests are available virtually, including videos, links can be found in the Tools section.

| | Virtual Test Description | Clinical Information |
|---|---|---|
| **All patients** | | |
| Gait | Walk forwards<br>(Approx. 8 feet distance/4 strides) | Antalgic, base of support, balance, Trendelenburg, step symmetry, dynamic instability |
| Heel/Toe Walking | Walk a short distance away from and/or facing the camera on heels then on toes. If stride is an issue take a few steps perpendicular to the camera. (Coronal view) | Strength, balance, motor neuron performance |
| Squat (90 degrees) | Squat down as far as can go to 90 degrees knee flexion. Coronal view if possible.<br>Can hold onto chair (or counter) for balance if required | Functional ROM knee, hips, ankles<br>Strength hips and knees, spine<br>Alignment (hip knee ER/IR, knee valgus/varus) |
| Sit to stand (if unable to squat) | Stand up and sit down from a chair<br>- not using hands<br>- using hands if required | Functional ROM knee and hips<br>Strength hips and knees<br>Basic balance, weight shift, tolerance for joint loading |
| Single and double limb heel raises | Push up onto toes<br><br>Double leg<br>Single leg | Functional ROM foot<br>Strength gastrocnemius<br>Balance, weight shift, tolerance for joint loading |

| | | |
|---|---|---|
| 30 second sit to stand chair test | Stand up and sit down from a chair maximum number of times in 30 secs (Standard chair height: 43-46 cm; no arm rests) | Functional ROM knee and hips<br>Strength hips and knees, endurance, balance |
| Balance tests (older adults) | 4 stage balance tests (10 secs per stage)<br>1. feet side by side<br>2. Instep next to big toe<br>3. Tandem<br>4. Stand on one foot | Balance in older adults where balance/falls risk or myelopathy may be an issue<br>Note: If can do stage #4 and if safe, can do single leg stand test (45 secs; eyes open) |
| General function (sock) | Take socks on and off | General spine and lower extremity mobility including external rotation |
| **Higher functioning patients (for safety, consider the need to have another person available in the home)** | | |
| Squat (full) | Full squat | Functional ROM knee, hips, ankles.<br>Strength hips and knees, spine |
| Single leg stance | Stand on each alternate leg and bring other leg off the floor | Balance, strength of hip abductors and gluteal muscles, Trendelenburg |
| Hop test | Distance that patient can hop | Strength of Lower extremity |
| Balance tests | Variations of standing, walking and dynamic balance activities | High level balance<br>Select components of Berg Balance Scale |
| Self-paced walking speed: | Walk in hallway or where there is sufficient space. Measure the distance and mark it on floor with masking tape | |

Functional tests for the Upper Extremity are covered in Chapter 3: Upper Extremity Assessment

# Chapter 1: Hip and Knee Assessment

## ROM

- This section provides some suggestions on how to complete a ROM assessment.
- Options are provided in lying, sitting and standing so that the testing can be modified to meet the needs and abilities of the patient.

### Hip

| Movement | | Lying | Sitting | Standing |
|---|---|---|---|---|
| Flexion | Active | Supine: Lift knee to chest with knee bent | Lift knee to chest with knee bent<br>Ask patient to sit straight and stabilize spine | Stand on one leg and lift knee to chest with knee bent and spine kept in a neutral/straight position |
| | Passive | Supine: Lift knee to chest with knee bent. Use hand or belt/strap to pull knee to chest | Lift knee to chest with knee bent. Use hand or belt/strap to pull knee to chest | Stand on one leg and lift knee to chest with knee bent. Use hand to pull knee to chest<br>*Camera: side view*<br><br>**Functional:** Squat |
| Extension | Active | Prone: Lift leg from hip with knee bent. | Sit at the side of the chair, slide foot back and actively extend the hip | Extend leg while holding on to stable support keeping low back in neutral |
| | Passive | Thomas Testing position<br><br>Stabilize other leg and hold lumbar spine in neutral position for hip extension (flexion deformity) up to neutral. | No test | Squat with the non-tested leg and the tested leg out backwards |

| | | | | |
|---|---|---|---|---|
| Abduction | Active | Supine: Abduct the leg | Sit at front of chair, with heel on floor, slide leg out to side | Stand on one leg and abduct non-weight bearing leg |
| | Passive | No test | No test | No test |
| Adduction | Active | Supine: Abduct the opposite leg and then slide the index leg towards that while keeping the pelvis still | As per supine and in seated position as above, slide heel towards abducted leg | Stand on one leg and move non-weight bearing leg forward and across body |
| | Passive | No test | No test | No test |
| External rotation | Active | Supine: Roll the straight leg outwards (log roll) | With hip and knee at 90 degrees flexion, move foot inwards | Stand on one leg and ER the straight, non-weight bearing leg |
| | Passive | No test | Pull the foot upwards with hand or a belt looped around ankle | No test |
| Internal rotation | Active | Supine: Roll the straight leg inwards (log roll) | As above but opposite direction Lift leg into flexion and move foot outwards | Stand on one leg and IR the straight non-weight bearing leg |
| | Passive | No test | No test<br>As above | No test |

## Knee

| Movement | | Lying | Sitting | Standing |
|---|---|---|---|---|
| Flexion | Active | Supine: Lift knee to chest with knee bent.<br>Or<br>Slide heel up the firm surface towards the buttocks maintaining contact with the surface | Lift knee to chest with knee bent<br>Or<br>Sit in front of chair, slide foot back under chair | Stand on one leg and lift knee to chest with knee bent |
| | Passive | Supine: Lift knee to chest with knee bent. Use hand or belt on ankle to pull knee to chest<br>Or<br>Slide heel up the towards the buttocks maintaining contact with the surface. Use other ankle to put pressure on the leg | Lift knee to chest with knee bent. Use hand to pull knee to chest | Stand on one leg and lift knee to chest with knee bent. Use hand to pull knee to chest |
| Extension | Active | Supine: Straighten leg down on firm surface | Sit at front of chair and extend knee keeping heel on floor<br>Or<br>Extend knee (measures at 90 degrees hip flexion) | Stand and actively straighten leg |
| | Passive | No test | Sit at front of chair and extend knee keeping heel on floor, apply pressure with hands just above the knee cap | |

## Strength

- For hip and knee assessments the strength of all the muscles in the lower extremity may be relevant so suggestions of how to assess each muscle group is provided here.
- The Modified Muscle Grading Scale identified above is used.
- Endurance is assessed by the number of repetitions of the functional tests.

| Muscle | Grading | | | |
|---|---|---|---|---|
| | 0 – 3V | | | 4/5V using Functional tests |
| | **Lying** | **Sitting** | **Standing** | **Functional test** |
| **Quads** | Put a pillow or rolled towel under knee and straighten knee | Straighten leg | Stand on one leg and bend hip as high as possible up to 90 degrees. Straighten knee | Squat down and up to 90 degrees<br>(e.g. Sit to stand with chair behind)<br>(Advanced - one leg) |
| **Hamstring** | Prone: Bend knee (note risk of hamstring cramps in test position) | No test | Stand on one leg and bend the opposite knee bringing foot up towards buttock. Keep inside of knees touching. | |
| **Glut**<br>- **Max**<br>- **Med** | Supine: Bend knees and place feet flat. Lift pelvis (bridging)<br><br>Prone: Raise straight leg (place pillow under hips if causes low back pain) | No test | Lift leg backwards<br><br>Lean forward over sturdy supporting surface, keeping spine in neutral. Lift straight leg backwards | Sit to stand with staggered legs or on one foot |
| **Abductors** | Grade 1: Lie on back and slide leg out to side | Sit and keep thigh on seat, move leg outwards while | Hold counter top or chair back for balance, lift leg outwards, leading with heel | Single leg stance and monitor for Trendelenburg |

| | | | | |
|---|---|---|---|---|
| | Grade 2-3: Lie on side: raise top leg upwards | keeping both feet on the floor | | |
| **Adductors** | Lie on side: Bend top leg and rest foot on floor behind other leg, lift bottom leg | Grade 2 & 3: Lift leg off seat and cross it over the other leg | Grade 1 & 2: Move leg slightly in front of other leg and bring across body | Sit at front of chair, straighten knee and use opposite hand to press against inner knee (isometric test) |
| **Gastrocnemius** | Extend knee and plantar flex ankle | Weight on one leg and push up on toes | Stand on both legs and push up onto toes (ensure weight bearing is symmetrical) Grade 3 standing on one foot (full ROM, 1 rep) | Stand on one leg and push up on toes, hold stable support for balance |
| **Dorsi Flexion** | See Chapter 4: Foot and Ankle Assessment | | | |
| **Eversion** | | | | |
| **Inversion** | | | | |

## Ligament/Stability Testing

- Ligament testing to assess the stability of the knee ligaments requires force to be placed through the knee in a controlled way which could be unsafe and/or cause extensive pain/symptoms for the patient.
- Symptoms of pain in the MCL and LCL can be identified in a controlled way by stabilizing the foot against a solid object in standing and pushing the knee into varus or valgus to put tension on the ligament. This will provide limited information on stability.
- Gross stability of the ligaments of the knee will be noticeable in the general movement and during functional testing (e.g. abnormal patterning when walking).
- Any potential issues with a ligament, that would change the clinical management, require manual testing during an in-person assessment. This can be completed by another HCP if available to the patient e.g. therapist

## Special Tests

There are a number of special tests that require specific positioning and can cause symptoms for the patient including pain. Many of these tests needs the HCP to put their hands on to move the joints or can require the patient to be in an unsafe position therefore they need to be completed in an in-person assessment. The following tests have been considered safe to be performed virtually for some patients, depending on their clinical presentation and comfort and safety with movement. These tests are not validated in a virtual assessment unless noted and are provided as examples only.

| | Virtual Option |
|---|---|
| FABERs | Patient puts manual pressure on knee in sitting |
| Thomas test | Lying supine with tested leg over end of bed |
| Patello-femoral Compression test | Patient put distal pressure on the patella as they contract their quadriceps |
| Thessaly | Patient completes the dynamic single leg squat movement holding onto a stable surface |
| Apprehension | Patient puts lateral pressure on the patella with their thumbs as they move the knee from straight to 90 degrees of flexion and back to straight |
| Modified apprehension | Patient puts medical pressure on their patella with their thumbs as they move the knee from straight to 90 degrees and back |

# Chapter 2: Lumbar, Thoracic and Cervical Spine Assessment

## Alignment

Assess gross overall spinal alignment in both the sagittal and coronal plane.

- Sagittal – preserved cervical lordosis, physiologic thoracic kyphosis, lumbar lordosis. Head centred over pelvis, horizontal gaze ability.
- Coronal – head centred over pelvis, shoulders level and parallel to the floor/horizon. Ask the patient to palpate the tip of their iliac crests (Anterior Superior Iliac Spine) to gauge if level and parallel to the floor/horizon.

## ROM

- ROM testing of the low back and thoracic spine is measured through gross movement with documentation of abnormal deviations in movement.
- A gross evaluation of overall spinal flexibility can be performed by asking the patient to forward flex with the knees fully extended to reach the floor. The distance from the tips of the fingers to the floor can be measured (e.g. using a tape measure) by an observer or referenced in relationship to the knee/mid-tibia/ankle region with flexible patients being able to fully reach the floor with their fingers/hands.
- Additional movements can then be performed with suggestions on how to complete the movements provided below. Each position can be modified to meet the needs and abilities of the patient.

| **Movement** | |
|---|---|
| **Standing** | **Lumbar and Thoracic** |
| Flexion<br>Extension<br>Side flexion<br><br>*Sagittal and/or coronal view* | Range of motion, reproduction of back/leg symptoms, willingness to move, strength.<br>In side flexion, ensure you remind patient not to forward flex their spine as side flexion is assessed. (Ask the patient to keep the palm of their hand against their leg as they side flex to prevent forward flexion). |
| **Sitting** | **Lumbar and Thoracic** |
| Flexion<br>Side flexion<br>Rotation | Range of motion, reproduction of back/leg symptoms, willingness to move, strength<br>Rotation is best tested in the sitting position to minimize pelvis/lower extremity rotation. (Ask the patient to cross their arms over the front of their chest with their hands holding on to the contralateral shoulder.) Sitting on a stool or forward on a chair with a back rest may be required to gauge left and right rotation as referenced from the coronal plane |

| Sitting | Cervical |
|---|---|
| Flexion<br>Extension<br>Side flexion<br>Rotation | Range of motion, reproduction of neck/arm symptoms, willingness to move, strength<br>Can measure passive ROM with overpressure |
| **Lying** | **Lumbar** |
| Extension | Prone |
| **Combined movements (standing and sitting)** | |
| All directions | Changes to pain pattern (centralization or peripheralization of symptoms and directional preferences) |
| **Repeat movement tests** | |
| All positions | Changes to pain pattern (centralization or peripheralization of symptoms and directional preferences) |

## Strength

The measurement of the strength in the spine includes the abdominals and low back muscles which function as a unit i.e. core.

| Movement | Grade 0 – 3 V | 4/5 V & Endurance |
|---|---|---|
| **Lumbar (core)** | | |
| Abdominals | Sit up* | Repetitions |
| Abdominals | Plank<br>Modification: Wall plank, Rest on knees | Time<br>Dynamic movement (e.g. lift alternating legs) |
| Abdominals | Side plank<br>Modification: Wall plank, Bent knees | Time<br>Lower and raise hips |
| **Cervical** | | |
| Flexion<br>Extension<br>Side flexion<br>Rotation | ROM testing | Self-resistance |

*not recommended in patients presenting with discogenic back / neuropathic leg dominant pain, or in flexion aggravated back dominant pain

# Neurological Assessment[2]

## Motor Function

The functional movement tests can be used in the virtual assessment to identify issues with the motor system. Subjective information on balance issues, progressive or generalized lower extremity weakness, bowel or bladder changes might warrant in person clinical assessment depending on the clinical context.

Testing options for the cervical and lumbar spine myotomes are provided below as examples of how to provide resistance. Fatigue testing can be assessed for certain myotomes and repeated movements can be considered. These tests are not validated and are provided as suggestions.

## Cervical Myotomes

| Myotome | Movement | Examples of Resistance Options |
|---|---|---|
| **C4** | Shoulder elevation | Standing holding approximately 1 kg weights in hands, vertically elevate shoulders. |
| **C5** | Shoulder Abduction | Holding weights, abduct shoulders to 90 with elbows extended. |
| **C6** | Elbow flexion, wrist extension | Holding weights in hand with elbow flexion at 90 and full pronation – perform wrist extension. |
| **C7** | Elbow extension, wrist flexion | Elbow extension with elbow pointing to ceiling, stabilizing proximal arm with opposite hand (as required), and using a weight.<br>**OR**<br>Holding weights in hand with elbow flexed at 90 and full supination – perform wrist flexion. |
| **C8** | Finger flexion, thumb extension/abduction | Hook flexed fingers (flexed DIP + PIP and extended MCPs) together and pull apart looking for asymmetry.<br>**OR**<br>Resisting thumbs against each other into extension or abduction, check for asymmetry. |
| **T1** | Abduction and/or adduction of fingers | Open hands facing patient, press opposite abducted fingers (ulnar aspect of opposite little fingers in contact) against each other.<br>**OR**<br>Holding a folded piece of paper between the adducted little and ring fingers resist pulling the paper away. Look for asymmetry. |
| **C8+T1** | Functional grip | Grip a water bottle or rolling pin – can the patient pull it out of the gripping hand with the unaffected hand? Do they feel a difference right and left? |

[2] Used and adapted with approval "Low Back Pain Rapid Access Clinic: Virtual Assessment and Education Toolkit" https://www.lowbackrac.ca/uploads/1/3/1/2/13123559/final_doc_august_9_2020_lb_rac_virtual_care_toolkit.pdf Accessed March 9, 2021

## Lumbar Myotomes

| Myotome | Movement | Examples of Resistance Options |
|---|---|---|
| **L2** | Hip flexion | Standing with tested leg hip and knee flexed at 90 -90, hold for 5 secs<br>**OR**<br>Self-resisted hip flexion in sitting hold for 5 sec |
| **L3** | Knee extension | Single leg sit to stand from chair<br>**OR**<br>Single leg squat checking for equality of depth, control R=L (ensure that patient is stabilized using a chair, counter etc. to prevent fall)<br>**OR**<br>Self-resisted knee extension with opposite leg in sitting, holding for 5 secs |
| **L4** | Ankle dorsi flexion | Heel waking minimum 10 steps or self-resisted in sitting |
| **L5** | Great toe extension, hip abduction | Toe extension: self-resisted with hands. If patient can reach then instruct to bring foot up to opposite knee.<br>Hip abduction: resisted band, one leg stand for 5 secs or Trendelenburg sign on walking (less than 4/5) |
| **S1** | Ankle plantar flexion | Single leg heel raises (5 full raises = 4/5, 10 raises = 5/5), toes walking 10 steps<br>Fatigue testing measuring number of heel raises |

If appropriate, the single leg sit to stand is a reliable test for assessing L3, L4 (Quadriceps) strength in patients who present with radiculopathy.

## Sensory function

Virtual dermatomal extremity screening can be performed by light touch assessment having patients touch the corresponding dermatome and compare sensation to the contralateral side. Systematic light touch starting distally in lower extremities moving proximally from lower extremities onto the anterior abdomen / ventral trunk may also assist in screening for a thoracic sensory level suggestive of an upper motor neuron/myelopathy condition.

## *Extremities*

Assessment of the strength of the lower and upper extremities may be required for some patients presenting with spine symptoms which is addressed in the relevant sections.

## Special Tests

Please refer to Chapter 1: Hip and Knee Assessment and Chapter 3: Upper Extremity for other special tests that may be considered in the context of a presenting neck or low back symptoms from a differential diagnosis and/or confirmatory perspective.

| | Virtual Care Considerations |
|---|---|
| **Cervical, Thoracic, Lumbar** | |
| Spurling's | Simultaneous neck extension, with rotation and bend towards the symptomatic side can be performed virtually, however, axial compression component of testing would require a trained assessor/evaluator in-person with the patient. |
| L'hermitte's sign (Upper Motor Neuron) | Patient can be asked to actively flex neck to determine if they experience electric shock like sensation down the spine. (To be avoided if additional physical or diagnostic imaging findings already confirm an upper motor neuron condition.) |
| ULTT (Upper Limb Tension Tests | Patient can be asked to complete the movements to provoke symptoms and confirm nerve involvement with head movements. |
| Finger escape sign (Wartnerberg's Sign) | Can be performed virtually. Weakness of hand intrinsics, Cervical Myelopathy, Ulnar neuropathy, Upper Motor Neuron Lesion. |
| **Rapid Alternating Movements**[3] (can be performed virtually) | |
| Rapid Open/Close fist | Cervical Myelopathy, Upper Motor Neuron Lesion |
| Rapid Finger Tapping | Cervical Myelopathy, Upper Motor Neuron Lesion |
| Rapid Foot Tapping | Cervical Myelopathy, Upper Motor Neuron Lesion<br><br>Significant if less than 18 taps in 10 secs. |
| Rapid Forearm Pronation/Supination | Cervical Myelopathy, Upper Motor Neuron Lesion |
| **Other Testing** | |

[3] Used and adapted with approval "Low Back Pain Rapid Access Clinic: Virtual Assessment and Education Toolkit" https://www.lowbackrac.ca/uploads/1/3/1/2/13123559/final_doc_august_9_2020_lb_rac_virtual_care_toolkit.pdf Accessed March 9, 2021

| | |
|---|---|
| Other Upper Motor Neuron testing (e.g. cervical myelopathy) | Dexterity can be assessed virtually, for example, by assessment of handwriting, buttoning of clothes, holding/lifting of cup, open/closing of jars or doorknobs. Patients can be asked to feel coins/keys in pockets in assessment of stereognosis. |
| Straight Leg Raise (SLR) | A passive test so would require an assistant (ideally trained) in attendance with the patient. Camera angle of view would need to be adapted to visually testing in the sitting or supine position. |
| Slump | The patient can be instructed to perform the forward flexed sequential thoracolumbar, cervical and ankle dorsiflexion maneuver, however, pressure cannot be applied without an in-person assistant/examiner with the patient. |
| Femoral nerve stretch test | As per SLR above, however, with patient in prone or lateral decubitus position. May be more difficult to perform than SLR (especially in lateral position) and likely to require a qualified trained assessor in attendance with patient. |
| Upper, abdominal, and lower extremity reflexes, Hoffman's, Clonus, Babinski tests | Typically require a trained and qualified health professional to perform in-person with patient. |

# Chapter 3: Upper Extremity Assessment

## Functional Tests

Functional tests can be used to provide information on general functional abilities and limitations (e.g. Activities of Daily Living) as well as for ROM, strength and endurance. When completing the functional tests the following should be considered:

- Limiting factors for movements will not always be obvious and will have to be explained by the patients e.g. pain, tightness, weakness, tiredness in the muscle.
- Functional movements will be repeated to identify neurological issue and endurance.
- Stabilization of the shoulder should be considered when testing the movement of the elbow.

| Test | Movement |
|---|---|
| **General assessment** | |
| Touch mouth, top of head | Shoulder: Flexion, ER |
| Hand behind head | Shoulder: Flexion, ER |
| Hand behind back | Shoulder: Ext, IR |
| Wall climb | Shoulder: Flexion, stability |
| Push up from chair | Shoulder: Stability, extension, strength<br>Elbow: Stability, extension, strength |
| Lifting tests – ground waist level overhead | Stability, general UE ROM |
| **High functioning patients** | |
| Wall push up, modified push up | Stability of the shoulder and scapula<br>Elbow stability |
| Athletes test | As above |
| Light throwing pass | Shoulder: Flex, ER, Abduction<br>Elbow: Full ROM<br>Stability |
| Weight bearing – switching from low to high plank | Strength, stability, functional ROM |

## ROM

- ROM assessment for the upper extremity should be undertaken in sitting or standing in order to assess ability to move in a functional position and against gravity.
- Active assisted movement can be assessed using the other hand, using the wall by walking the arm up a wall or using equipment such as a broom handle for abduction and ER.
- Passive overpressures can be completed using the other hand for some positions e.g. abduction and external rotation (ER).

## Shoulder

- ROM of the shoulder can be tested in many of the functional tests above as note by "*" in the table below.
- If additional information is required to identify the limitations the following movements can be considered.

| Movement | | Lying | Sitting/Standing |
|---|---|---|---|
| Flexion | Active | Supine, raise arm up | Raise arm up*<br>Note: stabilize low back in sitting or against wall if there is lumbar spine compensation |
| | Active assisted (AA)/ Passive | Over pressure with other hand | Active assisted<br>Passive – hand on table move away |
| Extension | Active | Side lying on opposite side, extend arm with elbow bent | Extend hand behind back* |
| | Passive Active assisted (AA)/ Passive | No test | No test |
| Abduction | Active | Side lying opposite side, raise arm up | Raise arm to the side |
| | Passive Active assisted (AA)/ Passive | Assisted with a broom stick | Assisted with a broom stick |
| Adduction | Active | Supine, Bring arm forward and cross in front of body | Bring arm forward and cross in front of body |
| | Passive Active assisted (AA)/ Passive | Assist with other hand | Assist with other hand |

| | | | |
|---|---|---|---|
| External rotation | Active | Supine, Arm at side with elbow at 90 degrees | Arm at side with elbow at 90 degrees |
| | Passive Active assisted (AA)/ Passive | Assist with stick e.g. broom stick | Assist with stick e.g. broom stick |
| Internal rotation | Active | No test | Reach behind back* |
| | Passive Active assisted (AA)/ Passive | No test | No test |

## Elbow

Stabilization of the shoulder should be considered to prevent compensation when testing the movement of the elbow.

| Movement Sitting/standing | Active | Passive |
|---|---|---|
| Flexion | Bring hand to shoulder | Over pressures applied with other hand |
| Extension | Arm hanging down and drop hand to the floor<br>Hand on table and straighten elbow | |
| Pronation | Shoulder stabilized to prevent IR & ER<br>Elbow at 90 degrees – palm up and down<br>Can use something in hand to emphasize | |
| Supination | Elbow stabilized on table holding humerus with other hand<br>Elbow at 90 degrees – palm up and down<br>Can use something in hand to emphasize | |

## Strength

- Strength testing (0-3V) can be noted during the functional tests and ROM assessment
- Endurance can be measured with number of repetitions

### Shoulder

| Movement | Grading | | |
|---|---|---|---|
| | 0 – 3 V | | 4/5 V using Functional tests |
| | **Lying** | **Sitting/standing** | **Functional test** |
| **Flexion** | Supine, elbow bent, shoulder in neutral flex shoulder to 90 degrees | Flex shoulder to 90 degrees from neutral Elbow straight | Basic: reach above head* Advanced: Weights |
| **Adduction** | Flex arm to 30 degrees and cross body | Forward flex to 30 degrees and cross body | Basic: Self resist with other hand Advanced: Repeat above |
| **Abduction** | Side lie on opposite side and abduct arm to 90 degrees | Elbow bent lift shoulder to 90 degrees | Basic: Move arm out, elbow at 90 degrees Advanced: As above with straight arm and/or weights |
| **Internal rotation** | Side lying, shoulder at neutral internally rotate against body Abduct shoulder out to 90 degree and internally rotate arm | No test | Basic: Internally rotate against resistance with other hand Advanced: Repeat for fatigue |
| **External rotation** | Shoulder at neutral externally rotate against body | No test | Basic: Externally rotate against resistance with other hand Advanced: Repeat for fatigue |

## Elbow

| Movement | Grading | |
|---|---|---|
| | **0 – 3 V** | **4/5 V using Functional tests** |
| | **Sitting/standing** | **Functional test** |
| **Flexion** | Shoulder in neutral flex elbow to 90 degrees<br>Also test in supination and pronation | Basic: Hand to mouth<br>Advanced: Weights |
| **Extension** | Extend shoulder to 30 degrees and extend elbow to end range | Basic: Push off chair<br>Advanced: Repetitions |
| **Pronation** | Pronate elbow through full ROM | Basic: Typing. Holding some article e.g. spatula<br>Advanced: holding weighted item e.g. hammer |
| **Supination** | Supinate elbow through full ROM | Basic: Typing. Holding some article e.g. spatula<br>Advanced: holding weighted item e.g. hammer |

## Special tests

Many special tests of the shoulder and elbow require the upper extremity to be in a specific position. As such the ability to complete any of the tests in a virtual assessment will be defined by the patients' active ROM and strength to obtain the necessary starting position.

| Test | Description |
|---|---|
| **Rotator cuff – Supraspinatous/ Infraspinatous** | |
| Drop arm | Patient raises arm using a support to 90 degrees abduction and actively lowers arm to side |
| ER lag sign (ERLS) | Arm supported by a table, patient passively externally rotates affected shoulder to maximal ER then releases support |
| **Rotator cuff - Subscapularis** | |
| Lift off sign | Patient attempts to lift hand away from his/her back |
| Belly press | Patient presses hands to abdomen while elbows push forward |

| | |
|---|---|
| **Impingement** | |
| Hawkins Kennedy | Patient flexes shoulder, supports elbow and passively internally rotates shoulder with contralateral arm |
| Neers sign | Patient forward flexes shoulder with hand pronated |
| **Adhesive Capsulitis** | |
| ER affected to contralateral limitation | Patient holds stick horizontally and opposite arm assists to externally rotate |
| **Other Tests** | |
| SLAPrehension Test (Labral Tears) | Patient horizontally adducts arm with IR and elbow extension<br>Patient repeats with arm in ER<br>Add resistance to flexion with other hand<br>Test is positive if pain is greater while in IR than ER |
| Jobe's (Supraspinatus weakness) | Arm at 90 degrees, internally rotated, 30 degrees forward<br>Resisted force in this position |
| Bear Hug test (Subscapularis weakness) | Palm placed on contralateral deltoid |
| Increase passive ER (Subscapularis tear) | Use a stick to assist with ER and compare to contralateral side. |
| Active apprehension test (Anterior-inferior GHJ instability) | 90 degrees abduction, patient actively ER as far as can go<br>Compare to unaffected side, looking for compensation, report of pain/apprehension |
| Teres minor strength | Evaluate the ER strength with the arm at 90 degrees of abduction |
| Hornblower sign (Teres minor strength) | Patient must hold his arm placed in 90 degrees of abduction and 90 degree of ER.<br>(Positive test if the patient is unable of holding the position and the arm falls in IR) |
| O'Brien's test (SLAP injuries) | Elbow extended, shoulder in 90deg of flexion and 15 degrees of ADDuction, forearm in pronation<br>Resisted strength in the position<br>Repeat with the forearm in supination<br>(Positive if pain occurs with the forearm in pronation but not in supination) |
| Biceps tests | Pain with palpation in the LPB groove |

# Chapter 4: Foot and Ankle Assessment

## Clinical Conditions

There are a number of different clinical conditions that affect the MSK functioning of the foot and ankle that will influence the reasons for the assessment and the recommendations.

| Pathology | Symptoms | Notes |
|---|---|---|
| Soft tissue injury | Acute or chronic pain and/or swelling | Assessments should confirm patients is following recovery protocols and identify need for additional intervention for full resolution |
| Fracture | Acute or chronic pain and/or swelling | Assessments should confirm patients is following recovery protocols and identify need for additional intervention for full resolution |
| Medical e.g. diabetic and vascular | Acute and chronic wounds, pain and swelling | • Assessment confirms the response to the management of the chronic condition and recommends adjustments in treatment<br>• Assessment often requires assistance from a health care provider with the patient to bandage wounds etc. |
| Deformity | Acute or chronic pain and/or swelling | Assessment should address the management or resolution of symptoms of the deformity which might include the resolution of the deformity |

## ROM

- This section provides some ideas on how to complete a ROM assessment. Each position can be modified to meet the needs and abilities of the patient
- Due to the number of joints within the foot and ankle there is limited ability to assess ROM in many of the individual joints virtually.
- Passive range can be assessed by the patient by placing the foot over the other knee and applying over pressures with their hands. This will provide general information on functional range and can be used to obtain information on a number of specific joint movements if clear verbal description of where to hold the foot, ankle and toes is provided (e.g. first Metatarsal)
- The movements can be tested in lying, sitting or standing however sitting allows for over pressure to be performed by the patient
- Documentation on how the ROM was measured will facilitate comparison on a future re assessment(s)

| Active Movement | Lying/Sitting | Standing |
|---|---|---|
| Ankle/ foot | Dorsi flexion<br>Plantar flexion<br>Inversion<br>Eversion<br>General – large circle leading with the toes | Doris flexion<br>- Squat<br>- Touch wall with knee and measure toes distance from wall |
| Toes | Point toes - Flexion<br>Pull toes up - Extension<br>Pick up a pencil off the floor<br>Passive for toes – push up toes | |

## Strength

An assessment of the muscles in the lower extremity may be required which is referenced in the Chapter 1: Hip and Knee Assessment.

| Muscle | Grading | | | |
|---|---|---|---|---|
| | 0 – 3 V | | | 4/5 V using Functional tests |
| | Lying | Sitting | Standing | Functional test |
| **Dorsi flexion** | Pull toes up towards knee | | | Walking on heels<br>Standing and double and single leg push ups |
| **Invertors** | Draw a circle with the toes | | | No test |
| **Evertors** | | | | |
| **Gastrocnemius** | Extend knee and plantar flex ankle | Weight on one leg and push up on toes | Stand on both legs and push up onto toes (ensure weight bearing is symmetrical)<br>Grade 3 standing on one foot (full ROM, 1 rep) | Stand on one leg and push up on toes, hold stable support for balance |

## Lower Extremity and Spine Assessment

Problems with the foot and ankle can result from clinical conditions in the lower extremity and lumbar spine. As such some patients will need to undergo a scan, or a full assessment, of their lower extremity (Chapter 1: Hip and Knee Assessment) or their low back (Chapter 2: Low back, Thoracic and Cervical Spine Assessment.)

## Neurological Assessment

**Dermatomes**
A sensory assessment can be completed for acute injury to the foot and ankle by touching one side then the other. Consideration needs to be given to patients with chronic conditions such as diabetes.

**Peripheral nerve**

Tinel's sign:

Posterior tibial nerve: tap over the tarsal tunnel
Deep Perineal nerve: tap over the anterior of the ankle

## Vascular Assessment

Capillary refill can be completed however its usefulness is limited by the quality of the video which may not accurately reflect the colour due to picture quality. General vascular condition can be determined by skin texture, hair growth and subjective information. If additional information is required an in-person assessment will be required.

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